D2Q5 ADE,
a supplementary material for
Lattice Boltzmann Method Analysis Tool (LBMAT)

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Contents

1 Global definitions

In $\mathbb{R}^2$, the position and velocity vectors are given by $\boldsymbol{x} = (x_1, x_2)^T$ and $\boldsymbol{v} = (v_1, v_2)^T$, respectively.
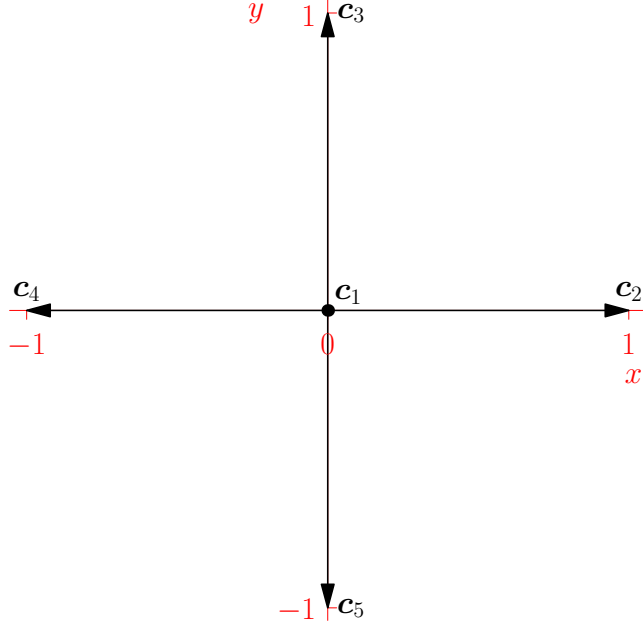
1.1 Discrete velocity vectors

Discrete velocity vectors and the lattice speed of sound are defined by

$$\{\boldsymbol{c}_i\}_{i=1}^5 = \left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \end{pmatrix}, \begin{pmatrix} -1 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ -1 \end{pmatrix} \right),$$

$$c_s = \frac{1}{\sqrt{3}},$$

respectively [1].

1.2 Raw and central moments

The raw and central moments are defined by

$$m_{\boldsymbol{\alpha}} := \sum_{i=1}^5 f_i \boldsymbol{c}_i^{\boldsymbol{\alpha}},$$

and

$$k_{\boldsymbol{\alpha}} := \sum_{i=1}^5 f_i (\boldsymbol{c}_i - \boldsymbol{v})^{\boldsymbol{\alpha}},$$

respectively, where $\boldsymbol{\alpha} = (\alpha_1, \alpha_2) \in \mathbb{Z}^2$ denotes a multi-index (as a row vector) and $\boldsymbol{c}_i^{\boldsymbol{\alpha}} := \prod_{j=1}^2 [\boldsymbol{c}_i]_j^{\alpha_j}$.

1.3 Transformation matrix M

Matrix $\mathbf{M}$, that defines macroscopic quantities (moments) $\boldsymbol{\mu}$ by

$$\boldsymbol{\mu} = \mathbf{M} \boldsymbol{f},$$

with $\boldsymbol{f} = (f_1, f_2, \ldots, f_5)^T$, is selected such that

$$\boldsymbol{\mu} = \Big(m_{(0,0)}, m_{(1,0)}, m_{(0,1)}, m_{(2,0)}, m_{(0,2)} \Big)^T,$$

i.e., $\mathbf{M}$ is given by

$$\mathbf{M} = \begin{pmatrix} 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 0 & -1 & 0 \\ 0 & 0 & 1 & 0 & -1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 \end{pmatrix}.$$

1.4 Equilibrium

The corresponding equilibrium raw moments are defined using the continuous Maxwell–Boltzmann distribution function [1]

$$f^{(eq)}(\boldsymbol{\xi}) = \frac{\rho}{2\pi c_s^2} \exp\left(-\frac{||\boldsymbol{\xi} - \boldsymbol{v}||^2}{2c_s^2} \right)$$

as

$$m_{\boldsymbol{\alpha}}^{(eq)} = \int\limits_{\mathbb{R}^2} \boldsymbol{\xi}^{\boldsymbol{\alpha}} f^{(eq)}(\boldsymbol{\xi}) \mathrm{d}\boldsymbol{\xi},$$

where $\alpha_i \in \{0, 1, 2\}$, $i = 1, 2$. Hence, the equilibrium moments $\boldsymbol{\mu}^{(eq)}$ satisfy

$$\boldsymbol{\mu}^{(eq)} = \Big(\rho, \rho v_1, \rho v_2, \rho(v_1^2 + c_s^2), \rho(v_2^2 + c_s^2), \Big)^T.$$

2 Spatial EPDEs

2.1 SRT

2.1.1 Definitions

Collision operator $\boldsymbol{C}$:

$$\boldsymbol{C}(\boldsymbol{f}) = \omega \left(\mathbf{M}^{-1} \boldsymbol{\mu}^{(eq)} - \boldsymbol{f} \right),$$

$\omega \in (0, 2)$.

2.1.2 Conservation of mass equation

📎 attached text file: `output_d2q5_ade_srt_symbolic_pde_00.txt`

$\frac{\partial \rho}{\partial t} + \frac{\delta_l v_1}{\delta_t} \frac{\partial \rho}{\partial x_1} + \frac{\rho \delta_l}{\delta_t} \frac{\partial v_1}{\partial x_1} + \frac{v_2 \delta_l}{\delta_t} \frac{\partial \rho}{\partial x_2} + \frac{\rho \delta_l}{\delta_t} \frac{\partial v_2}{\partial x_2} + (-2 + \omega) \frac{\delta_l}{2\omega} \frac{\partial \rho}{\partial x_1} \frac{\partial v_1}{\partial t} + (-2 + \omega) \frac{\delta_l^2 v_1}{2\omega \delta_t} \frac{\partial \rho}{\partial x_1} \frac{\partial v_1}{\partial x_1} +$

$(-2 + \omega) \frac{\rho \delta_l^2}{2\omega \delta_t} \left(\frac{\partial v_1}{\partial x_1} \right)^2 + (2 - \omega) \frac{v_2 \delta_l^2}{\omega \delta_t} \frac{\partial \rho}{\partial x_1} \frac{\partial v_1}{\partial x_2} + (2 - \omega) \frac{\delta_l^2 v_1}{\omega \delta_t} \frac{\partial \rho}{\partial x_1} \frac{\partial v_2}{\partial x_2} + (2 - \omega) \frac{\rho \delta_l^2}{\omega \delta_t} \frac{\partial v_1}{\partial x_1} \frac{\partial v_2}{\partial x_2} + (-2 + \omega) \frac{\delta_l}{2\omega} \frac{\partial \rho}{\partial x_2} \frac{\partial v_2}{\partial t} +$

$(2 - \omega) \frac{v_2 \delta_l^2}{\omega \delta_t} \frac{\partial \rho}{\partial x_2} \frac{\partial v_1}{\partial x_1} + (2 - \omega) \frac{\delta_l^2 v_1}{2\omega \delta_t} \frac{\partial \rho}{\partial x_2} \frac{\partial v_2}{\partial x_1} + (-2 + \omega) \frac{v_2 \delta_l^2}{2\omega \delta_t} \frac{\partial \rho}{\partial x_2} \frac{\partial v_2}{\partial x_2} + (-2 + \omega) \frac{\rho \delta_l^2}{2\omega \delta_t} \left(\frac{\partial v_2}{\partial x_2} \right)^2 + (-2 + \omega) \frac{\rho \delta_l}{2\omega} \frac{\partial^2 v_1}{\partial t \partial x_1} +$

$(-2 + \omega) \frac{c s^2 \delta_l^2}{2\omega \delta_t} \frac{\partial^2 \rho}{\partial x_1^2} + (-2 + \omega) \frac{\rho \delta_l^2 v_1}{2\omega \delta_t} \frac{\partial^2 v_1}{\partial x_1^2} + (-2 + \omega) \frac{\rho \delta_l}{2\omega} \frac{\partial^2 v_2}{\partial t \partial x_2} + (2 - \omega) \frac{v_2 \delta_l^2 v_1}{\omega \delta_t} \frac{\partial^2 \rho}{\partial x_1 \partial x_2} + (2 - \omega) \frac{\rho v_2 \delta_l^2}{2\omega \delta_t} \frac{\partial^2 v_1}{\partial x_1 \partial x_2} +$

$(2 - \omega) \frac{\rho \delta_l^2 v_1}{2\omega \delta_t} \frac{\partial^2 v_2}{\partial x_1 \partial x_2} + (-2 + \omega) \frac{c s^2 \delta_l^2}{2\omega \delta_t} \frac{\partial^2 \rho}{\partial x_2^2} + (-2 + \omega) \frac{\rho v_2 \delta_l^2}{2\omega \delta_t} \frac{\partial^2 v_2}{\partial x_2^2} + (12 - 12\omega + \omega^2) \frac{\rho \delta_l \delta_t}{12\omega^2} \frac{\partial^3 v_1}{\partial t^2 \partial x_1} +$

$$(12 - 12\omega + \omega^2)\frac{\rho\delta_l^2 v_1}{6\omega^2}\frac{\partial^3 v_1}{\partial t \partial x_1^2} + (6 - \omega^2 v_1^2 - 18cs^2 - 6\omega - 6v_1^2 + 18cs^2\omega - 3cs^2\omega^2 + \omega^2 + 6\omega v_1^2)\frac{\delta_l^3 v_1}{6\omega^2\delta_t}\frac{\partial^3\rho}{\partial x_1^3} +$$

$$(12 - 5\omega^2 v_1^2 - 24cs^2 - 12\omega - 24v_1^2 + 24cs^2\omega - 3cs^2\omega^2 + 2\omega^2 + 24\omega v_1^2)\frac{\rho\delta_l^3}{12\omega^2\delta_t}\frac{\partial^3 v_1}{\partial x_1^3} + (12 - 12\omega + \omega^2)\frac{\rho\delta_l\delta_t}{12\omega^2}\frac{\partial^3 v_2}{\partial t^2 \partial x_2} +$$

$$(-6 + 6\omega - \omega^2)\frac{\rho v_2\delta_l^2}{3\omega^2}\frac{\partial^3 v_1}{\partial t \partial x_1 \partial x_2} + (-6 + 6\omega - \omega^2)\frac{\rho\delta_l^2 v_1}{3\omega^2}\frac{\partial^3 v_2}{\partial t \partial x_1 \partial x_2} +$$

$$(\omega^2 v_1^2 - 6cs^2 + 6v_1^2 + 6cs^2\omega - cs^2\omega^2 - 6\omega v_1^2)\frac{v_2\delta_l^3}{2\omega^2\delta_t}\frac{\partial^3\rho}{\partial x_1^2 \partial x_2} + (12 - 12\omega + \omega^2)\frac{\rho v_2\delta_l^3 v_1}{6\omega^2\delta_t}\frac{\partial^3 v_1}{\partial x_1^2 \partial x_2} +$$

$$(\omega^2 v_1^2 - 24cs^2 + 24cs^2\omega - 3cs^2\omega^2)\frac{\rho\delta_l^3}{12\omega^2\delta_t}\frac{\partial^3 v_2}{\partial x_1^2 \partial x_2} + (12 - 12\omega + \omega^2)\frac{\rho v_2\delta_l^2}{6\omega^2}\frac{\partial^3 v_2}{\partial t \partial x_2^2} +$$

$$(-6cs^2 + \omega^2 v_2^2 + 6v_2^2 + 6cs^2\omega - 6\omega v_2^2 - cs^2\omega^2)\frac{\delta_l^3 v_1}{2\omega^2\delta_t}\frac{\partial^3\rho}{\partial x_1 \partial x_2^2} + (-24cs^2 + \omega^2 v_2^2 + 24cs^2\omega - 3cs^2\omega^2)\frac{\rho\delta_l^3}{12\omega^2\delta_t}\frac{\partial^3 v_1}{\partial x_1 \partial x_2^2} +$$

$$(12 - 12\omega + \omega^2)\frac{\rho v_2\delta_l^3 v_1}{6\omega^2\delta_t}\frac{\partial^3 v_2}{\partial x_1 \partial x_2^2} + (6 - 18cs^2 - \omega^2 v_2^2 - 6\omega - 6v_2^2 + 18cs^2\omega + 6\omega v_2^2 - 3cs^2\omega^2 + \omega^2)\frac{v_2\delta_l^3}{6\omega^2\delta_t}\frac{\partial^3\rho}{\partial x_2^3} +$$

$$(12 - 24cs^2 - 5\omega^2 v_2^2 - 12\omega - 24v_2^2 + 24cs^2\omega + 24\omega v_2^2 - 3cs^2\omega^2 + 2\omega^2)\frac{\rho\delta_l^3}{12\omega^2\delta_t}\frac{\partial^3 v_2}{\partial x_2^3} + (-2 + 3\omega - \omega^2)\frac{\rho\delta_l\delta_t^2}{2\omega^3}\frac{\partial^4 v_1}{\partial t^3 \partial x_1} +$$

$$(-2 + 3\omega - \omega^2)\frac{3\rho\delta_l^2 v_1\delta_t}{2\omega^3}\frac{\partial^4 v_1}{\partial t^2 \partial x_1^2} + C_1\frac{\rho\delta_l^3}{12\omega^3}\frac{\partial^4 v_1}{\partial t \partial x_1^3} + C_2\frac{\delta_l^4}{24\omega^3\delta_t}\frac{\partial^4\rho}{\partial x_1^4} + C_3\frac{\rho\delta_l^4 v_1}{12\omega^3\delta_t}\frac{\partial^4 v_1}{\partial x_1^4} + (-2 + 3\omega - \omega^2)\frac{\rho\delta_l\delta_t^2}{2\omega^3}\frac{\partial^4 v_2}{\partial t^3 \partial x_2} +$$

$$(36 - 54\omega + 20\omega^2 - \omega^3)\frac{\rho v_2\delta_l^2\delta_t}{12\omega^3}\frac{\partial^4 v_1}{\partial t^2 \partial x_1 \partial x_2} + (36 - 54\omega + 20\omega^2 - \omega^3)\frac{\rho\delta_l^2 v_1\delta_t}{12\omega^3}\frac{\partial^4 v_2}{\partial t^2 \partial x_1 \partial x_2} +$$

$$(-24 + 36\omega - 14\omega^2 + \omega^3)\frac{\rho v_2\delta_l^3 v_1}{6\omega^3}\frac{\partial^4 v_1}{\partial t \partial x_1^2 \partial x_2} + (-2\omega^2 v_1^2 + 60cs^2 + \omega^3 v_1^2 - 90cs^2\omega + 34cs^2\omega^2 - 2cs^2\omega^3)\frac{\rho\delta_l^3}{12\omega^3}\frac{\partial^4 v_2}{\partial t \partial x_1^2 \partial x_2}$$

$$+ (24 - 120cs^2 - 36\omega + 180cs^2\omega - 72cs^2\omega^2 + 14\omega^2 + 6cs^2\omega^3 - \omega^3)\frac{v_2\delta_l^4 v_1}{6\omega^3\delta_t}\frac{\partial^4\rho}{\partial x_1^3 \partial x_2} + C_4\frac{\rho v_2\delta_l^4}{12\omega^3\delta_t}\frac{\partial^4 v_1}{\partial x_1^3 \partial x_2} +$$

$$C_5\frac{\rho\delta_l^4 v_1}{12\omega^3\delta_t}\frac{\partial^4 v_2}{\partial x_1^3 \partial x_2} + (-2 + 3\omega - \omega^2)\frac{3\rho v_2\delta_l^2\delta_t}{2\omega^3}\frac{\partial^4 v_2}{\partial t^2 \partial x_2^2} +$$

$$(60cs^2 - 2\omega^2 v_2^2 + \omega^3 v_2^2 - 90cs^2\omega + 34cs^2\omega^2 - 2cs^2\omega^3)\frac{\rho\delta_l^3}{12\omega^3}\frac{\partial^4 v_1}{\partial t \partial x_1 \partial x_2^2} + (-24 + 36\omega - 14\omega^2 + \omega^3)\frac{\rho v_2\delta_l^3 v_1}{6\omega^3}\frac{\partial^4 v_2}{\partial t \partial x_1 \partial x_2^2}$$

$$+ C_6\frac{\delta_l^4}{4\omega^3\delta_t}\frac{\partial^4\rho}{\partial x_1^2 \partial x_2^2} + (-48cs^2 + 50\omega^2 v_2^2 - 4\omega^3 v_2^2 + 84v_2^2 + 72cs^2\omega - 126\omega v_2^2 - 26cs^2\omega^2 + cs^2\omega^3)\frac{\rho\delta_l^4 v_1}{12\omega^3\delta_t}\frac{\partial^4 v_1}{\partial x_1^2 \partial x_2^2} +$$

$$(50\omega^2 v_1^2 - 48cs^2 - 4\omega^3 v_1^2 + 84v_1^2 + 72cs^2\omega - 26cs^2\omega^2 + cs^2\omega^3 - 126\omega v_1^2)\frac{\rho v_2\delta_l^4}{12\omega^3\delta_t}\frac{\partial^4 v_2}{\partial x_1^2 \partial x_2^2} + C_7\frac{\rho\delta_l^3}{12\omega^3}\frac{\partial^4 v_2}{\partial t \partial x_2^3} +$$

$$(24 - 120cs^2 - 36\omega + 180cs^2\omega - 72cs^2\omega^2 + 14\omega^2 + 6cs^2\omega^3 - \omega^3)\frac{v_2\delta_l^4 v_1}{6\omega^3\delta_t}\frac{\partial^4\rho}{\partial x_1 \partial x_2^3} + C_8\frac{\rho v_2\delta_l^4}{12\omega^3\delta_t}\frac{\partial^4 v_1}{\partial x_1 \partial x_2^3} +$$

$$C_9\frac{\rho\delta_l^4 v_1}{12\omega^3\delta_t}\frac{\partial^4 v_2}{\partial x_1 \partial x_2^3} + C_{10}\frac{\delta_l^4}{24\omega^3\delta_t}\frac{\partial^4\rho}{\partial x_2^4} + C_{11}\frac{\rho v_2\delta_l^4}{12\omega^3\delta_t}\frac{\partial^4 v_2}{\partial x_2^4} = 0,$$

where:

$C_1 = -36 + 42\omega^2 v_1^2 + 60cs^2 + 54\omega - 3\omega^3 v_1^2 + 72v_1^2 - 90cs^2\omega + 34cs^2\omega^2 - 20\omega^2 - 2cs^2\omega^3 - 108\omega v_1^2 + \omega^3$

$C_2 = 42\omega^2 v_1^2 - 24cs^2 - 72cs^4\omega + 108\omega v_1^4 - 84cs^2\omega^2 v_1^2 - 3cs^4\omega^3 - 3\omega^3 v_1^2 + 6cs^2\omega^3 v_1^2 - 72v_1^4 + 30cs^4\omega^2 + 3\omega^3 v_1^4 - 144cs^2 v_1^2 + 72v_1^2 + 36cs^2\omega - 14cs^2\omega^2 - 42\omega^2 v_1^4 + 48cs^4 + 216cs^2\omega v_1^2 + cs^2\omega^3 - 108\omega v_1^2$

$C_3 = 24 - 22\omega^2 v_1^2 - 48cs^2 - 36\omega + 2\omega^3 v_1^2 - 36v_1^2 + 72cs^2\omega - 26cs^2\omega^2 + 14\omega^2 + cs^2\omega^3 + 54\omega v_1^2 - \omega^3$

$C_4 = 12 - 12\omega^2 v_1^2 - 96cs^2 - 18\omega + 3\omega^3 v_1^2 - 12v_1^2 + 144cs^2\omega - 56cs^2\omega^2 + 8\omega^2 + 4cs^2\omega^3 + 18\omega v_1^2 - \omega^3$

$C_5 = 36 - 20\omega^2 v_1^2 - 96cs^2 - 54\omega + \omega^3 v_1^2 - 36v_1^2 + 144cs^2\omega - 56cs^2\omega^2 + 20\omega^2 + 4cs^2\omega^3 + 54\omega v_1^2 - \omega^3$

$C_6 = -14cs^2\omega^2 v_2^2 - 24cs^4\omega - 84\omega v_2^2 v_1^2 - 14cs^2\omega^2 v_1^2 - cs^4\omega^3 + cs^2\omega^3 v_2^2 - 3\omega^3 v_2^2 v_1^2 + cs^2\omega^3 v_1^2 + 10cs^4\omega^2 - 24cs^2 v_2^2 + 56v_2^2 v_1^2 - 24cs^2 v_1^2 + 16cs^4 + 36cs^2\omega v_1^2 + 34\omega^2 v_2^2 v_1^2 + 36cs^2\omega v_2^2$

$C_7 = -36 + 60cs^2 + 42\omega^2 v_2^2 + 54\omega - 3\omega^3 v_2^2 + 72v_2^2 - 90cs^2\omega - 108\omega v_2^2 + 34cs^2\omega^2 - 20\omega^2 - 2cs^2\omega^3 + \omega^3$

$C_8 = 36 - 96cs^2 - 20\omega^2 v_2^2 - 54\omega + \omega^3 v_2^2 - 36v_2^2 + 144cs^2\omega + 54\omega v_2^2 - 56cs^2\omega^2 + 20\omega^2 + 4cs^2\omega^3 - \omega^3$

$C_9 = 12 - 96cs^2 - 12\omega^2 v_2^2 - 18\omega + 3\omega^3 v_2^2 - 12v_2^2 + 144cs^2\omega + 18\omega v_2^2 - 56cs^2\omega^2 + 8\omega^2 + 4cs^2\omega^3 - \omega^3$

$C_{10} = -24cs^2 + 108\omega v_2^4 - 84cs^2\omega^2 v_2^2 - 72cs^4\omega + 42\omega^2 v_2^2 - 3cs^4\omega^3 + 6cs^2\omega^3 v_2^2 - 72v_2^4 + 30cs^4\omega^2 - 3\omega^3 v_2^2 - 144cs^2 v_2^2 + 72v_2^2 + 3\omega^3 v_2^4 + 36cs^2\omega - 108\omega v_2^2 - 14cs^2\omega^2 + 48cs^4 + cs^2\omega^3 - 42\omega^2 v_2^4 + 216cs^2\omega v_2^2$

$C_{11} = 24 - 48cs^2 - 22\omega^2 v_2^2 - 36\omega + 2\omega^3 v_2^2 - 36v_2^2 + 72cs^2\omega + 54\omega v_2^2 - 26cs^2\omega^2 + 14\omega^2 + cs^2\omega^3 - \omega^3$

2.2 MRT1

2.2.1 Definitions

Collision operator $\boldsymbol{C}$:

$$\boldsymbol{C}\left(\boldsymbol{f}\right) = \mathbf{M}^{-1}\mathbf{S}\left(\boldsymbol{\mu}^{(eq)} - \mathbf{M}\boldsymbol{f}\right),$$

where

$$\mathbf{S} = \mathrm{diag}(\omega_1, \omega_2, \omega_3, \omega_4, \omega_5),$$

$\omega_1, \omega_2, \ldots, \omega_5 \in (0, 2)$.

2.2.2 Conservation of mass equation

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$\frac{\partial \rho}{\partial t} + \frac{v_1 \delta_l}{\delta_t}\frac{\partial \rho}{\partial x_1} + \frac{\rho \delta_l}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{v_2 \delta_l}{\delta_t}\frac{\partial \rho}{\partial x_2} + \frac{\rho \delta_l}{\delta_t}\frac{\partial v_2}{\partial x_2} + (-2 + \omega_2)\frac{\delta_l}{2\omega_2}\frac{\partial \rho}{\partial x_1}\frac{\partial v_1}{\partial t} + (-2 + \omega_2)\frac{v_1 \delta_l^2}{2\delta_t \omega_2}\frac{\partial \rho}{\partial x_1}\frac{\partial v_1}{\partial x_1} +$

$(-2 + \omega_2)\frac{\rho \delta_l^2}{2\delta_t \omega_2}\left(\frac{\partial v_1}{\partial x_1}\right)^2 + (2 - \omega_3)\frac{v_2 \delta_l^2}{2\omega_3 \delta_t}\frac{\partial \rho}{\partial x_1}\frac{\partial v_1}{\partial x_2} + (\omega_3 - \omega_3 \omega_2 + \omega_2)\frac{v_1 \delta_l^2}{\omega_3 \delta_t \omega_2}\frac{\partial \rho}{\partial x_1}\frac{\partial v_2}{\partial x_2} +$

$(\omega_3 - \omega_3 \omega_2 + \omega_2)\frac{\rho \delta_l^2}{\omega_3 \delta_t \omega_2}\frac{\partial v_1}{\partial x_1}\frac{\partial v_2}{\partial x_2} + (-2 + \omega_3)\frac{\delta_l}{2\omega_3}\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial t} + (\omega_3 - \omega_3 \omega_2 + \omega_2)\frac{v_2 \delta_l^2}{\omega_3 \delta_t \omega_2}\frac{\partial \rho}{\partial x_2}\frac{\partial v_1}{\partial x_1} + (2 - \omega_2)\frac{v_1 \delta_l^2}{2\delta_t \omega_2}\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial x_1}$

$+ (-2 + \omega_3)\frac{v_2 \delta_l^2}{2\omega_3 \delta_t}\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial x_2} + (-2 + \omega_3)\frac{\rho \delta_l^2}{2\omega_3 \delta_t}\left(\frac{\partial v_2}{\partial x_2}\right)^2 + (-2 + \omega_2)\frac{\rho \delta_l}{2\omega_2}\frac{\partial^2 v_1}{\partial t \partial x_1} + (-2 + \omega_2)\frac{cs^2 \delta_l^2}{2\delta_t \omega_2}\frac{\partial^2 \rho}{\partial x_1^2} +$

$(-2 + \omega_2)\frac{v_1 \rho \delta_l^2}{2\delta_t \omega_2}\frac{\partial^2 v_1}{\partial x_1^2} + (-2 + \omega_3)\frac{\rho \delta_l}{2\omega_3}\frac{\partial^2 v_2}{\partial t \partial x_2} + (\omega_3 - \omega_3 \omega_2 + \omega_2)\frac{v_2 v_1 \delta_l^2}{\omega_3 \delta_t \omega_2}\frac{\partial^2 \rho}{\partial x_1 \partial x_2} + (2 - \omega_3)\frac{v_2 \rho \delta_l^2}{2\omega_3 \delta_t}\frac{\partial^2 v_1}{\partial x_1 \partial x_2} +$

$(2 - \omega_2)\frac{v_1 \rho \delta_l^2}{2\delta_t \omega_2}\frac{\partial^2 v_2}{\partial x_1 \partial x_2} + (-2 + \omega_3)\frac{cs^2 \delta_l^2}{2\omega_3 \delta_t}\frac{\partial^2 \rho}{\partial x_2^2} + (-2 + \omega_3)\frac{v_2 \rho \delta_l^2}{2\omega_3 \delta_t}\frac{\partial^2 v_2}{\partial x_2^2} + (12 + \omega_2^2 - 12\omega_2)\frac{\delta_t \rho \delta_l}{12\omega_2^2}\frac{\partial^3 v_1}{\partial t^2 \partial x_1} +$

$(12 - 6\omega_4 + \omega_4 \omega_2 - 6\omega_2)\frac{v_1 \rho \delta_l^2}{6\omega_4 \omega_2}\frac{\partial^3 v_1}{\partial t \partial x_1^2} + C_1 \frac{v_1 \delta_l^3}{6\delta_t \omega_4 \omega_2^2}\frac{\partial^3 \rho}{\partial x_1^3} + C_2 \frac{\rho \delta_l^3}{12\delta_t \omega_4 \omega_2^2}\frac{\partial^3 v_1}{\partial x_1^3} + (12 + \omega_3^2 - 12\omega_3)\frac{\delta_t \rho \delta_l}{12\omega_3^2}\frac{\partial^3 v_2}{\partial t^2 \partial x_2} +$

$(3\omega_3^2 - 6\omega_3 + 9\omega_3 \omega_2 - 2\omega_3^2 \omega_2 - 6\omega_2)\frac{v_2 \rho \delta_l^2}{6\omega_3^2 \omega_2}\frac{\partial^3 v_1}{\partial t \partial x_1 \partial x_2} + (-2\omega_3 \omega_2^2 - 6\omega_3 + 9\omega_3 \omega_2 + 3\omega_2^2 - 6\omega_2)\frac{v_1 \rho \delta_l^2}{6\omega_3 \omega_2^2}\frac{\partial^3 v_2}{\partial t \partial x_1 \partial x_2} +$

$C_3 \frac{v_2 \delta_l^3}{2\omega_3^2 \delta_t \omega_4 \omega_2^2}\frac{\partial^3 \rho}{\partial x_1^2 \partial x_2} + (-6\omega_3 \omega_2^2 + 6\omega_3^2 + 6\omega_2^2 - 6\omega_3^2 \omega_2 + \omega_3^2 \omega_2^2)\frac{v_2 v_1 \rho \delta_l^3}{6\omega_3^2 \delta_t \omega_2^2}\frac{\partial^3 v_1}{\partial x_1^2 \partial x_2} + (-6v_1^2 \omega_4 \omega_2 - 3\omega_4 cs^2 \omega_2^2 -$

$12v_1^2 \omega_2 + 12v_1^2 \omega_4 + 6v_1^2 \omega_2^2 + 18\omega_4 cs^2 \omega_2 - 12\omega_4 cs^2 + v_1^2 \omega_4 \omega_2^2 + 6cs^2 \omega_2^2 - 12cs^2 \omega_2)\frac{\rho \delta_l^3}{12\delta_t \omega_4 \omega_2^2}\frac{\partial^3 v_2}{\partial x_1^2 \partial x_2} +$

$(12 - 6\omega_3 + \omega_3 \omega_5 - 6\omega_5)\frac{v_2 \rho \delta_l^2}{6\omega_3 \omega_5}\frac{\partial^3 v_2}{\partial t \partial x_2^2} + C_4 \frac{v_1 \delta_l^3}{2\omega_3^2 \delta_t \omega_5 \omega_2^2}\frac{\partial^3 \rho}{\partial x_1 \partial x_2^2} +$

$(6\omega_3^2 v_2^2 - 12cs^2 \omega_5 + 18\omega_3 cs^2 \omega_5 + \omega_3^2 v_2^2 \omega_5 + 6\omega_3^2 cs^2 - 6\omega_3 v_2^2 \omega_5 + 12v_2^2 \omega_5 - 12\omega_3 cs^2 - 12\omega_3 v_2^2 - 3\omega_3^2 cs^2 \omega_5)\frac{\rho \delta_l^3}{12\omega_3^2 \delta_t \omega_5}\frac{\partial^3 v_1}{\partial x_1 \partial x_2^2}$

$+ (-6\omega_3 \omega_2^2 + 6\omega_3^2 + 6\omega_2^2 - 6\omega_3^2 \omega_2 + \omega_3^2 \omega_2^2)\frac{v_2 v_1 \rho \delta_l^3}{6\omega_3^2 \delta_t \omega_2^2}\frac{\partial^3 v_2}{\partial x_1 \partial x_2^2} + C_5 \frac{v_2 \delta_l^3}{6\omega_3^2 \delta_t \omega_5}\frac{\partial^3 \rho}{\partial x_2^3} + C_6 \frac{\rho \delta_l^3}{12\omega_3^2 \delta_t \omega_5}\frac{\partial^3 v_2}{\partial x_2^3} +$

$(-2 - \omega_2^2 + 3\omega_2)\frac{\delta_t^2 \rho \delta_l}{2\omega_2^3}\frac{\partial^4 v_1}{\partial t^3 \partial x_1} + (-\omega_4^2 \omega_2^2 - \omega_4^2 \omega_2 - 4\omega_2^2 + 2\omega_2^3 - 4\omega_4 \omega_2 + 8\omega_4 \omega_2^2 - 2\omega_4 \omega_2^3 + 2\omega_4^2)\frac{\delta_t v_1 \rho \delta_l^2}{2\omega_4^2 \omega_2^3}\frac{\partial^4 v_1}{\partial t^2 \partial x_1^2} +$

$C_7 \frac{\rho \delta_l^3}{12\omega_4^2 \omega_2^3}\frac{\partial^4 v_1}{\partial t \partial x_1^3} + C_8 \frac{\delta_l^4}{24\delta_t \omega_4^2 \omega_2^3}\frac{\partial^4 \rho}{\partial x_1^4} + C_9 \frac{v_1 \rho \delta_l^4}{12\delta_t \omega_4^2 \omega_2^3}\frac{\partial^4 v_1}{\partial x_1^4} + (-2 - \omega_3^2 + 3\omega_3)\frac{\delta_t^2 \rho \delta_l}{2\omega_3^3}\frac{\partial^4 v_2}{\partial t^3 \partial x_2} +$

$(-24\omega_3 \omega_2^2 + 12\omega_3^2 - 6\omega_3^3 + 12\omega_3 \omega_2 + 12\omega_2^2 - 24\omega_3^2 \omega_2 - \omega_3^3 \omega_2^2 + 7\omega_3^3 \omega_2 + 13\omega_3^2 \omega_2^2)\frac{v_2 \delta_t \rho \delta_l^2}{12\omega_3^3 \omega_2^2}\frac{\partial^4 v_1}{\partial t^2 \partial x_1 \partial x_2} +$

$(-24\omega_3 \omega_2^2 + 12\omega_3^3 + 7\omega_3 \omega_2^3 + 12\omega_3 \omega_2 + 12\omega_2^2 - 24\omega_3^2 \omega_2 - 6\omega_2^3 - \omega_3^2 \omega_2^3 + 13\omega_3^2 \omega_2^2)\frac{\delta_t v_1 \rho \delta_l^2}{12\omega_3^3 \omega_2^3}\frac{\partial^4 v_2}{\partial t^2 \partial x_1 \partial x_2} +$

$C_{10}\frac{v_2 v_1 \rho \delta_l^3}{6\omega_3^3 \omega_4 \omega_2^3}\frac{\partial^4 v_1}{\partial t \partial x_1^2 \partial x_2} + C_{11}\frac{\rho \delta_l^3}{12\omega_3 \omega_4^2 \omega_2^3}\frac{\partial^4 v_2}{\partial t \partial x_1^2 \partial x_2} + C_{12}\frac{v_2 v_1 \delta_l^4}{6\omega_3^3 \delta_t \omega_4^2 \omega_2^3}\frac{\partial^4 \rho}{\partial x_1^3 \partial x_2} + C_{13}\frac{v_2 \rho \delta_l^4}{12\omega_3^3 \delta_t \omega_4^2 \omega_2^3}\frac{\partial^4 v_1}{\partial x_1^3 \partial x_2} +$

$C_{14}\frac{v_1 \rho \delta_l^4}{12\delta_t \omega_4^2 \omega_2^3}\frac{\partial^4 v_2}{\partial x_1^3 \partial x_2} + (-4\omega_3^2 - 2\omega_3^3 \omega_5 - \omega_3^2 \omega_5^2 + 2\omega_3^3 + 8\omega_3^2 \omega_5 + 2\omega_5^2 - 4\omega_3 \omega_5 - \omega_3 \omega_5^2)\frac{v_2 \delta_t \rho \delta_l^2}{2\omega_3^3 \omega_5^2}\frac{\partial^4 v_2}{\partial t^2 \partial x_2^2} +$

$C_{15}\frac{\rho \delta_l^3}{12\omega_3^3 \omega_5^2 \omega_2}\frac{\partial^4 v_1}{\partial t \partial x_1 \partial x_2^2} + C_{16}\frac{v_2 v_1 \rho \delta_l^3}{6\omega_3^3 \omega_5 \omega_2^3}\frac{\partial^4 v_2}{\partial t \partial x_1 \partial x_2^2} + C_{17}\frac{\delta_l^4}{4\omega_3^3 \omega_4^2 \omega_2^2 \omega_3}\frac{\partial^4 \rho}{\partial x_1^2 \partial x_2^2} + C_{18}\frac{v_1 \rho \delta_l^4}{12\omega_3^3 \delta_t \omega_5^2 \omega_2^3}\frac{\partial^4 v_1}{\partial x_1^2 \partial x_2^2} +$

$C_{19}\frac{v_2 \rho \delta_l^4}{12\omega_3^3 \delta_t \omega_4^2 \omega_2^3}\frac{\partial^4 v_2}{\partial x_1^2 \partial x_2^2} + C_{20}\frac{\rho \delta_l^3}{12\omega_3^3 \omega_5^2}\frac{\partial^4 v_2}{\partial t \partial x_2^3} + C_{21}\frac{v_2 v_1 \delta_l^4}{6\omega_3^3 \delta_t \omega_5^2 \omega_2^3}\frac{\partial^4 \rho}{\partial x_1 \partial x_2^3} + C_{22}\frac{v_2 \rho \delta_l^4}{12\omega_3^3 \delta_t \omega_5 \omega_2^3}\frac{\partial^4 v_1}{\partial x_1 \partial x_2^3} + C_{23}\frac{v_1 \rho \delta_l^4}{12\omega_3^3 \delta_t \omega_5 \omega_2^3}\frac{\partial^4 v_2}{\partial x_1 \partial x_2^3}$

$+ C_{24}\frac{\delta_l^4}{24\omega_3^3 \delta_t \omega_5^2}\frac{\partial^4 \rho}{\partial x_2^4} + C_{25}\frac{v_2 \rho \delta_l^4}{12\omega_3^3 \delta_t \omega_5^2}\frac{\partial^4 v_2}{\partial x_2^4} = 0,$

where:

$$C_1 = 3v_1^2\omega_4\omega_2 - 3\omega_4 cs^2\omega_2^2 - 6v_1^2\omega_2 + 3v_1^2\omega_2^2 + 15\omega_4 cs^2\omega_2 - 12\omega_4 cs^2 - v_1^2\omega_4\omega_2^2 - 3\omega_2^2 - 3\omega_4\omega_2 + 3cs^2\omega_2^2 + \omega_4\omega_2^2 - 6cs^2\omega_2 + 6\omega_2$$

$$C_2 = 18v_1^2\omega_4\omega_2 - 3\omega_4 cs^2\omega_2^2 - 12v_1^2\omega_2 - 12v_1^2\omega_4 + 6v_1^2\omega_2^2 + 18\omega_4 cs^2\omega_2 - 12\omega_4 cs^2 - 5v_1^2\omega_4\omega_2^2 - 6\omega_2^2 - 6\omega_4\omega_2 + 6cs^2\omega_2^2 + 2\omega_4\omega_2^2 - 12cs^2\omega_2 + 12\omega_2$$

$$C_3 = -3\omega_3 v_1^2\omega_4\omega_2^2 - 2\omega_3^2 cs^2\omega_2 - 2\omega_3\omega_4 cs^2\omega_2 + \omega_3\omega_4 cs^2\omega_2^2 + 2\omega_3 v_1^2\omega_4\omega_2 + \omega_3^2 cs^2\omega_2^2 + 2v_1^2\omega_4\omega_2^2 - 2\omega_3^2\omega_4 cs^2 + 4\omega_3^2 v_1^2\omega_4 + \omega_3^2 v_1^2\omega_2^2 + 4\omega_3^2\omega_4 cs^2\omega_2 + \omega_3^2 v_1^2\omega_4\omega_2^2 - 4\omega_3^2 v_1^2\omega_4\omega_2 - 2\omega_3^2 v_1^2\omega_2 - \omega_3^2\omega_4 cs^2\omega_2^2$$

$$C_4 = -3\omega_3 v_2^2\omega_5\omega_2 - \omega_3^2 cs^2\omega_5\omega_2 - 2\omega_3 v_2^2\omega_2^2 + 2\omega_3 v_2^2\omega_5 + \omega_3^2 cs^2\omega_2^2 + \omega_3^2 cs^2\omega_5\omega_2 + \omega_3^2 v_2^2\omega_5\omega_2^2 + 4\omega_3 cs^2\omega_5\omega_2^2 - 2\omega_3 cs^2\omega_2^2 + 2\omega_3 v_2^2\omega_5\omega_2 + 4v_2^2\omega_5\omega_2^2 - 2cs^2\omega_5\omega_2^2 - 4\omega_3 v_2^2\omega_5\omega_2^2 + \omega_3^2 v_2^2\omega_2^2 - 2\omega_3 cs^2\omega_5\omega_2$$

$$C_5 = 3\omega_3^2 v_2^2 - 3\omega_3^2 - 12cs^2\omega_5 + 6\omega_3 + 15\omega_3 cs^2\omega_5 - \omega_3^2 v_2^2\omega_5 + \omega_3^2\omega_5 + 3\omega_3^2 cs^2 + 3\omega_3 v_2^2\omega_5 - 3\omega_3\omega_5 - 6\omega_3 cs^2 - 6\omega_3 v_2^2 - 3\omega_3^2 cs^2\omega_5$$

$$C_6 = 6\omega_3^2 v_2^2 - 6\omega_3^2 - 12cs^2\omega_5 + 12\omega_3 + 18\omega_3 cs^2\omega_5 - 5\omega_3^2 v_2^2\omega_5 + 2\omega_3^2\omega_5 + 6\omega_3^2 cs^2 + 18\omega_3 v_2^2\omega_5 - 12v_2^2\omega_5 - 6\omega_3\omega_5 - 12\omega_3 cs^2 - 12\omega_3 v_2^2 - 3\omega_3^2 cs^2\omega_5$$

$$C_7 = \omega_4^2\omega_2^3 + 48v_1^2\omega_4\omega_2 - 36\omega_4 cs^2\omega_2^2 - 11\omega_4^2\omega_2^2 + 12v_1^2\omega_4^2 + 9\omega_4 cs^2\omega_2^3 + 12v_1^2\omega_2^2 + 15v_1^2\omega_4\omega_2^2 + 12\omega_4^2\omega_2 - 6v_1^2\omega_2^3 + 24\omega_4 cs^2\omega_2 - 60v_1^2\omega_4\omega_2^2 - 12\omega_2^2 - 6cs^2\omega_2^3 + 24\omega_4^2 cs^2 + 27v_1^2\omega_4^2\omega_2^2 + 6\omega_2^3 - 48\omega_4^2 cs^2\omega_2 - 24\omega_4\omega_2 - 3v_1^2\omega_4^2\omega_2^3 + 12cs^2\omega_2^2 + 36\omega_4\omega_2^2 + 25\omega_4^2 cs^2\omega_2^2 - 42v_1^2\omega_4^2\omega_2 - 9\omega_4\omega_2^3 - 2\omega_4^2 cs^2\omega_2^3$$

$$C_8 = -24v_1^2 cs^2\omega_2^2 - 48\omega_4^2 cs^4\omega_2 + 48v_1^2\omega_4\omega_2 - 18v_1^4\omega_4\omega_2^3 + 24\omega_4 cs^2\omega_2^2 - 24v_1^2\omega_4 cs^2\omega_2 + 12v_1^2 cs^2\omega_2^3 - 96v_1^2\omega_4^2 cs^2 - 6\omega_4 cs^2\omega_2^3 + 72v_1^4\omega_4\omega_2^2 - 12v_1^2\omega_4 cs^2\omega_2^3 + 24\omega_4^2 cs^4 + 24v_1^2\omega_2^2 - 48v_1^4\omega_4\omega_2 + 18v_1^2\omega_4\omega_2^3 - 3\omega_4 cs^4\omega_2^3 - 12v_1^2\omega_2^3 - 24\omega_4 cs^2\omega_2 + 48v_1^2\omega_4 cs^2\omega_2^2 + 24\omega_4^2 cs^4\omega_2^2 - 72v_1^2\omega_4\omega_2^2 + 6v_1^2\omega_4^2 cs^2\omega_2^3 + 6\omega_4 cs^4\omega_2^3 + 24v_1^2\omega_4^2\omega_2^2 - 72v_1^4\omega_4 cs^2\omega_2^2 + 12\omega_4^2 cs^2\omega_2 + 24v_1^4\omega_2^2\omega_2 - 3v_1^2\omega_4^2\omega_2^3 - 24\omega_4 cs^4\omega_2^2 + 12v_1^4\omega_2^3 + 24\omega_4 cs^4\omega_2 + 156v_1^2\omega_4^2 cs^2\omega_2 - 8\omega_4^2 cs^2\omega_2^2 - 24v_1^4\omega_2^2\omega_2 - 24v_1^2\omega_4^2\omega_2 - 24v_1^4\omega_2^2 + 3v_1^4\omega_4^2\omega_2^3 + \omega_4^2 cs^2\omega_2^3$$

$$C_9 = -\omega_4^2\omega_2^3 - 12v_1^2\omega_4\omega_2 + 24\omega_4 cs^2\omega_2^2 + 8\omega_4^2\omega_2^2 - 12v_1^2\omega_4^2 - 6\omega_4 cs^2\omega_2^3 - 12v_1^2\omega_2^2 - 6v_1^2\omega_4\omega_2^3 - 6\omega_4^2\omega_2 + 6v_1^2\omega_2^3 - 12\omega_4 cs^2\omega_2 + 24v_1^2\omega_4\omega_2^2 + 12\omega_2^2 + 6cs^2\omega_2^3 - 24\omega_4^2 cs^2 - 16v_1^2\omega_4^2\omega_2^2 - 6\omega_2^3 + 42\omega_4^2 cs^2\omega_2 + 12\omega_4\omega_2 + 2v_1^2\omega_4^2\omega_2^3 - 12cs^2\omega_2^2 - 24\omega_4\omega_2^2 - 20\omega_4^2 cs^2\omega_2^2 + 24v_1^2\omega_4^2\omega_2 + 6\omega_4\omega_2^3 + \omega_4^2 cs^2\omega_2^3$$

$$C_{10} = -7\omega_3^2\omega_4\omega_2^3 + 12\omega_3^2\omega_4\omega_2^2 - 12\omega_3\omega_4\omega_2 - 10\omega_3^3\omega_4\omega_2^2 + 3\omega_3^3\omega_2^2 - 12\omega_3^3\omega_4 + \omega_3^3\omega_4\omega_2^2 - 6\omega_3^2\omega_2^2 + 12\omega_3\omega_4\omega_2^3 - 6\omega_3^2\omega_2^3 + 12\omega_3^3\omega_2^2 + 24\omega_3^3\omega_4\omega_2 - 6\omega_3\omega_4\omega_2^2 - 6\omega_4\omega_2^3$$

$$C_{11} = 9\omega_3 v_1^2\omega_4\omega_2^3 + 12\omega_4 cs^2\omega_2^2 - 24\omega_3 v_1^2\omega_4^2 - 30\omega_3 v_1^2\omega_4\omega_2^2 - 6\omega_4 cs^2\omega_2^3 + 12\omega_3\omega_4 cs^2\omega_2 - 30\omega_3\omega_4 cs^2\omega_2^2 - 6\omega_3 v_1^2\omega_2^3 - 6v_1^2\omega_4\omega_2^3 + 12\omega_3 v_1^2\omega_4\omega_2 + 12\omega_3 v_1^2\omega_2^2 + 9\omega_3\omega_4 cs^2\omega_2^2 + 12v_1^2\omega_4\omega_2^2 + 22\omega_4^2 cs^2\omega_2^2 + 12\omega_3 cs^2\omega_2^2 + 6v_1^2\omega_4^2\omega_2^2 - 2\omega_3\omega_4^2 cs^2\omega_2^3 + 12\omega_4^2 cs^2\omega_2 + 36\omega_3 v_1^2\omega_4\omega_2 - v_1^2\omega_4^2\omega_2^3 + 12\omega_3\omega_4^2 cs^2 - 6\omega_3 cs^2\omega_2^2 - 10\omega_3 v_1^2\omega_4^2\omega_2^2 - 18\omega_4^2 cs^2\omega_2^2 - 12v_1^2\omega_4^2\omega_2 + \omega_3 v_1^2\omega_4^2\omega_2^3 + 3\omega_4^2 cs^2\omega_2^3 - 30\omega_3\omega_4^2 cs^2\omega_2$$

$$C_{12} = -6\omega_3^3\omega_4^2\omega_2 - 3\omega_3^2\omega_4\omega_2^3 + 78\omega_3^3\omega_4^2 cs^2\omega_2 + 42\omega_3^2\omega_4^2 cs^2\omega_2^2 - 12\omega_3^3 v_1^2\omega_2^2 + 6\omega_3^3\omega_4\omega_2^2 + 12\omega_3^3 v_1^2\omega_4\omega_2^2 + 6\omega_3^3 v_1^2\omega_2^3 + 6\omega_3^3 v_1^2\omega_4^2\omega_2^2 - 12\omega_3^2\omega_4^2 cs^2\omega_2^3 - 30\omega_3^3 v_1^2\omega_4\omega_2 + 6\omega_3^3\omega_4^2 cs^2\omega_2^3 - 12\omega_3^2 v_1^2\omega_4^2\omega_2^2 - \omega_3^3\omega_2^3 - 24\omega_3^3\omega_4^2 cs^2\omega_2 + 24\omega_3^3 v_1^2\omega_4^2 + 7\omega_3^3\omega_4^2\omega_2 + 6\omega_3^3 v_1^2\omega_4\omega_2^3 - 48\omega_3^3\omega_4^2 cs^2\omega_2^2 - 12\omega_3\omega_4^2 cs^2\omega_2^2 + 6\omega_3^3 v_1^2\omega_4\omega_2^3 - 21\omega_3^3\omega_4\omega_2^2 - 3\omega_3^3\omega_2^3 - 12\omega_3\omega_4 cs^2\omega_2^3 - 24\omega_3^3 v_1^2\omega_4\omega_2 + 6\omega_3\omega_4^2 cs^2\omega_2^3 + 42\omega_3^3\omega_4 cs^2\omega_2^2 + 6v_1^2\omega_4^2\omega_2^3 + 6\omega_3^2\omega_4\omega_2^2 + 6\omega_3^3\omega_2^2 - 12\omega_3^2 v_1^2\omega_4\omega_2^2 - 36\omega_3^3\omega_4^2 cs^2 + 6\omega_3 v_1^2\omega_4^2\omega_2^3 - 24\omega_3^3\omega_4 cs^2\omega_2 - 3\omega_3^2\omega_4^2\omega_2^2 + 6\omega_3^3 cs^2\omega_2^3 + 42\omega_3^3 v_1^2\omega_4\omega_2^2 - 12\omega_3^2\omega_4 cs^2\omega_2^2 + 12\omega_3^3\omega_4\omega_2 - 12\omega_3^3 cs^2\omega_2^2 + \omega_3^2\omega_4^2\omega_2^3 - 12\omega_3 v_1^2\omega_4^2\omega_2^3 + 6\omega_3^2\omega_4 cs^2\omega_2^3 - 12\omega_3^3 v_1^2\omega_4\omega_2^2$$

$$C_{13} = -6\omega_3^2\omega_4\omega_2^2 + 36\omega_3^3\omega_4^2 cs^2\omega_2 + 48\omega_3^2\omega_4^2 cs^2\omega_2^2 - 12\omega_3^3 v_1^2\omega_2^2 + 3\omega_3^3 v_1^2\omega_4^2\omega_2^3 + 12\omega_3^2\omega_4\omega_2^2 + 6\omega_3^3 v_1^2\omega_2^3 - 12\omega_3^2\omega_4^2 cs^2\omega_2^3 - 30\omega_3^3 v_1^2\omega_4^2\omega_2 + 4\omega_3^3\omega_4^2 cs^2\omega_2^3 + 12\omega_3^2 v_1^2\omega_4^2\omega_2^2 - \omega_3^3\omega_4^2\omega_2^3 - 24\omega_3^3\omega_4^2 cs^2\omega_2 + 24\omega_3^3 v_1^2\omega_4^2 + 3\omega_3^3\omega_4^2\omega_2 - 32\omega_3^3\omega_4^2 cs^2\omega_2 - 12\omega_3\omega_4^2 cs^2\omega_2 + 12\omega_3^3 v_1^2\omega_4\omega_2^3 - 6\omega_3\omega_4\omega_2^2 - 12\omega_3^3\omega_4 cs^2\omega_2^3 - 12\omega_3^3 v_1^2\omega_4\omega_2 + 6\omega_3\omega_4^2 cs^2\omega_2^3 + 36\omega_3^3\omega_4 cs^2\omega_2^2 + 12v_1^2\omega_4^2\omega_2^3 + 3\omega_3^3\omega_4\omega_2^2 - 24\omega_3^2 v_1^2\omega_4\omega_2^2 - 12\omega_3^3\omega_4 cs^2 - 12\omega_3\omega_4 cs^2\omega_2 - 6\omega_3^2\omega_4^2\omega_2^2 + 6\omega_3^3 cs^2\omega_2^3 + 36\omega_3^3 v_1^2\omega_4\omega_2^2 - 24\omega_3\omega_4 cs^2\omega_2^2 - 12\omega_3^3 cs^2\omega_2^2 + 2\omega_3^2\omega_4^2\omega_2^3 - 18\omega_3 v_1^2\omega_4^2\omega_2^3 + 12\omega_3^2\omega_4 cs^2\omega_2^3 - 12\omega_3^3 v_1^2\omega_4\omega_2^3$$

$$C_{14} = -\omega_4^2\omega_2^3 - 36v_1^2\omega_4\omega_2 + 48\omega_4 cs^2\omega_2^2 + 11\omega_4^2\omega_2^2 + 12v_1^2\omega_4^2 - 12\omega_4 cs^2\omega_2^3 - 12v_1^2\omega_2^2 - 12v_1^2\omega_4\omega_2^3 - 12\omega_4^2\omega_2 + 6v_1^2\omega_2^3 - 36\omega_4 cs^2\omega_2 + 48v_1^2\omega_4\omega_2^2 + 12\omega_2^2 + 6cs^2\omega_2^3 - 48\omega_4^2 cs^2 - 8v_1^2\omega_4^2\omega_2^2 - 6\omega_2^3 + 90\omega_4^2 cs^2\omega_2 + 24\omega_4\omega_2 + v_1^2\omega_4^2\omega_2^3 - 12cs^2\omega_2^2 - 36\omega_4\omega_2^2 - 44\omega_4^2 cs^2\omega_2^2 + 9\omega_4\omega_2^3 + 4\omega_4^2 cs^2\omega_2^3$$

$$C_{15} = 9\omega_3^3 cs^2\omega_5\omega_2 - 30\omega_3^2 v_2^2\omega_5\omega_2 - 30\omega_3 cs^2\omega_5^2\omega_2 - 6\omega_3^3 v_2^2\omega_2 - 24v_2^2\omega_5\omega_2 + 12\omega_3 cs^2\omega_2 + 3\omega_3^3 cs^2\omega_5 + 6\omega_3^2 v_2^2\omega_5 + 12\omega_3^2 v_2^2\omega_5 - 6\omega_3^3 cs^2\omega_5 + 12cs^2\omega_5\omega_2 + 12\omega_3 cs^2\omega_5^2 + 9\omega_3^3 v_2^2\omega_5\omega_2 - 30\omega_3 cs^2\omega_5\omega_2 + 36\omega_3 v_2^2\omega_5\omega_2 + 22\omega_3^2 cs^2\omega_5^2\omega_2 - \omega_3^3 v_2^2\omega_5 + \omega_3^3 v_2^2\omega_5\omega_2 - 18\omega_3^2 cs^2\omega_5^2 + 12\omega_3 v_2^2\omega_5\omega_2 - 6\omega_3^3 cs^2\omega_2 + 12\omega_3^2 v_2^2\omega_2 - 10\omega_3^2 v_2^2\omega_5^2\omega_2 - 2\omega_3^3 cs^2\omega_5^2\omega_2 + 12\omega_3^2 cs^2\omega_5 - 6\omega_3^2 v_2^2\omega_5 + 12\omega_3 cs^2\omega_5\omega_2 - 12\omega_3 v_2^2\omega_5^2$$

$$C_{16} = -6\omega_3^3\omega_5 - 6\omega_3^2\omega_5\omega_2 - 10\omega_3^2\omega_5\omega_2^3 + 12\omega_3^2\omega_5\omega_2^2 + 24\omega_3\omega_5\omega_2^3 + 3\omega_3^3\omega_2^2 - 12\omega_3\omega_5\omega_2^2 - 12\omega_5\omega_2^3 + 12\omega_3^3\omega_5\omega_2 - 6\omega_3^3\omega_2^2 - 6\omega_3^2\omega_2^3 - 7\omega_3^3\omega_5\omega_2^2 + 12\omega_3^2\omega_2^2 + \omega_3^3\omega_5\omega_2^3$$

$$C_{17} = 4\omega_3^2\omega_4^2 cs^4\omega_5^2\omega_2^3 + 20\omega_3^3 v_2^2 v_1^2\omega_4^2\omega_5^2\omega_2^2 - 4\omega_3^2 v_1^4\omega_4^2 cs^2\omega_5^2\omega_2^3 + 10\omega_3^3 v_2^2\omega_4 cs^2\omega_5^2\omega_2^2 - 4\omega_3^2 v_2^2\omega_4^2 cs^2\omega_5^2\omega_2^3 - 2\omega_3^2\omega_4 cs^4\omega_5\omega_2^2 + \omega_3^3 v_1^2\omega_4 cs^2\omega_5^2\omega_2^3 - 4\omega_3 v_2^2 v_1^2\omega_4\omega_5\omega_2^3 + 12\omega_3^3 v_1^2\omega_4^2 cs^2\omega_5^2\omega_2^2 + 4\omega_3^2\omega_4 cs^4\omega_5\omega_2^2 - 4v_1^2\omega_4^2 cs^2\omega_5^2\omega_2^2 + 2\omega_3^3 v_2^2 cs^2\omega_5\omega_2^2 - 3\omega_3^2 v_2^2\omega_4 cs^2\omega_5^2\omega_2^3 + 12\omega_3^3 v_2^2\omega_4^2 cs^2\omega_5^2\omega_2^2 - 3\omega_3^2 v_2^2 v_1^2\omega_4\omega_5^2\omega_2^3 - 12\omega_3^2\omega_4^2 cs^4\omega_5\omega_2^2 - 2\omega_3^3 v_1^2\omega_4 cs^2\omega_5^2\omega_2^2 - 2\omega_3\omega_4^2 cs^4\omega_5^2\omega_2^3 - 8\omega_3^2 v_1^2\omega_4^2 cs^2\omega_5^2\omega_2^3 - 4\omega_3^2 v_2^2\omega_4^2 cs^2\omega_5^2 + \omega_3^3\omega_4^2 cs^4\omega_5\omega_2^3 + \omega_3^3\omega_4 cs^4\omega_5^2\omega_2^3 - 8\omega_3 v_2^2\omega_4^2 cs^2\omega_5^2\omega_2^2 + 2\omega_3^3 v_1^2\omega_4^2 cs^2\omega_5\omega_2^2 - 4\omega_3^2 v_1^2\omega_4\omega_2^3 + 2\omega_3^3 v_2^2 v_1^2\omega_4\omega_5\omega_2^3 - 4\omega_3^2 v_2^2\omega_4^2 cs^2\omega_5^2\omega_2 - 4\omega_3^2 v_2^2 v_1^2\omega_4\omega_5\omega_2^3 + 10\omega_3 v_1^2\omega_4^2 cs^2\omega_5^2\omega_2^3 + \omega_3^3 v_2^2\omega_4^2 cs^2\omega_5\omega_2^3 + 4\omega_3^2\omega_4^2 cs^4\omega_5^2\omega_2^3 - 3\omega_3^3 v_1^2\omega_4^2 cs^2\omega_5\omega_2^3 - 8\omega_3^2 v_1^2\omega_4^2 cs^2\omega_5^2\omega_2 + 4\omega_3 v_2^2\omega_4^2 cs^2\omega_5^2\omega_2^3 - 2\omega_3\omega_4 cs^4\omega_5^2\omega_2^2 - 2\omega_3^3 v_2^2\omega_4^2 cs^2\omega_5\omega_2^2 - 38\omega_3^3 v_2^2 v_1^2\omega_4^2\omega_5^2\omega_2 + 10\omega_3^2 v_2^2 v_1^2\omega_4^2\omega_5\omega_2^3 - 4\omega_3 v_1^2\omega_4^2 cs^2\omega_5^2\omega_2 - 4\omega_3^2 v_2^2\omega_4 cs^2\omega_5^2\omega_2 + 20\omega_3^2 v_2^2 v_1^2\omega_4^2\omega_5^2 - 4\omega_3^2 v_2^2 v_1^2\omega_4\omega_5\omega_2^2 + \omega_3^3 v_2^2\omega_4^2 cs^2\omega_5^2\omega_2^3 - 2\omega_3^2\omega_4^2 cs^4\omega_5\omega_2 + 4\omega_3^2 v_1^2\omega_4 cs^2\omega_5^2\omega_2 + 2\omega_3^3 v_1^2\omega_4\omega_2^3 + 20v_2^2 v_1^2\omega_4^2\omega_5^2\omega_2^3 - 8\omega_3^2 v_2^2\omega_4^2 cs^2\omega_5^2\omega_2 + 2\omega_3^3 v_2^2\omega_4 cs^2\omega_5^2\omega_2^3 - 2\omega_3^2\omega_4 cs^4\omega_5^2\omega_2^3 + 20\omega_3^3 v_2^2 v_1^2\omega_4\omega_5^2\omega_2^3 - 4\omega_3^3 v_1^2\omega_4^2 cs^2\omega_5^2\omega_2 - 2\omega_3^2 v_1^2\omega_4 cs^2\omega_5^2\omega_2^3 - 4\omega_3 v_1^2\omega_4^2 cs^2\omega_5\omega_2^3 - 36\omega_3^2 v_2^2 v_1^2\omega_4\omega_5^2\omega_2 + 4\omega_3^2\omega_4 cs^4\omega_5^2\omega_2 - 4\omega_3^3 v_2^2 v_1^2\omega_4\omega_5\omega_2^3 + \omega_3^3 v_2^2\omega_4^2 cs^2\omega_5^2\omega_2^3 - 4\omega_3^3 v_2^2\omega_4 cs^2\omega_5^2\omega_2 + 4\omega_3^2 v_2^2\omega_4^2 cs^2\omega_5\omega_2^3 + 20\omega_3^2 v_2^2 v_1^2\omega_4\omega_5\omega_2^3 + 2\omega_3^3 v_2^2 v_1^2\omega_5^2\omega_2^3 + 10\omega_3^3 v_2^2 v_1^2\omega_4\omega_5\omega_2^2 + 4\omega_3^2\omega_4^2 cs^4\omega_5\omega_2^2 - 3\omega_3^3 v_2^2 v_1^2\omega_4\omega_5\omega_2^3 + 10\omega_3^3 v_1^2\omega_4^2 cs^2\omega_5\omega_2^3 + 20\omega_3^3 v_2^2 v_1^2\omega_4\omega_5^2\omega_2^2 + 4\omega_3^3 v_1^2\omega_4^2 cs^2\omega_5^2\omega_2 - \omega_3^3\omega_4^2 cs^4\omega_5^2\omega_2^3 +$$

$$2\omega_3^3 v_1^2 \omega_4^2 cs^2 \omega_2^3 + 10\omega_3^3 v_2^2 \omega_4^2 cs^2 \omega_5 \omega_2 + 2\omega_3^3 v_2^2 v_1^2 \omega_4^2 \omega_5 \omega_2 - 3\omega_3^3 v_2^2 v_1^2 \omega_4 \omega_5^2 \omega_2 - 2\omega_3^2 \omega_4^2 cs^4 \omega_5 \omega_2^3 - 4\omega_3^3 v_2^2 v_1^2 \omega_5^2 \omega_2^2 - 2\omega_3^2 v_2^2 \omega_4^2 cs^2 \omega_5 \omega_2^3 +$$
$$4\omega_3^3 \omega_4^2 cs^4 \omega_5^2 \omega_2^2 - 4\omega_3^3 v_1^2 \omega_4^2 cs^2 \omega_5 \omega_2^2 - 38\omega_3 v_2^2 v_1^2 \omega_4^2 \omega_5^2 \omega_2^3$$

$C_{18} = 24\omega_3 v_2^2 \omega_5^2 \omega_2^2 - 12cs^2 \omega_5^2 \omega_2^3 - 78\omega_3 v_2^2 \omega_5^2 \omega_2^3 + 24\omega_3^2 cs^2 \omega_5 \omega_2^3 - 6\omega_3^3 v_2^2 \omega_5 \omega_2^3 + 24\omega_3 cs^2 \omega_5^2 \omega_2^3 + 24\omega_3^3 v_2^2 \omega_5 \omega_2^3 - 6\omega_3^3 cs^2 \omega_5 \omega_2^3 - 12\omega_3^2 cs^2 \omega_2^3 +$
$48 v_2^2 \omega_5^2 \omega_2^3 + 6\omega_3^3 v_2^2 \omega_2^3 - 12\omega_3^2 cs^2 \omega_5^2 \omega_2 + 12\omega_3^3 v_2^2 \omega_5^2 - 30\omega_3^3 v_2^2 \omega_5^2 \omega_2 - 48\omega_3^2 v_2^2 \omega_5^2 \omega_2 - 6\omega_3^3 cs^2 \omega_5^2 \omega_2 - 12\omega_3^2 cs^2 \omega_5 \omega_2 + \omega_3^3 cs^2 \omega_5^2 \omega_2 + 34\omega_3^3 v_2^2 \omega_5 \omega_2^3 -$
$12\omega_3^2 v_2^2 \omega_2^3 + 6\omega_3^3 cs^2 \omega_2^3 - 12\omega_3 v_2^2 \omega_5 \omega_2^3 - 4\omega_3^3 v_2^2 \omega_5^2 \omega_2^3 - 14\omega_3^2 cs^2 \omega_5^2 \omega_2^3 + 24\omega_3^3 v_2^2 \omega_5^2 \omega_2 + 6\omega_3^3 cs^2 \omega_5^2 \omega_2 + 12\omega_3^2 cs^2 \omega_5^2 \omega_2 + 22\omega_3^3 v_2^2 \omega_5^2 \omega_2^2$

$C_{19} = 24\omega_3^3 \omega_4^2 cs^2 \omega_2 + 12\omega_3^2 \omega_4^2 cs^2 \omega_2^2 - 12\omega_3^3 v_1^2 \omega_2^2 - 4\omega_3^3 v_1^2 \omega_4^2 \omega_2^3 + 24\omega_3^2 v_1^2 \omega_4^2 \omega_2 + 6\omega_3^3 v_1^2 \omega_2^3 + 34\omega_3^3 v_1^2 \omega_4^2 \omega_2^2 - 6\omega_3^2 \omega_4^2 cs^2 \omega_2^3 - 78\omega_3^3 v_1^2 \omega_4^2 \omega_2 +$
$\omega_3^3 \omega_4^2 cs^2 \omega_2^3 - 48\omega_3^2 v_1^2 \omega_4^2 \omega_2^2 + 48\omega_3^3 v_1^2 \omega_4^2 + 22\omega_3^3 v_1^2 \omega_4^2 \omega_2^3 - 14\omega_3^2 \omega_4^2 cs^2 \omega_2^2 - 12\omega_3 \omega_4^2 cs^2 \omega_2^2 - 6\omega_3^3 \omega_4^2 cs^2 \omega_2^3 - 12\omega_3^3 v_1^2 \omega_4 \omega_2 + 6\omega_3^3 cs^2 \omega_2^3 +$
$24\omega_3^3 \omega_4 cs^2 \omega_2^2 + 12 v_1^2 \omega_4^2 \omega_2^3 - 12\omega_3^3 \omega_4^2 cs^2 + 24\omega_3 v_1^2 \omega_4^2 \omega_2 - 12\omega_3 \omega_4 cs^2 \omega_2 + 6\omega_3^3 cs^2 \omega_2^3 + 24\omega_3^3 v_1^2 \omega_4 \omega_2 - 12\omega_3^2 cs^2 \omega_2 - 30\omega_3 v_1^2 \omega_4^2 \omega_2 - 6\omega_3^3 v_1^2 \omega_4 \omega_2$

$C_{20} = -6\omega_3^3 cs^2 + 12\omega_3^2 v_2^2 - 12\omega_3^3 - 9\omega_3^3 \omega_5 - 2\omega_3^3 cs^2 \omega_5 + 27\omega_3^2 v_2^2 \omega_5 + 24\omega_3 cs^2 \omega_5 - 11\omega_3^2 \omega_5^2 + 6\omega_3^3 - 60\omega_3^3 v_2^2 \omega_5 + 9\omega_3^3 cs^2 \omega_5 + 36\omega_3^2 \omega_5 - 48\omega_3 cs^2 \omega_5 -$
$6\omega_3^3 v_2^2 + 12\omega_3^2 cs^2 + \omega_3^3 \omega_5^2 + 24cs^2 \omega_5 - 3\omega_3^3 v_2^2 \omega_5^2 + 25\omega_3^2 cs^2 \omega_5^2 + 48 v_2^2 \omega_5 - 24\omega_3 \omega_5 + 12 v_2^2 \omega_5^2 + 12\omega_3 \omega_5^2 - 36\omega_3^2 cs^2 \omega_5 + 15\omega_3^3 v_2^2 \omega_5 - 42\omega_3 v_2^2 \omega_5$

$C_{21} = 12\omega_3 v_2^2 \omega_5^2 \omega_2^2 - \omega_3^3 \omega_5^2 \omega_2^3 + 6\omega_3^3 v_2^2 \omega_5 \omega_2^2 - 12\omega_3^2 cs^2 \omega_5 \omega_2^2 - 36cs^2 \omega_5^2 \omega_2^3 - 30\omega_3 v_2^2 \omega_5^2 \omega_2^3 + 42\omega_3^2 cs^2 \omega_5 \omega_2^3 + \omega_3^3 \omega_5^2 \omega_2^2 - 12\omega_3 v_2^2 \omega_5 \omega_2^3 -$
$21\omega_3^2 \omega_5 \omega_2^3 + 78\omega_3 cs^2 \omega_5^2 \omega_2^3 + 42\omega_3^2 v_2^2 \omega_5 \omega_2^3 - 12\omega_3^2 cs^2 \omega_5 \omega_2^3 - 24\omega_3 cs^2 \omega_5^2 \omega_2^2 - 6\omega_3^3 \omega_5^2 \omega_2^3 + 6\omega_3^3 \omega_5 \omega_2^2 - 12\omega_3^2 cs^2 \omega_2^3 + 24 v_2^2 \omega_5^2 \omega_2^3 + 6\omega_3^3 v_2^2 \omega_2^3 +$
$6\omega_3^3 cs^2 \omega_5 \omega_2^2 - 12\omega_3^2 v_2^2 \omega_5 \omega_2^3 - 12\omega_3^2 cs^2 \omega_5^2 \omega_2 + 6\omega_3^3 v_2^2 \omega_5^2 - 12\omega_3^3 v_2^2 \omega_5 \omega_2 - 3\omega_3^2 \omega_5^2 \omega_2 + 12\omega_3 \omega_5 \omega_2^3 - 3\omega_3^3 \omega_2^3 - 12\omega_3^2 v_2^2 \omega_5^2 \omega_2 - 12\omega_3^2 cs^2 \omega_5^2 \omega_2 -$
$24\omega_3 cs^2 \omega_5 \omega_2^2 + 7\omega_3^3 \omega_5^2 \omega_2^3 + 6\omega_3^3 cs^2 \omega_5^2 \omega_2^3 + 6\omega_3^3 v_2^2 \omega_5^2 \omega_2^3 - 12\omega_3^2 v_2^2 \omega_2^3 + 6\omega_3^3 cs^2 \omega_2^3 - 24\omega_3 v_2^2 \omega_5 \omega_2^2 + 6\omega_3^3 \omega_2^3 - 3\omega_3^3 \omega_5 \omega_2^2 - 48\omega_3^2 cs^2 \omega_5^2 \omega_2^3 +$
$6\omega_3^3 v_2^2 \omega_5^2 \omega_2 + 6\omega_3^3 cs^2 \omega_5^2 \omega_2 + 42\omega_3^2 cs^2 \omega_5^2 \omega_2^2 + 6\omega_3^3 v_2^2 \omega_5^2 \omega_2^2 + 6\omega_3^3 \omega_5 \omega_2^3$

$C_{22} = 6\omega_3^3 cs^2 - 12\omega_3^2 v_2^2 + 12\omega_3^3 + 9\omega_3^3 \omega_5 + 4\omega_3^3 cs^2 \omega_5^2 - 8\omega_3^2 v_2^2 \omega_5^2 - 36\omega_3 cs^2 \omega_5 + 11\omega_3^2 \omega_5^2 - 6\omega_3^3 + 48\omega_3^2 v_2^2 \omega_5 - 12\omega_3^3 cs^2 \omega_5 - 36\omega_3^2 \omega_5 +$
$90\omega_3 cs^2 \omega_5^2 + 6\omega_3^3 v_2^2 - 12\omega_3^2 cs^2 - \omega_3^3 \omega_5^2 - 48cs^2 \omega_5^2 + \omega_3^3 v_2^2 \omega_5^2 - 44\omega_3^2 cs^2 \omega_5^2 - 36\omega_3 v_2^2 \omega_5 + 24\omega_3 \omega_5 + 12 v_2^2 \omega_5^2 - 12\omega_3 \omega_5^2 + 48\omega_3^2 cs^2 \omega_5 - 12\omega_3^3 v_2^2 \omega_5$

$C_{23} = -\omega_3^3 \omega_5^2 \omega_2^3 + 12\omega_3^3 v_2^2 \omega_5 \omega_2^2 - 24\omega_3^2 cs^2 \omega_5 \omega_2^2 - 12cs^2 \omega_5^2 \omega_2^3 - 30\omega_3 v_2^2 \omega_5^2 \omega_2^3 + 36\omega_3^2 cs^2 \omega_5 \omega_2^3 + 2\omega_3^3 \omega_5^2 \omega_2^2 - 12\omega_3 v_2^2 \omega_5 \omega_2^3 - 6\omega_3^3 \omega_5 \omega_2^3 +$
$36\omega_3 cs^2 \omega_5^2 \omega_2^3 + 36\omega_3^2 v_2^2 \omega_5 \omega_2^3 - 12\omega_3^2 cs^2 \omega_5 \omega_2^3 - 24\omega_3 cs^2 \omega_5^2 \omega_2^2 + 12\omega_3^3 \omega_5 \omega_2^2 - 12\omega_3^2 cs^2 \omega_2^3 + 24 v_2^2 \omega_5^2 \omega_2^3 + 6\omega_3^3 v_2^2 \omega_2^3 + 12\omega_3^3 cs^2 \omega_5 \omega_2^2 -$
$24\omega_3^2 v_2^2 \omega_5 \omega_2^2 - 12\omega_3^2 cs^2 \omega_5^2 \omega_2 + 12\omega_3^3 v_2^2 \omega_5 - 18\omega_3^3 v_2^2 \omega_5 \omega_2 - 6\omega_3^2 \omega_5^2 \omega_2 + 12\omega_3^2 v_2^2 \omega_5^2 \omega_2 - 12\omega_3^2 cs^2 \omega_5^2 \omega_2 - 12\omega_3 cs^2 \omega_5 \omega_2^3 + 3\omega_3^3 \omega_5^2 \omega_2^3 +$
$4\omega_3^3 cs^2 \omega_5^2 \omega_2^3 - 12\omega_3^3 v_2^2 \omega_2^3 + 6\omega_3^3 cs^2 \omega_2^3 - 12\omega_3 v_2^2 \omega_5 \omega_2^3 + 3\omega_3^3 v_2^2 \omega_5^2 \omega_2^3 - 6\omega_3^3 \omega_5 \omega_2^3 - 32\omega_3^2 cs^2 \omega_5^2 \omega_2^3 + 6\omega_3^3 cs^2 \omega_5^2 \omega_2 + 48\omega_3^2 cs^2 \omega_5^2 \omega_2^2 + 3\omega_3^3 \omega_5 \omega_2^3$

$C_{24} = 24\omega_3^2 v_2^2 + 156\omega_3 v_2^2 cs^2 \omega_5^2 + 24\omega_3^2 cs^4 \omega_5^2 + 3\omega_3^3 v_2^4 \omega_5^2 - 48\omega_3 v_2^4 \omega_5 + \omega_3^3 cs^2 \omega_5^2 + 24\omega_3^2 v_2^2 \omega_5 - 24\omega_3 cs^2 \omega_5 - 72\omega_3^2 v_2^2 \omega_5 - 6\omega_3^3 cs^2 \omega_5 +$
$12\omega_3 cs^2 \omega_5^2 - 96 v_2^2 cs^2 \omega_5^2 - 12\omega_3^3 v_2^2 - 18\omega_3^3 v_2^4 \omega_5 - 24\omega_3^2 cs^4 \omega_5 - 24\omega_3^2 v_2^2 cs^2 + 24\omega_3 v_2^4 \omega_5^2 - 24\omega_3 v_2^2 cs^2 \omega_5 + 12\omega_3 v_2^4 - 3\omega_3^3 v_2^2 \omega_5 - 8\omega_3^2 cs^2 \omega_5^2 -$
$12\omega_3^3 v_2^2 cs^2 \omega_5 + 48\omega_3 v_2^2 \omega_5 - 24\omega_3 v_2^4 \omega_5 - 3\omega_3^3 cs^4 \omega_5 - 72\omega_3^2 v_2^2 cs^2 \omega_5^2 + 24\omega_3 cs^4 \omega_5 + 24cs^4 \omega_5^2 - 24\omega_3^2 v_2^4 + 6\omega_3^3 cs^4 \omega_5 + 72\omega_3^2 v_2^4 \omega_5 +$
$48\omega_3^2 v_2^2 cs^2 \omega_5 - 48\omega_3 cs^4 \omega_5^2 + 12\omega_3^3 v_2^2 cs^2 + 24\omega_3^2 cs^2 \omega_5 + 18\omega_3^3 v_2^2 \omega_5 + 6\omega_3^3 v_2^2 cs^2 \omega_5^2 - 24\omega_3 v_2^2 \omega_5^2$

$C_{25} = 6\omega_3^3 cs^2 - 12\omega_3^2 v_2^2 + 12\omega_3^3 + 6\omega_3^3 \omega_5 + \omega_3^3 cs^2 \omega_5^2 - 16\omega_3^2 v_2^2 \omega_5^2 - 12\omega_3 cs^2 \omega_5 + 8\omega_3^2 \omega_5^2 - 6\omega_3^3 + 24\omega_3^2 v_2^2 \omega_5 - 6\omega_3^3 cs^2 \omega_5 - 24\omega_3^2 \omega_5 + 42\omega_3 cs^2 \omega_5^2 +$
$6\omega_3^3 v_2^2 - 12\omega_3^2 cs^2 - \omega_3^3 \omega_5^2 - 24cs^2 \omega_5^2 + 2\omega_3^3 v_2^2 \omega_5^2 - 20\omega_3^2 cs^2 \omega_5^2 - 12\omega_3 v_2^2 \omega_5 + 12\omega_3 \omega_5 - 12 v_2^2 \omega_5^2 - 6\omega_3 \omega_5^2 + 24\omega_3^2 cs^2 \omega_5 - 6\omega_3^3 v_2^2 \omega_5 + 24\omega_3 v_2^2 \omega_5$

2.3 MRT2

2.3.1 Definitions

Collision operator $\boldsymbol{C}$:

$$\boldsymbol{C}\left(\boldsymbol{f}\right) = \mathbf{M}_2^{-1}\mathbf{S}\left(\boldsymbol{\mu}_2^{(eq)} - \mathbf{M}_2 \boldsymbol{f}\right),$$

where

$$\mathbf{S} = \mathrm{diag}(\omega_1, \omega_2, \omega_3, \omega_4, \omega_5),$$

$\omega_1, \omega_2, \dots, \omega_5 \in (0, 2)$.

Matrix $\mathbf{M}_2$ corresponds to the transformation matrix to the raw moment basis defined by

$$\boldsymbol{\mu}_2 = \begin{pmatrix} m_{(0,0)} \\ m_{(1,0)} \\ m_{(0,1)} \\ m_{(2,0)} + m_{(0,2)} \\ m_{(2,0)} - m_{(0,2)} \end{pmatrix},$$

and is given by

$$\mathbf{M}_2 = \begin{pmatrix} 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 0 & -1 & 0 \\ 0 & 0 & 1 & 0 & -1 \\ 0 & 1 & 1 & 1 & 1 \\ 0 & 1 & -1 & 1 & -1 \end{pmatrix}.$$

The equilibrium moments $\boldsymbol{\mu}_2^{(eq)}$ are defined by

$$\boldsymbol{\mu}_2^{(eq)} = \mathbf{M}_2 \mathbf{M}^{-1} \boldsymbol{\mu}^{(eq)},$$

i.e.,

$$\boldsymbol{\mu}_2^{(eq)} = \begin{pmatrix} \rho \\ \rho v_1 \\ \rho v_2 \\ \rho\left(v_1^2 + v_2^2 + 2c_s^2\right) \\ \rho\left(v_1^2 - v_2^2\right) \end{pmatrix}.$$

2.3.2 Conservation of mass equation

📎 attached text file: `output_d2q5_ade_mrt2_symbolic_pde_00.txt`

$\frac{\partial \rho}{\partial t} + \frac{\delta_l v_1}{\delta_t}\frac{\partial \rho}{\partial x_1} + \frac{\delta_l \rho}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{v_2 \delta_l}{\delta_t}\frac{\partial \rho}{\partial x_2} + \frac{\delta_l \rho}{\delta_t}\frac{\partial v_2}{\partial x_2} + (-2 + \omega_2)\frac{\delta_l}{2\omega_2}\frac{\partial \rho}{\partial x_1}\frac{\partial v_1}{\partial t} + (-2 + \omega_2)\frac{\delta_l^2 v_1}{2\omega_2 \delta_t}\frac{\partial \rho}{\partial x_1}\frac{\partial v_1}{\partial x_1} +$

$(-2 + \omega_2)\frac{\delta_l^2 \rho}{2\omega_2 \delta_t}\left(\frac{\partial v_1}{\partial x_1}\right)^2 + (2 - \omega_3)\frac{v_2 \delta_l^2}{2\omega_3 \delta_t}\frac{\partial \rho}{\partial x_1}\frac{\partial v_1}{\partial x_2} + (-\omega_2\omega_3 + \omega_2 + \omega_3)\frac{\delta_l^2 v_1}{\omega_2\omega_3 \delta_t}\frac{\partial \rho}{\partial x_1}\frac{\partial v_2}{\partial x_2} +$

$(-\omega_2\omega_3 + \omega_2 + \omega_3)\frac{\delta_l^2 \rho}{\omega_2\omega_3 \delta_t}\frac{\partial v_1}{\partial x_1}\frac{\partial v_2}{\partial x_2} + (-2 + \omega_3)\frac{\delta_l}{2\omega_3}\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial t} + (-\omega_2\omega_3 + \omega_2 + \omega_3)\frac{v_2 \delta_l^2}{\omega_2\omega_3 \delta_t}\frac{\partial \rho}{\partial x_2}\frac{\partial v_1}{\partial x_1} +$

$(2 - \omega_2)\frac{\delta_l^2 v_1}{2\omega_2 \delta_t}\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial x_1} + (-2 + \omega_3)\frac{v_2 \delta_l^2}{2\omega_3 \delta_t}\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial x_2} + (-2 + \omega_3)\frac{\delta_l^2 \rho}{2\omega_3 \delta_t}\left(\frac{\partial v_2}{\partial x_2}\right)^2 + (-2 + \omega_2)\frac{\delta_l \rho}{2\omega_2}\frac{\partial^2 v_1}{\partial t \partial x_1} +$

$(-2 + \omega_2)\frac{cs^2 \delta_l^2}{2\omega_2 \delta_t}\frac{\partial^2 \rho}{\partial x_1^2} + (-2 + \omega_2)\frac{\delta_l^2 \rho v_1}{2\omega_2 \delta_t}\frac{\partial^2 v_1}{\partial x_1^2} + (-2 + \omega_3)\frac{\delta_l \rho}{2\omega_3}\frac{\partial^2 v_2}{\partial t \partial x_2} + (-\omega_2\omega_3 + \omega_2 + \omega_3)\frac{v_2 \delta_l^2 v_1}{\omega_2\omega_3 \delta_t}\frac{\partial^2 \rho}{\partial x_1 \partial x_2} +$

$(2 - \omega_3)\frac{v_2 \delta_l^2 \rho}{2\omega_3 \delta_t}\frac{\partial^2 v_1}{\partial x_1 \partial x_2} + (2 - \omega_2)\frac{\delta_l^2 \rho v_1}{2\omega_2 \delta_t}\frac{\partial^2 v_2}{\partial x_1 \partial x_2} + (-2 + \omega_3)\frac{cs^2 \delta_l^2}{2\omega_3 \delta_t}\frac{\partial^2 \rho}{\partial x_2^2} + (-2 + \omega_3)\frac{v_2 \delta_l^2 \rho}{2\omega_3 \delta_t}\frac{\partial^2 v_2}{\partial x_2^2} +$

$(12 - 12\omega_2 + \omega_2^2)\frac{\delta_l \rho \delta_t}{12\omega_2^2}\frac{\partial^3 v_1}{\partial t^2 \partial x_1} + (12 - 6\omega_4 + \omega_4\omega_2 - 6\omega_2)\frac{\delta_l^2 \rho v_1}{6\omega_4\omega_2}\frac{\partial^3 v_1}{\partial t \partial x_1^2} + C_1 \frac{\delta_l^3 v_1}{6\omega_4\omega_2^2 \delta_t}\frac{\partial^3 \rho}{\partial x_1^3} + C_2 \frac{\delta_l^3 \rho}{12\omega_4\omega_2^2 \delta_t}\frac{\partial^3 v_1}{\partial x_1^3} +$

$(12 + \omega_3^2 - 12\omega_3)\frac{\delta_l \rho \delta_t}{12\omega_3^2}\frac{\partial^3 v_2}{\partial t^2 \partial x_2} + (-2\omega_2\omega_3^2 + 9\omega_2\omega_3 + 3\omega_3^2 - 6\omega_2 - 6\omega_3)\frac{v_2 \delta_l^2 \rho}{6\omega_2\omega_3^2}\frac{\partial^3 v_1}{\partial t \partial x_1 \partial x_2} +$

$(9\omega_2\omega_3 - 6\omega_2 - 2\omega_2^2\omega_3 - 6\omega_3 + 3\omega_2^2)\frac{\delta_l^2 \rho v_1}{6\omega_2^2\omega_3}\frac{\partial^3 v_2}{\partial t \partial x_1 \partial x_2} + C_3 \frac{v_2 \delta_l^3}{2\omega_4\omega_2^2\omega_3^2 \delta_t}\frac{\partial^3 \rho}{\partial x_1^2 \partial x_2} +$

$(-6\omega_2\omega_3^2 + 6\omega_3^2 - 6\omega_2^2\omega_3 + \omega_2^2\omega_3^2 + 6\omega_2^2)\frac{v_2 \delta_l^3 \rho v_1}{6\omega_2^2\omega_3^2 \delta_t}\frac{\partial^3 v_1}{\partial x_1^2 \partial x_2} +$

$(6\omega_2^2 v_1^2 + \omega_4\omega_2^2 v_1^2 - 12\omega_4 cs^2 + 12\omega_4 v_1^2 + 6cs^2\omega_2^2 - 3\omega_4 cs^2\omega_2^2 + 18\omega_4 cs^2\omega_2 - 6\omega_4\omega_2 v_1^2 - 12\omega_2 v_1^2 - 12cs^2\omega_2)\frac{\delta_l^3 \rho}{12\omega_4\omega_2^2 \delta_t}\frac{\partial^3 v_2}{\partial x_1^2 \partial x_2}$

$+ (12 - 6\omega_5 + \omega_5\omega_3 - 6\omega_3)\frac{v_2 \delta_l^2 \rho}{6\omega_5\omega_3}\frac{\partial^3 v_2}{\partial t \partial x_2^2} + C_4 \frac{\delta_l^3 v_1}{2\omega_5\omega_2^2\omega_3^2 \delta_t}\frac{\partial^3 \rho}{\partial x_1 \partial x_2^2} + (-12cs^2\omega_5 + 6cs^2\omega_3^2 - 6\omega_5 v_2^2\omega_3 + \omega_5 v_2^2\omega_3^2 -$

$12cs^2\omega_3 + 12\omega_5 v_2^2 - 12v_2^2\omega_3 + 18cs^2\omega_5\omega_3 - 3cs^2\omega_5\omega_3^2 + 6v_2^2\omega_3^2)\frac{\delta_l^3 \rho}{12\omega_5\omega_3^2 \delta_t}\frac{\partial^3 v_1}{\partial x_1 \partial x_2^2} +$

$(-6\omega_2\omega_3^2 + 6\omega_3^2 - 6\omega_2^2\omega_3 + \omega_2^2\omega_3^2 + 6\omega_2^2)\frac{v_2 \delta_l^3 \rho v_1}{6\omega_2^2\omega_3^2 \delta_t}\frac{\partial^3 v_2}{\partial x_1 \partial x_2^2} + C_5 \frac{v_2 \delta_l^3}{6\omega_5\omega_3^2 \delta_t}\frac{\partial^3 \rho}{\partial x_2^3} + C_6 \frac{\delta_l^3 \rho}{12\omega_5\omega_3^2 \delta_t}\frac{\partial^3 v_2}{\partial x_2^3} +$

$(-2 + 3\omega_2 - \omega_2^2)\frac{\delta_l \rho \delta_t^2}{2\omega_2^3}\frac{\partial^4 v_1}{\partial t^3 \partial x_1} + (8\omega_4\omega_2^2 - 2\omega_4\omega_2^3 - 4\omega_4\omega_2 - \omega_4^2\omega_2 + 2\omega_4^2 + 2\omega_2^3 - \omega_4^2\omega_2^2 - 4\omega_2^2)\frac{\delta_l^2 \rho v_1 \delta_t}{2\omega_4^2\omega_2^3}\frac{\partial^4 v_1}{\partial t^2 \partial x_1^2} +$

$C_7 \frac{\delta_l^3 \rho}{12\omega_4^2\omega_2^3}\frac{\partial^4 v_1}{\partial t \partial x_1^3} + C_8 \frac{\delta_l^4}{24\omega_4^2\omega_2^3 \delta_t}\frac{\partial^4 \rho}{\partial x_1^4} + C_9 \frac{\delta_l^4 \rho v_1}{12\omega_4^2\omega_2^3 \delta_t}\frac{\partial^4 v_1}{\partial x_1^4} + (-2 - \omega_3^2 + 3\omega_3)\frac{\delta_l \rho \delta_t^2}{2\omega_3^3}\frac{\partial^4 v_2}{\partial t^3 \partial x_2} +$

$(7\omega_2\omega_3^3 - 24\omega_2\omega_3^2 + 12\omega_2\omega_3 + 12\omega_3^2 - 6\omega_3^3 - 24\omega_2^2\omega_3 + 13\omega_2^2\omega_3^2 - \omega_2^2\omega_3^3 + 12\omega_2^2)\frac{v_2 \delta_l^2 \rho \delta_t}{12\omega_2^2\omega_3^3}\frac{\partial^4 v_1}{\partial t^2 \partial x_1 \partial x_2} +$

$$(-24\omega_2\omega_3^2 + 12\omega_2\omega_3 + 12\omega_3^2 - \omega_2^3\omega_3^2 - 24\omega_2^2\omega_3 + 13\omega_2^2\omega_3^2 - 6\omega_2^3 + 7\omega_2^3\omega_3 + 12\omega_2^2)\frac{\delta_l^2\rho v_1\delta_t}{12\omega_2^3\omega_3^2}\frac{\partial^4 v_2}{\partial t^2\partial x_1\partial x_2} +$$

$$C_{10}\frac{v_2\delta_l^3\rho v_1}{6\omega_4\omega_2^3\omega_3^3}\frac{\partial^4 v_1}{\partial t\partial x_1^2\partial x_2} + C_{11}\frac{\delta_l^3\rho}{12\omega_4^2\omega_2^3\omega_3}\frac{\partial^4 v_2}{\partial t\partial x_1^2\partial x_2} + C_{12}\frac{v_2\delta_l^4 v_1}{6\omega_4^2\omega_2^3\omega_3^3\delta_t}\frac{\partial^4 \rho}{\partial x_1^3\partial x_2} + C_{13}\frac{v_2\delta_l^4\rho}{12\omega_4^2\omega_2^3\omega_3^3\delta_t}\frac{\partial^4 v_1}{\partial x_1^3\partial x_2} +$$

$$C_{14}\frac{\delta_l^4\rho v_1}{12\omega_4^2\omega_2^3\delta_t}\frac{\partial^4 v_2}{\partial x_1^3\partial x_2} + (-\omega_5^2\omega_3^2 + 2\omega_5^2 - 4\omega_3^2 + 2\omega_3^3 - \omega_5^2\omega_3 - 4\omega_5\omega_3 - 2\omega_5\omega_3^3 + 8\omega_5\omega_3^2)\frac{v_2\delta_l^2\rho\delta_t}{2\omega_5^2\omega_3^3}\frac{\partial^4 v_2}{\partial t^2\partial x_2^2} +$$

$$C_{15}\frac{\delta_l^3\rho}{12\omega_5^2\omega_2\omega_3^3}\frac{\partial^4 v_1}{\partial t\partial x_1\partial x_2^2} + C_{16}\frac{v_2\delta_l^3\rho v_1}{6\omega_5\omega_3^3\omega_3^3}\frac{\partial^4 v_2}{\partial t\partial x_1\partial x_2^2} + C_{17}\frac{\delta_l^4}{4\omega_4^2\omega_5^2\omega_3^3\omega_3^3\delta_t}\frac{\partial^4 \rho}{\partial x_1^2\partial x_2^2} + C_{18}\frac{\delta_l^4\rho v_1}{12\omega_5^2\omega_3^3\omega_3^3\delta_t}\frac{\partial^4 v_1}{\partial x_1^2\partial x_2^2} +$$

$$C_{19}\frac{v_2\delta_l^4\rho}{12\omega_4^2\omega_5^3\omega_3^3\delta_t}\frac{\partial^4 v_2}{\partial x_1^2\partial x_2^2} + C_{20}\frac{\delta_l^3\rho}{12\omega_5^2\omega_3^3}\frac{\partial^4 v_2}{\partial t\partial x_2^3} + C_{21}\frac{v_2\delta_l^4 v_1}{6\omega_5^2\omega_3^3\omega_3^3\delta_t}\frac{\partial^4 \rho}{\partial x_1\partial x_2^3} + C_{22}\frac{v_2\delta_l^4\rho}{12\omega_5^2\omega_3^3\delta_t}\frac{\partial^4 v_1}{\partial x_1\partial x_2^3} + C_{23}\frac{\delta_l^4\rho v_1}{12\omega_5^2\omega_2^3\omega_3^3\delta_t}\frac{\partial^4 v_2}{\partial x_1\partial x_2^3}$$

$$+ C_{24}\frac{\delta_l^4}{24\omega_5^2\omega_3^3\delta_t}\frac{\partial^4 \rho}{\partial x_2^4} + C_{25}\frac{v_2\delta_l^4\rho}{12\omega_5^2\omega_3^3\delta_t}\frac{\partial^4 v_2}{\partial x_2^4} = 0,$$

where:

$C_1 = \omega_4\omega_2^2 + 3\omega_2^2 v_1^2 - \omega_4\omega_2^2 v_1^2 - 12\omega_4 cs^2 - 3\omega_4\omega_2 + 3cs^2\omega_2^2 + 6\omega_2 - 3\omega_4 cs^2\omega_2^2 + 15\omega_4 cs^2\omega_2 + 3\omega_4\omega_2 v_1^2 - 6\omega_2 v_1^2 - 6cs^2\omega_2 - 3\omega_2^2$

$C_2 = 2\omega_4\omega_2^2 + 6\omega_2^2 v_1^2 - 5\omega_4\omega_2^2 v_1^2 - 12\omega_4 cs^2 - 6\omega_4\omega_2 - 12\omega_4 v_1^2 + 6cs^2\omega_2^2 + 12\omega_2 - 3\omega_4 cs^2\omega_2^2 + 18\omega_4 cs^2\omega_2 + 18\omega_4\omega_2 v_1^2 - 12\omega_2 v_1^2 - 12cs^2\omega_2 - 6\omega_2^2$

$C_3 = -2\omega_4 cs^2\omega_3^2 + 4\omega_4 v_1^2\omega_3^2 - 2\omega_2 v_1^2\omega_3^2 - 2cs^2\omega_2\omega_3^2 - 2\omega_4 cs^2\omega_2\omega_3 + 2\omega_4\omega_2 v_1^2\omega_3 + 2\omega_4\omega_2^2 v_1^2 + 4\omega_4 cs^2\omega_2\omega_3 - 4\omega_4\omega_2 v_1^2\omega_3 + \omega_4\omega_2^2 v_1^2\omega_3 - \omega_4 cs^2\omega_2^2\omega_3 + \omega_4 cs^2\omega_2^2\omega_3 + \omega_2^2 v_1^2\omega_3 - 3\omega_4\omega_2^2 v_1^2\omega_3 + cs^2\omega_2^2\omega_3$

$C_4 = -cs^2\omega_5\omega_2^2\omega_3^2 + \omega_2^2 v_2^2\omega_3^2 - 4\omega_5\omega_2^2 v_2^2\omega_3 + 2\omega_5 v_2^2\omega_3^2 + \omega_5\omega_2^2 v_2^2\omega_3^2 + 4cs^2\omega_5\omega_2^2\omega_3 - 2\omega_2^2 v_2^2\omega_3 - 2cs^2\omega_5\omega_2^2 - 2cs^2\omega_2^2\omega_3 - 2cs^2\omega_5\omega_2\omega_3 - 3\omega_5\omega_2 v_2^2\omega_3^2 + 4\omega_5\omega_2^2 v_2^2 + 2\omega_5\omega_2 v_2^2\omega_3 + cs^2\omega_2^2\omega_3^2 + cs^2\omega_5\omega_2\omega_3^2$

$C_5 = -12cs^2\omega_5 + 3cs^2\omega_3^2 + 3\omega_5 v_2^2\omega_3 - \omega_5 v_2^2\omega_3^2 - 6cs^2\omega_3 - 3\omega_3^2 - 6v_2^2\omega_3 - 3\omega_5\omega_3 + 15cs^2\omega_5\omega_3 + 6\omega_3 - 3cs^2\omega_5\omega_3^2 + 3v_2^2\omega_3^2 + \omega_5\omega_3^2$

$C_6 = -12cs^2\omega_5 + 6cs^2\omega_3^2 + 18\omega_5 v_2^2\omega_3 - 5\omega_5 v_2^2\omega_3^2 - 12cs^2\omega_3 - 6\omega_3^2 - 12\omega_5 v_2^2 - 12v_2^2\omega_3 - 6\omega_5\omega_3 + 18cs^2\omega_5\omega_3 + 12\omega_3 - 3cs^2\omega_5\omega_3^2 + 6v_2^2\omega_3^2 + 2\omega_5\omega_3^2$

$C_7 = 36\omega_4\omega_2^2 + 12\omega_2^2 v_1^2 - 42\omega_4^2\omega_2 v_1^2 - 48\omega_4^2 cs^2\omega_2 - 9\omega_4\omega_2^3 - 60\omega_4\omega_2^2 v_1^2 - 2\omega_4^2 cs^2\omega_3^2 - 6\omega_2^3 v_1^2 + 15\omega_4\omega_2^3 v_1^2 + 25\omega_4^2 cs^2\omega_2^2 - 24\omega_4\omega_2 + 12cs^2\omega_2^2 + 9\omega_4 cs^2\omega_3^2 + 12\omega_4^2\omega_2 + 12\omega_4^2 v_1^2 + 24\omega_4^2 cs^2 - 36\omega_4 cs^2\omega_2^2 - 3\omega_4^2\omega_2^3 v_1^2 - 6cs^2\omega_2^3 + \omega_4^2\omega_2^3 + 24\omega_4 cs^2\omega_2 + 6\omega_2^3 + 48\omega_4\omega_2 v_1^2 - 11\omega_4^2\omega_2^2 - 12\omega_2 + 27\omega_4^2\omega_2^2 v_1^2$

$C_8 = -24\omega_4 cs^4\omega_2^2 - 48\omega_4\omega_2 v_1^4 + 24\omega_2^2 v_1^2 - 24\omega_4^2\omega_2 v_1^2 + 12\omega_4^2 cs^2\omega_2 + 156\omega_4^2 cs^2\omega_2 v_1^2 - 96\omega_4^2 cs^2 v_1^2 - 24cs^2\omega_2^2 v_1^2 - 24\omega_4^2\omega_2 v_1^4 + 6\omega_4 cs^4\omega_2^3 - 72\omega_4\omega_2^2 v_1^2 - 12\omega_4 cs^2\omega_2^3 v_1^2 + \omega_4^2 cs^2\omega_2^3 - 12\omega_2^3 v_1^2 + 24\omega_4^2 cs^4 + 48\omega_4 cs^2\omega_2^2 v_1^2 + 18\omega_4\omega_2^3 v_1^2 - 8\omega_4^2 cs^2\omega_2^2 + 24\omega_4 cs^4\omega_2 + 12cs^2\omega_2^3 v_1^2 + 3\omega_4^2\omega_2^3 v_1^4 - 24\omega_4 cs^2\omega_2 v_1^2 - 6\omega_4 cs^2\omega_2^3 + 12\omega_2^3 v_1^4 + 24\omega_4 cs^2\omega_2^2 + 6\omega_4^2 cs^2\omega_2^3 v_1^2 - 3\omega_4^2\omega_2^3 v_1^2 - 18\omega_4\omega_2^3 v_1^4 - 48\omega_4^2 cs^4\omega_2 - 24\omega_2^2 v_1^4 + 24\omega_4^2\omega_2 v_1^4 + 24\omega_4^2 cs^4\omega_2^2 - 24\omega_4 cs^2\omega_2 + 48\omega_4\omega_2 v_1^2 + 72\omega_4\omega_2^2 v_1^4 - 3\omega_4^2 cs^4\omega_2^3 - 72\omega_4^2 cs^2\omega_2^2 v_1^2 + 24\omega_4^2\omega_2^2 v_1^2$

$C_9 = -24\omega_4\omega_2^2 - 12\omega_2^2 v_1^2 + 24\omega_4^2\omega_2 v_1^2 + 42\omega_4^2 cs^2\omega_2 + 6\omega_4\omega_2^3 + 24\omega_4\omega_2^2 v_1^2 + \omega_4^2 cs^2\omega_2^3 + 6\omega_2^3 v_1^2 - 6\omega_4\omega_2^3 v_1^2 - 20\omega_4^2 cs^2\omega_2^2 + 12\omega_4\omega_2 - 12cs^2\omega_2^2 - 6\omega_4 cs^2\omega_2^2 - 6\omega_4^2\omega_2 - 12\omega_4^2 v_1^2 - 24\omega_4^2 cs^2 + 24\omega_4 cs^2\omega_2^2 + 2\omega_4^2\omega_2^3 v_1^2 + 6cs^2\omega_2^3 - \omega_4^2\omega_2^2 - 12\omega_4 cs^2\omega_2 - 6\omega_2^3 - 12\omega_4\omega_2 v_1^2 + 8\omega_4^2\omega_2^2 + 12\omega_2 - 16\omega_4^2\omega_2^2 v_1^2$

$C_{10} = -12\omega_4\omega_2\omega_3^2 - 6\omega_4\omega_3^3 + 24\omega_4\omega_2\omega_3^3 - 12\omega_4\omega_3^3 - 6\omega_4\omega_2^2\omega_3 + \omega_4\omega_2^3\omega_3^3 - 6\omega_2^3\omega_3^2 + 3\omega_2^3\omega_3^3 - 7\omega_4\omega_2^3\omega_3^2 + 12\omega_2^3\omega_3^2 + 12\omega_4\omega_2^3\omega_3 - 10\omega_4\omega_2^2\omega_3^3 + 12\omega_4\omega_2^2\omega_3^2 - 6\omega_2^3\omega_3^3$

$C_{11} = -2\omega_4^2 cs^2\omega_2^3\omega_3 - 12\omega_4^2\omega_2 v_1^2 - 6\omega_3^2 v_1^2\omega_3 + 12\omega_4^2 cs^2\omega_2 + 12\omega_4 cs^2\omega_2\omega_3 + 12\omega_4\omega_2 v_1^2\omega_3 + 12\omega_4\omega_2^2 v_1^2 + 3\omega_4^2 cs^2\omega_2^3 + 9\omega_4\omega_2^3 v_1^2\omega_3 + 22\omega_4^2 cs^2\omega_2^2\omega_3 - 6\omega_4\omega_2^3 v_1^2 - 18\omega_4^2 cs^2\omega_2^2 - 10\omega_4^2\omega_2^2 v_1^2\omega_3 + 12cs^2\omega_2^2\omega_3 - 6\omega_4 cs^2\omega_2^2 + 9\omega_4 cs^2\omega_2^2\omega_3 + 12\omega_4 cs^2\omega_2^2 - \omega_4^2\omega_2^3 v_1^2 + 12\omega_2^2 v_1^2\omega_3 + 36\omega_4^2\omega_2 v_1^2\omega_3 - 24\omega_4 v_1^2\omega_3 + 12\omega_4^2 cs^2\omega_3 - 30\omega_4^2 cs^2\omega_2\omega_3 - 30\omega_4 cs^2\omega_2^2\omega_3 + \omega_4^2\omega_2^3 v_1^2\omega_3 - 6cs^2\omega_2^3\omega_3 - 30\omega_4\omega_2^2 v_1^2\omega_3 + 6\omega_4^2\omega_2^2 v_1^2$

$C_{12} = 6\omega_4^2 cs^2\omega_2^3\omega_3 + 7\omega_4^2\omega_2^2\omega_3^3 - 48\omega_4^2 cs^2\omega_2^2\omega_3^3 - 12\omega_4\omega_2^3 v_1^2\omega_3^3 - 12\omega_4^2\omega_2^2 v_1^2\omega_3^3 + 6\omega_4\omega_2^3 v_1^2\omega_3^3 + 6\omega_4^2\omega_2^2 v_1^2\omega_3^3 + 42\omega_4^2 cs^2\omega_2^2\omega_3^3 + 12\omega_4\omega_2\omega_3^3 - 3\omega_4^2\omega_2^2\omega_3^3 + 6\omega_2^3 v_1^2\omega_3^3 - \omega_4^2\omega_2^3\omega_3^3 - 12\omega_4^2 cs^2\omega_2^2\omega_3 + 6\omega_4^2 cs^2\omega_2^3\omega_3^3 - 24\omega_4\omega_2 v_1^2\omega_3^3 - 12\omega_4^2 cs^2\omega_2^3\omega_3^3 + \omega_4^2\omega_2^3\omega_3^3 + 6\omega_4^2\omega_2^2 v_1^2\omega_3 - 24\omega_4 cs^2\omega_2\omega_3^3 + 6cs^2\omega_2^3\omega_3^3 - 12\omega_4\omega_2^2 v_1^2\omega_3^3 + 6\omega_4\omega_2^3\omega_3^3 + 42\omega_4 cs^2\omega_2^2\omega_3^3 + 6\omega_4^2\omega_2^3 v_1^2 - 12\omega_4 cs^2\omega_2^2\omega_3^3 - 3\omega_3^3 - 3\omega_4\omega_2^3\omega_3^3 + 6\omega_4^2\omega_2^3 v_1^2\omega_3 + 42\omega_4\omega_2^2 v_1^2\omega_3^3 + 12\omega_4^2\omega_2 v_1^2\omega_3^3 - 12\omega_4 cs^2\omega_2^3\omega_3^3 - 21\omega_4\omega_2^2\omega_3^3 - 24\omega_4^2 cs^2\omega_2\omega_3^3 - 12\omega_4^2\omega_2^3 v_1^2\omega_3 - 12cs^2\omega_2^2\omega_3^3 + 6\omega_4\omega_2^2\omega_3^3 - 36\omega_4^2 cs^2\omega_3^3 + 78\omega_4^2 cs^2\omega_2\omega_3^3 + 24\omega_4^2 v_1^2\omega_3^3 - 6\omega_4^2\omega_2\omega_3^3 + 6\omega_2^3\omega_3^3 + 6\omega_4 cs^2\omega_2^3\omega_3^3 - 30\omega_4^2\omega_2 v_1^2\omega_3^3 - 12\omega_2^3 v_1^2\omega_3^3$

$C_{13} = 6\omega_4^2 cs^2\omega_2^3\omega_3 + 3\omega_4^2\omega_2^2\omega_3^3 - 32\omega_4^2 cs^2\omega_2^2\omega_3^3 - 12\omega_4\omega_2^3 v_1^2\omega_3^3 + 12\omega_4^2\omega_2^2 v_1^2\omega_3^3 + 12\omega_4\omega_2^3 v_1^2\omega_3^3 + 48\omega_4^2 cs^2\omega_2^2\omega_3^2 - 6\omega_4^2\omega_2^2\omega_3^2 + 6\omega_2^3 v_1^2\omega_3^3 - \omega_4^2\omega_2^3\omega_3^3 - 12\omega_4^2 cs^2\omega_2^2\omega_3 + 4\omega_4^2 cs^2\omega_2^3\omega_3^3 - 12\omega_4\omega_2 v_1^2\omega_3^3 - 12\omega_4^2 cs^2\omega_2^3\omega_3^3 + 2\omega_4^2\omega_2^3\omega_3^3 - 12\omega_4 cs^2\omega_2\omega_3^3 + 6cs^2\omega_2^3\omega_3^3 + 3\omega_4^2\omega_2^3 v_1^2\omega_3^3 - 24\omega_4\omega_2^2 v_1^2\omega_3^3 + 3\omega_4\omega_2^3\omega_3^3 + 36\omega_4 cs^2\omega_2^2\omega_3^3 + 12\omega_4^2\omega_2^3 v_1^2 - 24\omega_4 cs^2\omega_2^2\omega_3^3 - 6\omega_4\omega_2^3\omega_3^3 + 36\omega_4^2\omega_2^2 v_1^2\omega_3^3 - 12\omega_4 cs^2\omega_2^2\omega_3^3 - 6\omega_4\omega_2^2\omega_3^3 - 24\omega_4^2 cs^2\omega_2\omega_3^3 - 18\omega_4^2\omega_2^3 v_1^2\omega_3 - 12cs^2\omega_2^2\omega_3^3 + 12\omega_4\omega_2^2\omega_3^3 - 12\omega_4^2 cs^2\omega_3^3 + 36\omega_4^2 cs^2\omega_2\omega_3^3 + 24\omega_4^2 v_1^2\omega_3^3 + 12\omega_4 cs^2\omega_2^3\omega_3^3 - 30\omega_4^2\omega_2 v_1^2\omega_3^3 - 12\omega_2^3 v_1^2\omega_3^3$

$C_{14} = -36\omega_4\omega_2^2 - 12\omega_2^2 v_1^2 + 90\omega_4^2 cs^2\omega_2 + 9\omega_4\omega_2^3 + 48\omega_4\omega_2^2 v_1^2 + 4\omega_4^2 cs^2\omega_2^3 + 6\omega_2^3 v_1^2 - 12\omega_4\omega_2^3 v_1^2 - 44\omega_4^2 cs^2\omega_2^2 + 24\omega_4\omega_2 - 12cs^2\omega_2^2 - 12\omega_4 cs^2\omega_2^2 - 12\omega_4^2\omega_2 + 12\omega_4^2 v_1^2 - 48\omega_4^2 cs^2 + 48\omega_4 cs^2\omega_2^2 + \omega_4^2\omega_2^3 v_1^2 + 6cs^2\omega_2^3 - \omega_4^2\omega_2^3 - 36\omega_4 cs^2\omega_2 - 6\omega_2^3 - 36\omega_4\omega_2 v_1^2 + 11\omega_4^2\omega_2^2 + 12\omega_2 - 8\omega_4^2\omega_2^2 v_1^2$

$C_{15} = -10\omega_5^2\omega_2 v_2^2\omega_3^2 + 12cs^2\omega_2\omega_3^3 + 3cs^2\omega_5^2\omega_3^3 - 2cs^2\omega_5^2\omega_2\omega_3^3 + \omega_5^2\omega_2 v_2^2\omega_3^3 - 18cs^2\omega_5^2\omega_3^3 - 6cs^2\omega_2\omega_3^3 + 22cs^2\omega_5^2\omega_2\omega_3 - 30cs^2\omega_5^2\omega_2\omega_3 + 12cs^2\omega_5^2\omega_3 + 12\omega_5 v_2^2\omega_3^3 - 6\omega_5 v_2^2\omega_3^3 + 36\omega_5 v_2^2\omega_2\omega_3 + 6\omega_5^2 v_2^2\omega_3^3 + 12cs^2\omega_5\omega_2\omega_3 - 30\omega_5 v_2^2\omega_2\omega_3^3 - \omega_5^2 v_2^2\omega_3^3 + 9\omega_5\omega_2 v_2^2\omega_3^3 + 9cs^2\omega_5\omega_2\omega_3^3 + 12\omega_2 v_2^2\omega_3^3 + 12cs^2\omega_5\omega_3^3 + 12cs^2\omega_5^2\omega_2 + 12\omega_5\omega_2 v_2^2\omega_3 - 12\omega_5^2 v_2^2\omega_3 - 6cs^2\omega_5\omega_3^3 - 6\omega_2 v_2^2\omega_3^3 - 24\omega_5^2\omega_2 v_2^2 - 30cs^2\omega_5\omega_2\omega_3^2$

$C_{16} = \omega_5\omega_2^3\omega_3^3 - 12\omega_5\omega_2^2\omega_3 - 10\omega_5\omega_2^2\omega_3^3 - 7\omega_5\omega_2^2\omega_3^3 + 24\omega_5\omega_2^3\omega_3 + 12\omega_5\omega_2^2\omega_3^2 - 12\omega_5\omega_2^3 - 6\omega_5\omega_2\omega_3^2 - 6\omega_2^3\omega_3^2 + 12\omega_5\omega_2\omega_3^3 + 3\omega_2^3\omega_3^3 - 6\omega_5\omega_3^3 + 12\omega_2^2\omega_3^2 - 6\omega_2^2\omega_3^3$

$C_{17} = 20\omega_4^2\omega_5^2\omega_2^3v_2^2v_1^2 + 20\omega_4^2\omega_5^2\omega_2v_2^2v_1^2\omega_3 - 8\omega_4^2cs^2\omega_5^2\omega_3^3v_1^2\omega_3 - 8\omega_4^2cs^2\omega_5^2\omega_2^3v_2^2\omega_3 + 2\omega_4^2cs^2\omega_5\omega_2^3v_1^2\omega_3 - 4\omega_4cs^2\omega_5^2\omega_2^2v_2^2\omega_3 - 4cs^2\omega_5^2\omega_2^2v_2^2\omega_3^3 - 2\omega_4^2cs^4\omega_5\omega_2^3\omega_3 + 4\omega_4^2cs^4\omega_5^2\omega_2^3\omega_3 + \omega_4^2cs^2\omega_5^2\omega_2^3v_1^2\omega_3 - 38\omega_4^2\omega_5^2\omega_2v_2^2v_1^2\omega_3 - 4\omega_4^2cs^2\omega_5\omega_2^2v_1^2\omega_3 - 2\omega_4^2cs^4\omega_5^3\omega_2\omega_3 + 4\omega_4^2cs^4\omega_5\omega_2^2\omega_3 + 10\omega_4cs^2\omega_5^2\omega_2^2v_2^2\omega_3 + \omega_4^2cs^4\omega_5\omega_2^3\omega_3 - 4\omega_4\omega_5^2\omega_2v_2^2v_1^2\omega_3 + \omega_4cs^2\omega_5^2\omega_3^3v_1^2\omega_3 + 4\omega_4^2cs^2\omega_5^2\omega_2v_1^2\omega_3 - 8\omega_4cs^2\omega_5^2\omega_2^2v_2^2\omega_3 - 2\omega_4^2cs^2\omega_5\omega_2^3v_2^2\omega_3 - 2\omega_4cs^2\omega_5^2\omega_2^3v_1^2\omega_3 - 2\omega_4^2cs^4\omega_5\omega_2^3\omega_3 + 12\omega_4^2cs^2\omega_5^2\omega_2^2v_2^2\omega_3 + \omega_4^2cs^2\omega_5\omega_2^3v_2^2\omega_3 + 10\omega_4^2cs^2\omega_5^2\omega_3^3v_1^2\omega_3 - 4\omega_4^2cs^2\omega_5^2v_2^2\omega_3 - 8\omega_4^2cs^2\omega_5^2\omega_2v_1^2\omega_3 + 2\omega_4^2\omega_5\omega_2^2v_2^2v_1^2\omega_3 - 38\omega_4^2\omega_5^2\omega_2^3v_2v_1^2\omega_3 + 4\omega_4^2cs^4\omega_5^2\omega_2^2\omega_3 + 2\omega_4\omega_2^3v_2^2v_1^2\omega_3 - 3\omega_4cs^2\omega_5^2\omega_2^3v_2^2\omega_3 - \omega_4^2cs^4\omega_5\omega_2^3\omega_3 - 2\omega_4cs^4\omega_5^2\omega_2^3\omega_3 + 10\omega_4^2cs^2\omega_5^2\omega_2v_2^2\omega_3 + 2\omega_4\omega_5^2\omega_3^3v_2^2v_1^2\omega_3 + 2\omega_4^2cs^2\omega_5^3v_1^2\omega_3 + 10\omega_4^2cs^2\omega_5\omega_2^3v_1^2\omega_3 - 36\omega_4^2\omega_5^2\omega_2^2v_2^2v_1^2\omega_3 - 4\omega_4^2cs^2\omega_5^2\omega_2v_1^2\omega_3 + 4\omega_4cs^4\omega_5^2\omega_2^3\omega_3 - 4\omega_4\omega_2^3v_2^2v_1^2\omega_3 + 2cs^2\omega_5^2\omega_2^3v_2^2\omega_3 + 2\omega_4cs^2\omega_5^2\omega_3^3v_2^2\omega_3 - 4\omega_4\omega_5\omega_2^2v_2^2v_1^2\omega_3 + 20\omega_4^2\omega_5^2\omega_2^3v_2^2v_1^2\omega_3 - 3\omega_4^2cs^2\omega_5\omega_2^3v_1^2\omega_3 - 4\omega_4\omega_5\omega_3^3v_2^2v_1^2\omega_3 + 4\omega_4^2cs^2\omega_5^2\omega_3^3v_2^2\omega_3 + 12\omega_4^2cs^2\omega_5^2\omega_2v_1^2\omega_3 - 4\omega_4^2cs^2\omega_2v_1^2\omega_3 - 3\omega_4\omega_5\omega_2^3v_2^2v_1^2\omega_3 - 4\omega_4^2cs^2\omega_5\omega_2v_2^2\omega_3 + \omega_4cs^4\omega_5\omega_2^3\omega_3 - 4\omega_4cs^2\omega_5^2\omega_2^2v_1^2\omega_3 - 2\omega_4^2cs^2\omega_5\omega_2^2v_2^2\omega_3 + 10\omega_4^2\omega_5\omega_3^3v_2^2v_1^2\omega_3 - 4\omega_4^2cs^2\omega_5^2\omega_3^3v_2^2\omega_3 + 4\omega_4cs^4\omega_5^2\omega_2^2\omega_3 + 20\omega_4^2\omega_5^2v_2^2v_1^2\omega_3 - 2\omega_4^2cs^4\omega_5^3\omega_3\omega_3 + 10\omega_4\omega_5^2\omega_2^2v_2^2v_1^2\omega_3 + 4\omega_4cs^2\omega_5^2\omega_2v_1^2\omega_3 + 4\omega_4^2cs^4\omega_5^2\omega_2^2\omega_3 - 3\omega_4^2\omega_5^2\omega_3^3v_2^2v_1^2\omega_3 - 2\omega_4cs^4\omega_5\omega_2^2\omega_3 + 4\omega_4^2cs^2\omega_5\omega_2^2v_2^2\omega_3 + 20\omega_4^2\omega_5^2\omega_2^3v_2^2v_1^2\omega_3 + \omega_4^2cs^2\omega_5^2\omega_3^3v_2^2\omega_3 - 4\omega_4^2cs^2\omega_5\omega_2^3v_1^2\omega_3 - 3\omega_4^2\omega_5\omega_3^3v_2^2v_1^2\omega_3 - 4\omega_4cs^2\omega_5^2\omega_2v_2^2\omega_3 + 20\omega_4^2\omega_5^2\omega_3^3v_2^2v_1^2\omega_3 - 4\omega_5^2\omega_2^3v_2^2v_1^2\omega_3 - 4\omega_4\omega_5^2\omega_2^3v_2^2v_1^2\omega_3 - 12\omega_4^2cs^4\omega_5^2\omega_2^2\omega_3 - 2\omega_4cs^2\omega_5^2\omega_2^3v_1^2\omega_3 - 4\omega_4^2cs^2\omega_5^3\omega_2v_1^2$

$C_{18} = -78\omega_5^2\omega_3^3v_2^2\omega_3 + 24\omega_5^2\omega_2v_2^2\omega_3^2 + 6cs^2\omega_5^2\omega_2\omega_3^3 - 30\omega_5^2\omega_2v_2^2\omega_3^3 - 12cs^2\omega_5\omega_3^2\omega_3 - 12cs^2\omega_5^2\omega_2\omega_3^2 + 48\omega_5^2\omega_3^3v_2^2 + 24cs^2\omega_5\omega_3^2\omega_3 - 4\omega_5^2\omega_3^3v_2^2\omega_3 - 6cs^2\omega_5\omega_3^3\omega_3 + 34\omega_5^2\omega_2^3v_2^2\omega_3 + 6\omega_3^3v_2^2\omega_3 + 6cs^2\omega_2^3\omega_3^3 - 14cs^2\omega_5^2\omega_3^2\omega_3 - 12\omega_5\omega_3^3v_2^2\omega_3 - 12cs^2\omega_3^2\omega_3^2 + cs^2\omega_5^3\omega_3^3\omega_3 + 12\omega_5^2v_2^2\omega_3^3 - 12\omega_5^3v_2^2\omega_3^3 + 24\omega_5^2\omega_2v_2^2\omega_3 - 12cs^2\omega_5^2\omega_2 - 6\omega_5\omega_2^3v_2^2\omega_3 - 48\omega_5^2\omega_2^3v_2^2\omega_3 + 12cs^2\omega_5^2\omega_2\omega_3^2 + 24\omega_5\omega_3^3v_2^2\omega_3 + 22\omega_5^2\omega_2^3v_2^2\omega_3 - 6cs^2\omega_5^2\omega_2\omega_3 + 24cs^2\omega_5\omega_2\omega_3$

$C_{19} = 6\omega_4^2cs^2\omega_2^3\omega_3 - 14\omega_4^2cs^2\omega_2^3\omega_3 - 6\omega_4\omega_2^3v_1^2\omega_3 - 48\omega_4^2\omega_2^3v_1^2\omega_3 + 34\omega_4^2\omega_2^3v_1^2\omega_3 + 12\omega_4^2cs^2\omega_2^3\omega_3 + 6\omega_2^3v_1^2\omega_3 - 12\omega_4^2cs^2\omega_2^3\omega_3 + \omega_4^2cs^2\omega_3^3\omega_3 - 12\omega_4\omega_2v_1^2\omega_3 - 6\omega_4^2cs^2\omega_2^3\omega_3 + 24\omega_4^2\omega_2^3v_1^2\omega_3 - 12\omega_4 cs^2\omega_2\omega_3 + 6cs^2\omega_2^3\omega_3^3 - 4\omega_4^2\omega_2^3v_1^2\omega_3 + 24\omega_4 cs^2\omega_2^3\omega_3 + 12\omega_4^2\omega_2^3v_1^2 + 22\omega_4^2\omega_3^3v_1^2\omega_3 + 24\omega_4^2\omega_2^3v_1^2\omega_3 + 24\omega_4^2\omega_2v_1^2\omega_3 - 6\omega_4cs^2\omega_2^3\omega_3 - 30\omega_4^2\omega_2^3v_1^2\omega_3 - 12cs^2\omega_2^3\omega_3 - 12\omega_4^2cs^2\omega_3^3 + 24\omega_4^2cs^2\omega_2\omega_3 + 48\omega_4^2v_1^2\omega_3 - 78\omega_4^2\omega_2v_1^2\omega_3 - 12\omega_2^2v_1^2\omega_3$

$C_{20} = -6cs^2\omega_3^3 - 11\omega_5^2\omega_3^3 - 2cs^2\omega_5^2\omega_3^3 + \omega_5^2\omega_3^3 + 12cs^2\omega_3^3 + 25cs^2\omega_5^2\omega_3^3 + 48\omega_5v_2^2\omega_3 - 48cs^2\omega_5^2\omega_3 - 60\omega_5v_2^2\omega_3^3 - 12\omega_3^3 + 24cs^2\omega_5^2 + 15\omega_5v_2^2\omega_3^3 + 6\omega_3^3 + 12\omega_5^2\omega_3 + 27\omega_5^2v_2^2\omega_3^3 - 24\omega_5\omega_3 - 3\omega_5^2v_2^2\omega_3^3 + 24cs^2\omega_5\omega_3 + 12\omega_5^2v_2^2 - 9\omega_5\omega_3^3 - 6v_2^2\omega_3^3 - 36cs^2\omega_5\omega_3 + 12v_2^2\omega_3^3 + 36\omega_5\omega_3^3 - 42\omega_5^2v_2^2\omega_3 + 9cs^2\omega_5\omega_3^3$

$C_{21} = -30\omega_5^2\omega_2^3v_2^2\omega_3 + 6\omega_5^2\omega_2v_2^2\omega_3^2 + 6\omega_5\omega_2^3v_2^2\omega_3 - 12cs^2\omega_5\omega_2^3\omega_3^2 + 6cs^2\omega_5^2\omega_2\omega_3^3 - 12\omega_5^2\omega_2v_2^2\omega_3^3 - 24cs^2\omega_5\omega_2^3\omega_3 - 12cs^2\omega_5^2\omega_2\omega_3^2 + 6cs^2\omega_5\omega_2^3\omega_3^3 - 21\omega_5\omega_3^3\omega_3^3 + 24\omega_5^2\omega_3^3v_2^2 + 42cs^2\omega_5\omega_2^3\omega_3^2 - 3\omega_5\omega_3^3\omega_3^3 + 12\omega_5\omega_3^3\omega_3 - 12\omega_5\omega_2^3v_2^2\omega_3 + 6\omega_5\omega_2^3v_2^2\omega_3 - 12cs^2\omega_5\omega_3^3\omega_3^3 + 6\omega_5^2\omega_3^3v_2^2\omega_3 + 6\omega_5\omega_2^3v_2^2\omega_3 - 6\omega_5^2\omega_3^3\omega_3 + 6\omega_3^3v_2^2\omega_3 + \omega_5^2\omega_2^3\omega_3 + 6cs^2\omega_2^3\omega_3^3 - 48cs^2\omega_5^2\omega_3^3\omega_3 + 6\omega_3^3\omega_3 - 24\omega_5\omega_3^3v_2^2\omega_3 - 12cs^2\omega_2^3\omega_3 + 6cs^2\omega_5^2\omega_3^3\omega_3 + 6\omega_5^2v_2^2\omega_3 - 24cs^2\omega_5^2\omega_2\omega_3 - 12\omega_3^3v_2^2\omega_3 - 3\omega_5\omega_2^3\omega_3 + 12\omega_5^2\omega_2^3v_2^2\omega_3 - 3\omega_5\omega_3^3 - 36cs^2\omega_5^2\omega_3 - 12\omega_5\omega_3^3v_2^2\omega_3 - 12\omega_5^2\omega_2v_2^2\omega_3 + 42cs^2\omega_5^2\omega_2\omega_3 - \omega_5^2\omega_2\omega_3^3 + 42\omega_5\omega_3^3v_2^2\omega_3 + 6\omega_5^2\omega_2v_2^2\omega_3 + 7\omega_5^2\omega_2^3\omega_3 - 12cs^2\omega_5^2\omega_2\omega_3 + 78cs^2\omega_5^2\omega_2\omega_3$

$C_{22} = 6cs^2\omega_3^3 + 11\omega_5^2\omega_3^3 + 4cs^2\omega_5^2\omega_3^3 - \omega_5^2\omega_3^3 - 12cs^2\omega_3^3 - 44cs^2\omega_5^2\omega_3^3 - 36\omega_5v_2^2\omega_3 + 90cs^2\omega_5^2\omega_3 + 48\omega_5v_2^2\omega_3^3 + 12\omega_3^3 - 48cs^2\omega_5^2 - 12\omega_5v_2^2\omega_3^3 - 6\omega_3^3 - 12\omega_5^2\omega_3 - 8\omega_5^2v_2^2\omega_3^3 + 24\omega_5\omega_3 + \omega_5^2v_2^2\omega_3 - 36cs^2\omega_5\omega_3 + 12\omega_5^2v_2^2 + 9\omega_5\omega_3^3 + 6v_2^2\omega_3^3 + 48cs^2\omega_5\omega_3^3 - 12v_2^2\omega_3^3 - 36\omega_5\omega_3^3 - 12cs^2\omega_5\omega_3^3$

$C_{23} = -30\omega_5^2\omega_3^3v_2^2\omega_3 + 3\omega_5\omega_3^3\omega_3^3 - 24cs^2\omega_5\omega_2^3\omega_3^2 + 6cs^2\omega_5^2\omega_2\omega_3^3 - 18\omega_5^2\omega_2v_2^2\omega_3 - 12cs^2\omega_5\omega_2^3\omega_3 - 12cs^2\omega_5^2\omega_2\omega_3 + 12cs^2\omega_5\omega_2^3\omega_3 - 6\omega_5\omega_2^3\omega_3^3 + 24\omega_5^2\omega_3^3v_2^2 + 36cs^2\omega_5\omega_2^3\omega_3^2 - 6\omega_5\omega_2^3\omega_3 + 3\omega_5^2\omega_3^3v_2^2\omega_3 - 24\omega_5\omega_2^3v_2^2\omega_3 + 12\omega_5\omega_2^3\omega_3 - 12cs^2\omega_5\omega_3^3\omega_3^3 + 12\omega_5\omega_2^3v_2^2\omega_3 + 6\omega_3^3v_2^2\omega_3 + 2\omega_5^2\omega_2^3\omega_3 + 6cs^2\omega_2^3\omega_3^3 - 32cs^2\omega_5^2\omega_3^3\omega_3^3 - 12\omega_5\omega_3^3v_2^2\omega_3 - 12cs^2\omega_3^3\omega_3 + 4cs^2\omega_5^2\omega_3^3\omega_3 + 12\omega_5^2v_2^2\omega_3 - 24cs^2\omega_5^2\omega_2\omega_3 - 12\omega_3^3v_2^2\omega_3 - 6\omega_5^2\omega_2\omega_3 - 12cs^2\omega_5^2\omega_3 - 12\omega_5\omega_3^3v_2^2\omega_3 + 12\omega_5^2\omega_2v_2^2\omega_3 + 48cs^2\omega_5^2\omega_2\omega_3 - \omega_5^2\omega_2\omega_3^3 + 36\omega_5\omega_3^3v_2^2\omega_3 + 3\omega_5^2\omega_2^3\omega_3 - 12cs^2\omega_5^2\omega_2\omega_3 + 36cs^2\omega_5^2\omega_3\omega_3$

$C_{24} = 3\omega_5^2v_2^4\omega_3^3 - 48cs^4\omega_5^2\omega_3 - 12cs^2\omega_5v_2^2\omega_3^3 + cs^2\omega_5^3\omega_3^3 - 24\omega_5^2v_2^4\omega_3^2 - 8cs^2\omega_5^2\omega_3^3 + 48\omega_5v_2^2\omega_3 + 48cs^2\omega_5v_2^2\omega_3^2 + 12cs^2\omega_5^2\omega_3 - 72\omega_5v_2^2\omega_3^3 - 24v_2^4\omega_3^2 - 24cs^2\omega_5v_2^2\omega_3 + 24\omega_5v_2^4\omega_3^2 - 3cs^4\omega_5^3\omega_3 + 18\omega_5v_2^2\omega_3^3 + 12v_2^4\omega_3^3 + 24cs^4\omega_5^2\omega_3 - 96cs^2\omega_5^2v_2^2 + 156cs^2\omega_5^2v_2^2\omega_3 + 24\omega_5v_2^2\omega_3 - 24cs^4\omega_5\omega_3^3 - 48\omega_5v_2^4\omega_3^3 - 3\omega_5^2v_2^2\omega_3^3 - 24cs^2\omega_5\omega_3 + 6cs^4\omega_5\omega_3^3 + 24cs^4\omega_5^2 - 12v_2^2\omega_3^3 - 18\omega_5v_2^2\omega_3^3 + 24cs^2\omega_5\omega_3^3 - 24cs^2v_2^2\omega_3^3 + 6cs^2\omega_5^2v_2^2\omega_3^3 + 24cs^4\omega_5\omega_3 + 24v_2^2\omega_3^3 + 72\omega_5v_2^2\omega_3^3 + 12cs^2v_2^2\omega_3^3 - 72cs^2\omega_5^2v_2^2\omega_3 - 24\omega_5^2v_2^2\omega_3 - 6cs^2\omega_5\omega_3^3$

$C_{25} = 6cs^2\omega_3^3 + 8\omega_5^2\omega_3^3 + cs^2\omega_5^2\omega_3^3 - \omega_5^2\omega_3^3 - 12cs^2\omega_3^3 - 20cs^2\omega_5^2\omega_3^3 - 12\omega_5v_2^2\omega_3 + 42cs^2\omega_5^2\omega_3 + 24\omega_5v_2^2\omega_3^3 + 12\omega_3^3 - 24cs^2\omega_5^2 - 6\omega_5v_2^2\omega_3^3 - 6\omega_3^3 - 6\omega_5^2\omega_3 - 16\omega_5^2v_2^2\omega_3^3 + 12\omega_5\omega_3 + 2\omega_5^2v_2^2\omega_3^3 - 12cs^2\omega_5\omega_3 - 12\omega_5^2v_2^2 + 6\omega_5\omega_3^3 + 6v_2^2\omega_3^3 + 24cs^2\omega_5\omega_3^3 - 12v_2^2\omega_3^3 - 24\omega_5\omega_3^3 + 24\omega_5^2v_2^2\omega_3 - 6cs^2\omega_5\omega_3$

2.4 CLBM1

2.4.1 Definitions

Collision operator $\boldsymbol{C}$:

$$\boldsymbol{C}\left(\boldsymbol{f}\right) = \mathbf{K}^{-1}\mathbf{S}\left(\boldsymbol{\kappa}^{(eq)} - \mathbf{K}\boldsymbol{f}\right),$$

where

$$\mathbf{S} = \mathrm{diag}(\omega_1, \omega_2, \omega_3, \omega_4, \omega_5),$$

$\omega_1, \omega_2, \ldots, \omega_5 \in (0, 2)$.

Matrix $\mathbf{K}$ corresponds to the transformation matrix to the central moment basis defined by

$$\boldsymbol{\kappa} = \Big(k_{(0,0)}, k_{(1,0)}, k_{(0,1)}, k_{(2,0)}, k_{(0,2)} \Big)^T,$$

and is given by

$$\mathbf{K} = \begin{pmatrix} 1 & 1 & 1 & 1 & 1 \\ -v_1 & 1-v_1 & -v_1 & -v_1-1 & -v_1 \\ -v_2 & -v_2 & 1-v_2 & -v_2 & -v_2-1 \\ v_1^2 & (1-v_1)^2 & v_1^2 & (v_1+1)^2 & v_1^2 \\ v_2^2 & v_2^2 & (1-v_2)^2 & v_2^2 & (v_2+1)^2 \end{pmatrix}.$$

The equilibrium central moments are defined by

$$\boldsymbol{\kappa}^{(eq)} = \mathbf{KM}^{-1}\boldsymbol{\mu}^{(eq)},$$

i.e.,

$$\boldsymbol{\kappa}^{(eq)} = \Big(\rho, 0, 0, \rho c_s^2, \rho c_s^2 \Big)^T.$$

2.4.2 Conservation of mass equation

📎 attached text file: `output_d2q5_ade_clbm1_symbolic_pde_00.txt`

$\frac{\partial \rho}{\partial t} + \frac{v_1 \delta_l}{\delta_t}\frac{\partial \rho}{\partial x_1} + \frac{\delta_l \rho}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{v_2 \delta_l}{\delta_t}\frac{\partial \rho}{\partial x_2} + \frac{\delta_l \rho}{\delta_t}\frac{\partial v_2}{\partial x_2} + (-2+\omega_2)\frac{\delta_l}{2\omega_2}\frac{\partial \rho}{\partial x_1}\frac{\partial v_1}{\partial t} + (-2+\omega_2)\frac{v_1 \delta_l^2}{2\omega_2 \delta_t}\frac{\partial \rho}{\partial x_1}\frac{\partial v_1}{\partial x_1} +$

$(-2+\omega_2)\frac{\delta_l^2 \rho}{2\omega_2 \delta_t}\left(\frac{\partial v_1}{\partial x_1}\right)^2 + (2-\omega_3)\frac{v_2 \delta_l^2}{2\omega_3 \delta_t}\frac{\partial \rho}{\partial x_1}\frac{\partial v_1}{\partial x_2} + (\omega_2 - \omega_2\omega_3 + \omega_3)\frac{v_1 \delta_l^2}{\omega_2\omega_3 \delta_t}\frac{\partial \rho}{\partial x_1}\frac{\partial v_2}{\partial x_2} +$

$(\omega_2 - \omega_2\omega_3 + \omega_3)\frac{\delta_l^2 \rho}{\omega_2\omega_3 \delta_t}\frac{\partial v_1}{\partial x_1}\frac{\partial v_2}{\partial x_2} + (-2+\omega_3)\frac{\delta_l}{2\omega_3}\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial t} + (\omega_2 - \omega_2\omega_3 + \omega_3)\frac{v_2 \delta_l^2}{\omega_2\omega_3 \delta_t}\frac{\partial \rho}{\partial x_2}\frac{\partial v_1}{\partial x_1} + (2-\omega_2)\frac{v_1 \delta_l^2}{2\omega_2 \delta_t}\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial x_1}$

$+ (-2+\omega_3)\frac{v_2 \delta_l^2}{2\omega_3 \delta_t}\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial x_2} + (-2+\omega_3)\frac{\delta_l^2 \rho}{2\omega_3 \delta_t}\left(\frac{\partial v_2}{\partial x_2}\right)^2 + (-2+\omega_2)\frac{\delta_l \rho}{2\omega_2}\frac{\partial^2 v_1}{\partial t \partial x_1} + (-2+\omega_2)\frac{cs^2 \delta_l^2}{2\omega_2 \delta_t}\frac{\partial^2 \rho}{\partial x_1^2} +$

$(-2+\omega_2)\frac{v_1 \delta_l^2 \rho}{2\omega_2 \delta_t}\frac{\partial^2 v_1}{\partial x_1^2} + (-2+\omega_3)\frac{\delta_l \rho}{2\omega_3}\frac{\partial^2 v_2}{\partial t \partial x_2} + (\omega_2 - \omega_2\omega_3 + \omega_3)\frac{v_2 v_1 \delta_l^2}{\omega_2\omega_3 \delta_t}\frac{\partial^2 \rho}{\partial x_1 \partial x_2} + (2-\omega_3)\frac{v_2 \delta_l^2 \rho}{2\omega_3 \delta_t}\frac{\partial^2 v_1}{\partial x_1 \partial x_2} +$

$(2-\omega_2)\frac{v_1 \delta_l^2 \rho}{2\omega_2 \delta_t}\frac{\partial^2 v_2}{\partial x_1 \partial x_2} + (-2+\omega_3)\frac{cs^2 \delta_l^2}{2\omega_3 \delta_t}\frac{\partial^2 \rho}{\partial x_2^2} + (-2+\omega_3)\frac{v_2 \delta_l^2 \rho}{2\omega_3 \delta_t}\frac{\partial^2 v_2}{\partial x_2^2} + (12+\omega_2^2 - 12\omega_2)\frac{\delta_l \rho \delta_t}{12\omega_2^2}\frac{\partial^3 v_1}{\partial t^2 \partial x_1} +$

$(12+\omega_2^2 - 12\omega_2)\frac{v_1 \delta_l^2 \rho}{6\omega_2^2}\frac{\partial^3 v_1}{\partial t \partial x_1^2} + C_1 \frac{v_1 \delta_l^3}{6\omega_4\omega_2\delta_t}\frac{\partial^3 \rho}{\partial x_1^3} + C_2\frac{\delta_l^3 \rho}{12\omega_4\omega_2^2\delta_t}\frac{\partial^3 v_1}{\partial x_1^3} + (12+\omega_3^2 - 12\omega_3)\frac{\delta_l \rho \delta_t}{12\omega_3^2}\frac{\partial^3 v_2}{\partial t^2 \partial x_2} +$

$(3\omega_3^2 - 2\omega_2\omega_3^2 - 6\omega_2 + 9\omega_2\omega_3 - 6\omega_3)\frac{v_2 \delta_l^2 \rho}{6\omega_2\omega_3^2}\frac{\partial^3 v_1}{\partial t \partial x_1 \partial x_2} + (-2\omega_2^2\omega_3 + 3\omega_2^2 - 6\omega_2 + 9\omega_2\omega_3 - 6\omega_3)\frac{v_1 \delta_l^2 \rho}{6\omega_2^2\omega_3}\frac{\partial^3 v_2}{\partial t \partial x_1 \partial x_2} +$

$C_3\frac{v_2 \delta_l^3}{2\omega_4\omega_2^2\omega_3^2\delta_t}\frac{\partial^3 \rho}{\partial x_1^2 \partial x_2} + (-6\omega_2^2\omega_3 + 6\omega_2^2 + \omega_2^2\omega_3^2 + 6\omega_3^2 - 6\omega_2\omega_3^2)\frac{v_2 v_1 \delta_l^3 \rho}{6\omega_2^2\omega_3^2\delta_t}\frac{\partial^3 v_1}{\partial x_1^2 \partial x_2} +$

$(12\omega_2 v_1^2 + 6\omega_4\omega_2 v_1^2 - 12\omega_4 cs^2 - 12\omega_4 v_1^2 + 6cs^2\omega_2^2 - 3\omega_4 cs^2\omega_2^2 - 12cs^2\omega_2 + 18\omega_4 cs^2\omega_2 - 6\omega_2^2 v_1^2 + \omega_4\omega_2^2 v_1^2)\frac{\delta_l^3 \rho}{12\omega_4\omega_2^2\delta_t}\frac{\partial^3 v_2}{\partial x_1^2 \partial x_2}$

$+ (12+\omega_3^2 - 12\omega_3)\frac{v_2 \delta_l^2 \rho}{6\omega_3^2}\frac{\partial^3 v_2}{\partial t \partial x_2^2} + C_4\frac{v_1 \delta_l^3}{2\omega_5\omega_2^2\omega_3^2\delta_t}\frac{\partial^3 \rho}{\partial x_1 \partial x_2^2} + (-12cs^2\omega_3 - 12\omega_5 v_2^2 + 12v_2^2\omega_3 + 18cs^2\omega_5\omega_3 -$

$3cs^2\omega_5\omega_3^2 + 6cs^2\omega_3^2 - 6v_2^2\omega_3^2 + 6\omega_5 v_2^2\omega_3 + \omega_5 v_2^2\omega_3^2 - 12cs^2\omega_5)\frac{\delta_l^3 \rho}{12\omega_5\omega_3^2\delta_t}\frac{\partial^3 v_1}{\partial x_1 \partial x_2^2} +$

$(-6\omega_2^2\omega_3 + 6\omega_2^2 + \omega_2^2\omega_3^2 + 6\omega_3^2 - 6\omega_2\omega_3^2)\frac{v_2 v_1 \delta_l^3 \rho}{6\omega_2^2\omega_3^2\delta_t}\frac{\partial^3 v_2}{\partial x_1 \partial x_2^2} + C_5\frac{v_2 \delta_l^3}{6\omega_5\omega_3\delta_t}\frac{\partial^3 \rho}{\partial x_2^3} + C_6\frac{\delta_l^3 \rho}{12\omega_5\omega_3^2\delta_t}\frac{\partial^3 v_2}{\partial x_2^3} +$

$(-2-\omega_2^2+3\omega_2)\frac{\delta_l \rho \delta_t^2}{2\omega_2^3}\frac{\partial^4 v_1}{\partial t^3 \partial x_1} + (-2-\omega_2^2+3\omega_2)\frac{3v_1 \delta_l^2 \rho \delta_t}{2\omega_2^3}\frac{\partial^4 v_1}{\partial t^2 \partial x_1^2} + C_7\frac{\delta_l^3 \rho}{12\omega_4^2\omega_2^3}\frac{\partial^4 v_1}{\partial t \partial x_1^3} + C_8\frac{\delta_l^4 \rho}{24\omega_4^4\omega_2^3\delta_t}\frac{\partial^4 \rho}{\partial x_1^4} +$

$C_9\frac{v_1 \delta_l^4 \rho}{12\omega_4^2\omega_2^3\delta_t}\frac{\partial^4 v_1}{\partial x_1^4} + (-2-\omega_3^2+3\omega_3)\frac{\delta_l \rho \delta_t^2}{2\omega_3^3}\frac{\partial^4 v_2}{\partial t^3 \partial x_2} +$

$(-24\omega_2^2\omega_3 - \omega_2^2\omega_3^3 + 12\omega_2^2 + 13\omega_2^2\omega_3^2 + 12\omega_3^2 - 24\omega_2\omega_3^2 - 6\omega_3^3 + 7\omega_2\omega_3^3 + 12\omega_2\omega_3)\frac{v_2 \delta_l^2 \rho \delta_t}{12\omega_2^2\omega_3^3}\frac{\partial^4 v_1}{\partial t^2 \partial x_1 \partial x_2} +$

$(-24\omega_2^2\omega_3 - \omega_3^3\omega_2^2 - 6\omega_3^3 + 7\omega_3^3\omega_2 + 12\omega_2^2 + 13\omega_2^2\omega_3^2 + 12\omega_3^2 - 24\omega_2\omega_3^2 + 12\omega_2\omega_3)\frac{v_1 \delta_l^2 \rho \delta_t}{12\omega_2^3\omega_3^3}\frac{\partial^4 v_2}{\partial t^2 \partial x_1 \partial x_2} +$

$(\omega_2^3\omega_3^3 - 6\omega_2^2\omega_3 - 7\omega_2^2\omega_3^2 - 6\omega_3^2 - 7\omega_2^2\omega_3^3 + 12\omega_2^3\omega_3 + 6\omega_2^2\omega_3^3 - 12\omega_3^3 + 18\omega_2\omega_3^3)\frac{v_2 v_1 \delta_l^3 \rho}{6\omega_2^3\omega_3^3}\frac{\partial^4 v_1}{\partial t \partial x_1^2 \partial x_2} +$

$$C_{10}\frac{\delta_l^3\rho}{12\omega_4^2\omega_3^3\omega_3}\frac{\partial^4 v_2}{\partial t\partial x_1^2\partial x_2} \;+\; C_{11}\frac{v_2 v_1\delta_l^4}{6\omega_4^2\omega_3^3\omega_3^3\delta_t}\frac{\partial^4\rho}{\partial x_1^3\partial x_2} \;+\; C_{12}\frac{v_2\delta_l^4\rho}{12\omega_4^2\omega_2^3\omega_3^3\delta_t}\frac{\partial^4 v_1}{\partial x_1^3\partial x_2} \;+\; C_{13}\frac{v_1\delta_l^4\rho}{12\omega_4^2\omega_3^3\delta_t}\frac{\partial^4 v_2}{\partial x_1^3\partial x_2} \;+$$

$$(-2-\omega_3^2+3\omega_3)\frac{3v_2\delta_l^2\rho\delta_t}{2\omega_3^3}\frac{\partial^4 v_2}{\partial t^2\partial x_2^2} \;+\; C_{14}\frac{\delta_l^3\rho}{12\omega_5^2\omega_2\omega_3^3}\frac{\partial^4 v_1}{\partial t\partial x_1\partial x_2^2} \;+$$

$$(\omega_2^3\omega_3^3-7\omega_2^3\omega_3^2-12\omega_2^3-7\omega_2^2\omega_3^3+18\omega_3^3\omega_3+6\omega_2^2\omega_3^2-6\omega_2\omega_3^2-6\omega_3^3+12\omega_2\omega_3^3)\frac{v_2 v_1\delta_l^3\rho}{6\omega_2^3\omega_3^3}\frac{\partial^4 v_2}{\partial t\partial x_1\partial x_2^2} \;+$$

$$C_{15}\frac{\delta_l^4}{4\omega_4^2\omega_5^2\omega_2^3\omega_3^3\delta_t}\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2} \;+\; C_{16}\frac{v_1\delta_l^4\rho}{12\omega_5^2\omega_3^3\omega_3^3\delta_t}\frac{\partial^4 v_1}{\partial x_1^2\partial x_2^2} \;+\; C_{17}\frac{v_2\delta_l^4\rho}{12\omega_4^2\omega_3^3\omega_3^3\delta_t}\frac{\partial^4 v_2}{\partial x_1^2\partial x_2^2} \;+\; C_{18}\frac{\delta_l^3\rho}{12\omega_5^2\omega_3^3}\frac{\partial^4 v_2}{\partial t\partial x_2^3} \;+$$

$$C_{19}\frac{v_2 v_1\delta_l^4}{6\omega_5^2\omega_2^3\omega_3^3\delta_t}\frac{\partial^4\rho}{\partial x_1\partial x_2^3} \;+\; C_{20}\frac{v_2\delta_l^4\rho}{12\omega_5^2\omega_3^3\delta_t}\frac{\partial^4 v_1}{\partial x_1\partial x_2^3} \;+\; C_{21}\frac{v_1\delta_l^4\rho}{12\omega_5^2\omega_3^3\omega_3^3\delta_t}\frac{\partial^4 v_2}{\partial x_1\partial x_2^3} \;+\; C_{22}\frac{\delta_l^4}{24\omega_5^2\omega_3^3\delta_t}\frac{\partial^4\rho}{\partial x_2^4} \;+\; C_{23}\frac{v_2\delta_l^4\rho}{12\omega_5^2\omega_3^3\delta_t}\frac{\partial^4 v_2}{\partial x_2^4} = 0,$$

where:

$C_1 = 6+3\omega_2 v_1^2-\omega_4\omega_2 v_1^2-6v_1^2-3\omega_4+9\omega_4 cs^2+\omega_4\omega_2+3\omega_4 v_1^2-3\omega_2+9cs^2\omega_2-3\omega_4 cs^2\omega_2-18cs^2$

$C_2 = -36\omega_2 v_1^2+6\omega_4\omega_2 v_1^2-6\omega_2^2-12\omega_4 cs^2-6\omega_4\omega_2+12\omega_4 v_1^2+12\omega_2+6cs^2\omega_2^2-3\omega_4 cs^2\omega_2^2-12cs^2\omega_2+18\omega_4 cs^2\omega_2+18\omega_2^2 v_1^2-5\omega_4\omega_2^2 v_1^2+2\omega_4\omega_2^2$

$C_3 = -2cs^2\omega_2\omega_3^2+4\omega_4 cs^2\omega_2\omega_3^2-3\omega_4\omega_2^2 v_1^2\omega_3-\omega_2^2 v_1^2\omega_3^2+\omega_4\omega_2^2 v_1^2\omega_3^2-2\omega_4 cs^2\omega_3^2-2\omega_4 cs^2\omega_2\omega_3+\omega_4 cs^2\omega_2^2\omega_3^2+2\omega_2 v_1^2\omega_3^2-2\omega_4\omega_2 v_1^2\omega_3^2+cs^2\omega_2^2\omega_3^2+2\omega_4\omega_2 v_1^2\omega_3+2\omega_4\omega_2^2 v_1^2-\omega_4 cs^2\omega_2^2\omega_3^2$

$C_4 = -3\omega_5 v_2^2\omega_2\omega_3^2+cs^2\omega_5\omega_2\omega_3^2-2cs^2\omega_5\omega_2\omega_3+2\omega_5 v_2^2\omega_2\omega_3-2\omega_5 v_2^2\omega_2^2\omega_3+2v_2^2\omega_2^2\omega_3-2cs^2\omega_2^2\omega_3-2cs^2\omega_5\omega_2^2+4cs^2\omega_5\omega_2^2\omega_3-cs^2\omega_5\omega_2^2\omega_3^2+2\omega_5 v_2^2\omega_3^2+cs^2\omega_2^2\omega_3^2-v_2^2\omega_2^2\omega_3^2+\omega_5 v_2^2\omega_2^2\omega_3^2$

$C_5 = 6+9cs^2\omega_3+3\omega_5 v_2^2+3v_2^2\omega_3-3cs^2\omega_5\omega_3-6v_2^2-3\omega_5-\omega_5 v_2^2\omega_3+\omega_5\omega_3+9cs^2\omega_5-3\omega_3-18cs^2$

$C_6 = -12cs^2\omega_3+12\omega_5 v_2^2-36v_2^2\omega_3+18cs^2\omega_5\omega_3-3cs^2\omega_5\omega_3^2+6cs^2\omega_3^2+18v_2^2\omega_3^2-6\omega_3^2+6\omega_5 v_2^2\omega_3-6\omega_5\omega_3+2\omega_5\omega_3^2-5\omega_5 v_2^2\omega_3^2-12cs^2\omega_5+12\omega_3$

$C_7 = -48\omega_4^2 cs^2\omega_2+72\omega_4\omega_2 v_1^2-11\omega_4^2\omega_2^2+15\omega_4^2\omega_2^2 v_1^2+\omega_4^2\omega_2^3+6\omega_2^3-2\omega_4^2 cs^2\omega_2^3-12\omega_2^2-36\omega_4^2 v_1^2+12\omega_4^2\omega_2+25\omega_4^2 cs^2\omega_2^2-3\omega_4^2\omega_2^3 v_1^2-24\omega_4\omega_2+24\omega_4^2 cs^2+9\omega_4 cs^2\omega_2^3-6cs^2\omega_2^3+12cs^2\omega_2^2+27\omega_4\omega_2^3 v_1^2-18\omega_2^3 v_1^2-36\omega_4 cs^2\omega_2^2+18\omega_4^2\omega_2 v_1^2+24\omega_4 cs^2\omega_2-9\omega_4\omega_2^3+36\omega_2^2 v_1^2-108\omega_4\omega_2^2 v_1^2+36\omega_4\omega_2^2$

$C_8 = 12\omega_4^2 cs^2\omega_2-24\omega_4 cs^4\omega_2^2-36\omega_4^2 cs^2\omega_2 v_1^2+12\omega_4^2\omega_2^2 v_1^2+108cs^2\omega_2^3 v_1^2-72\omega_2^2 v_1^4+6\omega_4 cs^4\omega_2^3-72\omega_4 cs^2\omega_2^3 v_1^2+72\omega_4\omega_2^2 v_1^4+24\omega_4^2 cs^4+\omega_4^2 cs^2\omega_2^3+144\omega_4 cs^2\omega_2^2 v_1^2-30\omega_4\omega_2^3 v_1^4+36\omega_2^3 v_1^4+24\omega_4 cs^4\omega_2-8\omega_4^2 cs^2\omega_2^2-3\omega_4^2\omega_2^3 v_1^2-216cs^2\omega_2^2 v_1^2+72\omega_4 cs^2\omega_2 v_1^2-6\omega_4 cs^2\omega_2^3+6\omega_4^2 cs^2\omega_2^2 v_1^2-48\omega_4^2 cs^4\omega_2+3\omega_4^2\omega_2^2 v_1^4+30\omega_4\omega_2^3 v_1^2-36\omega_2^3 v_1^2+24\omega_4 cs^2\omega_2^2-24\omega_4 cs^2\omega_2+24\omega_4^2 cs^4\omega_2^2+72\omega_2^2 v_1^2-72\omega_4\omega_2^2 v_1^2-12\omega_4^2\omega_2^2 v_1^4-12\omega_4^2 cs^2\omega_2^2 v_1^2-3\omega_4^2 cs^4\omega_2^2$

$C_9 = -30\omega_4^2 cs^2\omega_2+60\omega_4\omega_2 v_1^2+2\omega_4^2\omega_2^2+2\omega_4^2\omega_2^2 v_1^2-\omega_4^2\omega_2^3-18\omega_2^3+\omega_4^2 cs^2\omega_2^3+36\omega_2^2-12\omega_4^2 v_1^2+6\omega_4^2\omega_2-2\omega_4^2 cs^2\omega_2^2+2\omega_4^2\omega_2^2 v_1^2-12\omega_4\omega_2-24\omega_4^2 cs^2-24\omega_4 cs^2\omega_2^3+30cs^2\omega_2^3-60cs^2\omega_2^2-24\omega_4\omega_2^3 v_1^2+42\omega_2^3 v_1^2+72\omega_4 cs^2\omega_2^2-12\omega_4^2\omega_2 v_1^2-12\omega_4 cs^2\omega_2+12\omega_4\omega_2^3-84\omega_2^2 v_1^2+24\omega_4\omega_2^2 v_1^2-24\omega_4\omega_2^2$

$C_{10} = 12\omega_4^2 cs^2\omega_2+\omega_4^2\omega_2^3 v_1^2\omega_3+22\omega_4^2 cs^2\omega_2^2\omega_3-6\omega_4^2\omega_2^2 v_1^2+30\omega_4\omega_2^2 v_1^2\omega_3+24\omega_4^2 v_1^2\omega_3-12\omega_2^2 v_1^2\omega_3-2\omega_4^2 cs^2\omega_2^3\omega_3+3\omega_4^2 cs^2\omega_2^3+12\omega_4 cs^2\omega_2\omega_3-18\omega_4^2 cs^2\omega_2^2-36\omega_4^2\omega_2 v_1^2\omega_3-\omega_4^2\omega_2^3 v_1^2-30\omega_4 cs^2\omega_2^2\omega_3+6\omega_2^3 v_1^2\omega_3-9\omega_4\omega_2^3 v_1^2\omega_3-6\omega_4 cs^2\omega_2^3+12cs^2\omega_2^2\omega_3+6\omega_4\omega_2^3 v_1^2+8\omega_4^2\omega_2^2 v_1^2\omega_3+12\omega_4 cs^2\omega_2^2-6cs^2\omega_2^3\omega_3+12\omega_4^2\omega_2 v_1^2+9\omega_4 cs^2\omega_2^3\omega_3+12\omega_4^2 cs^2\omega_3-12\omega_4\omega_2 v_1^2\omega_3-12\omega_4\omega_2^2 v_1^2-30\omega_4^2 cs^2\omega_2\omega_3$

$C_{11} = -3\omega_2^3\omega_3^3-12\omega_4^2\omega_2^3 v_1^2\omega_3+6\omega_4\omega_2^3\omega_3^3+6\omega_4^2 cs^2\omega_2^3\omega_3^3-12\omega_4^2 cs^2\omega_2^2\omega_3-3\omega_4\omega_2^3\omega_3^3+12\omega_4\omega_2 v_1^2\omega_3^3-12\omega_4^2 cs^2\omega_2^3\omega_3^3-24\omega_4 cs^2\omega_2\omega_3^3-36\omega_4^2 cs^2\omega_2^2\omega_3^3+6\omega_4^2 cs^2\omega_2^3\omega_3-21\omega_4\omega_2^3\omega_3^3+6\omega_2^3\omega_3^3+12\omega_2^2 v_1^2\omega_3^3+36\omega_4^2 cs^2\omega_2^2\omega_3^3+6\omega_4^2\omega_3^3 v_1^2+12\omega_4\omega_2^2 v_1^2\omega_3^3+6\omega_4\omega_2^3\omega_3^3+6\omega_4^2\omega_2^3 v_1^2\omega_3^2-6\omega_4^2\omega_2\omega_3^3-24\omega_4 cs^2\omega_3^3\omega_3^3-12\omega_4^2 cs^2\omega_2\omega_3^3+7\omega_4^2\omega_2^2\omega_3^3+18cs^2\omega_2^3\omega_3^3+36\omega_4 cs^2\omega_2\omega_3^3+12\omega_4 cs^2\omega_2^3\omega_3^3+12\omega_4\omega_2\omega_3^3-24\omega_4\omega_2 v_1^2\omega_3^3-3\omega_4^2\omega_2^2\omega_3^3-12\omega_4^2 cs^2\omega_3^3+6\omega_4^2\omega_2 v_1^2\omega_3^3-\omega_4^2\omega_2^3\omega_3^3-36cs^2\omega_2^2\omega_3^3-6\omega_4^2\omega_2^2 v_1^2\omega_3^3-6\omega_2^3 v_1^2\omega_3^3+72\omega_4 cs^2\omega_2^2\omega_3^3-6\omega_4^2\omega_2 v_1^2\omega_3^3+\omega_4^2\omega_2^3\omega_3^3-24\omega_4 cs^2\omega_2^2\omega_3^3$

$C_{12} = -18\omega_4^2\omega_3^3 v_1^2\omega_3+3\omega_4\omega_2^3\omega_3^3+4\omega_4^2 cs^2\omega_2^3\omega_3-12\omega_4^2 cs^2\omega_2^2\omega_3-6\omega_4\omega_2^3\omega_3^2+30\omega_4^2\omega_2 v_1^2\omega_3^3-12\omega_4^2 cs^2\omega_2^3\omega_3^2-12\omega_4 cs^2\omega_2\omega_3^3-32\omega_4^2 cs^2\omega_2^2\omega_3^3+6\omega_4^2 cs^2\omega_2^3\omega_3-24\omega_4\omega_2 v_1^2\omega_3^3+3\omega_4^2\omega_2^3 v_1^2\omega_3-6\omega_4\omega_2^3\omega_3^3+12\omega_2^2 v_1^2\omega_3^3+48\omega_4^2 cs^2\omega_2^2\omega_3-24\omega_4^2 v_1^2\omega_3^3+12\omega_4^2\omega_3^3 v_1^2-12\omega_4\omega_2^2 v_1^2\omega_3^3+12\omega_4\omega_2^2\omega_3^3-12\omega_4 cs^2\omega_2^3\omega_3^3-24\omega_4^2 cs^2\omega_2\omega_3^2+3\omega_4^2\omega_2^3\omega_3^3+6cs^2\omega_2^3\omega_3^3+36\omega_4^2 cs^2\omega_2\omega_3^3+12\omega_4 cs^2\omega_2^3\omega_3^3+12\omega_4\omega_2 v_1^2\omega_3^3-6\omega_4^2\omega_2^2\omega_3^3-12\omega_4^2 cs^2\omega_3^3-\omega_4^2\omega_2^3\omega_3^3-12cs^2\omega_2^2\omega_3^3+12\omega_4^2\omega_2 v_1^2\omega_3^3-6\omega_2^3 v_1^2\omega_3^3+36\omega_4 cs^2\omega_2^3\omega_3^3-12\omega_4^2\omega_2 v_1^2\omega_3^3+12\omega_4\omega_2^3 v_1^2\omega_3^3+2\omega_4^2\omega_2^3\omega_3^3-24\omega_4 cs^2\omega_2^2\omega_3^3$

$C_{13} = 18\omega_4^2 cs^2\omega_2-60\omega_4\omega_2 v_1^2+11\omega_4^2\omega_2^2-14\omega_4^2\omega_2^2 v_1^2-\omega_4^2\omega_2^3-6\omega_2^3+4\omega_4^2 cs^2\omega_2^3+12\omega_2^2+12\omega_4^2 v_1^2-12\omega_4^2\omega_2-26\omega_4^2 cs^2\omega_2^2+\omega_4^2\omega_2^3 v_1^2+24\omega_4\omega_2-30\omega_4 cs^2\omega_2^3+30cs^2\omega_2^3-60cs^2\omega_2^2-6\omega_4\omega_2^3 v_1^2-6\omega_2^3 v_1^2+96\omega_4 cs^2\omega_2^2+12\omega_4^2\omega_2 v_1^2-36\omega_4 cs^2\omega_2+9\omega_4\omega_2^3+12\omega_2^3 v_1^2+48\omega_4\omega_2^2 v_1^2-36\omega_4\omega_2^2$

$C_{14} = 9cs^2\omega_5\omega_2\omega_3^3+12cs^2\omega_2\omega_3^3-6\omega_5 v_2^2\omega_3^2-12v_2^2\omega_2\omega_3^3+30\omega_5 v_2^2\omega_2\omega_3^3-6cs^2\omega_2\omega_3^3-30cs^2\omega_5\omega_2\omega_3^3+12cs^2\omega_5^2\omega_3-9\omega_5 v_2^2\omega_2\omega_3^3+6v_2^2\omega_2\omega_3^3-\omega_5^2 v_2^2\omega_3^3+12cs^2\omega_5\omega_3^3+12cs^2\omega_5\omega_2\omega_3+12\omega_5^2 v_2^2\omega_3-12\omega_5 v_2^2\omega_2\omega_3-6cs^2\omega_5\omega_3^3+24\omega_5^2\omega_2+3cs^2\omega_5^2\omega_3^3+8\omega_5^2 v_2^2\omega_2\omega_3^3-30cs^2\omega_5^2\omega_2\omega_3+\omega_5^2 v_2^2\omega_2\omega_3^3-18cs^2\omega_5^2\omega_3^3-2cs^2\omega_5^2\omega_2\omega_3+12cs^2\omega_5^2\omega_3-12\omega_5 v_2^2\omega_3^3+22cs^2\omega_5\omega_2\omega_3^3+6\omega_5 v_2^2\omega_3^3-36\omega_5 v_2^2\omega_2\omega_3$

$C_{15} = 8\omega_4^2 cs^2\omega_5^2 v_2^2\omega_2\omega_3^3-4\omega_4^2 cs^2\omega_5^2 v_2^2\omega_3^3+2\omega_4^2 cs^2\omega_5\omega_2 v_1^2\omega_3-8\omega_4^2 cs^2\omega_5\omega_3^3 v_1^2\omega_3+4\omega_4\omega_5 v_2^2\omega_2^2 v_1^2\omega_3-2\omega_4^2 cs^4\omega_5\omega_3^3\omega_3^2-3\omega_4 cs^2\omega_5^2 v_2^2\omega_2\omega_3^3+12\omega_4\omega_5 v_2^2\omega_2^2 v_1^2\omega_3-4\omega_4^2 cs^2\omega_5\omega_2^2 v_1^2\omega_3-10\omega_4\omega_5^2 v_2^2\omega_2^2 v_1^2\omega_3+\omega_4^2 cs^2\omega_5^2\omega_3^3 v_1^2\omega_3-8\omega_4^2 cs^2\omega_5^2 v_2^2\omega_2\omega_3^3-4cs^2\omega_5^2 v_2^2\omega_2^2\omega_3+2\omega_4 cs^2\omega_5^2 v_2^2\omega_2\omega_3+\omega_4^2 cs^4\omega_5\omega_3^3\omega_3^3-\omega_4 cs^2\omega_5^2\omega_2^2 v_1^2\omega_3+14\omega_4^2\omega_5^2 v_2^2\omega_2^2 v_1^2\omega_3+4\omega_4^2 cs^4\omega_5\omega_2^2\omega_3+10\omega_4 cs^2\omega_5^2 v_2^2\omega_2^2\omega_3-2\omega_4^2 cs^4\omega_5^2\omega_2\omega_3^2+4\omega_5^2 v_2^2\omega_2^2 v_1^4\omega_3^3+4\omega_4\omega_5 v_2^2\omega_2^2 v_1^2\omega_2^2-2\omega_4^2 cs^2\omega_5^2 v_2^2\omega_2^3\omega_3^2-4\omega_4 cs^2\omega_5^2 v_2^2\omega_2^2\omega_3^2+4\omega_4^2 cs^4\omega_5^2\omega_2\omega_3^3-2\omega_4 cs^4\omega_5\omega_2^2\omega_3^2+2cs^2\omega_5^2 v_2^2\omega_2^3\omega_3^3-28\omega_4^2\omega_5^2 v_2^2\omega_2^2 v_1^2\omega_3+2\omega_4 cs^2\omega_5^2\omega_3^3 v_1^2\omega_3-2\omega_4\omega_5^2 v_2^2\omega_2^2 v_1^2\omega_3+\omega_4^2 cs^2\omega_5^2 v_2^2\omega_2\omega_3^3+10\omega_4^2 cs^2\omega_5^2\omega_3^3 v_1^2\omega_3-12\omega_4^2 cs^4\omega_5^2\omega_2^2\omega_3-14\omega_4^2\omega_5^2 v_2^2\omega_2 v_1^2\omega_3+3\omega_4\omega_5^2 v_2^2\omega_2^2 v_1^2\omega_3-2\omega_4^2 cs^2\omega_5^2\omega_2^2 v_1^2\omega_3+10\omega_4^2 cs^2\omega_5\omega_3^3 v_1^2\omega_3+4\omega_4\omega_5 v_2^2\omega_3^3 v_1^2\omega_3-2\omega_4 cs^4\omega_5^2\omega_2^2\omega_3-4\omega_4^2 cs^2\omega_5 v_2^2\omega_2\omega_3^2+12\omega_4^2\omega_5^2 v_2^2\omega_2\omega_2 v_1^2\omega_3^2+4\omega_4^2\omega_5^2 v_2^2 v_1^2\omega_3^3+4\omega_4^2 cs^4\omega_5^2\omega_2^2\omega_3^3+4\omega_4^2\omega_5^2 v_2^2\omega_2^2 v_1-4\omega_4 cs^2\omega_5^2 v_2^2\omega_2\omega_3^3-14\omega_4^2\omega_5^2 v_2^2\omega_2^3 v_1^2\omega_3-2\omega_4^2 cs^4\omega_5^2\omega_2^3\omega_3+2\omega_4^2 cs^2\omega_5 v_2^2\omega_2^2\omega_3^3+4\omega_4 cs^4\omega_5^2\omega_2^2\omega_3+8\omega_4^2 cs^2\omega_5^2\omega_2^2 v_1^2\omega_3-2\omega_4\omega_5^2 v_2^2\omega_2^2 v_1^2\omega_3-3\omega_4^2 cs^2\omega_5\omega_2^2 v_1^2\omega_3+\omega_4 cs^4\omega_5^2\omega_2^3\omega_3-4\omega_4^2 cs^2\omega_5^2\omega_2^3 v_1+3\omega_4^2\omega_5 v_2^2\omega_2^3 v_1^2\omega_3+$

$$2\omega_4^2 cs^2\omega_5 v_2^2\omega_3^2 - 4\omega_4^2 cs^2\omega_2^3 v_1^2\omega_3^2 + 10\omega_4^2 cs^2\omega_5^2 v_2^2\omega_2\omega_3 - 4\omega_4^2 cs^2\omega_5^2\omega_2^2 v_1^2\omega_3 - 2\omega_4^2 v_2^2\omega_3^3 v_1^2\omega_3^2 + 14\omega_4^2\omega_5^2 v_2^2\omega_3^2 v_1^2\omega_2 - 4\omega_4^2 cs^2\omega_5^2\omega_2^2 v_1^2\omega_3^2 +$$
$$4\omega_4^2 cs^4\omega_5^2\omega_2^3\omega_3^2 - 4\omega_4^2 cs^2\omega_5\omega_2^3 v_1^2\omega_3 - 4\omega_4^2 cs^2\omega_5^2 v_2^2\omega_2\omega_3^2 + 2\omega_4^2 cs^2\omega_2^3 v_1^2\omega_3^2 + 4\omega_4\omega_5^2 v_2^2\omega_2 v_1^2\omega_3^3 - 10\omega_4^2\omega_5 v_2^2\omega_2^2 v_1^2\omega_3^2 - \omega_4^2 cs^2\omega_5 v_2^2\omega_2^3\omega_3^3 -$$
$$2\omega_5^2 v_2^2\omega_2^3 v_1^2\omega_3^3 - 2\omega_4 cs^4\omega_5^2\omega_2^3\omega_3^2 - \omega_4^2 cs^4\omega_5^2\omega_2^3\omega_3^3 + 2\omega_4 cs^2\omega_5^2\omega_2^2 v_1^2\omega_3^3 - 3\omega_4^2\omega_5^2 v_2^2\omega_3^3 v_1^2\omega_3^3 + 4\omega_4^2 cs^4\omega_5^2\omega_2^3\omega_3 + 4\omega_4^2 v_2^2\omega_3^3 v_1^2\omega_3^3$$

$C_{16} = 12cs^2\omega_5^2\omega_2^3\omega_3^2 + 24\omega_5^2 v_2^2\omega_2^2\omega_3 - 4\omega_5^2 v_2^2\omega_2^3\omega_3^2 + 24cs^2\omega_5^2\omega_2^3\omega_3 - 6cs^2\omega_5^2\omega_2^3\omega_3^2 + 22\omega_5^2 v_2^2\omega_2^3\omega_3^2 + 12\omega_5^2 v_2^2\omega_3^3 - 18\omega_5^2 v_2^2\omega_2^3\omega_3 + 22\omega_5^2 v_2^2\omega_2\omega_3^2 - 14cs^2\omega_5^2\omega_2^3\omega_3^2 - 12cs^2\omega_5^2\omega_2^3 - 48\omega_5^2 v_2^2\omega_2^2\omega_3^2 + cs^2\omega_5^2\omega_2^3\omega_3^3 - 6v_2^2\omega_2^3\omega_3^3 + 6\omega_5 v_2^2\omega_2^3\omega_3^3 + 24\omega_5^2 v_2^2\omega_2\omega_3^3 + 24cs^2\omega_5\omega_2^3\omega_3^2 + 6cs^2\omega_2^3\omega_3^3 - 30\omega_5^2 v_2^2\omega_2\omega_3^3 - 24\omega_5 v_2^2\omega_2^3\omega_3^2 + 12v_2^2\omega_2^3\omega_3^2 - 12cs^2\omega_2^3\omega_3^2 - 6cs^2\omega_5\omega_2^3\omega_3^2 + 6cs^2\omega_5^2\omega_2\omega_3^2 + 12\omega_5 v_2^2\omega_2^3\omega_3^2 - 12cs^2\omega_5^2\omega_2\omega_3^2 - 12cs^2\omega_5\omega_2\omega_3$

$C_{17} = 24\omega_4^2\omega_2 v_1^2\omega_3^2 - 30\omega_4^2\omega_2^3 v_1^2\omega_3 + \omega_4^2 cs^2\omega_2^3\omega_3^3 - 12\omega_4^2 cs^2\omega_2^3\omega_3 - 18\omega_4^2\omega_2^3 v_1^2\omega_3^3 - 6\omega_4^2 cs^2\omega_2^3\omega_3^2 - 12\omega_4 cs^2\omega_2^3\omega_3 - 14\omega_4^2 cs^2\omega_2^3\omega_3^2 + 6\omega_4^2 cs^2\omega_2^3\omega_3 - 4\omega_4^2\omega_2^3 v_1^2\omega_3^2 + 12\omega_2^3 v_1^2\omega_3^3 + 12\omega_4^2 cs^2\omega_2^2\omega_3^2 + 12\omega_4^2\omega_2^3 v_1^2 - 24\omega_4\omega_2^2 v_1^2\omega_3^3 + 22\omega_4^2\omega_2^3 v_1^2\omega_3^2 - 6\omega_4 cs^2\omega_2^3\omega_3^3 + 6cs^2\omega_2^3\omega_3^2 + 24\omega_4^2 cs^2\omega_2\omega_3^2 + 12\omega_4\omega_2 v_1^2\omega_3^3 - 12\omega_4^2 cs^2\omega_3^3 + 24\omega_4^2\omega_2^2 v_1^2\omega_3 - 12cs^2\omega_2^3\omega_3^2 - 48\omega_4^2\omega_2^2 v_1^2\omega_3^2 + 6\omega_4\omega_2^3 v_1^2\omega_3^3 - 6\omega_2^3 v_1^2\omega_3^3 + 24\omega_4 cs^2\omega_2^3\omega_3 + 22\omega_4^2\omega_2 v_1^2\omega_3^2$

$C_{18} = 15\omega_5^2 v_2^2\omega_3^2 + \omega_5^3\omega_3^3 + 24cs^2\omega_5\omega_3 - 11\omega_5^2\omega_3^2 - 3\omega_5^2 v_2^2\omega_3^3 - 36cs^2\omega_5\omega_3^2 + 12\omega_5^2\omega_3 + 12cs^2\omega_3^3 + 36v_2^2\omega_3^3 + 18\omega_5^2 v_2^2\omega_3 + 9cs^2\omega_5\omega_3^3 - 18v_2^2\omega_3^3 - 6cs^2\omega_3^3 - 12\omega_3^3 - 2cs^2\omega_5^2\omega_3^3 + 24cs^2\omega_5^2 + 25cs^2\omega_5^2\omega_3^2 + 6\omega_3^3 + 72\omega_5 v_2^2\omega_3 - 24\omega_5\omega_3 - 36\omega_5^2 - 48cs^2\omega_5^2\omega_3 + 36\omega_5\omega_3^2 - 108\omega_5 v_2^2\omega_3 - 9\omega_5\omega_3^3 + 27\omega_5 v_2^2\omega_3^3$

$C_{19} = -3\omega_2^3\omega_3^3 + 36cs^2\omega_5^2\omega_2^2\omega_3^2 - 6\omega_5^2\omega_2^3\omega_3 + \omega_5^2\omega_2^3\omega_3^3 + 36cs^2\omega_5^2\omega_2^3\omega_3^2 - 12cs^2\omega_5^2\omega_2^2\omega_3 + 6\omega_2^3\omega_3^2 - 6\omega_5^2 v_2^2\omega_2^3\omega_3^2 - 3\omega_5^2\omega_2^3\omega_3^2 + 6\omega_5^2 v_2^2\omega_2^3 + 12\omega_5^2 v_2^2\omega_2^3\omega_3 + 6\omega_5^2 v_2^2\omega_2^2\omega_3 - \omega_5^2\omega_2^3\omega_3^3 - 36cs^2\omega_5^2\omega_2^3\omega_3^2 + 7\omega_5^2\omega_2^3\omega_3^2 - 12cs^2\omega_5^2\omega_2^2 - 6\omega_5^2 v_2^2\omega_2^2\omega_3 - 12cs^2\omega_5^2\omega_2^2\omega_3 + 6cs^2\omega_5^2\omega_2^3\omega_3^2 + 6\omega_5\omega_2^3\omega_3^2 - 6v_2^2\omega_2^3\omega_3^2 + 6\omega_5^2 v_2^2\omega_2\omega_3^2 + 72cs^2\omega_5\omega_2^3\omega_3^2 + 18cs^2\omega_2^3\omega_3^2 - 12\omega_5^2 v_2^2\omega_2\omega_3 + 12\omega_5 v_2^2\omega_2^3\omega_3^2 + 12v_2^2\omega_2^3\omega_3^2 - 21\omega_5\omega_2^3\omega_3^2 - 36cs^2\omega_2^3\omega_3^2 - 24cs^2\omega_5\omega_2^3\omega_3^2 + 6cs^2\omega_5^2\omega_2\omega_3^2 - 24cs^2\omega_5\omega_2^2\omega_3^2 - 3\omega_5\omega_2^3\omega_3^2 - 24\omega_5 v_2^2\omega_2^3\omega_3 + 12\omega_5\omega_2^3\omega_3 + 12cs^2\omega_5\omega_2^3\omega_3^2 - 12cs^2\omega_5^2\omega_2\omega_3 - 24cs^2\omega_5\omega_2\omega_3 + 6\omega_5\omega_2^3\omega_3^2$

$C_{20} = -14\omega_5^2 v_2^2\omega_3^2 - \omega_5^2\omega_3^3 - 36cs^2\omega_5\omega_3 + 11\omega_5^2\omega_3^2 + \omega_5^2 v_2^2\omega_3^2 + 96cs^2\omega_5\omega_3^2 - 12\omega_5^2\omega_3 - 60cs^2\omega_3^3 + 12v_2^2\omega_3^3 + 12\omega_5^2 v_2^2\omega_3 - 30cs^2\omega_5\omega_3^3 - 6v_2^2\omega_3^3 + 30cs^2\omega_3^3 + 12\omega_3^3 + 4cs^2\omega_5^2\omega_3^3 - 26cs^2\omega_5^2\omega_3^2 - 6\omega_3^3 - 60\omega_5 v_2^2\omega_3 + 24\omega_5\omega_3 + 12\omega_5^2 v_2^2 + 18cs^2\omega_5^2\omega_3 - 36\omega_5\omega_3^2 + 48\omega_5 v_2^2\omega_3^2 + 9\omega_5\omega_3^3 - 6\omega_5 v_2^2\omega_3^3$

$C_{21} = 48cs^2\omega_5^2\omega_2^2\omega_3^2 + 2\omega_5^2\omega_2^2\omega_3^3 + 3\omega_5^2 v_2^2\omega_2^3\omega_3^2 + 36cs^2\omega_5^2\omega_2^3\omega_3\omega_3 - 12cs^2\omega_5^2\omega_2^2\omega_3^2 - 12\omega_5^2 v_2^2\omega_2^3\omega_3^2 - 6\omega_5^2\omega_2^2\omega_3^2 + 12\omega_5^2 v_2^2\omega_2^3 + 30\omega_5^2 v_2^2\omega_2^3\omega_3 - \omega_5^2\omega_2^3\omega_3^3 - 32cs^2\omega_5^2\omega_2^3\omega_3^2 + 3\omega_5^3\omega_2^3\omega_3^2 - 12cs^2\omega_5^2\omega_2^2 + 12\omega_5^2 v_2^2\omega_2^2\omega_3^2 - 24cs^2\omega_5^2\omega_2\omega_3^2 + 4cs^2\omega_5^2\omega_2^3\omega_3^2 + 3\omega_5\omega_2^3\omega_3^3 - 6v_2^2\omega_2^3\omega_3^3 + 36cs^2\omega_5\omega_2^3\omega_3^2 + 6cs^2\omega_2^3\omega_3^3 - 18\omega_5^2 v_2^2\omega_2\omega_3^2 - 12\omega_5 v_2^2\omega_2^3\omega_3^2 + 12v_2^2\omega_2^3\omega_3^2 - 6\omega_5\omega_2^3\omega_3^3 - 12cs^2\omega_2^3\omega_3^2 - 12cs^2\omega_5\omega_2^3\omega_3^2 + 6cs^2\omega_5^2\omega_2\omega_3^2 - 24cs^2\omega_5\omega_2^2\omega_3^2 - 6\omega_5\omega_2^2\omega_3^2 + 12\omega_5 v_2^2\omega_2^3\omega_3 - 24\omega_5^2 v_2^2\omega_2^2 + 12\omega_5 v_2^2\omega_2^2\omega_3^2 + 12cs^2\omega_5\omega_2^2\omega_3^2 - 12cs^2\omega_5^2\omega_2\omega_3 - 12cs^2\omega_5\omega_2^3\omega_3 - 24\omega_5 v_2^2\omega_2^2\omega_3^2 + 12\omega_5\omega_2\omega_3^2$

$C_{22} =$
$6cs^2\omega_5^2 v_2^2\omega_3^3 - 24cs^4\omega_5\omega_3^2 + 12\omega_5^2 v_2^2\omega_3^2 + 6cs^4\omega_5\omega_3^3 - 12cs^2\omega_5^2 v_2^2\omega_3^2 - 24cs^2\omega_5\omega_3 + 24cs^4\omega_5^2 - 3\omega_5^2 v_2^2\omega_3^3 + 24cs^2\omega_5\omega_3^3 - 30\omega_5 v_2^4\omega_3^3 - 36cs^2\omega_5^2 v_2^2\omega_3 + 72v_2^2\omega_3^3 - 6cs^2\omega_5\omega_3^3 - 36v_2^2\omega_3^3 + 24cs^4\omega_5\omega_3^3 + 72\omega_5 v_2^4\omega_3^2 + cs^2\omega_5^2\omega_3^3 - 48cs^4\omega_5^2\omega_3 + 72cs^2\omega_5 v_2^2\omega_3 + 3\omega_5^2 v_2^4\omega_3^3 - 8cs^2\omega_5^2\omega_3^3 - 12\omega_5^2 v_2^4\omega_3^3 - 216cs^2 v_2^2\omega_3^3 - 72cs^2\omega_5 v_2^2\omega_3^3 - 3cs^4\omega_5^2\omega_3^3 + 36v_2^4\omega_3^3 + 12cs^2\omega_5^2\omega_3 - 72\omega_5 v_2^2\omega_3^3 + 24cs^4\omega_5^2\omega_3^3 + 144cs^2\omega_5 v_2^2\omega_3^3 + 108cs^2 v_2^2\omega_3^3 + 30\omega_5 v_2^2\omega_3^3 - 72v_2^4\omega_3^3$

$C_{23} = 2\omega_5^2 v_2^2\omega_3^2 - \omega_5^2\omega_3^3 - 12cs^2\omega_5\omega_3 + 2\omega_5^2\omega_3^2 + 2\omega_5^2 v_2^2\omega_3^3 + 72cs^2\omega_5\omega_3^2 + 6\omega_5^2\omega_3 - 60cs^2\omega_3^3 - 84v_2^2\omega_3^3 - 12\omega_5^2 v_2^2\omega_3 - 24cs^2\omega_5\omega_3^3 + 42v_2^2\omega_3^3 + 30cs^2\omega_3^3 + 36\omega_3^3 + cs^2\omega_5^2\omega_3^3 + 24cs^2\omega_5^2 - 2cs^2\omega_5^2\omega_3^3 - 18\omega_3^3 + 60\omega_5 v_2^2\omega_3 - 12\omega_5\omega_3 - 12\omega_5^2 v_2^2 - 30cs^2\omega_5^2\omega_3 - 24\omega_5\omega_3 + 24\omega_5 v_2^2\omega_3^2 + 12\omega_5\omega_3^2 - 24\omega_5 v_2^2\omega_3^2$

2.5 CLBM2

2.5.1 Definitions

Collision operator $\boldsymbol{C}$:

$$\boldsymbol{C}\left(\boldsymbol{f}\right) = \mathbf{K}^{-1}\mathbf{S}\left(\boldsymbol{\kappa}^{(eq)} - \mathbf{K}\boldsymbol{f}\right),$$

where

$$\mathbf{S} = \mathrm{diag}(\omega_1, \omega_2, \omega_3, \omega_4, \omega_5),$$

$\omega_1, \omega_2, \ldots, \omega_5 \in (0, 2)$.
Matrix $\mathbf{K}$ corresponds to the transformation matrix to the central moment basis defined by

$$\boldsymbol{\kappa} = \begin{pmatrix} k_{(0,0)} \\ k_{(1,0)} \\ k_{(0,1)} \\ k_{(2,0)} + k_{(0,2)} \\ k_{(2,0)} - k_{(0,2)} \end{pmatrix}.$$

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The transformation matrix $\mathbf{K}$ satisfies

$$\mathbf{K} = \begin{pmatrix} 1 & 1 & 1 & 1 & 1 \\ -v_1 & 1-v_1 & -v_1 & -v_1-1 & -v_1 \\ -v_2 & -v_2 & 1-v_2 & -v_2 & -v_2-1 \\ v_1^2+v_2^2 & v_1^2+v_2^2-2v_1+1 & v_1^2+v_2^2-2v_2+1 & v_1^2+v_2^2+2v_1+1 & v_1^2+v_2^2+2v_2+1 \\ v_1^2-v_2^2 & v_1^2-v_2^2-2v_1+1 & v_1^2-v_2^2+2v_2-1 & v_1^2-v_2^2+2v_1+1 & v_1^2-v_2^2-2v_2-1 \end{pmatrix}.$$

The equilibrium central moments are defined by

$$\boldsymbol{\kappa}^{(eq)} = \mathbf{K}\mathbf{M}^{-1}\boldsymbol{\mu}^{(eq)},$$

i.e.,

$$\boldsymbol{\kappa}^{(eq)} = \left(\rho, 0, 0, 2\rho c_s^2, 0\right)^T.$$

2.5.2 Conservation of mass equation

📎 attached text file: `output_d2q5_ade_clbm2_symbolic_pde_00.txt`

$\frac{\partial \rho}{\partial t} + \frac{v_1 \delta_l}{\delta_t}\frac{\partial \rho}{\partial x_1} + \frac{\rho \delta_l}{\delta_t}\frac{\partial v_1}{\partial x_1} + \frac{v_2 \delta_l}{\delta_t}\frac{\partial \rho}{\partial x_2} + \frac{\rho \delta_l}{\delta_t}\frac{\partial v_2}{\partial x_2} + (-2+\omega_2)\frac{\delta_l}{2\omega_2}\frac{\partial \rho}{\partial x_1}\frac{\partial v_1}{\partial t} + (-2+\omega_2)\frac{v_1 \delta_l^2}{2\delta_t \omega_2}\frac{\partial \rho}{\partial x_1}\frac{\partial v_1}{\partial x_1} +$

$(-2+\omega_2)\frac{\rho \delta_l^2}{2\delta_t \omega_2}\left(\frac{\partial v_1}{\partial x_1}\right)^2 + (2-\omega_3)\frac{v_2 \delta_l^2}{2\omega_3 \delta_t}\frac{\partial \rho}{\partial x_1}\frac{\partial v_1}{\partial x_2} + (\omega_3 - \omega_3\omega_2 + \omega_2)\frac{v_1 \delta_l^2}{\omega_3 \delta_t \omega_2}\frac{\partial \rho}{\partial x_1}\frac{\partial v_2}{\partial x_2} +$

$(\omega_3 - \omega_3\omega_2 + \omega_2)\frac{\rho \delta_l^2}{\omega_3 \delta_t \omega_2}\frac{\partial v_1}{\partial x_1}\frac{\partial v_2}{\partial x_2} + (-2+\omega_3)\frac{\delta_l}{2\omega_3}\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial t} + (\omega_3 - \omega_3\omega_2 + \omega_2)\frac{v_2 \delta_l^2}{\omega_3 \delta_t \omega_2}\frac{\partial \rho}{\partial x_2}\frac{\partial v_1}{\partial x_1} + (2-\omega_2)\frac{v_1 \delta_l^2}{2\delta_t \omega_2}\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial x_1}$

$+ (-2+\omega_3)\frac{v_2 \delta_l^2}{2\omega_3 \delta_t}\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial x_2} + (-2+\omega_3)\frac{\rho \delta_l^2}{2\omega_3 \delta_t}\left(\frac{\partial v_2}{\partial x_2}\right)^2 + (-2+\omega_2)\frac{\rho \delta_l}{2\omega_2}\frac{\partial^2 v_1}{\partial t \partial x_1} + (-2+\omega_2)\frac{cs^2 \delta_l^2}{2\delta_t \omega_2}\frac{\partial^2 \rho}{\partial x_1^2} +$

$(-2+\omega_2)\frac{v_1 \rho \delta_l^2}{2\delta_t \omega_2}\frac{\partial^2 v_1}{\partial x_1^2} + (-2+\omega_3)\frac{\rho \delta_l}{2\omega_3}\frac{\partial^2 v_2}{\partial t \partial x_2} + (\omega_3 - \omega_3\omega_2 + \omega_2)\frac{v_1 v_2 \delta_l^2}{\omega_3 \delta_t \omega_2}\frac{\partial^2 \rho}{\partial x_1 \partial x_2} + (2-\omega_3)\frac{\rho v_2 \delta_l^2}{2\omega_3 \delta_t}\frac{\partial^2 v_1}{\partial x_1 \partial x_2} +$

$(2-\omega_2)\frac{v_1 \rho \delta_l^2}{2\delta_t \omega_2}\frac{\partial^2 v_2}{\partial x_1 \partial x_2} + (-2+\omega_3)\frac{cs^2 \delta_l^2}{2\omega_3 \delta_t}\frac{\partial^2 \rho}{\partial x_2^2} + (-2+\omega_3)\frac{\rho v_2 \delta_l^2}{2\omega_3 \delta_t}\frac{\partial^2 v_2}{\partial x_2^2} + (12+\omega_2^2-12\omega_2)\frac{\delta_t \rho \delta_l}{12\omega_2^2}\frac{\partial^3 v_1}{\partial t^2 \partial x_1} +$

$(12+\omega_2^2-12\omega_2)\frac{v_1 \rho \delta_l^2}{6\omega_2^2}\frac{\partial^3 v_1}{\partial t \partial x_1^2} + C_1 \frac{v_1 \delta_l^3}{6\delta_t \omega_4 \omega_2}\frac{\partial^3 \rho}{\partial x_1^3} + C_2 \frac{\rho \delta_l^3}{12\delta_t \omega_4 \omega_2}\frac{\partial^3 v_1}{\partial x_1^3} + (12-12\omega_3+\omega_3^2)\frac{\delta_t \rho \delta_l}{12\omega_3^2}\frac{\partial^3 v_2}{\partial t^2 \partial x_2} +$

$(-6\omega_3+3\omega_3^2+9\omega_3\omega_2-2\omega_3^2\omega_2-6\omega_2)\frac{\rho v_2 \delta_l^2}{6\omega_3^2 \omega_2}\frac{\partial^3 v_1}{\partial t \partial x_1 \partial x_2} + (-6\omega_3-2\omega_3\omega_2^2+9\omega_3\omega_2+3\omega_2^2-6\omega_2)\frac{v_1 \rho \delta_l^2}{6\omega_3 \omega_2^2}\frac{\partial^3 v_2}{\partial t \partial x_1 \partial x_2} +$

$C_3 \frac{v_2 \delta_l^3}{2\omega_3^2 \delta_t \omega_4 \omega_2}\frac{\partial^3 \rho}{\partial x_1^2 \partial x_2} + (6\omega_3^2-6\omega_3\omega_2^2-6\omega_3^2\omega_2+6\omega_2^2+\omega_3^2\omega_2^2)\frac{v_1 \rho v_2 \delta_l^3}{6\omega_3^2 \delta_t \omega_2^2}\frac{\partial^3 v_1}{\partial x_1^2 \partial x_2} +$

$(12v_1^2\omega_2+18\omega_4 cs^2\omega_2-12\omega_4 v_1^2-12\omega_4 cs^2-3\omega_4 cs^2\omega_2^2-6v_1^2\omega_2^2+\omega_4 v_1^2\omega_2^2+6cs^2\omega_2^2-12cs^2\omega_2+6\omega_4 v_1^2\omega_2)\frac{\rho \delta_l^3}{12\delta_t \omega_4 \omega_2^2}\frac{\partial^3 v_2}{\partial x_1^2 \partial x_2}$

$+ (12-12\omega_3+\omega_3^2)\frac{\rho v_2 \delta_l^2}{6\omega_3^2}\frac{\partial^3 v_2}{\partial t \partial x_2^2} + C_4 \frac{v_1 \delta_l^3}{2\omega_3^2 \delta_t \omega_5 \omega_2}\frac{\partial^3 \rho}{\partial x_1 \partial x_2^2} +$

$(18\omega_3 cs^2\omega_5-12cs^2\omega_5+12\omega_3 v_2^2+\omega_3^2\omega_5 v_2^2+6\omega_3^2 cs^2-12\omega_5 v_2^2+6\omega_3\omega_5 v_2^2-12\omega_3 cs^2-6\omega_3^2 v_2^2-3\omega_3^2 cs^2\omega_5)\frac{\rho \delta_l^3}{12\omega_3^2 \delta_t \omega_5}\frac{\partial^3 v_1}{\partial x_1 \partial x_2^2}$

$+ (6\omega_3^2-6\omega_3\omega_2^2-6\omega_3^2\omega_2+6\omega_2^2+\omega_3^2\omega_2^2)\frac{v_1 \rho v_2 \delta_l^3}{6\omega_3^2 \delta_t \omega_2^2}\frac{\partial^3 v_2}{\partial x_1 \partial x_2^2} + C_5 \frac{v_2 \delta_l^3}{6\omega_3^2 \delta_t \omega_5}\frac{\partial^3 \rho}{\partial x_2^3} + C_6 \frac{\rho \delta_l^3}{12\omega_3^2 \delta_t \omega_5}\frac{\partial^3 v_2}{\partial x_2^3} +$

$(-2-\omega_2^2+3\omega_2)\frac{\delta_t^2 \rho \delta_l}{2\omega_2^3}\frac{\partial^4 v_1}{\partial t^3 \partial x_1} + (-2-\omega_2^2+3\omega_2)\frac{3\delta_t v_1 \rho \delta_l^2}{2\omega_2^3}\frac{\partial^4 v_1}{\partial t^2 \partial x_1^2} + C_7 \frac{\rho \delta_l^3}{12\omega_4^2 \omega_2^3}\frac{\partial^4 v_1}{\partial t \partial x_1^3} + C_8 \frac{\delta_l^4}{24\delta_t \omega_4^2 \omega_2^3}\frac{\partial^4 \rho}{\partial x_1^4} +$

$C_9 \frac{v_1 \rho \delta_l^4}{12\delta_t \omega_4^2 \omega_2^3}\frac{\partial^4 v_1}{\partial x_1^4} + (-2+3\omega_3-\omega_3^2)\frac{\delta_t^2 \rho \delta_l}{2\omega_3^3}\frac{\partial^4 v_2}{\partial t^3 \partial x_2} +$

$(12\omega_3^2-24\omega_3\omega_2^2-6\omega_3^3+12\omega_3\omega_2-\omega_3^3\omega_2^2-24\omega_3^2\omega_2+12\omega_2^2+13\omega_3^2\omega_2^2+7\omega_3^3\omega_2)\frac{\delta_t \rho v_2 \delta_l^2}{12\omega_3^3\omega_2^2}\frac{\partial^4 v_1}{\partial t^2 \partial x_1 \partial x_2} +$

$(7\omega_3\omega_2^3+12\omega_3^2-24\omega_3\omega_2^2+12\omega_3\omega_2-6\omega_2^3-24\omega_3^2\omega_2+12\omega_2^2+13\omega_3^2\omega_2^2-\omega_3^3\omega_2^3)\frac{\delta_t v_1 \rho \delta_l^2}{12\omega_3^2\omega_2^3}\frac{\partial^4 v_2}{\partial t^2 \partial x_1 \partial x_2} +$

$(12\omega_3\omega_2^3-6\omega_3\omega_2^2-12\omega_3^3-6\omega_2^3-7\omega_3^3\omega_2^2+\omega_3^3\omega_2^3+6\omega_3^2\omega_2^2-7\omega_3^2\omega_2^3+18\omega_3^3\omega_2)\frac{v_1 \rho v_2 \delta_l^3}{6\omega_3^3\omega_2^3}\frac{\partial^4 v_1}{\partial t \partial x_1^2 \partial x_2} +$

$C_{10} \frac{\rho \delta_l^3}{12\omega_3\omega_4^2\omega_2^3}\frac{\partial^4 v_2}{\partial t \partial x_1^2 \partial x_2} + C_{11}\frac{v_1 v_2 \delta_l^4}{6\omega_3^3 \delta_t \omega_4^2 \omega_2^3}\frac{\partial^4 \rho}{\partial x_1^3 \partial x_2} + C_{12}\frac{\rho v_2 \delta_l^4}{12\omega_3^3 \delta_t \omega_4^2 \omega_2^3}\frac{\partial^4 v_1}{\partial x_1^3 \partial x_2} + C_{13}\frac{v_1 \rho \delta_l^4}{12\delta_t \omega_4^2 \omega_2^3}\frac{\partial^4 v_2}{\partial x_1^3 \partial x_2} +$

$(-2+3\omega_3-\omega_3^2)\frac{3\delta_t \rho v_2 \delta_l^2}{2\omega_3^3}\frac{\partial^4 v_2}{\partial t^2 \partial x_2^2} + C_{14}\frac{\rho \delta_l^3}{12\omega_3^3 \omega_5^2 \omega_2}\frac{\partial^4 v_1}{\partial t \partial x_1 \partial x_2^2} +$

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$$(18\omega_3\omega_2^3 - 6\omega_3^3 - 12\omega_2^3 - 7\omega_3^3\omega_2^2 + \omega_3^3\omega_2^3 - 6\omega_3^2\omega_2 + 6\omega_3^2\omega_2^2 - 7\omega_3^2\omega_2^3 + 12\omega_3^3\omega_2)\frac{v_1\rho v_2\delta_l^3}{6\omega_3^3\omega_2^3}\frac{\partial^4 v_2}{\partial t\partial x_1\partial x_2^2} +$$

$$C_{15}\frac{\delta_l^4}{4\omega_3^3\delta_t\omega_4^2\omega_5^2\omega_2^3}\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2} + C_{16}\frac{v_1\rho\delta_l^4}{12\omega_3^3\delta_t\omega_5^2\omega_2^3}\frac{\partial^4 v_1}{\partial x_1^2\partial x_2^2} + C_{17}\frac{\rho v_2\delta_l^4}{12\omega_3^3\delta_t\omega_4^2\omega_2^3}\frac{\partial^4 v_2}{\partial x_1^2\partial x_2^2} + C_{18}\frac{\rho\delta_l^3}{12\omega_3^3\omega_2^5}\frac{\partial^4 v_2}{\partial t\partial x_2^3} +$$

$$C_{19}\frac{v_1 v_2\delta_l^4}{6\omega_3^3\delta_t\omega_5^2\omega_2^3}\frac{\partial^4\rho}{\partial x_1\partial x_2^3} + C_{20}\frac{\rho v_2\delta_l^4}{12\omega_3^3\delta_t\omega_5^2}\frac{\partial^4 v_1}{\partial x_1\partial x_2^3} + C_{21}\frac{v_1\rho\delta_l^4}{12\omega_3^3\delta_t\omega_5^2\omega_2^3}\frac{\partial^4 v_2}{\partial x_1\partial x_2^3} + C_{22}\frac{\delta_l^4}{24\omega_3^3\delta_t\omega_5^2}\frac{\partial^4\rho}{\partial x_2^4} + C_{23}\frac{\rho v_2\delta_l^4}{12\omega_3^3\delta_t\omega_5^2}\frac{\partial^4 v_2}{\partial x_2^4} = 0,$$

where:

$C_1 = 6 + 3v_1^2\omega_2 - 3\omega_4 cs^2\omega_2 + 3\omega_4 v_1^2 - 18cs^2 - 6v_1^2 + 9\omega_4 cs^2 - 3\omega_4 + \omega_4\omega_2 - 3\omega_2 + 9cs^2\omega_2 - \omega_4 v_1^2\omega_2$

$C_2 = -36v_1^2\omega_2 + 18\omega_4 cs^2\omega_2 + 12\omega_4 v_1^2 - 12\omega_4 cs^2 - 3\omega_4 cs^2\omega_2^2 + 18v_1^2\omega_2^2 - 5\omega_4 v_1^2\omega_2^2 + 6cs^2\omega_2^2 - 6\omega_4\omega_2 - 6\omega_2^2 + 12\omega_2 - 12cs^2\omega_2 + 2\omega_4\omega_2^2 + 6\omega_4 v_1^2\omega_2$

$C_3 = \omega_3^2\omega_4 v_1^2\omega_2^2 - 2\omega_3^2 cs^2\omega_2 - 2\omega_3\omega_4 cs^2\omega_2 + \omega_3\omega_4 cs^2\omega_2^2 + \omega_3^2 cs^2\omega_2^2 - 2\omega_3^2\omega_4 v_1^2\omega_2 + 2\omega_4 v_1^2\omega_2^2 - 2\omega_3^2\omega_4 cs^2 - 3\omega_3\omega_4 v_1^2\omega_2^2 + 4\omega_3^2\omega_4 cs^2\omega_2 - \omega_3^2 v_1^2\omega_2^2 + 2\omega_3^2 v_1^2\omega_2 - \omega_3^2\omega_4 cs^2\omega_2^2 + 2\omega_3\omega_4 v_1^2\omega_2$

$C_4 = -\omega_3^2 cs^2\omega_5\omega_2^2 - 3\omega_3^2\omega_5 v_2^2\omega_2 + 2\omega_3^2\omega_5 v_2^2 + \omega_3^2\omega_5 v_2^2\omega_2^2 + \omega_3^2 cs^2\omega_2^2 + \omega_3^2 cs^2\omega_5\omega_2 - \omega_3^2 v_2^2\omega_2^2 + 4\omega_3 cs^2\omega_5\omega_2^2 - 2cs^2\omega_5\omega_2^2 - 2\omega_3 cs^2\omega_2^2 + 2\omega_3\omega_5 v_2^2\omega_2 + 2\omega_3 v_2^2\omega_2^2 - 2\omega_3\omega_5 v_2^2\omega_2^2 - 2\omega_3 cs^2\omega_5\omega_2$

$C_5 = 6 - 3\omega_3 - 3\omega_3 cs^2\omega_5 + 9cs^2\omega_5 - 18cs^2 + 3\omega_3 v_2^2 + 3\omega_5 v_2^2 - \omega_3\omega_5 v_2^2 - 6v_2^2 + \omega_3\omega_5 + 9\omega_3 cs^2 - 3\omega_5$

$C_6 = 12\omega_3 - 6\omega_3^2 + 18\omega_3 cs^2\omega_5 - 12cs^2\omega_5 - 36\omega_3 v_2^2 - 5\omega_3^2\omega_5 v_2^2 + 2\omega_3^2\omega_5 + 6\omega_3^2 cs^2 + 12\omega_5 v_2^2 + 6\omega_3\omega_5 v_2^2 - 6\omega_3\omega_5 - 12\omega_3 cs^2 + 18\omega_3^2 v_2^2 - 3\omega_3^2 cs^2\omega_5$

$C_7 = \omega_4^2\omega_2^3 + 24\omega_4 cs^2\omega_2 + 18\omega_4^2 v_1^2\omega_2 - 11\omega_4^2\omega_2^2 + 15\omega_4^2 v_1^2\omega_2^2 + 12\omega_4^2\omega_2 - 18v_1^2\omega_2^3 - 36\omega_4 cs^2\omega_2^2 - 3\omega_4^2 v_1^2\omega_2^3 + 9\omega_4 cs^2\omega_2^3 + 36v_1^2\omega_2^2 - 108\omega_4 v_1^2\omega_2^2 - 6cs^2\omega_2^3 + 6\omega_2^3 + 25\omega_4^2 cs^2\omega_2^2 + 12cs^2\omega_2^3 + 27\omega_4 v_1^2\omega_2^3 + 24\omega_4^2 cs^2 - 24\omega_4\omega_2 - 2\omega_4^2 cs^2\omega_2^3 - 12\omega_2^2 - 36\omega_4^2 v_1^2 + 36\omega_4\omega_2^2 - 48\omega_4^2 cs^2\omega_2 - 9\omega_4\omega_2^3 + 72\omega_4 v_1^2\omega_2$

$C_8 = -30\omega_4 v_1^4\omega_2^3 - 12\omega_4^2 cs^2 v_1^2\omega_2^2 - 3\omega_4^2 cs^4\omega_2^3 + 6\omega_4^2 cs^2 v_1^2\omega_2^3 - 24\omega_4 cs^2\omega_2 + 72\omega_4 v_1^4\omega_2^2 + 24\omega_4^2 cs^4\omega_2^2 + 12\omega_4^2 v_1^2\omega_2^2 - 48\omega_4^2 cs^4\omega_2 - 36v_1^2\omega_2^3 + 24\omega_4 cs^2\omega_2^2 + 108cs^2 v_1^2\omega_2^3 - 3\omega_4^2 v_1^2\omega_2^3 + 24\omega_4^2 cs^4 - 216cs^2 v_1^2\omega_2^2 - 36\omega_4^2 cs^2 v_1^2\omega_2 - 6\omega_4 cs^2\omega_2^3 + 72v_1^2\omega_2^2 + 24\omega_4 cs^4\omega_2 - 72\omega_4 v_1^2\omega_2^2 + 144\omega_4 cs^2 v_1^2\omega_2^2 - 8\omega_4^2 cs^2\omega_2^2 + 30\omega_4 v_1^2\omega_2^3 + \omega_4^2 cs^2\omega_2^3 - 72\omega_4 cs^2 v_1^2\omega_2^3 + 3\omega_4^2 v_1^4\omega_2^3 - 72v_1^4\omega_2^2 + 6\omega_4 cs^4\omega_2^3 - 12\omega_4^2 v_1^4\omega_2^3 + 72\omega_4 cs^2 v_1^2\omega_2 + 12\omega_4^2 cs^2\omega_2 - 24\omega_4 cs^4\omega_2^2 + 36v_1^4\omega_2^3$

$C_9 = -\omega_4^2\omega_2^3 - 12\omega_4 cs^2\omega_2 - 12\omega_4^2 v_1^2\omega_2 + 2\omega_4^2\omega_2^2 + 2\omega_4^2 v_1^2\omega_2^2 + 6\omega_4^2\omega_2 + 42v_1^2\omega_2^3 + 72\omega_4 cs^2\omega_2^2 + 2\omega_4^2 v_1^2\omega_2^3 - 24\omega_4 cs^2\omega_2^3 - 84v_1^2\omega_2^2 + 24\omega_4 v_1^2\omega_2^2 + 30cs^2\omega_2^2 - 18\omega_2^3 - 2\omega_4^2 cs^2\omega_2^2 - 60cs^2\omega_2^2 - 24\omega_4 v_1^2\omega_2^3 + 24\omega_4^2 cs^2 - 12\omega_4\omega_2 + \omega_4^2 cs^2\omega_2^3 + 36\omega_2^2 - 12\omega_4^2 v_1^2 - 24\omega_4\omega_2^2 - 30\omega_4^2 cs^2\omega_2 + 12\omega_4\omega_2^3 + 60\omega_4 v_1^2\omega_2$

$C_{10} = -36\omega_3\omega_4^2 v_1^2\omega_2 + 12\omega_4^2 v_1^2\omega_2^2 + 12\omega_3\omega_4 cs^2\omega_2 - 6\omega_4^2 v_1^2\omega_2^2 - 30\omega_3\omega_4 cs^2\omega_2^2 + 12\omega_4 cs^2\omega_2^2 + 8\omega_3\omega_4^2 v_1^2\omega_2^2 + 6\omega_3 v_1^2\omega_2^3 + 9\omega_3\omega_4 cs^2\omega_2^3 - \omega_4^2 v_1^2\omega_2^3 - 12\omega_3 v_1^2\omega_2^2 + \omega_3\omega_4^2 v_1^2\omega_2^3 - 6\omega_4 cs^2\omega_2^3 + 22\omega_3\omega_4^2 cs^2\omega_2^2 - 6\omega_3 cs^2\omega_2^3 - 12\omega_4 v_1^2\omega_2^2 + 30\omega_3\omega_4 v_1^2\omega_2^2 - 18\omega_4^2 cs^2\omega_2^2 + 6\omega_4 v_1^2\omega_2^3 + 12\omega_3\omega_4^2 cs^2 + 12\omega_3 cs^2\omega_2^2 - 2\omega_3\omega_4^2 cs^2\omega_2^3 + 3\omega_4^2 cs^2\omega_2^3 - 9\omega_3\omega_4 v_1^2\omega_2^3 + 24\omega_3\omega_4^2 v_1^2 - 12\omega_3\omega_4 v_1^2\omega_2^2 + 12\omega_4^2 cs^2\omega_2 - 30\omega_3\omega_4 cs^2\omega_2$

$C_{11} = 36\omega_3^3\omega_4^2 cs^2\omega_2 + 12\omega_3^3 v_1^2\omega_2^2 - 24\omega_3^3\omega_4 v_1^2\omega_2 + 36\omega_3^2\omega_4^2 cs^2\omega_2^2 + 6\omega_3^3\omega_4\omega_2^2 - 6\omega_3^3 v_1^2\omega_2^3 - 3\omega_3^3\omega_4\omega_2^3 - 12\omega_3^3\omega_4^2 cs^2\omega_2^3 - 6\omega_3^3\omega_4^2\omega_2 + 7\omega_3^3\omega_4^2\omega_2^2 + 6\omega_3^3\omega_4^2 cs^2\omega_2^3 + 6\omega_3\omega_4^2 v_1^2\omega_2^2 + 12\omega_3^3\omega_4 v_1^2\omega_2^2 - \omega_3^3\omega_4^2\omega_2^3 + 6\omega_4^2 v_1^2\omega_2^3 - 12\omega_3^3\omega_4^2 cs^2\omega_2 - 36\omega_3^3\omega_4^2 cs^2\omega_2^2 - 12\omega_3^3 v_1^2\omega_2^3 - 12\omega_3^3 cs^2\omega_2^2 + 6\omega_3^3\omega_4\omega_2^3 - 24\omega_3\omega_4 cs^2\omega_2^3 + 6\omega_3^3\omega_2^2 - 21\omega_3^3\omega_4\omega_2^2 + 6\omega_3\omega_4^2 cs^2\omega_2^3 - 6\omega_3^3\omega_4^2 v_1^2\omega_2 - 3\omega_3^3\omega_2^3 + 72\omega_3^3\omega_4 cs^2\omega_2^2 - 6\omega_3^2\omega_4^2 v_1^2\omega_2 - 24\omega_3\omega_4 cs^2\omega_2 - 36\omega_3^3 cs^2\omega_2^2 + \omega_3^2\omega_4^2\omega_2^3 - 24\omega_3^3\omega_4 cs^2\omega_2^2 + 12\omega_3^3\omega_4\omega_2 - 12\omega_3^3\omega_4^2 cs^2 + 12\omega_3^3\omega_4 v_1^2\omega_2 + 6\omega_3^2\omega_4^2 v_1^2\omega_2^3 + 12\omega_3^3\omega_4 cs^2\omega_2^3 - 3\omega_3^3\omega_4^2\omega_2^2 + 18\omega_3^3 cs^2\omega_2^3$

$C_{12} = 36\omega_3^3\omega_4^2 cs^2\omega_2 + 12\omega_3^3 v_1^2\omega_2^2 - 24\omega_3^2\omega_4 v_1^2\omega_2 + 12\omega_3^3\omega_4 v_1^2\omega_2 + 48\omega_3^3\omega_4^2 cs^2\omega_2^2 + 12\omega_3^2\omega_4\omega_2^2 + 12\omega_3^3\omega_4 v_1^2\omega_2^3 - 6\omega_3^3 v_1^2\omega_2^3 - 6\omega_3^3\omega_4\omega_2^3 - 12\omega_3^3\omega_4^2 cs^2\omega_2^3 + 3\omega_3^3\omega_4^2\omega_2^2 + 4\omega_3^3\omega_4^2 cs^2\omega_2^3 - 12\omega_3^3\omega_4 v_1^2\omega_2^2 - \omega_3^3\omega_4^2\omega_2^3 + 12\omega_4^2 v_1^2\omega_2^3 - 24\omega_3^3\omega_4^2 cs^2\omega_2 - 32\omega_3^3\omega_4^2 cs^2\omega_2^2 - 18\omega_3\omega_4^2 v_1^2\omega_2^3 - 12\omega_3\omega_4^2 cs^2\omega_2^2 + 3\omega_3^3\omega_4^2 v_1^2\omega_2^3 + 3\omega_3^3\omega_4\omega_2^3 - 12\omega_3^3\omega_4 cs^2\omega_2^3 - 6\omega_3^3\omega_4\omega_2^2 + 6\omega_3\omega_4^2 cs^2\omega_2^3 - 12\omega_3^3\omega_4 v_1^2\omega_2^2 - 24\omega_3^3\omega_4 v_1^2 + 36\omega_3\omega_4 cs^2\omega_2^2 + 12\omega_3^3\omega_4 v_1^2\omega_2^2 - 12\omega_3\omega_4 cs^2\omega_2 - 12\omega_3^3 cs^2\omega_2^2 + 2\omega_3^2\omega_4^2\omega_2^3 - 24\omega_3\omega_4 cs^2\omega_2^2 - 12\omega_3^3\omega_4^2 cs^2 + 30\omega_3^3\omega_4 v_1^2\omega_2 + 12\omega_3\omega_4 cs^2\omega_2^3 - 6\omega_3^3\omega_4^2\omega_2^2 + 6\omega_3^3 cs^2\omega_2^3$

$C_{13} = -\omega_4^2\omega_2^3 - 36\omega_4 cs^2\omega_2 + 12\omega_4^2 v_1^2\omega_2 + 11\omega_4^2\omega_2^2 - 14\omega_4^2 v_1^2\omega_2^2 - 12\omega_4^2\omega_2 - 6v_1^2\omega_2^3 + 96\omega_4 cs^2\omega_2^2 + \omega_4^2 v_1^2\omega_2^3 - 30\omega_4 cs^2\omega_2^3 + 12v_1^2\omega_2^2 + 48\omega_4 v_1^2\omega_2^2 + 30cs^2\omega_2^2 - 6\omega_2^2 - 26\omega_4^2 cs^2\omega_2^2 - 60cs^2\omega_2^2 - 6\omega_4 v_1^2\omega_2^3 + 24\omega_4\omega_2 + 4\omega_4^2 cs^2\omega_2^3 + 12\omega_2^2 + 12\omega_4^2 v_1^2 - 36\omega_4\omega_2^2 + 18\omega_4^2 cs^2\omega_2 + 9\omega_4\omega_2^3 - 60\omega_4 v_1^2\omega_2$

$C_{14} = 9\omega_3^3 cs^2\omega_5\omega_2 - 12\omega_3^3 v_2^2\omega_2 + 12cs^2\omega_5^2\omega_2 + 12\omega_3^2 cs^2\omega_2 - \omega_3^2\omega_5^2 v_2^2 - 30\omega_3 cs^2\omega_5^2\omega_2 + 3\omega_3^3 cs^2\omega_5 + 30\omega_3^2\omega_5 v_2^2\omega_2 - 12\omega_3^2\omega_5 v_2^2 + 12\omega_3 cs^2\omega_5^2 - 9\omega_3^3\omega_5 v_2^2\omega_2 - 6\omega_3^2 cs^2\omega_5 - 36\omega_3\omega_5 v_2^2\omega_2 - 30\omega_3^2 cs^2\omega_5\omega_2 + 12\omega_3\omega_5 v_2^2 + 24\omega_5 v_2^2\omega_2 + 22\omega_3^2 cs^2\omega_5\omega_2 + \omega_3^3\omega_5 v_2^2\omega_2 - 18\omega_3^2 cs^2\omega_5 - 6\omega_3^2\omega_5 v_2^2 - 6\omega_3^2 cs^2\omega_2 - 12\omega_3\omega_5 v_2^2\omega_2 + 6\omega_3^3 v_2^2\omega_2 - 2\omega_3^2 cs^2\omega_5^2\omega_2 + 12\omega_3^2 cs^2\omega_5 + 12\omega_3 cs^2\omega_5\omega_2 + 6\omega_3^3\omega_5 v_2^2 + 8\omega_3^2\omega_5 v_2^2\omega_2$

$C_{15} = -4\omega_3^3\omega_4 cs^2\omega_5^2 v_2^2\omega_2 - 3\omega_3^3\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_2 - 2\omega_3\omega_4 cs^4\omega_5^2\omega_2^2 - 4\omega_3^2\omega_4 cs^2 v_1^2\omega_5^2\omega_2 - 4\omega_4^2 cs^2 v_1^2\omega_5^2\omega_2^3 + 2\omega_3^3\omega_4^2 cs^2\omega_5 v_2^2\omega_2^3 - 8\omega_3^2\omega_4^2 cs^2 v_1^2\omega_5^2\omega_2^3 + 4\omega_3\omega_4 v_1^2\omega_5 v_2^2\omega_2^3 - 10\omega_3^3\omega_4 v_1^2\omega_5^2 v_2^2\omega_2^2 + 14\omega_3^3\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_2^2 + 2\omega_3^3\omega_4 cs^2 v_1^2\omega_5^2\omega_2^3 + \omega_3^3\omega_4 cs^4\omega_5^2\omega_2^3 - 4\omega_3^3\omega_4^2 cs^2 v_1^2\omega_2^3 + 10\omega_3^3\omega_4^2 cs^2\omega_5 v_2^2\omega_2 + 8\omega_3^3\omega_4^2 cs^2 v_1^2\omega_5^2\omega_2^2 + 3\omega_3^3\omega_4 v_1^2\omega_5^2 v_2^2\omega_2^3 + 4\omega_3^3\omega_4 cs^4\omega_5^2\omega_2^2 - 4\omega_3^3\omega_4^2 cs^2\omega_5 v_2^2\omega_2^2 - 8\omega_3^3\omega_4^2 cs^2\omega_5 v_2^2\omega_2^2 - 12\omega_3^3\omega_4 cs^4\omega_5^2\omega_2^2 - 3\omega_3^3\omega_4^2 cs^2 v_1^2\omega_5\omega_2 - 4\omega_3\omega_4^2 cs^2 v_1^2\omega_5^2\omega_2^2 + 4\omega_3^2\omega_4^2 v_1^2\omega_5 v_2^2\omega_2^2 + \omega_3^3\omega_4^2 cs^4\omega_5\omega_2^3 - 14\omega_3^3\omega_4 v_1^2\omega_5^2 v_2^2\omega_2 - 2\omega_3\omega_4 cs^4\omega_5^2\omega_2^3 - 3\omega_3\omega_4 cs^2\omega_5^2 v_2^2\omega_2^3 + 4\omega_3^2\omega_4^2 v_1^2 v_2^2\omega_2^3 + 2\omega_3^3\omega_4 cs^2 v_1^2\omega_5\omega_2^2 + 4\omega_3\omega_4 v_1^2\omega_5^2 v_2^2\omega_2 + 4\omega_3^3\omega_4^2 cs^4\omega_5^2\omega_2^2 + \omega_3^3\omega_4^2 cs^2\omega_5^2 v_2^2\omega_2^3 + 10\omega_3\omega_4 cs^2\omega_5^2 v_2^2\omega_2^2 + 4\omega_3^3\omega_4 v_1^2\omega_5^2 v_2^2 + 4\omega_3\omega_4 cs^4\omega_5^2\omega_2 - 2\omega_3^3\omega_4 cs^4\omega_5\omega_2^2 + 10\omega_3\omega_4 cs^2 v_1^2\omega_5^2\omega_2^3 - 10\omega_3^3\omega_4 v_1^2\omega_5 v_2^2\omega_2^3 - 2\omega_3\omega_4 v_1^2\omega_5^2 v_2^2\omega_2^3 - 2\omega_3\omega_4^2 cs^2 v_1^2\omega_5^2\omega_2 - 4\omega_3^2\omega_4^2 cs^2\omega_5 v_2^2\omega_2 - 2\omega_3\omega_4^2 v_1^2 v_2^2\omega_2^3 + 2\omega_3^3\omega_4^2 cs^2\omega_5 v_2^2\omega_2^2 - 2\omega_3^2\omega_4^2 cs^4\omega_5\omega_2^3 - 2\omega_3^3 v_1^2\omega_5^2 v_2^2\omega_2^3 - 4\omega_3\omega_4^2 cs^2 v_1^2\omega_5\omega_2^3 - \omega_3^3\omega_4 cs^2 v_1^2\omega_5\omega_2^3 - 28\omega_3^2\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_2^2 + 4\omega_3^3\omega_4^2 cs^4\omega_5^2\omega_2^2 + 4\omega_3^3\omega_4^2 cs^4\omega_5\omega_2^2 - \omega_3^3\omega_4^2 cs^2\omega_5 v_2^2\omega_2^3 + 4\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_2^3 + 4\omega_3^3\omega_4 v_1^2\omega_5^2 v_2^2\omega_2^2 + \omega_3^3\omega_4^2 cs^2 v_1^2\omega_5^2\omega_2^3 + 2\omega_3^3\omega_4 cs^2 v_1^2\omega_5^2\omega_2^2 - \omega_3^3\omega_4^2 cs^4\omega_5^2\omega_2^3 + 14\omega_3^3\omega_4^2 v_1^2\omega_5 v_2^2\omega_2^3 + 4\omega_3^3 v_1^2\omega_5 v_2^2\omega_2^2 - 4\omega_3\omega_4 cs^2\omega_5^2 v_2^2\omega_2^2 - 4\omega_3^3\omega_4^2 cs^2\omega_5^2 v_2^2 + 3\omega_3^3\omega_4 v_1^2\omega_5\omega_2\omega_2^3 - 4\omega_3^3 cs^2\omega_5 v_2^2\omega_2^2 - 4\omega_3^3\omega_4^2 cs^2 v_1^2\omega_5\omega_2^2 - 14\omega_3\omega_4 v_1^2\omega_5^2 v_2^2\omega_2^3 - 2\omega_3^3\omega_4^2 cs^2\omega_5^2 v_2^2\omega_2^3 + 4\omega_3\omega_4 cs^4\omega_5^2\omega_2^2 - 2\omega_3^3\omega_4^2 v_1^2\omega_5 v_2^2\omega_2^2 + 2\omega_3\omega_4 cs^2\omega_5 v_2^2\omega_2^2 - 2\omega_3^2\omega_4^2 cs^4\omega_5\omega_2^2 + 12\omega_3^3\omega_4^2 v_1^2\omega_5 v_2^2\omega_2 - 2\omega_3^3\omega_4 cs^4\omega_5^2\omega_2^3 + 8\omega_3^3\omega_4^2 cs^2\omega_5 v_2^2\omega_2^2 + 2\omega_3^3\omega_4^2 cs^2 v_1^2\omega_2^3 + 12\omega_3^3\omega_4^2 v_1^2\omega_5 v_2^2\omega_2^2 + 10\omega_3^2\omega_4^2 cs^2 v_1^2\omega_5\omega_2^3 + 2\omega_3^3 cs^2\omega_5^2 v_2^2\omega_2^3$

$C_{16} = 6\omega_3^3\omega_5 v_2^2\omega_2^3 + 24\omega_3\omega_5^2 v_2^2\omega_2^2 + 12\omega_3^3\omega_5^2 v_2^2 + 24\omega_3^2 cs^2\omega_5\omega_2^2 - 18\omega_3\omega_5^2 v_2^2\omega_2^3 - 12\omega_3^2 cs^2\omega_2^3 + 24\omega_3 cs^2\omega_5^2\omega_2^3 - 12 cs^2\omega_5^2\omega_2^3 + 12\omega_3^3 v_2^2\omega_2^3 - 6\omega_3^3 cs^2\omega_5\omega_2^3 - 24\omega_3^2\omega_5 v_2^2\omega_2^3 - 48\omega_3^2\omega_5 v_2^2\omega_2^2 - 12\omega_3^2 cs^2\omega_5^2\omega_2 - 6\omega_3^3 cs^2\omega_5^2\omega_2 - 30\omega_3^3\omega_5^2 v_2^2\omega_2 + 22\omega_3^2\omega_5^2 v_2^2\omega_2^3 - 12\omega_3 cs^2\omega_5\omega_2^3 + \omega_3^3 cs^2\omega_5^2\omega_2^3 - 4\omega_3^2\omega_5^2 v_2^2\omega_2^3 - 14\omega_3^2 cs^2\omega_5^2\omega_2^2 - 6\omega_3^3 v_2^2\omega_2^3 + 6\omega_3^3 cs^2\omega_5\omega_2 + 22\omega_3^3\omega_5^2 v_2^2\omega_2^3 + 12\omega_3\omega_5 v_2^2\omega_2^3 + 24\omega_3^3\omega_5^2 v_2^2\omega_2 + 6\omega_3^3 cs^2\omega_2^3 + 12\omega_3^2 cs^2\omega_5^2\omega_2^2$

$C_{17} = 24\omega_3^3\omega_4^2 cs^2\omega_2 + 12\omega_3^3 v_1^2\omega_2^2 + 12\omega_3^3\omega_4 v_1^2\omega_2 + 12\omega_3^3\omega_4^2 cs^2\omega_2^2 - 6\omega_3^3 v_1^2\omega_2^3 - 6\omega_3^2\omega_4^2 cs^2\omega_2^3 + 6\omega_3^3\omega_4 v_1^2\omega_2^3 + \omega_3^3\omega_4^2 cs^2\omega_2^3 + 24\omega_3\omega_4^2 v_1^2\omega_2^2 - 24\omega_3^3\omega_4 v_1^2\omega_2^2 + 12\omega_4^2 v_1^2\omega_2^3 - 14\omega_3^2\omega_4^2 cs^2\omega_2^2 - 30\omega_3\omega_4^2 v_1^2\omega_2^3 - 12\omega_3\omega_4^2 cs^2\omega_2^2 - 4\omega_3^3\omega_4^2 v_1^2\omega_2^3 - 6\omega_3^3\omega_4 cs^2\omega_2^3 + 6\omega_3\omega_4^2 cs^2\omega_2^3 + 22\omega_3^3\omega_4^2 v_1^2\omega_2^2 + 24\omega_3^2\omega_4^2 v_1^2\omega_2 + 24\omega_3^3\omega_4 cs^2\omega_2^2 - 48\omega_3^2\omega_4^2 v_1^2\omega_2^2 - 12\omega_3^3\omega_4 cs^2\omega_2 - 12\omega_3^3 cs^2\omega_2^2 - 12\omega_3^3\omega_4^2 cs^2 - 18\omega_3^3\omega_4^2 v_1^2\omega_2 + 22\omega_3^3\omega_4^2 v_1^2\omega_2^3 + 6\omega_3^3 cs^2\omega_2^3$

$C_{18} = -6\omega_3^3 cs^2 - 9\omega_3^3\omega_5 - 3\omega_3^3\omega_5^2 v_2^2 - 12\omega_3^2 + 24\omega_3 cs^2\omega_5 - 2\omega_3^3 cs^2\omega_5^2 + 6\omega_3^3 - 11\omega_3^2\omega_5^2 - 108\omega_3^2\omega_5 v_2^2 + 36\omega_3^2\omega_5 + 12\omega_3^2 cs^2 - 48\omega_3 cs^2\omega_5^2 + 24 cs^2\omega_5^2 + 9\omega_3^3 cs^2\omega_5 - 36\omega_5^2 v_2^2 + \omega_3^3\omega_5^2 + 18\omega_3\omega_5^2 v_2^2 - 18\omega_3^3 v_2^2 + 72\omega_3\omega_5 v_2^2 + 25\omega_3^2 cs^2\omega_5^2 + 15\omega_3^3\omega_5^2 v_2^2 - 24\omega_3\omega_5 + 36\omega_3^3 v_2^2 + 12\omega_3\omega_5^2 - 36\omega_3^2 cs^2\omega_5 + 27\omega_3^3\omega_5 v_2^2$

$C_{19} = \omega_3^3\omega_5^2\omega_2^2 + 6\omega_3^3\omega_5^2 v_2^2 - 24\omega_3^2 cs^2\omega_5\omega_2^2 - \omega_3^3\omega_5^2\omega_2^3 + 72\omega_3^2 cs^2\omega_5\omega_2^3 + 12\omega_3\omega_5^2 v_2^2\omega_2^3 - 36\omega_3^2 cs^2\omega_2^3 + 36\omega_3 cs^2\omega_5^2\omega_2^3 - 12 cs^2\omega_5^2\omega_2^3 + 12\omega_3^3 v_2^2\omega_2^3 + 6\omega_3^3\omega_5\omega_2^2 - 24\omega_3^3 cs^2\omega_5\omega_2^3 - 6\omega_3\omega_5^2\omega_2^3 - 12\omega_3 cs^2\omega_5^2\omega_2^2 + 12\omega_3\omega_5 v_2^2\omega_2^3 + 12\omega_3^3 cs^2\omega_5\omega_2^3 - 21\omega_3^3\omega_5\omega_2^3 - 6\omega_3^2\omega_5^2 v_2^2\omega_2^3 - 12\omega_3^3 cs^2\omega_5\omega_2 - 12\omega_3^3 cs^2\omega_5^2\omega_2 + 7\omega_3^2\omega_5^2\omega_2^3 - 12\omega_3^3\omega_5^2 v_2^2\omega_2 - 6\omega_3^3\omega_5^2 v_2^2\omega_2^3 - 24\omega_3 cs^2\omega_5\omega_2^3 - 3\omega_3^3\omega_2^3 + 12\omega_3\omega_5\omega_2^3 - 3\omega_3^3\omega_5^2\omega_2 + 6\omega_3^3 cs^2\omega_5^2\omega_2^3 + 6\omega_3^3\omega_5\omega_2^3 - 36\omega_3^2 cs^2\omega_5^2\omega_2^3 - 6\omega_3^3 v_2^2\omega_2^3 + 6\omega_3^3 cs^2\omega_5^2\omega_2 + 6\omega_3^3\omega_5 v_2^2\omega_2^3 + 6\omega_3^3\omega_2^3 - 3\omega_3^3\omega_5\omega_2 - 24\omega_3\omega_5 v_2^2\omega_2^3 + 6\omega_3^3\omega_5 v_2^2\omega_2 + 18\omega_3^3 cs^2\omega_2^3 + 36\omega_3^2 cs^2\omega_5\omega_2^2$

$C_{20} = 30\omega_3^3 cs^2 + 9\omega_3^3\omega_5 + \omega_3^3\omega_5^2 v_2^2 + 12\omega_3^2 - 36\omega_3 cs^2\omega_5 + 4\omega_3^3 cs^2\omega_5^2 - 6\omega_3^3 + 11\omega_3^2\omega_5^2 + 48\omega_3^2\omega_5 v_2^2 - 36\omega_3^2\omega_5 - 60\omega_3^2 cs^2 + 18\omega_3 cs^2\omega_5^2 - 30\omega_3^3 cs^2\omega_5 + 12\omega_5^2 v_2^2 - \omega_3^3\omega_5^2 + 12\omega_3\omega_5^2 v_2^2 - 6\omega_3^3 v_2^2 - 60\omega_3\omega_5 v_2^2 - 26\omega_3^2 cs^2\omega_5^2 - 14\omega_3^3\omega_5^2 v_2^2 + 24\omega_3\omega_5 + 12\omega_3^3 v_2^2 - 12\omega_3\omega_5^2 + 96\omega_3^2 cs^2\omega_5 - 6\omega_3^3\omega_5 v_2^2$

$C_{21} = 2\omega_3^3\omega_5^2\omega_2^2 + 12\omega_3^3\omega_5^2 v_2^2 - 24\omega_3^2 cs^2\omega_5\omega_2^2 - 24\omega_5^2 v_2^2\omega_2^3 - \omega_3^3\omega_5^2\omega_2^3 + 12\omega_3\omega_5 v_2^2\omega_2^2 + 36\omega_3^2 cs^2\omega_5\omega_2^3 + 30\omega_3\omega_5^2 v_2^2\omega_2^3 - 24\omega_3\omega_5 v_2^2\omega_2^2 - 12\omega_3^3 cs^2\omega_2^3 + 36\omega_3 cs^2\omega_5^2\omega_2^3 - 12 cs^2\omega_5^2\omega_2^3 + 12\omega_5^3 v_2^2\omega_2^3 + 12\omega_3\omega_5\omega_2^3 - 12\omega_3^3 cs^2\omega_5\omega_2^3 - 24\omega_3 cs^2\omega_5^2\omega_2 - 12\omega_3\omega_5 v_2^2\omega_2^3 + 12\omega_3^3 cs^2\omega_5\omega_2 - 6\omega_3^3\omega_5\omega_2^2 + 12\omega_3^3\omega_5^2 v_2^2\omega_2^2 - 12\omega_3^3 cs^2\omega_5\omega_2 - 12\omega_3^3 cs^2\omega_5^2\omega_2 + 3\omega_3^3\omega_5^2\omega_2^3 - 18\omega_3^3\omega_5^2 v_2^2\omega_2 - 12\omega_3^3\omega_5 v_2^2\omega_2^3 - 12\omega_3 cs^2\omega_5\omega_2^3 - 6\omega_3^3\omega_5^2\omega_2^2 + 4\omega_3^3 cs^2\omega_5^2\omega_2^3 + 3\omega_3^3\omega_5\omega_2^3 + 3\omega_3^3\omega_5 v_2^2\omega_2^3 - 32\omega_3^3 cs^2\omega_5^2\omega_2^3 - 6\omega_3^3 v_2^2\omega_2^3 + 6\omega_3^3 cs^2\omega_5^2\omega_2 - 6\omega_3\omega_5\omega_2^2 + 12\omega_3\omega_5 v_2^2\omega_2^3 + 6\omega_3^3 cs^2\omega_2^3 + 48\omega_3^2 cs^2\omega_5\omega_2^2$

$C_{22} = 144\omega_3^2 cs^2\omega_5 v_2^2 - 72\omega_3^2 v_2^4 - 3\omega_3^3 cs^2\omega_5^2 v_2^2 - 30\omega_3^3\omega_5 v_2^4 - 24\omega_3 cs^2\omega_5 v_2^2 + \omega_3^3 cs^2\omega_5^2 + 24\omega_3^3 cs^4\omega_5^2 - 72\omega_3^2\omega_5 v_2^2 - 24\omega_3^2 cs^4\omega_5 + 36\omega_3^3 v_2^4 + 12\omega_3 cs^2\omega_5^2 - 6\omega_3^3 cs^2\omega_5 - 72\omega_3^3 cs^2\omega_5 v_2^2 - 12\omega_3^3\omega_5^2 v_2^4 - 216\omega_3^2 cs^2 v_2^2 - 36\omega_3 cs^2\omega_5^2 v_2^2 - 36\omega_3^3 v_2^2 + 24\omega_3 cs^4\omega_5 - 3\omega_3^3 cs^4\omega_5^2 + 6\omega_3^3 cs^2\omega_5^2 v_2^2 + 72\omega_3^2\omega_5 v_2^4 - 8\omega_3^2 cs^2\omega_5^2 + 72\omega_3 cs^2\omega_5 v_2^2 + 12\omega_3^3\omega_5^2 v_2^2 + 3\omega_3^3\omega_5^2 v_2^4 + 108\omega_3^3 cs^2 v_2^2 + 72\omega_3^2 v_2^2 - 12\omega_3^3 cs^2\omega_5^2 v_2^2 + 24\omega_3^2 cs^2\omega_5 + 30\omega_3^3\omega_5 v_2^2 - 48\omega_3 cs^4\omega_5^2 + 24 cs^4\omega_5^2 + 6\omega_3^3 cs^4\omega_5$

$C_{23} = 30\omega_3^3 cs^2 + 12\omega_3^3\omega_5 + 2\omega_3^3\omega_5^2 v_2^2 + 36\omega_3^2 - 12\omega_3 cs^2\omega_5 + \omega_3^3 cs^2\omega_5^2 - 18\omega_3^3 + 2\omega_3^2\omega_5^2 + 24\omega_3^2\omega_5 v_2^2 - 24\omega_3^2\omega_5 - 60\omega_3^2 cs^2 - 30\omega_3 cs^2\omega_5^2 + 24 cs^2\omega_5^2 - 24\omega_3^3 cs^2\omega_5 - 12\omega_5^2 v_2^2 - \omega_3^3\omega_5^2 - 12\omega_3\omega_5^2 v_2^2 + 42\omega_3^3 v_2^2 + 60\omega_3\omega_5 v_2^2 - 2\omega_3^2 cs^2\omega_5^2 + 2\omega_3^3\omega_5^2 v_2^2 - 12\omega_3\omega_5 - 84\omega_3^2 v_2^2 + 6\omega_3^3\omega_5 + 72\omega_3^2 cs^2\omega_5 - 24\omega_3^3\omega_5 v_2^2$

3 Comparison of SRT, MRT, and CLBM

3.1 Conservation of mass equation

$\frac{\partial\rho}{\partial t} + v_1\frac{\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_1} + \rho\frac{\delta_l}{\delta_t}\frac{\partial v_1}{\partial x_1} + v_2\frac{\delta_l}{\delta_t}\frac{\partial\rho}{\partial x_2} + \rho\frac{\delta_l}{\delta_t}\frac{\partial v_2}{\partial x_2} + C_{\mathrm{D}_x\rho,\mathrm{D}_t v_1}^{(0)}\delta_l\frac{\partial\rho}{\partial x_1}\frac{\partial v_1}{\partial t} + C_{\mathrm{D}_x\rho,\mathrm{D}_x v_1}^{(0)}\frac{\delta_l^2}{\delta_t}\frac{\partial\rho}{\partial x_1}\frac{\partial v_1}{\partial x_1} +$

$C_{\mathrm{D}_x v_1,\mathrm{D}_x v_1}^{(0)}\frac{\delta_l^2}{\delta_t}\left(\frac{\partial v_1}{\partial x_1}\right)^2 + C_{\mathrm{D}_x\rho,\mathrm{D}_y v_1}^{(0)}\frac{\delta_l^2}{\delta_t}\frac{\partial\rho}{\partial x_1}\frac{\partial v_1}{\partial x_2} + C_{\mathrm{D}_x\rho,\mathrm{D}_y v_2}^{(0)}\frac{\delta_l^2}{\delta_t}\frac{\partial\rho}{\partial x_1}\frac{\partial v_2}{\partial x_2} + C_{\mathrm{D}_x v_1,\mathrm{D}_y v_2}^{(0)}\frac{\delta_l^2}{\delta_t}\frac{\partial v_1}{\partial x_1}\frac{\partial v_2}{\partial x_2} +$

$C_{\mathrm{D}_y\rho,\mathrm{D}_t v_2}^{(0)}\delta_l\frac{\partial\rho}{\partial x_2}\frac{\partial v_2}{\partial t} + C_{\mathrm{D}_y\rho,\mathrm{D}_x v_1}^{(0)}\frac{\delta_l^2}{\delta_t}\frac{\partial\rho}{\partial x_2}\frac{\partial v_1}{\partial x_1} + C_{\mathrm{D}_y\rho,\mathrm{D}_x v_2}^{(0)}\frac{\delta_l^2}{\delta_t}\frac{\partial\rho}{\partial x_2}\frac{\partial v_2}{\partial x_1} + C_{\mathrm{D}_y\rho,\mathrm{D}_y v_2}^{(0)}\frac{\delta_l^2}{\delta_t}\frac{\partial\rho}{\partial x_2}\frac{\partial v_2}{\partial x_2} +$

$C_{\mathrm{D}_y v_2,\mathrm{D}_y v_2}^{(0)}\frac{\delta_l^2}{\delta_t}\left(\frac{\partial v_2}{\partial x_2}\right)^2 + C_{\mathrm{D}_t\mathrm{D}_x v_1}^{(0)}\delta_l\frac{\partial^2 v_1}{\partial t\partial x_1} + C_{\mathrm{D}_x^2\rho}^{(0)}\frac{\delta_l^2}{\delta_t}\frac{\partial^2\rho}{\partial x_1^2} + C_{\mathrm{D}_x^2 v_1}^{(0)}\frac{\delta_l^2}{\delta_t}\frac{\partial^2 v_1}{\partial x_1^2} + C_{\mathrm{D}_t\mathrm{D}_y v_2}^{(0)}\delta_l\frac{\partial^2 v_2}{\partial t\partial x_2} + C_{\mathrm{D}_x\mathrm{D}_y\rho}^{(0)}\frac{\delta_l^2}{\delta_t}\frac{\partial^2\rho}{\partial x_1\partial x_2} +$

$+ C_{\mathrm{D}_x\mathrm{D}_y v_1}^{(0)}\frac{\delta_l^2}{\delta_t}\frac{\partial^2 v_1}{\partial x_1\partial x_2} + C_{\mathrm{D}_x\mathrm{D}_y v_2}^{(0)}\frac{\delta_l^2}{\delta_t}\frac{\partial^2 v_2}{\partial x_1\partial x_2} + C_{\mathrm{D}_y^2\rho}^{(0)}\frac{\delta_l^2}{\delta_t}\frac{\partial^2\rho}{\partial x_2^2} + C_{\mathrm{D}_y^2 v_2}^{(0)}\frac{\delta_l^2}{\delta_t}\frac{\partial^2 v_2}{\partial x_2^2} + C_{\mathrm{D}_t^2\mathrm{D}_x v_1}^{(0)}\delta_l\delta_t\frac{\partial^3 v_1}{\partial t^2\partial x_1} +$

$C_{\mathrm{D}_t\mathrm{D}_x^2 v_1}^{(0)}\delta_l^2\frac{\partial^3 v_1}{\partial t\partial x_1^2} + C_{\mathrm{D}_x^3\rho}^{(0)}\frac{\delta_l^3}{\delta_t}\frac{\partial^3\rho}{\partial x_1^3} + C_{\mathrm{D}_x^3 v_1}^{(0)}\frac{\delta_l^3}{\delta_t}\frac{\partial^3 v_1}{\partial x_1^3} + C_{\mathrm{D}_t^2\mathrm{D}_y v_2}^{(0)}\delta_l\delta_t\frac{\partial^3 v_2}{\partial t^2\partial x_2} + C_{\mathrm{D}_t\mathrm{D}_x\mathrm{D}_y v_1}^{(0)}\delta_l^2\frac{\partial^3 v_1}{\partial t\partial x_1\partial x_2} +$

$C_{\mathrm{D}_t\mathrm{D}_x\mathrm{D}_y v_2}^{(0)}\delta_l^2\frac{\partial^3 v_2}{\partial t\partial x_1\partial x_2} + C_{\mathrm{D}_x^2\mathrm{D}_y\rho}^{(0)}\frac{\delta_l^3}{\delta_t}\frac{\partial^3\rho}{\partial x_1^2\partial x_2} + C_{\mathrm{D}_x^2\mathrm{D}_y v_1}^{(0)}\frac{\delta_l^3}{\delta_t}\frac{\partial^3 v_1}{\partial x_1^2\partial x_2} + C_{\mathrm{D}_x^2\mathrm{D}_y v_2}^{(0)}\frac{\delta_l^3}{\delta_t}\frac{\partial^3 v_2}{\partial x_1^2\partial x_2} + C_{\mathrm{D}_t\mathrm{D}_y^2 v_2}^{(0)}\delta_l^2\frac{\partial^3 v_2}{\partial t\partial x_2^2} +$

$C_{\mathrm{D}_x\mathrm{D}_y^2\rho}^{(0)}\frac{\delta_l^3}{\delta_t}\frac{\partial^3\rho}{\partial x_1\partial x_2^2} + C_{\mathrm{D}_x\mathrm{D}_y^2 v_1}^{(0)}\frac{\delta_l^3}{\delta_t}\frac{\partial^3 v_1}{\partial x_1\partial x_2^2} + C_{\mathrm{D}_x\mathrm{D}_y^2 v_2}^{(0)}\frac{\delta_l^3}{\delta_t}\frac{\partial^3 v_2}{\partial x_1\partial x_2^2} + C_{\mathrm{D}_y^3\rho}^{(0)}\frac{\delta_l^3}{\delta_t}\frac{\partial^3\rho}{\partial x_2^3} + C_{\mathrm{D}_y^3 v_2}^{(0)}\frac{\delta_l^3}{\delta_t}\frac{\partial^3 v_2}{\partial x_2^3} +$

$C_{\mathrm{D}_t^3\mathrm{D}_x v_1}^{(0)}\delta_l\delta_t^2\frac{\partial^4 v_1}{\partial t^3\partial x_1} + C_{\mathrm{D}_t^2\mathrm{D}_x^2 v_1}^{(0)}\delta_l^2\delta_t\frac{\partial^4 v_1}{\partial t^2\partial x_1^2} + C_{\mathrm{D}_t\mathrm{D}_x^3 v_1}^{(0)}\delta_l^3\frac{\partial^4 v_1}{\partial t\partial x_1^3} + C_{\mathrm{D}_x^4\rho}^{(0)}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_1^4} + C_{\mathrm{D}_x^4 v_1}^{(0)}\frac{\delta_l^4}{\delta_t}\frac{\partial^4 v_1}{\partial x_1^4} +$

$C_{\mathrm{D}_t^3\mathrm{D}_y v_2}^{(0)}\delta_l\delta_t^2\frac{\partial^4 v_2}{\partial t^3\partial x_2} + C_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_1}^{(0)}\delta_l^2\delta_t\frac{\partial^4 v_1}{\partial t^2\partial x_1\partial x_2} + C_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_2}^{(0)}\delta_l^2\delta_t\frac{\partial^4 v_2}{\partial t^2\partial x_1\partial x_2} + C_{\mathrm{D}_t\mathrm{D}_x^2\mathrm{D}_y v_1}^{(0)}\delta_l^3\frac{\partial^4 v_1}{\partial t\partial x_1^2\partial x_2} +$

$C_{\mathrm{D}_t\mathrm{D}_x^2\mathrm{D}_y v_2}^{(0)}\delta_l^3\frac{\partial^4 v_2}{\partial t\partial x_1^2\partial x_2} + C_{\mathrm{D}_x^3\mathrm{D}_y\rho}^{(0)}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_1^3\partial x_2} + C_{\mathrm{D}_x^3\mathrm{D}_y v_1}^{(0)}\frac{\delta_l^4}{\delta_t}\frac{\partial^4 v_1}{\partial x_1^3\partial x_2} + C_{\mathrm{D}_x^3\mathrm{D}_y v_2}^{(0)}\frac{\delta_l^4}{\delta_t}\frac{\partial^4 v_2}{\partial x_1^3\partial x_2} + C_{\mathrm{D}_t^2\mathrm{D}_y^2 v_2}^{(0)}\delta_l^2\delta_t\frac{\partial^4 v_2}{\partial t^2\partial x_2^2} +$

$C_{\mathrm{D}_t\mathrm{D}_x\mathrm{D}_y^2 v_1}^{(0)}\delta_l^3\frac{\partial^4 v_1}{\partial t\partial x_1\partial x_2^2} + C_{\mathrm{D}_t\mathrm{D}_x\mathrm{D}_y^2 v_2}^{(0)}\delta_l^3\frac{\partial^4 v_2}{\partial t\partial x_1\partial x_2^2} + C_{\mathrm{D}_x^2\mathrm{D}_y^2\rho}^{(0)}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2} + C_{\mathrm{D}_x^2\mathrm{D}_y^2 v_1}^{(0)}\frac{\delta_l^4}{\delta_t}\frac{\partial^4 v_1}{\partial x_1^2\partial x_2^2} + C_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2}^{(0)}\frac{\delta_l^4}{\delta_t}\frac{\partial^4 v_2}{\partial x_1^2\partial x_2^2} +$

$+ C_{\mathrm{D}_t\mathrm{D}_y^3 v_2}^{(0)}\delta_l^3\frac{\partial^4 v_2}{\partial t\partial x_2^3} + C_{\mathrm{D}_x\mathrm{D}_y^3\rho}^{(0)}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_1\partial x_2^3} + C_{\mathrm{D}_x\mathrm{D}_y^3 v_1}^{(0)}\frac{\delta_l^4}{\delta_t}\frac{\partial^4 v_1}{\partial x_1\partial x_2^3} + C_{\mathrm{D}_x\mathrm{D}_y^3 v_2}^{(0)}\frac{\delta_l^4}{\delta_t}\frac{\partial^4 v_2}{\partial x_1\partial x_2^3} + C_{\mathrm{D}_y^4\rho}^{(0)}\frac{\delta_l^4}{\delta_t}\frac{\partial^4\rho}{\partial x_2^4} +$

$C_{\mathrm{D}_y^4 v_2}^{(0)}\frac{\delta_l^4}{\delta_t}\frac{\partial^4 v_2}{\partial x_2^4} = 0,$

where:

coefficient $C^{(0)}_{D_x\rho, D_t v_1}$ **at** $\frac{\partial \rho}{\partial x_1} \frac{\partial v_1}{\partial t}$:

$$C^{(0),\text{SRT}}_{D_x\rho, D_t v_1} = (-2 + \omega)\frac{1}{2\omega}$$

$$C^{(0),\text{MRT1}}_{D_x\rho, D_t v_1} = (-2 + \omega_2)\frac{1}{2\omega_2}$$

$$C^{(0),\text{MRT2}}_{D_x\rho, D_t v_1} = C^{(0),\text{MRT1}}_{D_x\rho, D_t v_1}$$

$$C^{(0),\text{CLBM1}}_{D_x\rho, D_t v_1} = C^{(0),\text{MRT1}}_{D_x\rho, D_t v_1}$$

$$C^{(0),\text{CLBM2}}_{D_x\rho, D_t v_1} = C^{(0),\text{MRT1}}_{D_x\rho, D_t v_1}$$

coefficient $C^{(0)}_{D_x\rho, D_x v_1}$ **at** $\frac{\partial \rho}{\partial x_1} \frac{\partial v_1}{\partial x_1}$:

$$C^{(0),\text{SRT}}_{D_x\rho, D_x v_1} = (-2 + \omega)\frac{v_1}{2\omega}$$

$$C^{(0),\text{MRT1}}_{D_x\rho, D_x v_1} = (-2 + \omega_2)\frac{v_1}{2\omega_2}$$

$$C^{(0),\text{MRT2}}_{D_x\rho, D_x v_1} = C^{(0),\text{MRT1}}_{D_x\rho, D_x v_1}$$

$$C^{(0),\text{CLBM1}}_{D_x\rho, D_x v_1} = C^{(0),\text{MRT1}}_{D_x\rho, D_x v_1}$$

$$C^{(0),\text{CLBM2}}_{D_x\rho, D_x v_1} = C^{(0),\text{MRT1}}_{D_x\rho, D_x v_1}$$

coefficient $C^{(0)}_{D_x v_1, D_x v_1}$ **at** $\left(\frac{\partial v_1}{\partial x_1}\right)^2$:

$$C^{(0),\text{SRT}}_{D_x v_1, D_x v_1} = (-2 + \omega)\frac{\rho}{2\omega}$$

$$C^{(0),\text{MRT1}}_{D_x v_1, D_x v_1} = (-2 + \omega_2)\frac{\rho}{2\omega_2}$$

$$C^{(0),\text{MRT2}}_{D_x v_1, D_x v_1} = C^{(0),\text{MRT1}}_{D_x v_1, D_x v_1}$$

$$C^{(0),\text{CLBM1}}_{D_x v_1, D_x v_1} = C^{(0),\text{MRT1}}_{D_x v_1, D_x v_1}$$

$$C^{(0),\text{CLBM2}}_{D_x v_1, D_x v_1} = C^{(0),\text{MRT1}}_{D_x v_1, D_x v_1}$$

coefficient $C^{(0)}_{D_x\rho, D_y v_1}$ **at** $\frac{\partial \rho}{\partial x_1} \frac{\partial v_1}{\partial x_2}$:

$$C^{(0),\text{SRT}}_{D_x\rho, D_y v_1} = (2 - \omega)\frac{v_2}{2\omega}$$

$$C^{(0),\text{MRT1}}_{D_x\rho, D_y v_1} = (2 - \omega_3)\frac{v_2}{2\omega_3}$$

$$C^{(0),\text{MRT2}}_{D_x\rho, D_y v_1} = C^{(0),\text{MRT1}}_{D_x\rho, D_y v_1}$$

$$C^{(0),\text{CLBM1}}_{D_x\rho, D_y v_1} = C^{(0),\text{MRT1}}_{D_x\rho, D_y v_1}$$

$$C^{(0),\text{CLBM2}}_{D_x\rho, D_y v_1} = C^{(0),\text{MRT1}}_{D_x\rho, D_y v_1}$$

coefficient $C^{(0)}_{D_x\rho, D_y v_2}$ **at** $\frac{\partial \rho}{\partial x_1} \frac{\partial v_2}{\partial x_2}$:

$$C^{(0),\text{SRT}}_{D_x\rho, D_y v_2} = (2 - \omega)\frac{v_1}{\omega}$$

$$C^{(0),\text{MRT1}}_{D_x\rho, D_y v_2} = (-\omega_2\omega_3 + \omega_2 + \omega_3)\frac{v_1}{\omega_2\omega_3}$$

$$C^{(0),\text{MRT2}}_{D_x\rho, D_y v_2} = C^{(0),\text{MRT1}}_{D_x\rho, D_y v_2}$$

$$C_{\mathrm{D}_x\rho,\mathrm{D}_y v_2}^{(0),\mathrm{CLBM1}} = C_{\mathrm{D}_x\rho,\mathrm{D}_y v_2}^{(0),\mathrm{MRT1}}$$

$$C_{\mathrm{D}_x\rho,\mathrm{D}_y v_2}^{(0),\mathrm{CLBM2}} = C_{\mathrm{D}_x\rho,\mathrm{D}_y v_2}^{(0),\mathrm{MRT1}}$$

coefficient $C_{\mathrm{D}_x v_1,\mathrm{D}_y v_2}^{(0)}$ **at** $\frac{\partial v_1}{\partial x_1}\frac{\partial v_2}{\partial x_2}$:

$$C_{\mathrm{D}_x v_1,\mathrm{D}_y v_2}^{(0),\mathrm{SRT}} = (2-\omega)\frac{\rho}{\omega}$$

$$C_{\mathrm{D}_x v_1,\mathrm{D}_y v_2}^{(0),\mathrm{MRT1}} = (-\omega_2\omega_3+\omega_2+\omega_3)\frac{\rho}{\omega_2\omega_3}$$

$$C_{\mathrm{D}_x v_1,\mathrm{D}_y v_2}^{(0),\mathrm{MRT2}} = C_{\mathrm{D}_x v_1,\mathrm{D}_y v_2}^{(0),\mathrm{MRT1}}$$

$$C_{\mathrm{D}_x v_1,\mathrm{D}_y v_2}^{(0),\mathrm{CLBM1}} = C_{\mathrm{D}_x v_1,\mathrm{D}_y v_2}^{(0),\mathrm{MRT1}}$$

$$C_{\mathrm{D}_x v_1,\mathrm{D}_y v_2}^{(0),\mathrm{CLBM2}} = C_{\mathrm{D}_x v_1,\mathrm{D}_y v_2}^{(0),\mathrm{MRT1}}$$

coefficient $C_{\mathrm{D}_y\rho,\mathrm{D}_t v_2}^{(0)}$ **at** $\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial t}$:

$$C_{\mathrm{D}_y\rho,\mathrm{D}_t v_2}^{(0),\mathrm{SRT}} = (-2+\omega)\frac{1}{2\omega}$$

$$C_{\mathrm{D}_y\rho,\mathrm{D}_t v_2}^{(0),\mathrm{MRT1}} = (-2+\omega_3)\frac{1}{2\omega_3}$$

$$C_{\mathrm{D}_y\rho,\mathrm{D}_t v_2}^{(0),\mathrm{MRT2}} = C_{\mathrm{D}_y\rho,\mathrm{D}_t v_2}^{(0),\mathrm{MRT1}}$$

$$C_{\mathrm{D}_y\rho,\mathrm{D}_t v_2}^{(0),\mathrm{CLBM1}} = C_{\mathrm{D}_y\rho,\mathrm{D}_t v_2}^{(0),\mathrm{MRT1}}$$

$$C_{\mathrm{D}_y\rho,\mathrm{D}_t v_2}^{(0),\mathrm{CLBM2}} = C_{\mathrm{D}_y\rho,\mathrm{D}_t v_2}^{(0),\mathrm{MRT1}}$$

coefficient $C_{\mathrm{D}_y\rho,\mathrm{D}_x v_1}^{(0)}$ **at** $\frac{\partial \rho}{\partial x_2}\frac{\partial v_1}{\partial x_1}$:

$$C_{\mathrm{D}_y\rho,\mathrm{D}_x v_1}^{(0),\mathrm{SRT}} = (2-\omega)\frac{v_2}{\omega}$$

$$C_{\mathrm{D}_y\rho,\mathrm{D}_x v_1}^{(0),\mathrm{MRT1}} = (-\omega_2\omega_3+\omega_2+\omega_3)\frac{v_2}{\omega_2\omega_3}$$

$$C_{\mathrm{D}_y\rho,\mathrm{D}_x v_1}^{(0),\mathrm{MRT2}} = C_{\mathrm{D}_y\rho,\mathrm{D}_x v_1}^{(0),\mathrm{MRT1}}$$

$$C_{\mathrm{D}_y\rho,\mathrm{D}_x v_1}^{(0),\mathrm{CLBM1}} = C_{\mathrm{D}_y\rho,\mathrm{D}_x v_1}^{(0),\mathrm{MRT1}}$$

$$C_{\mathrm{D}_y\rho,\mathrm{D}_x v_1}^{(0),\mathrm{CLBM2}} = C_{\mathrm{D}_y\rho,\mathrm{D}_x v_1}^{(0),\mathrm{MRT1}}$$

coefficient $C_{\mathrm{D}_y\rho,\mathrm{D}_x v_2}^{(0)}$ **at** $\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial x_1}$:

$$C_{\mathrm{D}_y\rho,\mathrm{D}_x v_2}^{(0),\mathrm{SRT}} = (2-\omega)\frac{v_1}{2\omega}$$

$$C_{\mathrm{D}_y\rho,\mathrm{D}_x v_2}^{(0),\mathrm{MRT1}} = (2-\omega_2)\frac{v_1}{2\omega_2}$$

$$C_{\mathrm{D}_y\rho,\mathrm{D}_x v_2}^{(0),\mathrm{MRT2}} = C_{\mathrm{D}_y\rho,\mathrm{D}_x v_2}^{(0),\mathrm{MRT1}}$$

$$C_{\mathrm{D}_y\rho,\mathrm{D}_x v_2}^{(0),\mathrm{CLBM1}} = C_{\mathrm{D}_y\rho,\mathrm{D}_x v_2}^{(0),\mathrm{MRT1}}$$

$$C_{\mathrm{D}_y\rho,\mathrm{D}_x v_2}^{(0),\mathrm{CLBM2}} = C_{\mathrm{D}_y\rho,\mathrm{D}_x v_2}^{(0),\mathrm{MRT1}}$$

coefficient $C_{\mathrm{D}_y\rho,\mathrm{D}_y v_2}^{(0)}$ **at** $\frac{\partial \rho}{\partial x_2}\frac{\partial v_2}{\partial x_2}$:

$$C_{\mathrm{D}_y\rho,\mathrm{D}_y v_2}^{(0),\mathrm{SRT}} = (-2+\omega)\frac{v_2}{2\omega}$$

$$C_{\mathrm{D}_y\rho,\mathrm{D}_y v_2}^{(0),\mathrm{MRT1}} = (-2+\omega_3)\frac{v_2}{2\omega_3}$$

$$C^{(0),\text{MRT2}}_{\text{D}_y\rho,\text{D}_y v_2} = C^{(0),\text{MRT1}}_{\text{D}_y\rho,\text{D}_y v_2}$$

$$C^{(0),\text{CLBM1}}_{\text{D}_y\rho,\text{D}_y v_2} = C^{(0),\text{MRT1}}_{\text{D}_y\rho,\text{D}_y v_2}$$

$$C^{(0),\text{CLBM2}}_{\text{D}_y\rho,\text{D}_y v_2} = C^{(0),\text{MRT1}}_{\text{D}_y\rho,\text{D}_y v_2}$$

coefficient $C^{(0)}_{\text{D}_y v_2,\text{D}_y v_2}$ at $\left(\frac{\partial v_2}{\partial x_2}\right)^2$:

$$C^{(0),\text{SRT}}_{\text{D}_y v_2,\text{D}_y v_2} = (-2+\omega)\frac{\rho}{2\omega}$$

$$C^{(0),\text{MRT1}}_{\text{D}_y v_2,\text{D}_y v_2} = (-2+\omega_3)\frac{\rho}{2\omega_3}$$

$$C^{(0),\text{MRT2}}_{\text{D}_y v_2,\text{D}_y v_2} = C^{(0),\text{MRT1}}_{\text{D}_y v_2,\text{D}_y v_2}$$

$$C^{(0),\text{CLBM1}}_{\text{D}_y v_2,\text{D}_y v_2} = C^{(0),\text{MRT1}}_{\text{D}_y v_2,\text{D}_y v_2}$$

$$C^{(0),\text{CLBM2}}_{\text{D}_y v_2,\text{D}_y v_2} = C^{(0),\text{MRT1}}_{\text{D}_y v_2,\text{D}_y v_2}$$

coefficient $C^{(0)}_{\text{D}_t\text{D}_x v_1}$ at $\frac{\partial^2 v_1}{\partial t \partial x_1}$:

$$C^{(0),\text{SRT}}_{\text{D}_t\text{D}_x v_1} = (-2+\omega)\frac{\rho}{2\omega}$$

$$C^{(0),\text{MRT1}}_{\text{D}_t\text{D}_x v_1} = (-2+\omega_2)\frac{\rho}{2\omega_2}$$

$$C^{(0),\text{MRT2}}_{\text{D}_t\text{D}_x v_1} = C^{(0),\text{MRT1}}_{\text{D}_t\text{D}_x v_1}$$

$$C^{(0),\text{CLBM1}}_{\text{D}_t\text{D}_x v_1} = C^{(0),\text{MRT1}}_{\text{D}_t\text{D}_x v_1}$$

$$C^{(0),\text{CLBM2}}_{\text{D}_t\text{D}_x v_1} = C^{(0),\text{MRT1}}_{\text{D}_t\text{D}_x v_1}$$

coefficient $C^{(0)}_{\text{D}_x^2\rho}$ at $\frac{\partial^2\rho}{\partial x_1^2}$:

$$C^{(0),\text{SRT}}_{\text{D}_x^2\rho} = (-2+\omega)\frac{cs^2}{2\omega}$$

$$C^{(0),\text{MRT1}}_{\text{D}_x^2\rho} = (-2+\omega_2)\frac{cs^2}{2\omega_2}$$

$$C^{(0),\text{MRT2}}_{\text{D}_x^2\rho} = (-2+\omega_2)\frac{cs^2}{2\omega_2}$$

$$C^{(0),\text{CLBM1}}_{\text{D}_x^2\rho} = (-2+\omega_2)\frac{cs^2}{2\omega_2}$$

$$C^{(0),\text{CLBM2}}_{\text{D}_x^2\rho} = (-2+\omega_2)\frac{cs^2}{2\omega_2}$$

coefficient $C^{(0)}_{\text{D}_x^2 v_1}$ at $\frac{\partial^2 v_1}{\partial x_1^2}$:

$$C^{(0),\text{SRT}}_{\text{D}_x^2 v_1} = (-2+\omega)\frac{\rho v_1}{2\omega}$$

$$C^{(0),\text{MRT1}}_{\text{D}_x^2 v_1} = (-2+\omega_2)\frac{\rho v_1}{2\omega_2}$$

$$C^{(0),\text{MRT2}}_{\text{D}_x^2 v_1} = C^{(0),\text{MRT1}}_{\text{D}_x^2 v_1}$$

$$C^{(0),\text{CLBM1}}_{\text{D}_x^2 v_1} = C^{(0),\text{MRT1}}_{\text{D}_x^2 v_1}$$

$$C^{(0),\text{CLBM2}}_{\text{D}_x^2 v_1} = C^{(0),\text{MRT1}}_{\text{D}_x^2 v_1}$$

coefficient $C_{\mathrm{D}_t \mathrm{D}_y v_2}^{(0)}$ **at** $\frac{\partial^2 v_2}{\partial t \partial x_2}$:

$$C_{\mathrm{D}_t \mathrm{D}_y v_2}^{(0),\mathrm{SRT}} = (-2 + \omega)\frac{\rho}{2\omega}$$

$$C_{\mathrm{D}_t \mathrm{D}_y v_2}^{(0),\mathrm{MRT1}} = (-2 + \omega_3)\frac{\rho}{2\omega_3}$$

$$C_{\mathrm{D}_t \mathrm{D}_y v_2}^{(0),\mathrm{MRT2}} = C_{\mathrm{D}_t \mathrm{D}_y v_2}^{(0),\mathrm{MRT1}}$$

$$C_{\mathrm{D}_t \mathrm{D}_y v_2}^{(0),\mathrm{CLBM1}} = C_{\mathrm{D}_t \mathrm{D}_y v_2}^{(0),\mathrm{MRT1}}$$

$$C_{\mathrm{D}_t \mathrm{D}_y v_2}^{(0),\mathrm{CLBM2}} = C_{\mathrm{D}_t \mathrm{D}_y v_2}^{(0),\mathrm{MRT1}}$$

coefficient $C_{\mathrm{D}_x \mathrm{D}_y \rho}^{(0)}$ **at** $\frac{\partial^2 \rho}{\partial x_1 \partial x_2}$:

$$C_{\mathrm{D}_x \mathrm{D}_y \rho}^{(0),\mathrm{SRT}} = (2 - \omega)\frac{v_1 v_2}{\omega}$$

$$C_{\mathrm{D}_x \mathrm{D}_y \rho}^{(0),\mathrm{MRT1}} = (-\omega_2 \omega_3 + \omega_2 + \omega_3)\frac{v_1 v_2}{\omega_2 \omega_3}$$

$$C_{\mathrm{D}_x \mathrm{D}_y \rho}^{(0),\mathrm{MRT2}} = C_{\mathrm{D}_x \mathrm{D}_y \rho}^{(0),\mathrm{MRT1}}$$

$$C_{\mathrm{D}_x \mathrm{D}_y \rho}^{(0),\mathrm{CLBM1}} = C_{\mathrm{D}_x \mathrm{D}_y \rho}^{(0),\mathrm{MRT1}}$$

$$C_{\mathrm{D}_x \mathrm{D}_y \rho}^{(0),\mathrm{CLBM2}} = C_{\mathrm{D}_x \mathrm{D}_y \rho}^{(0),\mathrm{MRT1}}$$

coefficient $C_{\mathrm{D}_x \mathrm{D}_y v_1}^{(0)}$ **at** $\frac{\partial^2 v_1}{\partial x_1 \partial x_2}$:

$$C_{\mathrm{D}_x \mathrm{D}_y v_1}^{(0),\mathrm{SRT}} = (2 - \omega)\frac{\rho v_2}{2\omega}$$

$$C_{\mathrm{D}_x \mathrm{D}_y v_1}^{(0),\mathrm{MRT1}} = (2 - \omega_3)\frac{\rho v_2}{2\omega_3}$$

$$C_{\mathrm{D}_x \mathrm{D}_y v_1}^{(0),\mathrm{MRT2}} = C_{\mathrm{D}_x \mathrm{D}_y v_1}^{(0),\mathrm{MRT1}}$$

$$C_{\mathrm{D}_x \mathrm{D}_y v_1}^{(0),\mathrm{CLBM1}} = C_{\mathrm{D}_x \mathrm{D}_y v_1}^{(0),\mathrm{MRT1}}$$

$$C_{\mathrm{D}_x \mathrm{D}_y v_1}^{(0),\mathrm{CLBM2}} = C_{\mathrm{D}_x \mathrm{D}_y v_1}^{(0),\mathrm{MRT1}}$$

coefficient $C_{\mathrm{D}_x \mathrm{D}_y v_2}^{(0)}$ **at** $\frac{\partial^2 v_2}{\partial x_1 \partial x_2}$:

$$C_{\mathrm{D}_x \mathrm{D}_y v_2}^{(0),\mathrm{SRT}} = (2 - \omega)\frac{\rho v_1}{2\omega}$$

$$C_{\mathrm{D}_x \mathrm{D}_y v_2}^{(0),\mathrm{MRT1}} = (2 - \omega_2)\frac{\rho v_1}{2\omega_2}$$

$$C_{\mathrm{D}_x \mathrm{D}_y v_2}^{(0),\mathrm{MRT2}} = C_{\mathrm{D}_x \mathrm{D}_y v_2}^{(0),\mathrm{MRT1}}$$

$$C_{\mathrm{D}_x \mathrm{D}_y v_2}^{(0),\mathrm{CLBM1}} = C_{\mathrm{D}_x \mathrm{D}_y v_2}^{(0),\mathrm{MRT1}}$$

$$C_{\mathrm{D}_x \mathrm{D}_y v_2}^{(0),\mathrm{CLBM2}} = C_{\mathrm{D}_x \mathrm{D}_y v_2}^{(0),\mathrm{MRT1}}$$

coefficient $C_{\mathrm{D}_y^2 \rho}^{(0)}$ **at** $\frac{\partial^2 \rho}{\partial x_2^2}$:

$$C_{\mathrm{D}_y^2 \rho}^{(0),\mathrm{SRT}} = (-2 + \omega)\frac{c s^2}{2\omega}$$

$$C_{\mathrm{D}_y^2 \rho}^{(0),\mathrm{MRT1}} = (-2 + \omega_3)\frac{c s^2}{2\omega_3}$$

$$C_{\mathrm{D}_y^2 \rho}^{(0),\mathrm{MRT2}} = (-2 + \omega_3)\frac{c s^2}{2\omega_3}$$

$C^{(0),\text{CLBM1}}_{\mathrm{D}^2_y \rho} = (-2 + \omega_3)\frac{cs^2}{2\omega_3}$

$C^{(0),\text{CLBM2}}_{\mathrm{D}^2_y \rho} = (-2 + \omega_3)\frac{cs^2}{2\omega_3}$

coefficient $C^{(0)}_{\mathrm{D}^2_y v_2}$ at $\frac{\partial^2 v_2}{\partial x^2_2}$:

$C^{(0),\text{SRT}}_{\mathrm{D}^2_y v_2} = (-2 + \omega)\frac{\rho v_2}{2\omega}$

$C^{(0),\text{MRT1}}_{\mathrm{D}^2_y v_2} = (-2 + \omega_3)\frac{\rho v_2}{2\omega_3}$

$C^{(0),\text{MRT2}}_{\mathrm{D}^2_y v_2} = C^{(0),\text{MRT1}}_{\mathrm{D}^2_y v_2}$

$C^{(0),\text{CLBM1}}_{\mathrm{D}^2_y v_2} = C^{(0),\text{MRT1}}_{\mathrm{D}^2_y v_2}$

$C^{(0),\text{CLBM2}}_{\mathrm{D}^2_y v_2} = C^{(0),\text{MRT1}}_{\mathrm{D}^2_y v_2}$

coefficient $C^{(0)}_{\mathrm{D}^2_t \mathrm{D}_x v_1}$ at $\frac{\partial^3 v_1}{\partial t^2 \partial x_1}$:

$C^{(0),\text{SRT}}_{\mathrm{D}^2_t \mathrm{D}_x v_1} = (12 - 12\omega + \omega^2)\frac{\rho}{12\omega^2}$

$C^{(0),\text{MRT1}}_{\mathrm{D}^2_t \mathrm{D}_x v_1} = (12 + \omega^2_2 - 12\omega_2)\frac{\rho}{12\omega^2_2}$

$C^{(0),\text{MRT2}}_{\mathrm{D}^2_t \mathrm{D}_x v_1} = C^{(0),\text{MRT1}}_{\mathrm{D}^2_t \mathrm{D}_x v_1}$

$C^{(0),\text{CLBM1}}_{\mathrm{D}^2_t \mathrm{D}_x v_1} = C^{(0),\text{MRT1}}_{\mathrm{D}^2_t \mathrm{D}_x v_1}$

$C^{(0),\text{CLBM2}}_{\mathrm{D}^2_t \mathrm{D}_x v_1} = C^{(0),\text{MRT1}}_{\mathrm{D}^2_t \mathrm{D}_x v_1}$

coefficient $C^{(0)}_{\mathrm{D}_t \mathrm{D}^2_x v_1}$ at $\frac{\partial^3 v_1}{\partial t \partial x^2_1}$:

$C^{(0),\text{SRT}}_{\mathrm{D}_t \mathrm{D}^2_x v_1} = (12 - 12\omega + \omega^2)\frac{\rho v_1}{6\omega^2}$

$C^{(0),\text{MRT1}}_{\mathrm{D}_t \mathrm{D}^2_x v_1} = (12 - 6\omega_4 + \omega_4\omega_2 - 6\omega_2)\frac{\rho v_1}{6\omega_4\omega_2}$

$C^{(0),\text{MRT2}}_{\mathrm{D}_t \mathrm{D}^2_x v_1} = C^{(0),\text{MRT1}}_{\mathrm{D}_t \mathrm{D}^2_x v_1}$

$C^{(0),\text{CLBM1}}_{\mathrm{D}_t \mathrm{D}^2_x v_1} = (12 + \omega^2_2 - 12\omega_2)\frac{\rho v_1}{6\omega^2_2}$

$C^{(0),\text{CLBM2}}_{\mathrm{D}_t \mathrm{D}^2_x v_1} = C^{(0),\text{CLBM1}}_{\mathrm{D}_t \mathrm{D}^2_x v_1}$

coefficient $C^{(0)}_{\mathrm{D}^3_x \rho}$ at $\frac{\partial^3 \rho}{\partial x^3_1}$:

$C^{(0),\text{SRT}}_{\mathrm{D}^3_x \rho} = (6 - 18cs^2 - 6\omega + \omega^2 + 18\omega cs^2 - v^2_1\omega^2 - 3\omega^2 cs^2 + 6v^2_1\omega - 6v^2_1)\frac{v_1}{6\omega^2}$

$C^{(0),\text{MRT1}}_{\mathrm{D}^3_x \rho} = (-3\omega^2_2 - 3\omega_4\omega_2 - 12\omega_4 cs^2 - 3\omega_4\omega^2_2 cs^2 + 3\omega^2_2 cs^2 + \omega_4\omega^2_2 + 6\omega_2 - 6\omega_2 cs^2 - \omega_4 v^2_1\omega^2_2 - 6v^2_1\omega_2 + 3\omega_4 v^2_1\omega_2 + 3v^2_1\omega^2_2 + 15\omega_4\omega_2 cs^2)\frac{v_1}{6\omega_4\omega^2_2}$

$C^{(0),\text{MRT2}}_{\mathrm{D}^3_x \rho} = (15\omega_4 cs^2\omega_2 + 3cs^2\omega^2_2 - 3\omega^2_2 - 3\omega_4\omega_2 + \omega_4\omega^2_2 + 6\omega_2 - 3\omega_4 cs^2\omega^2_2 - 6cs^2\omega_2 - \omega_4 v^2_1\omega^2_2 - 6v^2_1\omega_2 + 3\omega_4 v^2_1\omega_2 + 3v^2_1\omega^2_2 - 12\omega_4 cs^2)\frac{v_1}{6\omega_4\omega^2_2}$

$C^{(0),\text{CLBM1}}_{\mathrm{D}^3_x \rho} = (6 - 3\omega_4 + \omega_4\omega_2 - 18cs^2 + 9\omega_4 cs^2 - 3\omega_2 + 3\omega_4 v^2_1 - 3\omega_4\omega_2 cs^2 + 3v^2_1\omega_2 - \omega_4 v^2_1\omega_2 + 9\omega_2 cs^2 - 6v^2_1)\frac{v_1}{6\omega_4\omega_2}$

$C^{(0),\text{CLBM2}}_{\mathrm{D}^3_x \rho} = (6 - 3\omega_4 + \omega_4\omega_2 + 9\omega_4 cs^2 - 18cs^2 - 3\omega_2 + 9\omega_2 cs^2 + 3\omega_4 v^2_1 + 3v^2_1\omega_2 - \omega_4 v^2_1\omega_2 - 3\omega_4\omega_2 cs^2 - 6v^2_1)\frac{v_1}{6\omega_4\omega_2}$

coefficient $C_{\mathrm{D}_x^3 v_1}^{(0)}$ **at** $\frac{\partial^3 v_1}{\partial x_1^3}$:

$C_{\mathrm{D}_x^3 v_1}^{(0),\mathrm{SRT}} = (12 - 24cs^2 - 12\omega + 2\omega^2 + 24\omega cs^2 - 5v_1^2\omega^2 - 3\omega^2 cs^2 + 24v_1^2\omega - 24v_1^2)\frac{\rho}{12\omega^2}$

$C_{\mathrm{D}_x^3 v_1}^{(0),\mathrm{MRT1}} =$
$(-6\omega_2^2 - 6\omega_4\omega_2 - 12\omega_4 cs^2 - 3\omega_4\omega_2^2 cs^2 + 6\omega_2^2 cs^2 + 2\omega_4\omega_2^2 + 12\omega_2 - 12\omega_4 v_1^2 - 12\omega_2 cs^2 - 5\omega_4 v_1^2\omega_2^2 - 12v_1^2\omega_2 + 18\omega_4 v_1^2\omega_2 + 6v_1^2\omega_2^2 + 18\omega_4\omega_2 cs^2)\frac{\rho}{12\omega_4\omega_2^2}$

$C_{\mathrm{D}_x^3 v_1}^{(0),\mathrm{MRT2}} =$
$(18\omega_4 cs^2\omega_2 + 6cs^2\omega_2^2 - 6\omega_2^2 - 6\omega_4\omega_2 + 2\omega_4\omega_2^2 + 12\omega_2 - 3\omega_4 cs^2\omega_2^2 - 12cs^2\omega_2 - 12\omega_4 v_1^2 - 5\omega_4 v_1^2\omega_2^2 - 12v_1^2\omega_2 + 18\omega_4 v_1^2\omega_2 + 6v_1^2\omega_2^2 - 12\omega_4\omega_2 cs^2)\frac{\rho}{12\omega_4\omega_2^2}$

$C_{\mathrm{D}_x^3 v_1}^{(0),\mathrm{CLBM1}} =$
$(6\omega_2^2 cs^2 - 6\omega_2^2 - 6\omega_4\omega_2 - 12\omega_4 cs^2 + 2\omega_4\omega_2^2 + 12\omega_2 - 3\omega_4\omega_2^2 cs^2 + 12\omega_4 v_1^2 + 18\omega_4\omega_2 cs^2 - 5\omega_4 v_1^2\omega_2^2 - 36v_1^2\omega_2 + 6\omega_4 v_1^2\omega_2 + 18v_1^2\omega_2^2 - 12\omega_2 cs^2)\frac{\rho}{12\omega_4\omega_2^2}$

$C_{\mathrm{D}_x^3 v_1}^{(0),\mathrm{CLBM2}} =$
$(-6\omega_2^2 - 3\omega_4\omega_2^2 cs^2 - 6\omega_4\omega_2 - 12\omega_4 cs^2 + 2\omega_4\omega_2^2 + 12\omega_2 + 6\omega_2^2 cs^2 - 12\omega_2 cs^2 + 12\omega_4 v_1^2 - 5\omega_4 v_1^2\omega_2^2 - 36v_1^2\omega_2 + 6\omega_4 v_1^2\omega_2 + 18v_1^2\omega_2^2 + 18\omega_4\omega_2 cs^2)\frac{\rho}{12\omega_4\omega_2^2}$

coefficient $C_{\mathrm{D}_t^2 \mathrm{D}_y v_2}^{(0)}$ **at** $\frac{\partial^3 v_2}{\partial t^2 \partial x_2}$:

$C_{\mathrm{D}_t^2 \mathrm{D}_y v_2}^{(0),\mathrm{SRT}} = (12 - 12\omega + \omega^2)\frac{\rho}{12\omega^2}$

$C_{\mathrm{D}_t^2 \mathrm{D}_y v_2}^{(0),\mathrm{MRT1}} = (12 + \omega_3^2 - 12\omega_3)\frac{\rho}{12\omega_3^2}$

$C_{\mathrm{D}_t^2 \mathrm{D}_y v_2}^{(0),\mathrm{MRT2}} = C_{\mathrm{D}_t^2 \mathrm{D}_y v_2}^{(0),\mathrm{MRT1}}$

$C_{\mathrm{D}_t^2 \mathrm{D}_y v_2}^{(0),\mathrm{CLBM1}} = C_{\mathrm{D}_t^2 \mathrm{D}_y v_2}^{(0),\mathrm{MRT1}}$

$C_{\mathrm{D}_t^2 \mathrm{D}_y v_2}^{(0),\mathrm{CLBM2}} = C_{\mathrm{D}_t^2 \mathrm{D}_y v_2}^{(0),\mathrm{MRT1}}$

coefficient $C_{\mathrm{D}_t \mathrm{D}_x \mathrm{D}_y v_1}^{(0)}$ **at** $\frac{\partial^3 v_1}{\partial t \partial x_1 \partial x_2}$:

$C_{\mathrm{D}_t \mathrm{D}_x \mathrm{D}_y v_1}^{(0),\mathrm{SRT}} = (-6 + 6\omega - \omega^2)\frac{\rho v_2}{3\omega^2}$

$C_{\mathrm{D}_t \mathrm{D}_x \mathrm{D}_y v_1}^{(0),\mathrm{MRT1}} = (9\omega_2\omega_3 - 6\omega_2 - 2\omega_2\omega_3^2 + 3\omega_3^2 - 6\omega_3)\frac{\rho v_2}{6\omega_2\omega_3^2}$

$C_{\mathrm{D}_t \mathrm{D}_x \mathrm{D}_y v_1}^{(0),\mathrm{MRT2}} = C_{\mathrm{D}_t \mathrm{D}_x \mathrm{D}_y v_1}^{(0),\mathrm{MRT1}}$

$C_{\mathrm{D}_t \mathrm{D}_x \mathrm{D}_y v_1}^{(0),\mathrm{CLBM1}} = C_{\mathrm{D}_t \mathrm{D}_x \mathrm{D}_y v_1}^{(0),\mathrm{MRT1}}$

$C_{\mathrm{D}_t \mathrm{D}_x \mathrm{D}_y v_1}^{(0),\mathrm{CLBM2}} = C_{\mathrm{D}_t \mathrm{D}_x \mathrm{D}_y v_1}^{(0),\mathrm{MRT1}}$

coefficient $C_{\mathrm{D}_t \mathrm{D}_x \mathrm{D}_y v_2}^{(0)}$ **at** $\frac{\partial^3 v_2}{\partial t \partial x_1 \partial x_2}$:

$C_{\mathrm{D}_t \mathrm{D}_x \mathrm{D}_y v_2}^{(0),\mathrm{SRT}} = (-6 + 6\omega - \omega^2)\frac{\rho v_1}{3\omega^2}$

$C_{\mathrm{D}_t \mathrm{D}_x \mathrm{D}_y v_2}^{(0),\mathrm{MRT1}} = (9\omega_2\omega_3 + 3\omega_2^2 - 6\omega_2 - 6\omega_3 - 2\omega_2^2\omega_3)\frac{\rho v_1}{6\omega_2^2\omega_3}$

$C_{\mathrm{D}_t \mathrm{D}_x \mathrm{D}_y v_2}^{(0),\mathrm{MRT2}} = C_{\mathrm{D}_t \mathrm{D}_x \mathrm{D}_y v_2}^{(0),\mathrm{MRT1}}$

$C_{\mathrm{D}_t \mathrm{D}_x \mathrm{D}_y v_2}^{(0),\mathrm{CLBM1}} = C_{\mathrm{D}_t \mathrm{D}_x \mathrm{D}_y v_2}^{(0),\mathrm{MRT1}}$

$C_{\mathrm{D}_t \mathrm{D}_x \mathrm{D}_y v_2}^{(0),\mathrm{CLBM2}} = C_{\mathrm{D}_t \mathrm{D}_x \mathrm{D}_y v_2}^{(0),\mathrm{MRT1}}$

coefficient $C_{\mathrm{D}_x^2 \mathrm{D}_y \rho}^{(0)}$ **at** $\frac{\partial^3 \rho}{\partial x_1^2 \partial x_2}$:

$C^{(0),\text{SRT}}_{\text{D}^2_x\text{D}_y\rho} = (-6cs^2 + 6\omega cs^2 + v_1^2\omega^2 - \omega^2 cs^2 - 6v_1^2\omega + 6v_1^2)\frac{v_2}{2\omega^2}$

$C^{(0),\text{MRT1}}_{\text{D}^2_x\text{D}_y\rho} = (4\omega_4 v_1^2\omega_3^2 - 2\omega_2\omega_3^2 cs^2 - 2\omega_4\omega_2\omega_3 cs^2 - 3\omega_4 v_1^2\omega_2^2\omega_3 - \omega_4\omega_2^2\omega_3^2 cs^2 + \omega_4 v_1^2\omega_2^2\omega_3^2 - 2v_1^2\omega_2\omega_3^2 - 2\omega_4\omega_3^2 cs^2 - 4\omega_4 v_1^2\omega_2\omega_3^2 + v_1^2\omega_2^2\omega_3^2 + 2\omega_4 v_1^2\omega_2^2 + \omega_2^2\omega_3^2 cs^2 + \omega_4\omega_2\omega_3 cs^2 + 4\omega_4\omega_2\omega_3^2 cs^2 + 2\omega_4 v_1^2\omega_2\omega_3)\frac{v_2}{2\omega_4\omega_2^2\omega_3^2}$

$C^{(0),\text{MRT2}}_{\text{D}^2_x\text{D}_y\rho} = (4\omega_4 v_1^2\omega_3^2 - 3\omega_4 v_1^2\omega_2^2\omega_3 + 4\omega_4 cs^2\omega_2\omega_3^2 + cs^2\omega_2^2\omega_3^2 - 2\omega_4 cs^2\omega_2\omega_3^2 + \omega_4 v_1^2\omega_2^2\omega_3^2 - 2v_1^2\omega_2\omega_3^2 - 4\omega_4 v_1^2\omega_2\omega_3^2 + v_1^2\omega_2^2\omega_3^2 + 2\omega_4 v_1^2\omega_2^2 + \omega_4 cs^2\omega_2^2\omega_3 - \omega_4 cs^2\omega_2^2\omega_3^2 - 2\omega_4 cs^2\omega_3^2 - 2cs^2\omega_2\omega_3^2 + 2\omega_4 v_1^2\omega_2\omega_3)\frac{v_2}{2\omega_4\omega_2^2\omega_3^2}$

$C^{(0),\text{CLBM1}}_{\text{D}^2_x\text{D}_y\rho} = (4\omega_4\omega_2 cs^2\omega_3^2 - 3\omega_4 v_1^2\omega_2^2\omega_3 + \omega_2^2 cs^2\omega_3^2 - 2\omega_4\omega_2 cs^2\omega_3 + \omega_4 v_1^2\omega_2^2\omega_3^2 + 2v_1^2\omega_2\omega_3^2 - 2\omega_4 v_1^2\omega_2\omega_3^2 - 2\omega_4 cs^2\omega_3^2 - v_1^2\omega_2^2\omega_3^2 + 2\omega_4 v_1^2\omega_2^2 + \omega_4\omega_2^2 cs^2\omega_3 - \omega_4\omega_2^2 cs^2\omega_3^2 - 2\omega_2 cs^2\omega_3^2 + 2\omega_4 v_1^2\omega_2\omega_3)\frac{v_2}{2\omega_4\omega_2^2\omega_3^2}$

$C^{(0),\text{CLBM2}}_{\text{D}^2_x\text{D}_y\rho} = (-\omega_4\omega_2^2\omega_3^2 cs^2 - 3\omega_4 v_1^2\omega_2^2\omega_3 - 2\omega_2\omega_3^2 cs^2 - 2\omega_4\omega_2\omega_3 cs^2 - 2\omega_4\omega_3^2 cs^2 + \omega_4 v_1^2\omega_2^2\omega_3^2 + 2v_1^2\omega_2\omega_3^2 - 2\omega_4 v_1^2\omega_2\omega_3^2 - v_1^2\omega_2^2\omega_3^2 + 2\omega_4 v_1^2\omega_2^2 + 4\omega_4\omega_2\omega_3^2 cs^2 + \omega_2^2\omega_3^2 cs^2 + \omega_4\omega_2\omega_3 cs^2 + 2\omega_4 v_1^2\omega_2\omega_3)\frac{v_2}{2\omega_4\omega_2^2\omega_3^2}$

coefficient $C^{(0)}_{\text{D}^2_x\text{D}_y v_1}$ **at** $\frac{\partial^3 v_1}{\partial x_1^2\partial x_2}$:

$C^{(0),\text{SRT}}_{\text{D}^2_x\text{D}_y v_1} = (12 - 12\omega + \omega^2)\frac{\rho v_1 v_2}{6\omega^2}$

$C^{(0),\text{MRT1}}_{\text{D}^2_x\text{D}_y v_1} = (6\omega_2^2 - 6\omega_2\omega_3^2 + \omega_2^2\omega_3^2 + 6\omega_3^2 - 6\omega_2^2\omega_3)\frac{\rho v_1 v_2}{6\omega_2^2\omega_3^2}$

$C^{(0),\text{MRT2}}_{\text{D}^2_x\text{D}_y v_1} = C^{(0),\text{MRT1}}_{\text{D}^2_x\text{D}_y v_1}$

$C^{(0),\text{CLBM1}}_{\text{D}^2_x\text{D}_y v_1} = C^{(0),\text{MRT1}}_{\text{D}^2_x\text{D}_y v_1}$

$C^{(0),\text{CLBM2}}_{\text{D}^2_x\text{D}_y v_1} = C^{(0),\text{MRT1}}_{\text{D}^2_x\text{D}_y v_1}$

coefficient $C^{(0)}_{\text{D}^2_x\text{D}_y v_2}$ **at** $\frac{\partial^3 v_2}{\partial x_1^2\partial x_2}$:

$C^{(0),\text{SRT}}_{\text{D}^2_x\text{D}_y v_2} = (-24cs^2 + 24\omega cs^2 + v_1^2\omega^2 - 3\omega^2 cs^2)\frac{\rho}{12\omega^2}$

$C^{(0),\text{MRT1}}_{\text{D}^2_x\text{D}_y v_2} = (-12\omega_4 cs^2 - 3\omega_4\omega_2^2 cs^2 + 6\omega_2^2 cs^2 + 12\omega_4 v_1^2 - 12\omega_2 cs^2 + \omega_4 v_1^2\omega_2^2 - 12v_1^2\omega_2 - 6\omega_4 v_1^2\omega_2 + 6v_1^2\omega_2^2 + 18\omega_4\omega_2 cs^2)\frac{\rho}{12\omega_4\omega_2^2}$

$C^{(0),\text{MRT2}}_{\text{D}^2_x\text{D}_y v_2} = (18\omega_4 cs^2\omega_2 + 6cs^2\omega_2^2 - 3\omega_4 cs^2\omega_2^2 - 12cs^2\omega_2 + 12\omega_4 v_1^2 + \omega_4 v_1^2\omega_2^2 - 12v_1^2\omega_2 - 6\omega_4 v_1^2\omega_2 + 6v_1^2\omega_2^2 - 12\omega_4 cs^2)\frac{\rho}{12\omega_4\omega_2^2}$

$C^{(0),\text{CLBM1}}_{\text{D}^2_x\text{D}_y v_2} = (6\omega_2^2 cs^2 - 12\omega_4 cs^2 - 3\omega_4\omega_2^2 cs^2 - 12\omega_4 v_1^2 + 18\omega_4\omega_2 cs^2 + \omega_4 v_1^2\omega_2^2 + 12v_1^2\omega_2 + 6\omega_4 v_1^2\omega_2 - 6v_1^2\omega_2^2 - 12\omega_2 cs^2)\frac{\rho}{12\omega_4\omega_2^2}$

$C^{(0),\text{CLBM2}}_{\text{D}^2_x\text{D}_y v_2} = (-3\omega_4\omega_2^2 cs^2 - 12\omega_4 cs^2 + 6\omega_2^2 cs^2 - 12\omega_2 cs^2 - 12\omega_4 v_1^2 + \omega_4 v_1^2\omega_2^2 + 12v_1^2\omega_2 + 6\omega_4 v_1^2\omega_2 - 6v_1^2\omega_2^2 + 18\omega_4\omega_2 cs^2)\frac{\rho}{12\omega_4\omega_2^2}$

coefficient $C^{(0)}_{\text{D}_t\text{D}^2_y v_2}$ **at** $\frac{\partial^3 v_2}{\partial t\partial x_2^2}$:

$C^{(0),\text{SRT}}_{\text{D}_t\text{D}^2_y v_2} = (12 - 12\omega + \omega^2)\frac{\rho v_2}{6\omega^2}$

$C^{(0),\text{MRT1}}_{\text{D}_t\text{D}^2_y v_2} = (12 - 6\omega_5 - 6\omega_3 + \omega_5\omega_3)\frac{\rho v_2}{6\omega_5\omega_3}$

$C^{(0),\text{MRT2}}_{\text{D}_t\text{D}^2_y v_2} = C^{(0),\text{MRT1}}_{\text{D}_t\text{D}^2_y v_2}$

$C^{(0),\text{CLBM1}}_{\text{D}_t\text{D}^2_y v_2} = (12 + \omega_3^2 - 12\omega_3)\frac{\rho v_2}{6\omega_3^2}$

$C^{(0),\text{CLBM2}}_{\text{D}_t\text{D}^2_y v_2} = C^{(0),\text{CLBM1}}_{\text{D}_t\text{D}^2_y v_2}$

coefficient $C^{(0)}_{\text{D}_x\text{D}^2_y\rho}$ **at** $\frac{\partial^3\rho}{\partial x_1\partial x_2^2}$:

$C^{(0),\text{SRT}}_{\text{D}_x\text{D}_y^2\rho} = (-6cs^2 + 6v_2^2 - 6\omega v_2^2 + 6\omega cs^2 + \omega^2 v_2^2 - \omega^2 cs^2)\frac{v_1}{2\omega^2}$

$C^{(0),\text{MRT1}}_{\text{D}_x\text{D}_y^2\rho} = (-3\omega_5 v_2^2\omega_2\omega_3^2 + v_2^2\omega_2^2\omega_3^2 - 2\omega_5\omega_2\omega_3 cs^2 - 2\omega_2^2\omega_3 cs^2 - \omega_5\omega_2^2\omega_3^2 cs^2 + 2\omega_5 v_2^2\omega_3^2 - 2v_2^2\omega_2^2\omega_3 + 2\omega_5 v_2^2\omega_2\omega_3 - 4\omega_5 v_2^2\omega_2^2\omega_3 - 2\omega_5\omega_2^2 cs^2 + \omega_2^2\omega_3^2 cs^2 + 4\omega_5\omega_2^2\omega_3 cs^2 + 4\omega_5 v_2^2\omega_2^2 + \omega_5 v_2^2\omega_2^2\omega_3^2 + \omega_5\omega_2\omega_3^2 cs^2)\frac{v_1}{2\omega_5\omega_2^2\omega_3^2}$

$C^{(0),\text{MRT2}}_{\text{D}_x\text{D}_y^2\rho} = (-3\omega_5 v_2^2\omega_2\omega_3^2 + v_2^2\omega_2^2\omega_3^2 - cs^2\omega_5\omega_2^2\omega_3^2 + cs^2\omega_2^2\omega_3^2 + 2\omega_5 v_2^2\omega_3^2 - 2cs^2\omega_2^2\omega_3 + 4cs^2\omega_5\omega_2^2\omega_3 - 2v_2^2\omega_2^2\omega_3 + 2\omega_5 v_2^2\omega_2\omega_3 - 2cs^2\omega_5\omega_2^2 - 4\omega_5 v_2^2\omega_2^2\omega_3 - 2cs^2\omega_5\omega_2\omega_3 + cs^2\omega_5\omega_2\omega_3^2 + 4\omega_5 v_2^2\omega_2^2 + \omega_5 v_2^2\omega_2^2\omega_3^2)\frac{v_1}{2\omega_5\omega_2^2\omega_3^2}$

$C^{(0),\text{CLBM1}}_{\text{D}_x\text{D}_y^2\rho} = (-3\omega_5 v_2^2\omega_2\omega_3^2 + \omega_5\omega_2 cs^2\omega_3^2 - v_2^2\omega_2^2\omega_3^2 + \omega_2^2 cs^2\omega_3^2 + 2\omega_5 v_2^2\omega_3^2 - 2\omega_2^2 cs^2\omega_3 - 2\omega_5\omega_2 cs^2\omega_3 + 2v_2^2\omega_2^2\omega_3 + 2\omega_5 v_2^2\omega_2\omega_3 - 2\omega_5 v_2^2\omega_2^2\omega_3 + 4\omega_5\omega_2^2 cs^2\omega_3 - \omega_5\omega_2^2 cs^2\omega_3^2 + \omega_5 v_2^2\omega_2^2\omega_3^2 - 2\omega_5\omega_2^2 cs^2)\frac{v_1}{2\omega_5\omega_2^2\omega_3^2}$

$C^{(0),\text{CLBM2}}_{\text{D}_x\text{D}_y^2\rho} = (-2\omega_2^2\omega_3 cs^2 - 3\omega_5 v_2^2\omega_2\omega_3^2 - v_2^2\omega_2^2\omega_3^2 - \omega_5\omega_2^2\omega_3^2 cs^2 - 2\omega_5\omega_2\omega_3 cs^2 + 2\omega_5 v_2^2\omega_3^2 + 2v_2^2\omega_2^2\omega_3 + 2\omega_5 v_2^2\omega_2\omega_3 - 2\omega_5\omega_2^2 cs^2 - 2\omega_5 v_2^2\omega_2^2\omega_3 + \omega_5\omega_2\omega_3^2 cs^2 + \omega_5 v_2^2\omega_2^2\omega_3^2 + \omega_2^2\omega_3 cs^2 + 4\omega_5\omega_2^2\omega_3 cs^2)\frac{v_1}{2\omega_5\omega_2^2\omega_3^2}$

coefficient $C^{(0)}_{\text{D}_x\text{D}_y^2 v_1}$ **at** $\frac{\partial^3 v_1}{\partial x_1 \partial x_2^2}$:

$C^{(0),\text{SRT}}_{\text{D}_x\text{D}_y^2 v_1} = (-24cs^2 + 24\omega cs^2 + \omega^2 v_2^2 - 3\omega^2 cs^2)\frac{\rho}{12\omega^2}$

$C^{(0),\text{MRT1}}_{\text{D}_x\text{D}_y^2 v_1} = (6\omega_3^2 cs^2 + 18\omega_5\omega_3 cs^2 - 6\omega_5 v_2^2\omega_3 + 12\omega_5 v_2^2 + \omega_5 v_2^2\omega_3^2 - 12\omega_5 cs^2 + 6v_2^2\omega_3^2 - 12v_2^2\omega_3 - 12\omega_3 cs^2 - 3\omega_5\omega_3^2 cs^2)\frac{\rho}{12\omega_5\omega_3^2}$

$C^{(0),\text{MRT2}}_{\text{D}_x\text{D}_y^2 v_1} = (-12cs^2\omega_5 - 3cs^2\omega_5\omega_3^2 - 6\omega_5 v_2^2\omega_3 + 12\omega_5 v_2^2 + \omega_5 v_2^2\omega_3^2 + 18cs^2\omega_5\omega_3 + 6cs^2\omega_3^2 + 6v_2^2\omega_3^2 - 12v_2^2\omega_3 - 12cs^2\omega_3)\frac{\rho}{12\omega_5\omega_3^2}$

$C^{(0),\text{CLBM1}}_{\text{D}_x\text{D}_y^2 v_1} = (-3\omega_5 cs^2\omega_3^2 - 12\omega_5 cs^2 + 6\omega_5 v_2^2\omega_3 - 12\omega_5 v_2^2 + \omega_5 v_2^2\omega_3^2 + 18\omega_5 cs^2\omega_3 - 12cs^2\omega_3 - 6v_2^2\omega_3^2 + 12v_2^2\omega_3 + 6cs^2\omega_3^2)\frac{\rho}{12\omega_5\omega_3^2}$

$C^{(0),\text{CLBM2}}_{\text{D}_x\text{D}_y^2 v_1} = (6\omega_3^2 cs^2 + 6\omega_5 v_2^2\omega_3 + 18\omega_5\omega_3 cs^2 - 12\omega_5 v_2^2 + \omega_5 v_2^2\omega_3^2 - 12\omega_5 cs^2 - 6v_2^2\omega_3^2 + 12v_2^2\omega_3 - 12\omega_3 cs^2 - 3\omega_5\omega_3^2 cs^2)\frac{\rho}{12\omega_5\omega_3^2}$

coefficient $C^{(0)}_{\text{D}_x\text{D}_y^2 v_2}$ **at** $\frac{\partial^3 v_2}{\partial x_1 \partial x_2^2}$:

$C^{(0),\text{SRT}}_{\text{D}_x\text{D}_y^2 v_2} = (12 - 12\omega + \omega^2)\frac{\rho v_1 v_2}{6\omega^2}$

$C^{(0),\text{MRT1}}_{\text{D}_x\text{D}_y^2 v_2} = (6\omega_2^2 - 6\omega_2\omega_3^2 + \omega_2^2\omega_3^2 + 6\omega_3^2 - 6\omega_2^2\omega_3)\frac{\rho v_1 v_2}{6\omega_2^2\omega_3^2}$

$C^{(0),\text{MRT2}}_{\text{D}_x\text{D}_y^2 v_2} = C^{(0),\text{MRT1}}_{\text{D}_x\text{D}_y^2 v_2}$

$C^{(0),\text{CLBM1}}_{\text{D}_x\text{D}_y^2 v_2} = C^{(0),\text{MRT1}}_{\text{D}_x\text{D}_y^2 v_2}$

$C^{(0),\text{CLBM2}}_{\text{D}_x\text{D}_y^2 v_2} = C^{(0),\text{MRT1}}_{\text{D}_x\text{D}_y^2 v_2}$

coefficient $C^{(0)}_{\text{D}_y^3\rho}$ **at** $\frac{\partial^3\rho}{\partial x_2^3}$:

$C^{(0),\text{SRT}}_{\text{D}_y^3\rho} = (6 - 18cs^2 - 6v_2^2 - 6\omega + 6\omega v_2^2 + \omega^2 + 18\omega cs^2 - \omega^2 v_2^2 - 3\omega^2 cs^2)\frac{v_2}{6\omega^2}$

$C^{(0),\text{MRT1}}_{\text{D}_y^3\rho} = (3\omega_3^2 cs^2 + 15\omega_5\omega_3 cs^2 + 3\omega_5 v_2^2\omega_3 - \omega_5 v_2^2\omega_3^2 - 12\omega_5 cs^2 + \omega_5\omega_3^2 - 3\omega_3^2 + 6\omega_3 + 3v_2^2\omega_3^2 - 6v_2^2\omega_3 - 6\omega_3 cs^2 - 3\omega_5\omega_3 - 3\omega_5\omega_3^2 cs^2)\frac{v_2}{6\omega_5\omega_3^2}$

$C^{(0),\text{MRT2}}_{\text{D}_y^3\rho} = (-12cs^2\omega_5 - 3cs^2\omega_5\omega_3^2 + 3\omega_5 v_2^2\omega_3 - \omega_5 v_2^2\omega_3^2 + 15cs^2\omega_5\omega_3 + \omega_5\omega_3^2 + 3cs^2\omega_3^2 - 3\omega_3^2 + 6\omega_3 + 3v_2^2\omega_3^2 - 6v_2^2\omega_3 - 6cs^2\omega_3 - 3\omega_5\omega_3)\frac{v_2}{6\omega_5\omega_3^2}$

$C^{(0),\text{CLBM1}}_{\text{D}_y^3\rho} = (6 + 9\omega_5 cs^2 - 6v_2^2 - \omega_5 v_2^2\omega_3 - 18cs^2 + 3\omega_5 v_2^2 - 3\omega_5 - 3\omega_5 cs^2\omega_3 + 9cs^2\omega_3 - 3\omega_3 + 3v_2^2\omega_3 + \omega_5\omega_3)\frac{v_2}{6\omega_5\omega_3}$

$C^{(0),\text{CLBM2}}_{\text{D}_y^3\rho} = (6 - 6v_2^2 - \omega_5 v_2^2\omega_3 - 3\omega_5\omega_3 cs^2 + 3\omega_5 v_2^2 - 3\omega_5 - 18cs^2 + 9\omega_5 cs^2 - 3\omega_3 + 3v_2^2\omega_3 + 9\omega_3 cs^2 + \omega_5\omega_3)\frac{v_2}{6\omega_5\omega_3}$

coefficient $C^{(0)}_{\mathrm{D}^3_y v_2}$ **at** $\frac{\partial^3 v_2}{\partial x_2^3}$:

$C^{(0),\mathrm{SRT}}_{\mathrm{D}^3_y v_2} = (12 - 24cs^2 - 24v_2^2 - 12\omega + 24\omega v_2^2 + 2\omega^2 + 24\omega cs^2 - 5\omega^2 v_2^2 - 3\omega^2 cs^2)\frac{\rho}{12\omega^2}$

$C^{(0),\mathrm{MRT1}}_{\mathrm{D}^3_y v_2} =$
$(6\omega_3^2 cs^2 + 18\omega_5\omega_3 cs^2 + 18\omega_5 v_2^2 \omega_3 - 12\omega_5 v_2^2 - 5\omega_5 v_2^2 \omega_3^2 - 12\omega_5 cs^2 + 2\omega_5\omega_3^2 - 6\omega_3^2 + 12\omega_3 + 6v_2^2\omega_3^2 - 12v_2^2\omega_3 - 12\omega_3 cs^2 - 6\omega_5\omega_3 - 3\omega_5\omega_3^2 cs^2)\frac{\rho}{12\omega_5\omega_3^2}$

$C^{(0),\mathrm{MRT2}}_{\mathrm{D}^3_y v_2} =$
$(-12cs^2\omega_5 - 3cs^2\omega_5\omega_3^2 + 18\omega_5 v_2^2\omega_3 - 12\omega_5 v_2^2 - 5\omega_5 v_2^2\omega_3^2 + 18cs^2\omega_5\omega_3 + 2\omega_5\omega_3^2 + 6cs^2\omega_3^2 - 6\omega_3^2 + 12\omega_3 + 6v_2^2\omega_3^2 - 12v_2^2\omega_3 - 12cs^2\omega_3 - 6\omega_5\omega_3)\frac{\rho}{12\omega_5\omega_3^2}$

$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}^3_y v_2} =$
$(-3\omega_5 cs^2\omega_3^2 - 12\omega_5 cs^2 + 6\omega_5 v_2^2\omega_3 + 12\omega_5 v_2^2 - 5\omega_5 v_2^2\omega_3^2 + 18\omega_5 cs^2\omega_3 + 2\omega_5\omega_3^2 - 12cs^2\omega_3 - 6\omega_3^2 + 12\omega_3 + 18v_2^2\omega_3^2 - 36v_2^2\omega_3 + 6cs^2\omega_3^2 - 6\omega_5\omega_3)\frac{\rho}{12\omega_5\omega_3^2}$

$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}^3_y v_2} =$
$(6\omega_3^2 cs^2 + 6\omega_5 v_2^2\omega_3 + 18\omega_5\omega_3 cs^2 + 12\omega_5 v_2^2 - 5\omega_5 v_2^2\omega_3^2 - 12\omega_5 cs^2 + 2\omega_5\omega_3^2 - 6\omega_3^2 + 12\omega_3 + 18v_2^2\omega_3^2 - 36v_2^2\omega_3 - 12\omega_3 cs^2 - 3\omega_5\omega_3^2 cs^2 - 6\omega_5\omega_3)\frac{\rho}{12\omega_5\omega_3^2}$

coefficient $C^{(0)}_{\mathrm{D}^3_t \mathrm{D}_x v_1}$ **at** $\frac{\partial^4 v_1}{\partial t^3 \partial x_1}$:

$C^{(0),\mathrm{SRT}}_{\mathrm{D}^3_t \mathrm{D}_x v_1} = (-2 + 3\omega - \omega^2)\frac{\rho}{2\omega^3}$

$C^{(0),\mathrm{MRT1}}_{\mathrm{D}^3_t \mathrm{D}_x v_1} = (-2 - \omega_2^2 + 3\omega_2)\frac{\rho}{2\omega_2^3}$

$C^{(0),\mathrm{MRT2}}_{\mathrm{D}^3_t \mathrm{D}_x v_1} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}^3_t \mathrm{D}_x v_1}$

$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}^3_t \mathrm{D}_x v_1} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}^3_t \mathrm{D}_x v_1}$

$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}^3_t \mathrm{D}_x v_1} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}^3_t \mathrm{D}_x v_1}$

coefficient $C^{(0)}_{\mathrm{D}^2_t \mathrm{D}^2_x v_1}$ **at** $\frac{\partial^4 v_1}{\partial t^2 \partial x_1^2}$:

$C^{(0),\mathrm{SRT}}_{\mathrm{D}^2_t \mathrm{D}^2_x v_1} = (-2 + 3\omega - \omega^2)\frac{3\rho v_1}{2\omega^3}$

$C^{(0),\mathrm{MRT1}}_{\mathrm{D}^2_t \mathrm{D}^2_x v_1} = (-4\omega_2^2 - 4\omega_4\omega_2 + 2\omega_2^3 - 2\omega_4\omega_2^3 + 8\omega_4\omega_2^2 - \omega_4^2\omega_2^2 + 2\omega_4^2 - \omega_4^2\omega_2)\frac{\rho v_1}{2\omega_4^2\omega_2^3}$

$C^{(0),\mathrm{MRT2}}_{\mathrm{D}^2_t \mathrm{D}^2_x v_1} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}^2_t \mathrm{D}^2_x v_1}$

$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}^2_t \mathrm{D}^2_x v_1} = (-2 - \omega_2^2 + 3\omega_2)\frac{3\rho v_1}{2\omega_2^3}$

$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}^2_t \mathrm{D}^2_x v_1} = C^{(0),\mathrm{CLBM1}}_{\mathrm{D}^2_t \mathrm{D}^2_x v_1}$

coefficient $C^{(0)}_{\mathrm{D}_t \mathrm{D}^3_x v_1}$ **at** $\frac{\partial^4 v_1}{\partial t \partial x_1^3}$:

$C^{(0),\mathrm{SRT}}_{\mathrm{D}_t \mathrm{D}^3_x v_1} = (-36 + 60cs^2 + 54\omega - 20\omega^2 - 90\omega cs^2 + \omega^3 + 42v_1^2\omega^2 - 3v_1^2\omega^3 + 34\omega^2 cs^2 - 2\omega^3 cs^2 - 108v_1^2\omega + 72v_1^2)\frac{\rho}{12\omega^3}$

$C^{(0),\mathrm{MRT1}}_{\mathrm{D}_t \mathrm{D}^3_x v_1} = (-12\omega_2^2 - 48\omega_4^2\omega_2 cs^2 - 24\omega_4\omega_2 - 42\omega_2^2 v_1^2\omega_2 - 6\omega_2^3 cs^2 + 6\omega_2^3 - 36\omega_4\omega_2^2 cs^2 - 3\omega_4^2 v_1^2\omega_2^3 + 12\omega_2^2 cs^2 - 9\omega_4\omega_2^3 + 9\omega_4\omega_2^3 cs^2 + 36\omega_4\omega_2^2 + 27\omega_4^2 v_1^2\omega_2^2 + 12\omega_4^2 v_1^2 - 11\omega_4^2\omega_2^2 + 15\omega_4 v_1^2\omega_2^3 - 60\omega_4 v_1^2\omega_2^2 + \omega_4^2\omega_2^3 - 2\omega_4^2\omega_2^3 cs^2 + 48\omega_4 v_1^2\omega_2 + 12v_1^2\omega_2^2 + 24\omega_4\omega_2 cs^2 + 12\omega_4^2\omega_2 - 6v_1^2\omega_2^3 + 25\omega_4^2\omega_2^2 cs^2 + 24\omega_4^2 cs^2)\frac{\rho}{12\omega_4^2\omega_2^3}$

$C^{(0),\mathrm{MRT2}}_{\mathrm{D}_t \mathrm{D}^3_x v_1} =$
$(24\omega_4 cs^2\omega_2 + 12cs^2\omega_2^2 - 12\omega_2^2 - 24\omega_4\omega_2 + 24\omega_4^2 cs^2 - 42\omega_4^2 v_1^2\omega_2 + 6\omega_2^3 - 6cs^2\omega_2^3 - 3\omega_4^2 v_1^2\omega_2^3 - 9\omega_4\omega_2^3 + 9\omega_4 cs^2\omega_2^3 + 36\omega_4\omega_2^2 + 27\omega_4^2 v_1^2\omega_2^2 + 12\omega_4^2 v_1^2 - 36\omega_4 cs^2\omega_2^2 - 11\omega_4^2\omega_2^2 + 15\omega_4 v_1^2\omega_2^3 - 2\omega_4^2 cs^2\omega_2^3 - 60\omega_4 v_1^2\omega_2^2 + \omega_4^2\omega_2^3 + 25\omega_4^2 cs^2\omega_2^2 - 48\omega_4^2 cs^2\omega_2 + 48\omega_4 v_1^2\omega_2 + 12v_1^2\omega_2^2 + 12\omega_4^2\omega_2 - 6v_1^2\omega_2^3)\frac{\rho}{12\omega_4^2\omega_2^3}$

$C^{(0),\text{CLBM1}}_{\text{D}_t\text{D}^3_x v_1} =$

$(12\omega_2^2 cs^2 - 12\omega_2^2 - 24\omega_4\omega_2 + 18\omega_4^2 v_1^2\omega_2 + 6\omega_2^3 + 9\omega_4\omega_2^3 cs^2 - 3\omega_4^2 v_1^2\omega_2^3 - 9\omega_4\omega_2^3 - 48\omega_4^2\omega_2 cs^2 - 6\omega_2^3 cs^2 + 36\omega_4\omega_2^2 + 15\omega_4^2 v_1^2\omega_2^2 - 36\omega_4^2 v_1^2 - 36\omega_4\omega_2^2 cs^2 - 11\omega_4^2\omega_2^2 + 27\omega_4 v_1^2\omega_2^3 + 24\omega_4\omega_2 cs^2 - 108\omega_4 v_1^2\omega_2^2 + \omega_4^2\omega_2^3 + 25\omega_4^2\omega_2^2 cs^2 + 24\omega_4^2 cs^2 + 72\omega_4 v_1^2\omega_2 + 36 v_1^2\omega_2^2 - 2\omega_4^2\omega_2^3 cs^2 + 12\omega_4^2\omega_2 - 18 v_1^2\omega_2^3)\frac{\rho}{12\omega_4^2\omega_2^3}$

$C^{(0),\text{CLBM2}}_{\text{D}_t\text{D}^3_x v_1} = (-12\omega_2^2 - 36\omega_4\omega_2^2 cs^2 - 24\omega_4\omega_2 + 18\omega_4^2 v_1^2\omega_2 + 6\omega_2^3 - 6\omega_2^3 cs^2 - 48\omega_4^2\omega_2 cs^2 - 3\omega_4^2 v_1^2\omega_2^3 - 9\omega_4\omega_2^3 + 9\omega_4\omega_2^3 cs^2 + 36\omega_4\omega_2^2 + 12\omega_2^2 cs^2 + 15\omega_4^2 v_1^2\omega_2^2 - 36\omega_4^2 v_1^2 - 11\omega_4^2\omega_2^2 - 2\omega_4^2\omega_2^3 cs^2 + 27\omega_4 v_1^2\omega_2^3 - 108\omega_4 v_1^2\omega_2^2 + \omega_4^2\omega_2^3 + 72\omega_4 v_1^2\omega_2 + 24\omega_4^2 cs^2 + 25\omega_4^2\omega_2^2 cs^2 + 36 v_1^2\omega_2^2 + 12\omega_4^2\omega_2 - 18 v_1^2\omega_2^3 + 24\omega_4\omega_2 cs^2)\frac{\rho}{12\omega_4^2\omega_2^3}$

coefficient $C^{(0)}_{\text{D}^4_x \rho}$ at $\frac{\partial^4\rho}{\partial x_1^4}$:

$C^{(0),\text{SRT}}_{\text{D}^4_x \rho} = (-24 cs^2 + 3v_1^4\omega^3 - 72 v_1^4 - 3\omega^3 cs^4 - 42 v_1^4\omega^2 + 108 v_1^4\omega + 216 v_1^2\omega cs^2 + 36\omega cs^2 + 30\omega^2 cs^4 - 72\omega cs^4 + 42 v_1^2\omega^2 - 3v_1^2\omega^3 - 84 v_1^2\omega^2 cs^2 - 14\omega^2 cs^2 - 144 v_1^2 cs^2 + 48 cs^4 + \omega^3 cs^2 + 6v_1^2\omega^3 cs^2 - 108 v_1^2\omega + 72 v_1^2)\frac{1}{24\omega^3}$

$C^{(0),\text{MRT1}}_{\text{D}^4_x \rho} = (72\omega_4 v_1^4\omega_2^2 + 24\omega_4\omega_2 cs^4 - 96\omega_4^2 v_1^2 cs^2 + 12\omega_4^2\omega_2 cs^2 + 12 v_1^2\omega_2^3 cs^2 - 24\omega_4^2 v_1^2\omega_2 + 24\omega_4^2\omega_2^2 cs^4 - 72\omega_4^2 v_1^2\omega_2^2 cs^2 - 18\omega_4 v_1^4\omega_2^3 + 24\omega_4^2 cs^4 + 24\omega_4\omega_2^2 cs^2 - 3\omega_4^2 v_1^2\omega_2^3 - 24 v_1^2\omega_2^2 cs^2 + 12 v_1^4\omega_2^3 - 24\omega_4 v_1^2\omega_2 cs^2 - 6\omega_4\omega_2^3 cs^2 + 24\omega_4^2 v_1^2\omega_2^2 - 48\omega_4 v_1^4\omega_2 + 6\omega_4^2 v_1^2\omega_2^3 cs^2 - 24 v_1^4\omega_2^2 - 3\omega_4^2\omega_2^2 cs^4 + 18\omega_4 v_1^2\omega_2^2 - 72\omega_4 v_1^2\omega_2^2 + \omega_4^2\omega_2^3 cs^2 + 6\omega_4\omega_2^3 cs^4 + 48\omega_4 v_1^2\omega_2^2 cs^2 + 24\omega_4^2 v_1^4\omega_2 - 48\omega_4^2\omega_2 cs^2 + 156\omega_4^2 v_1^2\omega_2 cs^2 - 24\omega_4 v_1^4\omega_2^2 + 48\omega_4 v_1^2\omega_2 + 24 v_1^2\omega_2^2 - 24\omega_4\omega_2 cs^2 + 3\omega_4^2 v_1^4\omega_2^3 - 24\omega_4\omega_2 cs^4 - 12\omega_4 v_1^2\omega_2^3 cs^2 - 12 v_1^4\omega_2^3 - 8\omega_4^2\omega_2 cs^2)\frac{1}{24\omega_4^2\omega_2^3}$

$C^{(0),\text{MRT2}}_{\text{D}^4_x \rho} = (-24 v_1^2 cs^2\omega_2^2 + 72\omega_4 v_1^4\omega_2^2 - 24\omega_4 cs^2\omega_2 + 156\omega_4^2 v_1^2 cs^2\omega_2 + 24\omega_4^2 cs^4\omega_2 - 24\omega_4^2 v_1^2\omega_2 - 18\omega_4 v_1^4\omega_2^3 + 12 v_1^2 cs^2\omega_2^3 - 3\omega_4^2 cs^4\omega_2^3 - 3\omega_4^2 v_1^2\omega_2^3 + 6\omega_4^2 v_1^2 cs^2\omega_2^3 + 12 v_1^4\omega_2^3 - 6\omega_4 cs^2\omega_2^3 - 72\omega_4^2 v_1^2 cs^2\omega_2^2 - 48\omega_4^2 cs^4\omega_2 + 24\omega_4^2 v_1^2\omega_2 - 48\omega_4 v_1^4\omega_2 + 24\omega_4 cs^2\omega_2^2 - 24 v_1^4\omega_2^2 - 24\omega_4 v_1^2 cs^2\omega_2 + 18\omega_4 v_1^2\omega_2^2 + \omega_4^2 cs^2\omega_2^3 - 72\omega_4 v_1^2\omega_2^2 + 24\omega_4 cs^4\omega_2 - 8\omega_4^2 cs^2\omega_2^2 + 24\omega_4^2 v_1^4\omega_2 + 12\omega_4^2 cs^2\omega_2 + 24\omega_4^2 cs^4 - 24\omega_4^2 v_1^4\omega_2^2 + 48\omega_4 v_1^2\omega_2 - 24\omega_4 cs^4\omega_2^2 - 12\omega_4 v_1^2 cs^2\omega_2^3 + 24 v_1^2\omega_2^2 + 3\omega_4^2 v_1^4\omega_2^3 - 12 v_1^2\omega_2^3 - 96\omega_4^2 v_1^2 cs^2 + 6\omega_4 cs^2\omega_2^3 + 48\omega_4 v_1^2 cs^2\omega_2^2)\frac{1}{24\omega_4^2\omega_2^3}$

$C^{(0),\text{CLBM1}}_{\text{D}^4_x \rho} =$

$(72\omega_4 v_1^4\omega_2^2 - 216 v_1^2\omega_2^2 cs^2 + 72\omega_4 v_1^2\omega_2 cs^2 - 6\omega_4\omega_2^2 cs^2 - 30\omega_4 v_1^4\omega_2^3 + 6\omega_4^2 v_1^2\omega_2^3 cs^2 - 3\omega_4^2\omega_2^3 cs^4 - 3\omega_4^2 v_1^2\omega_2^3 + 24\omega_4\omega_2 cs^4 + 108 v_1^2\omega_2^3 cs^2 + 36 v_1^4\omega_2^3 + 12\omega_4^2\omega_2 cs^2 + 24\omega_4^2\omega_2^2 cs^4 + 24\omega_4^2 cs^4 - 12\omega_4^2 v_1^2\omega_2^2 cs^2 + 12\omega_4^2 v_1^2\omega_2^2 - 72 v_1^4\omega_2^2 + 24\omega_4\omega_2^2 cs^2 - 48\omega_4^2\omega_2 cs^4 + 30\omega_4 v_1^2\omega_2^3 - 36\omega_4^2 v_1^2\omega_2 cs^2 - 24\omega_4\omega_2 cs^2 - 72\omega_4 v_1^2\omega_2^2 - 72\omega_4 v_1^2\omega_2^3 cs^2 - 24\omega_4\omega_2^2 cs^4 - 8\omega_4^2\omega_2^2 cs^2 - 12\omega_4^2 v_1^4\omega_2^2 + 72 v_1^2\omega_2^2 + 3\omega_4^2 v_1^4\omega_2^3 + \omega_4^2\omega_2^3 cs^2 + 144\omega_4 v_1^2\omega_2^2 cs^2 - 36 v_1^2\omega_2^3 + 6\omega_4\omega_2^3 cs^4)\frac{1}{24\omega_4^2\omega_2^3}$

$C^{(0),\text{CLBM2}}_{\text{D}^4_x \rho} =$

$(72\omega_4 v_1^4\omega_2^2 + 24\omega_4^2 cs^4 - 12\omega_4^2 v_1^2\omega_2^2 cs^2 + 24\omega_4^2\omega_2^2 cs^4 + 24\omega_4\omega_2^2 cs^2 + 24\omega_4\omega_2 cs^4 - 30\omega_4 v_1^4\omega_2^3 + 12\omega_4^2\omega_2 cs^2 + 108 v_1^2\omega_2^3 cs^2 - 3\omega_4^2 v_1^2\omega_2^3 - 6\omega_4\omega_2^3 cs^2 + 36 v_1^4\omega_2^3 - 3\omega_4^2\omega_2^3 cs^4 + 6\omega_4^2 v_1^2\omega_2^3 cs^2 - 216 v_1^2\omega_2^2 cs^2 + 12\omega_4^2 v_1^2\omega_2^2 + 72\omega_4 v_1^2\omega_2 cs^2 - 72 v_1^4\omega_2^2 + \omega_4^2\omega_2^3 cs^2 + 30\omega_4 v_1^2\omega_2^3 + 6\omega_4\omega_2^3 cs^4 + 144\omega_4 v_1^2\omega_2^2 cs^2 - 72\omega_4 v_1^2\omega_2^2 - 24\omega_4\omega_2^2 cs^4 - 72\omega_4 v_1^2\omega_2^3 cs^2 - 12\omega_4^2 v_1^4\omega_2^2 - 8\omega_4^2\omega_2^2 cs^2 + 72 v_1^2\omega_2^2 + 3\omega_4^2 v_1^4\omega_2^3 - 36\omega_4^2 v_1^2\omega_2 cs^2 - 48\omega_4^2\omega_2 cs^4 - 36 v_1^2\omega_2^3 - 24\omega_4\omega_2 cs^2)\frac{1}{24\omega_4^2\omega_2^3}$

coefficient $C^{(0)}_{\text{D}^4_x v_1}$ at $\frac{\partial^4 v_1}{\partial x_1^4}$:

$C^{(0),\text{SRT}}_{\text{D}^4_x v_1} = (24 - 48 cs^2 - 36\omega + 14\omega^2 + 72\omega cs^2 - \omega^3 - 22 v_1^2\omega^2 + 2v_1^2\omega^3 - 26\omega^2 cs^2 + \omega^3 cs^2 + 54 v_1^2\omega - 36 v_1^2)\frac{\rho v_1}{12\omega^3}$

$C^{(0),\text{MRT1}}_{\text{D}^4_x v_1} =$

$(12\omega_2^2 + 42\omega_4^2\omega_2 cs^2 + 12\omega_4\omega_2 + 24\omega_4^2 v_1^2\omega_2 + 6\omega_2^3 cs^2 - 6\omega_2^3 + 24\omega_4\omega_2^2 cs^2 + 2\omega_4^2 v_1^2\omega_2^3 - 12\omega_2^2 cs^2 + 6\omega_4\omega_2^3 - 6\omega_4\omega_2^3 cs^2 - 24\omega_4\omega_2^2 - 16\omega_4^2 v_1^2\omega_2^2 - 12\omega_4^2 v_1^2 + 8\omega_4^2\omega_2^2 - 6\omega_4 v_1^2\omega_2^3 + 24\omega_4 v_1^2\omega_2^2 - \omega_4^2\omega_2^3 + \omega_4^2\omega_2^3 cs^2 - 12\omega_4 v_1^2\omega_2 - 12 v_1^2\omega_2^2 - 12\omega_4\omega_2 cs^2 - 6\omega_4^2\omega_2 + 6v_1^2\omega_2^3 - 20\omega_4^2\omega_2^2 cs^2 - 24\omega_4^2 cs^2)\frac{\rho v_1}{12\omega_4^2\omega_2^3}$

$C^{(0),\text{MRT2}}_{\text{D}^4_x v_1} =$

$(-12\omega_4 cs^2\omega_2 - 12 cs^2\omega_2^2 + 12\omega_2^2 + 12\omega_4\omega_2 - 24\omega_4^2 cs^2 + 24\omega_4^2 v_1^2\omega_2 - 6\omega_2^3 + 6 cs^2\omega_2^3 + 2\omega_4^2 v_1^2\omega_2^3 + 6\omega_4\omega_2^3 - 6\omega_4 cs^2\omega_2^3 - 24\omega_4\omega_2^2 - 16\omega_4^2 v_1^2\omega_2^2 - 12\omega_4^2 v_1^2 + 24\omega_4 cs^2\omega_2^2 + 8\omega_4^2\omega_2^2 - 6\omega_4 v_1^2\omega_2^3 + \omega_4^2 cs^2\omega_2^3 + 24\omega_4 v_1^2\omega_2^2 - \omega_4^2\omega_2^3 - 20\omega_4^2 cs^2\omega_2^2 + 42\omega_4^2 cs^2\omega_2 - 12\omega_4 v_1^2\omega_2 - 12 v_1^2\omega_2^2 - 6\omega_4^2\omega_2 + 6v_1^2\omega_2^3)\frac{\rho v_1}{12\omega_4^2\omega_2^3}$

$C^{(0),\text{CLBM1}}_{\text{D}^4_x v_1} = (-60\omega_2^2 cs^2 + 36\omega_2^2 - 12\omega_4\omega_2 - 12\omega_4^2 v_1^2\omega_2 - 18\omega_2^3 - 24\omega_4\omega_2^3 cs^2 + 2\omega_4^2 v_1^2\omega_2^3 + 12\omega_4\omega_2^3 - 30\omega_4^2\omega_2 cs^2 + 30\omega_2^3 cs^2 - 24\omega_4\omega_2^2 + 2\omega_4^2 v_1^2\omega_2^2 - 12\omega_4^2 v_1^2 + 72\omega_4\omega_2^2 cs^2 + 2\omega_4^2\omega_2^2 - 24\omega_4 v_1^2\omega_2^3 - 12\omega_4\omega_2 cs^2 + 24\omega_4 v_1^2\omega_2^2 - \omega_4^2\omega_2^3 - 2\omega_4^2\omega_2^2 cs^2 + 24\omega_4^2 cs^2 + 60\omega_4 v_1^2\omega_2 - 84 v_1^2\omega_2^2 + \omega_4^2\omega_2^3 cs^2 + 6\omega_4^2\omega_2 + 42 v_1^2\omega_2^3)\frac{\rho v_1}{12\omega_4^2\omega_2^3}$

$C^{(0),\text{CLBM2}}_{\text{D}^4_x v_1} =$

$(36\omega_2^2 + 72\omega_4\omega_2^2 cs^2 - 12\omega_4\omega_2 - 12\omega_4^2 v_1^2\omega_2 - 18\omega_2^3 + 30\omega_2^3 cs^2 - 30\omega_4^2\omega_2 cs^2 + 2\omega_4^2 v_1^2\omega_2^3 + 12\omega_4\omega_2^3 - 24\omega_4\omega_2^3 cs^2 - 24\omega_4\omega_2^2 - 60\omega_2^2 cs^2 + 2\omega_4^2 v_1^2\omega_2^2 - 12\omega_4^2 v_1^2 + 2\omega_4^2\omega_2^2 + \omega_4^2\omega_2^3 cs^2 - 24\omega_4 v_1^2\omega_2^3 + 24\omega_4 v_1^2\omega_2^2 - \omega_4^2\omega_2^3 + 60\omega_4 v_1^2\omega_2 + 24\omega_4^2 cs^2 - 2\omega_4^2\omega_2^2 cs^2 - 84 v_1^2\omega_2^2 + 6\omega_4^2\omega_2 + 42 v_1^2\omega_2^3 - 12\omega_4\omega_2 cs^2)\frac{\rho v_1}{12\omega_4^2\omega_2^3}$

coefficient $C^{(0)}_{\mathrm{D}_t^3\mathrm{D}_y v_2}$ **at** $\frac{\partial^4 v_2}{\partial t^3 \partial x_2}$**:**

$$C^{(0),\mathrm{SRT}}_{\mathrm{D}_t^3\mathrm{D}_y v_2} = (-2 + 3\omega - \omega^2)\frac{\rho}{2\omega^3}$$

$$C^{(0),\mathrm{MRT1}}_{\mathrm{D}_t^3\mathrm{D}_y v_2} = (-2 - \omega_3^2 + 3\omega_3)\frac{\rho}{2\omega_3^3}$$

$$C^{(0),\mathrm{MRT2}}_{\mathrm{D}_t^3\mathrm{D}_y v_2} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_t^3\mathrm{D}_y v_2}$$

$$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}_t^3\mathrm{D}_y v_2} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_t^3\mathrm{D}_y v_2}$$

$$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}_t^3\mathrm{D}_y v_2} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_t^3\mathrm{D}_y v_2}$$

coefficient $C^{(0)}_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_1}$ **at** $\frac{\partial^4 v_1}{\partial t^2 \partial x_1 \partial x_2}$**:**

$$C^{(0),\mathrm{SRT}}_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_1} = (36 - 54\omega + 20\omega^2 - \omega^3)\frac{\rho v_2}{12\omega^3}$$

$$C^{(0),\mathrm{MRT1}}_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_1} = (12\omega_2\omega_3 + 12\omega_2^2 + 7\omega_2\omega_3^3 - 24\omega_2\omega_3^2 - 6\omega_3^3 + 13\omega_2^2\omega_3^2 + 12\omega_3^2 - \omega_2^2\omega_3^3 - 24\omega_2^2\omega_3)\frac{\rho v_2}{12\omega_2^2\omega_3^3}$$

$$C^{(0),\mathrm{MRT2}}_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_1} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_1}$$

$$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_1} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_1}$$

$$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_1} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_1}$$

coefficient $C^{(0)}_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_2}$ **at** $\frac{\partial^4 v_2}{\partial t^2 \partial x_1 \partial x_2}$**:**

$$C^{(0),\mathrm{SRT}}_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_2} = (36 - 54\omega + 20\omega^2 - \omega^3)\frac{\rho v_1}{12\omega^3}$$

$$C^{(0),\mathrm{MRT1}}_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_2} = (12\omega_2\omega_3 + 12\omega_2^2 - 6\omega_2^3 - 24\omega_2\omega_3^2 + 13\omega_2^2\omega_3^2 + 12\omega_3^2 + 7\omega_3^3\omega_3 - \omega_2^3\omega_3^2 - 24\omega_2^2\omega_3)\frac{\rho v_1}{12\omega_2^3\omega_3^2}$$

$$C^{(0),\mathrm{MRT2}}_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_2} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_2}$$

$$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_2} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_2}$$

$$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_2} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_t^2\mathrm{D}_x\mathrm{D}_y v_2}$$

coefficient $C^{(0)}_{\mathrm{D}_t\mathrm{D}_x^2\mathrm{D}_y v_1}$ **at** $\frac{\partial^4 v_1}{\partial t \partial x_1^2 \partial x_2}$**:**

$$C^{(0),\mathrm{SRT}}_{\mathrm{D}_t\mathrm{D}_x^2\mathrm{D}_y v_1} = (-24 + 36\omega - 14\omega^2 + \omega^3)\frac{\rho v_1 v_2}{6\omega^3}$$

$$C^{(0),\mathrm{MRT1}}_{\mathrm{D}_t\mathrm{D}_x^2\mathrm{D}_y v_1} = (-12\omega_4\omega_2\omega_3^2 + 24\omega_4\omega_2\omega_3^3 - 6\omega_4\omega_2^3 + \omega_4\omega_2^3\omega_3^3 - 6\omega_4\omega_2^2\omega_3 + 12\omega_2^2\omega_3^3 - 6\omega_2^3\omega_3^3 - 7\omega_4\omega_2^3\omega_3^2 - 6\omega_2^3\omega_3^2 - 10\omega_4\omega_2^2\omega_3^3 + 12\omega_4\omega_2^3\omega_3 + 12\omega_4\omega_2^2\omega_3^2 - 12\omega_4\omega_2^3 + 3\omega_2^3\omega_3^3)\frac{\rho v_1 v_2}{6\omega_4\omega_2^3\omega_3^3}$$

$$C^{(0),\mathrm{MRT2}}_{\mathrm{D}_t\mathrm{D}_x^2\mathrm{D}_y v_1} = C^{(0),\mathrm{MRT1}}_{\mathrm{D}_t\mathrm{D}_x^2\mathrm{D}_y v_1}$$

$$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}_t\mathrm{D}_x^2\mathrm{D}_y v_1} = (-6\omega_2^3 + 18\omega_2\omega_3^3 - 12\omega_3^3 + 6\omega_2^2\omega_3^2 + 12\omega_2^3\omega_3 - 7\omega_2^2\omega_3^3 - 7\omega_2^3\omega_3^2 - 6\omega_2^2\omega_3 + \omega_2^3\omega_3^3)\frac{\rho v_1 v_2}{6\omega_2^3\omega_3^3}$$

$$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}_t\mathrm{D}_x^2\mathrm{D}_y v_1} = C^{(0),\mathrm{CLBM1}}_{\mathrm{D}_t\mathrm{D}_x^2\mathrm{D}_y v_1}$$

coefficient $C^{(0)}_{\mathrm{D}_t\mathrm{D}_x^2\mathrm{D}_y v_2}$ **at** $\frac{\partial^4 v_2}{\partial t \partial x_1^2 \partial x_2}$**:**

$$C^{(0),\text{SRT}}_{\text{D}_t\text{D}_x^2\text{D}_y v_2} = (60cs^2 - 90\omega cs^2 - 2v_1^2\omega^2 + v_1^2\omega^3 + 34\omega^2 cs^2 - 2\omega^3 cs^2)\frac{\rho}{12\omega^3}$$

$$C^{(0),\text{MRT1}}_{\text{D}_t\text{D}_x^2\text{D}_y v_2} = (12\omega_4\omega_2\omega_3 cs^2 + 12\omega_4^2\omega_2 cs^2 - 30\omega_4 v_1^2\omega_2^2\omega_3 - 12\omega_4^2 v_1^2\omega_2 + 12\omega_2^2\omega_3 cs^2 + 12\omega_4\omega_2^2 cs^2 + 9\omega_4 v_1^2\omega_2^3\omega_3 - \omega_4^2 v_1^2\omega_2^3 + 22\omega_4^2\omega_2^2\omega_3 cs^2 +$$
$$12\omega_4^2\omega_3 cs^2 - 6\omega_4\omega_2^3 cs^2 + 36\omega_4^2 v_1^2\omega_2\omega_3 + 9\omega_4\omega_2^3\omega_3 cs^2 + 6\omega_4^2 v_1^2\omega_2^2 - 10\omega_4^2 v_1^2\omega_2^2\omega_3 - 30\omega_4^2\omega_2\omega_3 cs^2 - 6\omega_4 v_1^2\omega_2^3 - 6\omega_2^3\omega_3 cs^2 + 12\omega_4 v_1^2\omega_2^2 +$$
$$3\omega_4^2\omega_2^3 cs^2 - 6v_1^2\omega_2^3\omega_3 - 24\omega_4^2 v_1^2\omega_3 + \omega_4^2 v_1^2\omega_2^3\omega_3 - 30\omega_4\omega_2^2\omega_3 cs^2 + 12v_1^2\omega_2^2\omega_3 - 2\omega_4^2\omega_2^3\omega_3 cs^2 - 18\omega_4^2\omega_2^2 cs^2 + 12\omega_4 v_1^2\omega_2\omega_3)\frac{\rho}{12\omega_4^2\omega_2^3\omega_3}$$

$$C^{(0),\text{MRT2}}_{\text{D}_t\text{D}_x^2\text{D}_y v_2} = (-6cs^2\omega_3^3 - 30\omega_4 v_1^2\omega_2^2\omega_3 - 12\omega_4^2 v_1^2\omega_2 + 22\omega_4^2 cs^2\omega_2^2\omega_3 + 9\omega_4 v_1^2\omega_2^3\omega_3 - \omega_4^2 v_1^2\omega_2^3 + 12cs^2\omega_2^2\omega_3 + 12\omega_4 cs^2\omega_2\omega_3 - 6\omega_4 cs^2\omega_2^3 +$$
$$36\omega_4^2 v_1^2\omega_2\omega_3 + 12\omega_4^2 cs^2\omega_3 + 6\omega_4^2 v_1^2\omega_2^2 - 2\omega_4^2 cs^2\omega_2^3\omega_3 + 12\omega_4 cs^2\omega_2^2 - 10\omega_4^2 v_1^2\omega_2^2\omega_3 - 6\omega_4 v_1^2\omega_2^3 + 3\omega_4^2 cs^2\omega_2^3 + 12\omega_4 v_1^2\omega_2^2 - 30\omega_4 cs^2\omega_2^2\omega_3 -$$
$$6v_1^2\omega_2^3\omega_3 - 18\omega_4^2 cs^2\omega_2^2 - 24\omega_4^2 v_1^2\omega_3 + 12\omega_4^2 cs^2\omega_2 - 30\omega_4^2 cs^2\omega_2\omega_3 + \omega_4^2 v_1^2\omega_2^3\omega_3 + 12v_1^2\omega_2^2\omega_3 + 9\omega_4 cs^2\omega_2^3\omega_3 + 12\omega_4 v_1^2\omega_2\omega_3)\frac{\rho}{12\omega_4^2\omega_2^3\omega_3}$$

$$C^{(0),\text{CLBM1}}_{\text{D}_t\text{D}_x^2\text{D}_y v_2} = (9\omega_4\omega_2^3 cs^2\omega_3 + 30\omega_4 v_1^2\omega_2^2\omega_3 + 12\omega_4^2 v_1^2\omega_2 - 6\omega_4\omega_2^3 cs^2 + 12\omega_4^2 cs^2\omega_3 + 22\omega_4^2\omega_2^2 cs^2\omega_3 - 9\omega_4 v_1^2\omega_2^3\omega_3 - \omega_4^2 v_1^2\omega_2^3 + 12\omega_4^2\omega_2 cs^2 +$$
$$12\omega_2^2 cs^2\omega_3 - 36\omega_4^2 v_1^2\omega_2\omega_3 + 12\omega_4\omega_2 cs^2\omega_3 - 6\omega_4^2 v_1^2\omega_2^2 + 12\omega_4\omega_2^2 cs^2 + 8\omega_4^2 v_1^2\omega_2^2\omega_3 - 2\omega_4^2\omega_2^3 cs^2\omega_3 + 6\omega_4 v_1^2\omega_2^3 - 12\omega_4 v_1^2\omega_2^2 - 30\omega_4\omega_2^2 cs^2\omega_3 -$$
$$18\omega_4^2\omega_2^2 cs^2 + 6v_1^2\omega_2^3\omega_3 + 24\omega_4^2 v_1^2\omega_3 + \omega_4^2 v_1^2\omega_2^3\omega_3 - 12v_1^2\omega_2^2\omega_3 - 6\omega_2^3 cs^2\omega_3 + 3\omega_4^2\omega_2^3 cs^2 - 30\omega_4^2\omega_2 cs^2\omega_3 - 12\omega_4 v_1^2\omega_2\omega_3)\frac{\rho}{12\omega_4^2\omega_2^3\omega_3}$$

$$C^{(0),\text{CLBM2}}_{\text{D}_t\text{D}_x^2\text{D}_y v_2} = (12\omega_2^2\omega_3 cs^2 + 12\omega_4\omega_2^2 cs^2 + 30\omega_4 v_1^2\omega_2^2\omega_3 + 12\omega_4^2 v_1^2\omega_2 + 12\omega_4^2\omega_2 cs^2 + 12\omega_4\omega_2\omega_3 cs^2 - 9\omega_4 v_1^2\omega_2^3\omega_3 + 9\omega_4\omega_2^3\omega_3 cs^2 - \omega_4^2 v_1^2\omega_2^3 -$$
$$6\omega_4\omega_2^3 cs^2 - 36\omega_4^2 v_1^2\omega_2\omega_3 + 22\omega_4^2\omega_2^2\omega_3 cs^2 - 6\omega_4^2 v_1^2\omega_2^2 + 12\omega_4^2\omega_3 cs^2 + 8\omega_4^2 v_1^2\omega_2^2\omega_3 + 3\omega_4^2\omega_2^3 cs^2 + 6\omega_4 v_1^2\omega_2^3 - 12\omega_4 v_1^2\omega_2^2 - 30\omega_4\omega_2\omega_3 cs^2 -$$
$$6\omega_2^3\omega_3 cs^2 + 6v_1^2\omega_2^3\omega_3 + 24\omega_4^2 v_1^2\omega_3 - 2\omega_4^2\omega_2^3\omega_3 cs^2 + \omega_4^2 v_1^2\omega_2^3\omega_3 - 18\omega_4^2\omega_2^2 cs^2 - 12v_1^2\omega_2^2\omega_3 - 30\omega_4\omega_2^2\omega_3 cs^2 - 12\omega_4 v_1^2\omega_2\omega_3)\frac{\rho}{12\omega_4^2\omega_2^3\omega_3}$$

coefficient $C^{(0)}_{\text{D}_x^3\text{D}_y\rho}$ **at** $\frac{\partial^4\rho}{\partial x_1^3\partial x_2}$:

$$C^{(0),\text{SRT}}_{\text{D}_x^3\text{D}_y\rho} = (24 - 120cs^2 - 36\omega + 14\omega^2 + 180\omega cs^2 - \omega^3 - 72\omega^2 cs^2 + 6\omega^3 cs^2)\frac{v_1 v_2}{6\omega^3}$$

$$C^{(0),\text{MRT1}}_{\text{D}_x^3\text{D}_y\rho} = (7\omega_4^2\omega_2^2\omega_3^3 - 12\omega_4^2\omega_2^3\omega_3^2 cs^2 + 12\omega_4^2 v_1^2\omega_2\omega_3^3 - 12\omega_4 v_1^2\omega_2^3\omega_3^3 - 3\omega_4^2\omega_2^2\omega_3^3 + 6\omega_2^3\omega_3^3 cs^2 + 12\omega_4\omega_2\omega_3^3 + 6\omega_4 v_1^2\omega_2^3\omega_3^2 + 78\omega_4^2\omega_2\omega_3^3 cs^2 -$$
$$30\omega_4^2 v_1^2\omega_2\omega_3^3 - 12\omega_4\omega_2^2\omega_3^2 cs^2 + 6\omega_4^2 v_1^2\omega_2^3 - 12\omega_4^2\omega_2^2\omega_3 cs^2 + 42\omega_4 v_1^2\omega_2^2\omega_3^3 + 6\omega_4^2\omega_2^3\omega_3^2 cs^2 - \omega_4^2\omega_2^3\omega_3^3 + 42\omega_4\omega_2^2\omega_3^3 cs^2 - 12\omega_4 v_1^2\omega_2^2\omega_3^2 -$$
$$24\omega_4^2\omega_2\omega_3^3 cs^2 + \omega_4^2\omega_2^3\omega_3^2 + 6\omega_4^2 v_1^2\omega_2^2\omega_3 + 6\omega_4\omega_2^3\omega_3^2 cs^2 + 6\omega_4\omega_2^3\omega_3^3 - 12\omega_2^3\omega_3^3 cs^2 + 42\omega_2^2\omega_2^2\omega_3^3 cs^2 - 24v_1^2\omega_2\omega_3^3 + 6\omega_4^2 v_1^2\omega_2^3\omega_3^2 -$$
$$24\omega_4\omega_2\omega_3^3 cs^2 + 6\omega_2^2\omega_3^3 - 12v_1^2\omega_2^2\omega_3^3 - 3\omega_4\omega_2^3\omega_3^2 - 21\omega_4\omega_2^2\omega_3^3 - 12\omega_4\omega_2^3\omega_3^2 cs^2 - 12\omega_4^2 v_1^2\omega_2^3\omega_3 + 6\omega_4^2 v_1^2\omega_2^2\omega_3^3 + 24\omega_4^2 v_1^2\omega_3^3 - 6\omega_4\omega_2\omega_3^3 +$$
$$6\omega_4\omega_2^2\omega_3^3 + 6v_1^2\omega_2^3\omega_3^3 - 36\omega_4^2\omega_3^3 cs^2 - 3\omega_2^3\omega_3^3 - 12\omega_4^2 v_1^2\omega_2^2\omega_3^2 + 6\omega_4^2\omega_2^3\omega_3 cs^2 - 48\omega_4^2\omega_2^2\omega_3^3 cs^2)\frac{v_1 v_2}{6\omega_4^2\omega_2^3\omega_3^3}$$

$$C^{(0),\text{MRT2}}_{\text{D}_x^3\text{D}_y\rho} = (-12\omega_4^2 cs^2\omega_2^3\omega_3^2 + 7\omega_4^2\omega_2^2\omega_3^3 - 24\omega_4 cs^2\omega_2\omega_3^3 - 12cs^2\omega_2^2\omega_3^3 + 12\omega_4^2 v_1^2\omega_2\omega_3^3 - 12\omega_4 v_1^2\omega_2^3\omega_3^3 - 3\omega_4^2\omega_2^2\omega_3^3 - 12\omega_4^2 cs^2\omega_2^2\omega_3 +$$
$$6\omega_4^2 cs^2\omega_2^3\omega_3^2 + 12\omega_4\omega_2\omega_3^3 + 6\omega_4 v_1^2\omega_2^3\omega_3^2 - 36\omega_4^2 cs^2\omega_3^3 - 30\omega_4^2 v_1^2\omega_2\omega_3^3 + 6\omega_4^2 v_1^2\omega_2^3 + 42\omega_4 v_1^2\omega_2^2\omega_3^3 + 6cs^2\omega_2^3\omega_3^3 + 42\omega_4^2 cs^2\omega_2^2\omega_3^2 - \omega_4^2\omega_2^3\omega_3^3 -$$
$$12\omega_4 v_1^2\omega_2^2\omega_3^2 + 6\omega_4^2 cs^2\omega_2^3\omega_3 + \omega_4^2\omega_2^3\omega_3^2 - 48\omega_4^2 cs^2\omega_2^2\omega_3^3 + 6\omega_4^2 v_1^2\omega_2^2\omega_3 + 78\omega_4^2 cs^2\omega_2\omega_3^3 + 6\omega_4\omega_2^3\omega_3^3 + 6\omega_4 cs^2\omega_2^2\omega_3^3 - 24\omega_4 v_1^2\omega_2\omega_3^3 +$$
$$6\omega_4^2 v_1^2\omega_2^3\omega_3^2 + 6\omega_2^2\omega_3^3 - 12\omega_4 cs^2\omega_2^3\omega_3^3 - 12v_1^2\omega_2^3\omega_3^3 - 3\omega_4\omega_2^3\omega_3^2 - 24\omega_4^2 cs^2\omega_2\omega_3^3 - 12\omega_4 cs^2\omega_2^2\omega_3^2 - 21\omega_4\omega_2^2\omega_3^3 - 12\omega_4^2 v_1^2\omega_2^3\omega_3 + 6\omega_4^2 v_1^2\omega_2^2\omega_3^3 +$$
$$24\omega_4^2 v_1^2\omega_3^3 - 6\omega_4\omega_2\omega_3^3 + 6\omega_4\omega_2^2\omega_3^3 + 6v_1^2\omega_2^3\omega_3^3 + 42\omega_4 cs^2\omega_2^2\omega_3^3 - 3\omega_2^3\omega_3^3 - 12\omega_4^2 v_1^2\omega_2^2\omega_3^2)\frac{v_1 v_2}{6\omega_4^2\omega_2^3\omega_3^3}$$

$$C^{(0),\text{CLBM1}}_{\text{D}_x^3\text{D}_y\rho} = (-36\omega_2^2 cs^2\omega_3^3 + 7\omega_4^2\omega_2^2\omega_3^3 - 3\omega_4^2\omega_2^2\omega_3^3 + 12\omega_4\omega_2\omega_3^3 - 24\omega_4\omega_2 cs^2\omega_3^3 + 12\omega_4^2 v_1^2\omega_2\omega_3^3 - 12\omega_4^2\omega_2 cs^2\omega_3 + 6\omega_4^2 v_1^2\omega_2^3 + 12\omega_4 v_1^2\omega_2^2\omega_3^3 -$$
$$24\omega_4\omega_2^3 cs^2\omega_3^3 + 36\omega_4^2\omega_2^2 cs^2\omega_3^2 - \omega_4^2\omega_2^3\omega_3^3 + 12\omega_4\omega_2^3 cs^2\omega_3^2 - 36\omega_4^2\omega_2^2 cs^2\omega_3^3 - 12\omega_4^2 cs^2\omega_3^3 + \omega_4^2\omega_2^3\omega_3^2 + 6\omega_4^2 v_1^2\omega_2^2\omega_3 - 12\omega_4\omega_2 cs^2\omega_3^3 + 6\omega_4^2\omega_2^3 cs^2\omega_3 +$$
$$6\omega_4\omega_2^3\omega_3^3 - 24\omega_4 v_1^2\omega_2\omega_3^3 + 6\omega_4^2 v_1^2\omega_2^3\omega_3^2 + 36\omega_4\omega_2 cs^2\omega_3^3 + 6\omega_2^2\omega_3^3 + 18\omega_2^3 cs^2\omega_3^3 + 12v_1^2\omega_2^3\omega_3^3 - 3\omega_4\omega_2^3\omega_3^2 - 21\omega_4\omega_2^2\omega_3^3 + 6\omega_4^2\omega_2^3 cs^2\omega_3^3 -$$
$$24\omega_4\omega_2^2 cs^2\omega_3^2 - 12\omega_4^2 v_1^2\omega_2^3\omega_3 - 6\omega_4^2 v_1^2\omega_2^2\omega_3^3 - 6\omega_4^2\omega_2\omega_3^3 + 6\omega_4\omega_2^2\omega_3^3 - 6v_1^2\omega_2^3\omega_3^3 - 3\omega_2^3\omega_3^3 - 6\omega_4^2 v_1^2\omega_2^2\omega_3^2 - 12\omega_4^2\omega_2^3 cs^2\omega_3^3 + 72\omega_4\omega_2^2 cs^2\omega_3^3)\frac{v_1 v_2}{6\omega_4^2\omega_2^3\omega_3^3}$$

$$C^{(0),\text{CLBM2}}_{\text{D}_x^3\text{D}_y\rho} = (7\omega_4^2\omega_2^2\omega_3^3 + 18\omega_2^2\omega_3^3 cs^2 - 24\omega_4\omega_2^2\omega_3^2 cs^2 + 36\omega_4^2\omega_2\omega_3^3 cs^2 - 3\omega_4^2\omega_2^2\omega_3^3 + 12\omega_4\omega_2\omega_3^3 + 12\omega_4^2 v_1^2\omega_2\omega_3^3 - 12\omega_4^2\omega_2^3\omega_3^2 cs^2 + 6\omega_4^2 v_1^2\omega_2^3 -$$
$$12\omega_4^2\omega_2\omega_3 cs^2 + 12\omega_4 v_1^2\omega_2^2\omega_3^3 + 72\omega_4\omega_2^2\omega_3^3 cs^2 - \omega_4^2\omega_2^3\omega_3^3 + 6\omega_4^2\omega_2^3\omega_3^3 cs^2 - 12\omega_2^2\omega_2 cs^2\omega_3 + \omega_4^2\omega_2^3\omega_3^2 + 6\omega_4^2 v_1^2\omega_2^2\omega_3 - 24\omega_4\omega_2\omega_3^3 cs^2 +$$
$$36\omega_4^2\omega_2^2\omega_3^2 cs^2 + 6\omega_4\omega_2^3\omega_3^3 - 24\omega_4 v_1^2\omega_2\omega_3^3 + 12\omega_4\omega_2^3\omega_3^3 cs^2 + 6\omega_4^2 v_1^2\omega_2^3\omega_3^2 - 36\omega_2^3\omega_3^3 cs^2 + 6\omega_2^2\omega_3^3 + 12v_1^2\omega_2^3\omega_3^3 - 3\omega_4\omega_2^3\omega_3^2 - 12\omega_4^2\omega_3^3 cs^2 - 21\omega_4\omega_2^2\omega_3^3 -$$
$$36\omega_4^2\omega_2^2\omega_3^3 cs^2 + 6\omega_4^2\omega_2^3\omega_3 cs^2 - 12\omega_4^2 v_1^2\omega_2^3\omega_3 - 6\omega_4^2 v_1^2\omega_2^2\omega_3^3 - 6\omega_4^2\omega_2\omega_3^3 + 6\omega_4\omega_2^2\omega_3^3 - 6v_1^2\omega_2^3\omega_3^3 - 3\omega_2^3\omega_3^3 - 6\omega_4^2 v_1^2\omega_2^2\omega_3^2 - 24\omega_4\omega_2^3\omega_3^3 cs^2)\frac{v_1 v_2}{6\omega_4^2\omega_2^3\omega_3^3}$$

coefficient $C^{(0)}_{\text{D}_x^3\text{D}_y v_1}$ **at** $\frac{\partial^4 v_1}{\partial x_1^3\partial x_2}$:

$$C^{(0),\text{SRT}}_{\text{D}_x^3\text{D}_y v_1} = (12 - 96cs^2 - 18\omega + 8\omega^2 + 144\omega cs^2 - \omega^3 - 12v_1^2\omega^2 + 3v_1^2\omega^3 - 56\omega^2 cs^2 + 4\omega^3 cs^2 + 18v_1^2\omega - 12v_1^2)\frac{\rho v_2}{12\omega^3}$$

$$C^{(0),\text{MRT1}}_{\text{D}_x^3\text{D}_y v_1} = (3\omega_4^2\omega_2^2\omega_3^3 - 12\omega_4^2\omega_2^3\omega_3^2 cs^2 - 12\omega_4 v_1^2\omega_2^3\omega_3^3 - 6\omega_4^2\omega_2^2\omega_3^2 + 6\omega_2^3\omega_3^3 cs^2 + 12\omega_4 v_1^2\omega_2^3\omega_3^2 + 36\omega_4^2\omega_2\omega_3^3 cs^2 - 30\omega_4^2 v_1^2\omega_2\omega_3^3 -$$
$$24\omega_4\omega_2^2\omega_3^2 cs^2 + 12\omega_4^2 v_1^2\omega_2^3 - 12\omega_4^2\omega_2\omega_3 cs^2 + 36\omega_4 v_1^2\omega_2^2\omega_3^3 + 4\omega_4^2\omega_2^3\omega_3^3 cs^2 - \omega_4^2\omega_2^3\omega_3^3 + 36\omega_4\omega_2^2\omega_3^3 cs^2 - 24\omega_4 v_1^2\omega_2^2\omega_3^2 - 24\omega_4\omega_2\omega_3^3 cs^2 + 2\omega_4^2\omega_2^3\omega_3^2 +$$
$$3\omega_4^2 v_1^2\omega_2^3\omega_3^3 + 12\omega_4\omega_2^3\omega_3^2 cs^2 + 3\omega_4\omega_2^3\omega_3^3 - 12\omega_2^3\omega_3^3 cs^2 + 48\omega_4^2\omega_2^2\omega_3^3 cs^2 - 12\omega_4 v_1^2\omega_2\omega_3^3 - 12\omega_4\omega_2\omega_3^3 cs^2 - 12v_1^2\omega_2^2\omega_3^3 - 6\omega_4\omega_2^3\omega_3^2 - 6\omega_4\omega_2^2\omega_3^3 -$$
$$12\omega_4\omega_2^3\omega_3^3 cs^2 - 18\omega_4^2 v_1^2\omega_2^3\omega_3 + 24\omega_4^2 v_1^2\omega_3^3 + 12\omega_4\omega_2^2\omega_3^3 + 6v_1^2\omega_2^3\omega_3^3 - 12\omega_4^2\omega_3^3 cs^2 + 12\omega_4^2 v_1^2\omega_2^2\omega_3^3 + 6\omega_4^2\omega_2^3\omega_3 cs^2 - 32\omega_4^2\omega_2^2\omega_3^3 cs^2)\frac{\rho v_2}{12\omega_4^2\omega_2^3\omega_3^3}$$

$$C^{(0),\text{MRT2}}_{\text{D}_x^3\text{D}_y v_1} = (-12\omega_4^2 cs^2\omega_2^2\omega_3^2 + 3\omega_4^2\omega_2^2\omega_3^3 - 12\omega_4 cs^2\omega_2\omega_3^3 - 12cs^2\omega_2^2\omega_3^3 - 12\omega_4 v_1^2\omega_2^3\omega_3^3 - 6\omega_4^2\omega_2^2\omega_3^2 - 12\omega_4^2 cs^2\omega_2^2\omega_3 + 4\omega_4^2 cs^2\omega_2^3\omega_3^3 +$$

$12\omega_4 v_1^2\omega_2^3\omega_3^2 - 12\omega_4^2 cs^2\omega_3^3 - 30\omega_4^2 v_1^2\omega_2\omega_3^3 + 12\omega_4^2 v_1^2\omega_2^3 + 36\omega_4 v_1^2\omega_2^3\omega_3^3 + 6cs^2\omega_3^3\omega_3^3 + 48\omega_4^2 cs^2\omega_2^3\omega_3^2 - \omega_4^2\omega_2^3\omega_3^3 - 24\omega_4 v_1^2\omega_2\omega_3^3 + 6\omega_4^2 cs^2\omega_3^3\omega_3 + 2\omega_4^2\omega_2^3\omega_3^2 - 32\omega_4^2 cs^2\omega_2^3\omega_3 + 3\omega_4^2 v_1^2\omega_3^2\omega_3^3 + 36\omega_4 cs^2\omega_2^3\omega_3^3 + 3\omega_4\omega_2^3\omega_3^3 + 12\omega_4 cs^2\omega_2^3\omega_3^2 - 12\omega_4 v_1^2\omega_2\omega_3^3 - 12\omega_4 cs^2\omega_2^3\omega_3^3 - 12v_1^2\omega_2^3\omega_3^3 - 6\omega_4\omega_2^3\omega_3^2 - 24\omega_4^2 cs^2\omega_2\omega_3^2 - 24\omega_4 cs^2\omega_2^2\omega_3^2 - 6\omega_4\omega_2^3\omega_3^2 - 18\omega_4^2 v_1^2\omega_2^3\omega_3 + 24\omega_4^2 v_1^2\omega_3^3 + 12\omega_4\omega_2^3\omega_3^2 + 6v_1^2\omega_2^3\omega_3^3 + 36\omega_4 cs^2\omega_2^3\omega_3^2 + 12\omega_4^2 v_1^2\omega_2^2\omega_3)\frac{\rho v_2}{12\omega_4^2\omega_2^3\omega_3^3}$

$C_{\mathrm{D}_x^3\mathrm{D}_y v_1}^{(0),\mathrm{CLBM1}} = (-12\omega_2^2 cs^2\omega_3^3 + 3\omega_4^2\omega_2^2\omega_3^3 - 6\omega_4^2\omega_2^2\omega_3^2 + 12\omega_4 v_1^2\omega_2^3\omega_3^2 - 12\omega_4\omega_2 cs^2\omega_3^3 + 30\omega_4^2 v_1^2\omega_2\omega_3^3 - 12\omega_4^2\omega_2^2 cs^2\omega_3 + 12\omega_4^2 v_1^2\omega_3^2 - 12\omega_4 v_1^2\omega_2^2\omega_3^3 - 12\omega_4\omega_2^3 cs^2\omega_3^3 + 48\omega_4^2\omega_2^2 cs^2\omega_3^2 - \omega_4^2\omega_2^3\omega_3^3 + 12\omega_4\omega_2^2 cs^2\omega_3^2 - 32\omega_4^2\omega_2^2 cs^2\omega_3 - 24\omega_4 v_1^2\omega_2^3\omega_3 - 12\omega_4^2 cs^2\omega_3^3 + 2\omega_4^2\omega_2^3\omega_3^2 - 24\omega_4\omega_2 cs^2\omega_3^2 + 3\omega_4^2 v_1^2\omega_2^3\omega_3^3 + 6\omega_4^2\omega_2^3 cs^2\omega_3 + 3\omega_4\omega_2^3\omega_3^3 + 12\omega_4 v_1^2\omega_2^3\omega_3 + 36\omega_4\omega_2 cs^2\omega_3^3 + 6\omega_2^3 cs^2\omega_3^3 + 12v_1^2\omega_2^3\omega_3^3 - 6\omega_4\omega_2^3\omega_3^2 - 6\omega_4\omega_2^2\omega_3^3 + 4\omega_4^2\omega_2^3 cs^2\omega_3 - 24\omega_4\omega_2^2 cs^2\omega_3^3 - 18\omega_4^2 v_1^2\omega_2^3\omega_3 - 12\omega_4^2 v_1^2\omega_2^2\omega_3 - 24\omega_4^2 v_1^2\omega_3^3 + 12\omega_4\omega_2^3\omega_3^2 - 6v_1^2\omega_2^3\omega_3^3 + 12\omega_4^2 v_1^2\omega_2^2\omega_3 - 12\omega_4^2\omega_2^2 cs^2\omega_3^2 + 36\omega_4\omega_2^2 cs^2\omega_3)\frac{\rho v_2}{12\omega_4^2\omega_2^3\omega_3^3}$

$C_{\mathrm{D}_x^3\mathrm{D}_y v_1}^{(0),\mathrm{CLBM2}} = (3\omega_4^2\omega_2^2\omega_3^3 + 6\omega_2^3\omega_3^3 cs^2 - 24\omega_4\omega_2^2\omega_3^3 cs^2 + 36\omega_4^2\omega_2\omega_3^3 cs^2 - 6\omega_4^2\omega_2^2\omega_3^2 + 12\omega_4 v_1^2\omega_2^3\omega_3^2 + 30\omega_4^2 v_1^2\omega_2\omega_3^3 - 12\omega_4^2\omega_2^3\omega_3^2 cs^2 + 12\omega_4^2 v_1^2\omega_2^2 - 24\omega_4^2\omega_2\omega_3^3 cs^2 - 12\omega_4 v_1^2\omega_2^2\omega_3^3 + 36\omega_4\omega_2^2\omega_3^3 cs^2 - \omega_4^2\omega_2^3\omega_3^3 + 4\omega_4^2\omega_2^3\omega_3^3 cs^2 - 24\omega_4 v_1^2\omega_2^3\omega_3 - 12\omega_4^2\omega_2\omega_3^3 cs^2 + 2\omega_4^2\omega_2^3\omega_3^2 - 12\omega_4\omega_2\omega_3^3 cs^2 + 3\omega_4^2 v_1^2\omega_2^3\omega_3^3 + 48\omega_4^2\omega_2^2\omega_3^3 cs^2 + 3\omega_4\omega_2^3\omega_3^3 + 12\omega_4 v_1^2\omega_2^3\omega_3 + 12\omega_4\omega_2^3\omega_3^2 cs^2 - 12\omega_2^3\omega_3^3 cs^2 + 12v_1^2\omega_2^3\omega_3^3 - 6\omega_4\omega_2^3\omega_3^2 - 12\omega_4^2\omega_3^3 cs^2 - 6\omega_4\omega_2^2\omega_3^3 - 32\omega_4^2\omega_2^2\omega_3^3 cs^2 + 6\omega_4^2\omega_2^3\omega_3 cs^2 - 18\omega_4^2 v_1^2\omega_2^3\omega_3 - 12\omega_4^2 v_1^2\omega_2^2\omega_3 - 24\omega_4^2 v_1^2\omega_3^3 + 12\omega_4\omega_2^3\omega_3^2 - 6v_1^2\omega_2^3\omega_3^3 + 12\omega_4^2 v_1^2\omega_2^2\omega_3 - 12\omega_4\omega_2^3\omega_3^3 cs^2)\frac{\rho v_2}{12\omega_4^2\omega_2^3\omega_3^3}$

coefficient $C_{\mathrm{D}_x^3\mathrm{D}_y v_2}^{(0)}$ **at** $\frac{\partial^4 v_2}{\partial x_1^3\partial x_2}$:

$C_{\mathrm{D}_x^3\mathrm{D}_y v_2}^{(0),\mathrm{SRT}} = (36 - 96cs^2 - 54\omega + 20\omega^2 + 144\omega cs^2 - \omega^3 - 20v_1^2\omega^2 + v_1^2\omega^3 - 56\omega^2 cs^2 + 4\omega^3 cs^2 + 54v_1^2\omega - 36v_1^2)\frac{\rho v_1}{12\omega^3}$

$C_{\mathrm{D}_x^3\mathrm{D}_y v_2}^{(0),\mathrm{MRT1}} = (12\omega_2^2 + 90\omega_4^2\omega_2 cs^2 + 24\omega_4\omega_2 + 6\omega_3^3 cs^2 - 6\omega_3^3 + 48\omega_4\omega_2^2 cs^2 + \omega_4^2 v_1^2\omega_2^3 - 12\omega_2^2 cs^2 + 9\omega_4\omega_2^3 - 12\omega_4\omega_2^3 cs^2 - 36\omega_4\omega_2^2 - 8\omega_4^2 v_1^2\omega_2^2 + 12\omega_4^2 v_1^2 + 11\omega_4^2\omega_2^2 - 12\omega_4 v_1^2\omega_2^3 + 48\omega_4 v_1^2\omega_2^2 - \omega_4^2\omega_2^3 + 4\omega_4^2\omega_2^3 cs^2 - 36\omega_4 v_1^2\omega_2 - 12v_1^2\omega_2^2 - 36\omega_4\omega_2 cs^2 - 12\omega_4^2\omega_2 + 6v_1^2\omega_2^3 - 44\omega_4^2\omega_2^2 cs^2 - 48\omega_4^2 cs^2)\frac{\rho v_1}{12\omega_4^2\omega_2^3}$

$C_{\mathrm{D}_x^3\mathrm{D}_y v_2}^{(0),\mathrm{MRT2}} = (-36\omega_4 cs^2\omega_2 - 12cs^2\omega_2^2 + 12\omega_2^2 + 24\omega_4\omega_2 - 48\omega_4^2 cs^2 - 6\omega_2^3 + 6cs^2\omega_2^3 + \omega_4^2 v_1^2\omega_2^3 + 9\omega_4\omega_2^3 - 12\omega_4 cs^2\omega_2^3 - 36\omega_4\omega_2^2 - 8\omega_4^2 v_1^2\omega_2^2 + 12\omega_4^2 v_1^2 + 48\omega_4 cs^2\omega_2^2 + 11\omega_4^2\omega_2^2 - 12\omega_4 v_1^2\omega_2^3 + 4\omega_4^2 cs^2\omega_2^3 + 48\omega_4 v_1^2\omega_2^2 - \omega_4^2\omega_2^3 - 44\omega_4^2 cs^2\omega_2^2 + 90\omega_4^2 cs^2\omega_2 - 36\omega_4 v_1^2\omega_2 - 12v_1^2\omega_2^2 - 12\omega_4^2\omega_2 + 6v_1^2\omega_2^3)\frac{\rho v_1}{12\omega_4^2\omega_2^2}$

$C_{\mathrm{D}_x^3\mathrm{D}_y v_2}^{(0),\mathrm{CLBM1}} =$
$(-60\omega_2^2 cs^2 + 12\omega_2^2 + 24\omega_4\omega_2 + 12\omega_4^2 v_1^2\omega_2 - 6\omega_2^3 - 30\omega_4\omega_2^3 cs^2 + \omega_4^2 v_1^2\omega_2^3 + 9\omega_4\omega_2^3 + 18\omega_4^2\omega_2 cs^2 + 30\omega_2^3 cs^2 - 36\omega_4\omega_2^2 - 14\omega_4^2 v_1^2\omega_2^2 + 12\omega_4^2 v_1^2 + 96\omega_4\omega_2^2 cs^2 + 11\omega_4^2\omega_2^2 - 6\omega_4 v_1^2\omega_2^3 - 36\omega_4\omega_2 cs^2 + 48\omega_4 v_1^2\omega_2^2 - \omega_4^2\omega_2^3 - 26\omega_4^2\omega_2^2 cs^2 - 60\omega_4 v_1^2\omega_2 + 12v_1^2\omega_2^2 + 4\omega_4^2\omega_2^3 cs^2 - 12\omega_4^2\omega_2 - 6v_1^2\omega_2^3)\frac{\rho v_1}{12\omega_4^2\omega_2^2}$

$C_{\mathrm{D}_x^3\mathrm{D}_y v_2}^{(0),\mathrm{CLBM2}} =$
$(12\omega_2^2 + 96\omega_4\omega_2^2 cs^2 + 24\omega_4\omega_2 + 12\omega_4^2 v_1^2\omega_2 - 6\omega_2^3 + 30\omega_2^3 cs^2 + 18\omega_4^2\omega_2 cs^2 + \omega_4^2 v_1^2\omega_2^3 + 9\omega_4\omega_2^3 - 30\omega_4\omega_2^3 cs^2 - 36\omega_4\omega_2^2 - 60\omega_2^2 cs^2 - 14\omega_4^2 v_1^2\omega_2^2 + 12\omega_4^2 v_1^2 + 11\omega_4^2\omega_2^2 + 4\omega_4^2\omega_2^3 cs^2 - 6\omega_4 v_1^2\omega_2^3 + 48\omega_4 v_1^2\omega_2^2 - \omega_4^2\omega_2^3 - 60\omega_4 v_1^2\omega_2 - 26\omega_4^2\omega_2^2 cs^2 + 12v_1^2\omega_2^2 - 12\omega_4^2\omega_2 - 6v_1^2\omega_2^3 - 36\omega_4\omega_2 cs^2)\frac{\rho v_1}{12\omega_4^2\omega_2^2}$

coefficient $C_{\mathrm{D}_t^2\mathrm{D}_y^2 v_2}^{(0)}$ **at** $\frac{\partial^4 v_2}{\partial t^2\partial x_2^2}$:

$C_{\mathrm{D}_t^2\mathrm{D}_y^2 v_2}^{(0),\mathrm{SRT}} = (-2 + 3\omega - \omega^2)\frac{3\rho v_2}{2\omega^3}$

$C_{\mathrm{D}_t^2\mathrm{D}_y^2 v_2}^{(0),\mathrm{MRT1}} = (-\omega_5^2\omega_3 - \omega_5^2\omega_3^2 + 2\omega_5 + 2\omega_3^3 + 8\omega_5\omega_3^2 - 2\omega_5\omega_3^3 - 4\omega_3^2 - 4\omega_5\omega_3)\frac{\rho v_2}{2\omega_5^2\omega_3^3}$

$C_{\mathrm{D}_t^2\mathrm{D}_y^2 v_2}^{(0),\mathrm{MRT2}} = C_{\mathrm{D}_t^2\mathrm{D}_y^2 v_2}^{(0),\mathrm{MRT1}}$

$C_{\mathrm{D}_t^2\mathrm{D}_y^2 v_2}^{(0),\mathrm{CLBM1}} = (-2 - \omega_3^2 + 3\omega_3)\frac{3\rho v_2}{2\omega_3^3}$

$C_{\mathrm{D}_t^2\mathrm{D}_y^2 v_2}^{(0),\mathrm{CLBM2}} = C_{\mathrm{D}_t^2\mathrm{D}_y^2 v_2}^{(0),\mathrm{CLBM1}}$

coefficient $C_{\mathrm{D}_t\mathrm{D}_x\mathrm{D}_y^2 v_1}^{(0)}$ **at** $\frac{\partial^4 v_1}{\partial t\partial x_1\partial x_2^2}$:

$C_{\mathrm{D}_t\mathrm{D}_x\mathrm{D}_y^2 v_1}^{(0),\mathrm{SRT}} = (60cs^2 - 90\omega cs^2 - 2\omega^2 v_2^2 + 34\omega^2 cs^2 - 2\omega^3 cs^2 + \omega^3 v_2^2)\frac{\rho}{12\omega^3}$

$C_{\mathrm{D}_t\mathrm{D}_x\mathrm{D}_y^2 v_1}^{(0),\mathrm{MRT1}} = (12\omega_2\omega_3^2 cs^2 - 30\omega_5 v_2^2\omega_2\omega_3^2 + 12\omega_5\omega_2\omega_3 cs^2 + 9\omega_5 v_2^2\omega_2\omega_3^3 - 18\omega_5^2\omega_3^2 cs^2 - 2\omega_5^2\omega_2\omega_3^3 cs^2 + 12\omega_5 v_2^2\omega_3^3 - 6\omega_2\omega_3^3 cs^2 - 24\omega_5^2 v_2^2\omega_2 + 22\omega_5^2\omega_2\omega_3^2 cs^2 - 6\omega_5 v_2^2\omega_3^3 + 3\omega_5^2\omega_3^3 cs^2 + 12\omega_5 v_2^2\omega_2\omega_3 - 30\omega_5^2\omega_2\omega_3^3 cs^2 + 6\omega_5 v_2^2\omega_3^3 + 12\omega_5^2\omega_2 cs^2 - 10\omega_5 v_2^2\omega_2\omega_3^2 - \omega_5^2 v_2^2\omega_3^3 - 6\omega_5\omega_3^3 cs^2 + 9\omega_5\omega_2\omega_3^2 cs^2 + \omega_5^2 v_2^2\omega_2\omega_3^3 + 12\omega_5^2\omega_3^3 cs^2 - 6v_2^2\omega_2\omega_3^3 + 36\omega_5^2 v_2^2\omega_2\omega_3 - 30\omega_5\omega_2\omega_3^3 cs^2 + 12\omega_5^2\omega_3^3 cs^2 + 12v_2^2\omega_2\omega_3^3 - 12\omega_5^2 v_2^2\omega_3)\frac{\rho}{12\omega_5^2\omega_2\omega_3^3}$

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$C^{(0),\text{MRT2}}_{\text{D}_t\text{D}_x\text{D}_y^2 v_1} = (-6cs^2\omega_5\omega_3^3 + 22cs^2\omega_5^2\omega_2\omega_3^2 - 30\omega_5 v_2^2\omega_2\omega_3^2 + 12cs^2\omega_5^2\omega_2 - 2cs^2\omega_5^2\omega_2\omega_3 + 9\omega_5 v_2^2\omega_2\omega_3^3 + 12cs^2\omega_5\omega_3^2 + 12\omega_5 v_2^2\omega_3^2 - 24\omega_5^2 v_2^2\omega_2 - 6\omega_5 v_2^2\omega_3^3 + 12\omega_5 v_2^2\omega_2\omega_3 - 30cs^2\omega_5^2\omega_2\omega_3 + 6\omega_5^2 v_2^2\omega_3^2 - 10\omega_5^2 v_2^2\omega_2\omega_3 - \omega_5^2 v_2^2\omega_3^3 + 12cs^2\omega_5\omega_2\omega_3 + 12cs^2\omega_5^2\omega_3 + \omega_5^2 v_2^2\omega_2\omega_3 - 18cs^2\omega_5^2\omega_3^2 - 30cs^2\omega_5\omega_2\omega_3^2 - 6v_2^2\omega_2\omega_3^3 + 12cs^2\omega_2\omega_3^2 + 36\omega_5^2 v_2^2\omega_2\omega_3 + 9cs^2\omega_5\omega_2\omega_3^3 + 3cs^2\omega_5^2\omega_3^3 - 6cs^2\omega_2\omega_3^3 + 12v_2^2\omega_2\omega_3^2 - 12\omega_5^2 v_2^2\omega_3)\frac{\rho}{12\omega_5^2\omega_2\omega_3^3}$

$C^{(0),\text{CLBM1}}_{\text{D}_t\text{D}_x\text{D}_y^2 v_1} = (30\omega_5 v_2^2\omega_2\omega_3^2 - 30\omega_5\omega_2 cs^2\omega_3^2 + 12\omega_5 cs^2\omega_3^2 - 9\omega_5 v_2^2\omega_2\omega_3^3 + 9\omega_5\omega_2 cs^2\omega_3^3 - 6\omega_5 cs^2\omega_3^3 - 12\omega_5 v_2^2\omega_3^2 + 24\omega_5^2 v_2^2\omega_2 + 12\omega_5\omega_2 cs^2\omega_3 + 6\omega_5^2 v_2^2\omega_3^3 - 12\omega_5 v_2^2\omega_2\omega_3 + 22\omega_5^2\omega_2 cs^2\omega_3^2 - 6\omega_5^2 v_2^2\omega_3^2 + 8\omega_5^2 v_2^2\omega_2\omega_3^2 - \omega_5^2 v_2^2\omega_3^3 - 2\omega_5\omega_2 cs^2\omega_3^3 + 12\omega_5^2 cs^2\omega_3 + \omega_5^2 v_2^2\omega_2\omega_3^3 - 6\omega_2 cs^2\omega_3^3 + 12\omega_5^2\omega_2 cs^2 + 6v_2^2\omega_2\omega_3^3 - 18\omega_5^2 cs^2\omega_3^2 + 12\omega_2 cs^2\omega_3^3 - 36\omega_5^2 v_2^2\omega_2\omega_3 + 3\omega_5^2 cs^2\omega_3^3 - 12v_2^2\omega_2\omega_3^2 + 12\omega_5^2 v_2^2\omega_3 - 30\omega_5\omega_2 cs^2\omega_3)\frac{\rho}{12\omega_5^2\omega_2\omega_3^3}$

$C^{(0),\text{CLBM2}}_{\text{D}_t\text{D}_x\text{D}_y^2 v_1} = (30\omega_5 v_2^2\omega_2\omega_3^2 - 2\omega_5^2\omega_2\omega_3^3 cs^2 - 18\omega_5^2\omega_3^2 cs^2 - 9\omega_5 v_2^2\omega_2\omega_3^3 + 12\omega_2\omega_3^2 cs^2 + 12\omega_5\omega_2\omega_3 cs^2 - 12\omega_5 v_2^2\omega_3^2 + 3\omega_5^2\omega_3^3 cs^2 + 22\omega_5^2\omega_2\omega_3^2 cs^2 + 24\omega_5^2 v_2^2\omega_2 + 6\omega_5 v_2^2\omega_3^3 - 6\omega_2\omega_3^3 cs^2 - 12\omega_5 v_2^2\omega_2\omega_3 + 9\omega_5\omega_2\omega_3^3 cs^2 - 6\omega_5\omega_3^3 cs^2 - 6\omega_5^2 v_2^2\omega_3^2 + 8\omega_5^2 v_2^2\omega_2\omega_3^2 - \omega_5^2 v_2^2\omega_3^3 - 30\omega_5\omega_2\omega_3 cs^2 + \omega_5^2 v_2^2\omega_2\omega_3^3 + 12\omega_5^2\omega_2 cs^2 + 12\omega_5\omega_3^2 cs^2 - 30\omega_5\omega_2\omega_3^2 cs^2 + 6v_2^2\omega_2\omega_3^3 - 36\omega_5^2 v_2^2\omega_2\omega_3 + 12\omega_5^2\omega_3 cs^2 - 12v_2^2\omega_2\omega_3^2 + 12\omega_5^2 v_2^2\omega_3)\frac{\rho}{12\omega_5^2\omega_2\omega_3^3}$

coefficient $C^{(0)}_{\text{D}_t\text{D}_x\text{D}_y^2 v_2}$ **at** $\frac{\partial^4 v_2}{\partial t\partial x_1\partial x_2^2}$:

$C^{(0),\text{SRT}}_{\text{D}_t\text{D}_x\text{D}_y^2 v_2} = (-24 + 36\omega - 14\omega^2 + \omega^3)\frac{\rho v_1 v_2}{6\omega^3}$

$C^{(0),\text{MRT1}}_{\text{D}_t\text{D}_x\text{D}_y^2 v_2} = (-12\omega_5\omega_3^3 - 12\omega_5\omega_2^2\omega_3 + \omega_5\omega_2^3\omega_3^3 - 10\omega_5\omega_3^3\omega_2^2 + 24\omega_5\omega_2^2\omega_3 - 7\omega_5\omega_2^2\omega_3^3 + 12\omega_5\omega_2^3\omega_3^2 - 6\omega_5\omega_2\omega_3^2 + 12\omega_2^2\omega_3^3 + 12\omega_5\omega_2\omega_3^3 - 6\omega_5\omega_3^3 - 6\omega_2^3\omega_3^3 - 6\omega_2^3\omega_3^2 + 3\omega_2^3\omega_3^3)\frac{\rho v_1 v_2}{6\omega_5\omega_2^3\omega_3^3}$

$C^{(0),\text{MRT2}}_{\text{D}_t\text{D}_x\text{D}_y^2 v_2} = C^{(0),\text{MRT1}}_{\text{D}_t\text{D}_x\text{D}_y^2 v_2}$

$C^{(0),\text{CLBM1}}_{\text{D}_t\text{D}_x\text{D}_y^2 v_2} = (-12\omega_2^3 + 12\omega_2\omega_3^3 - 6\omega_2\omega_3^2 - 6\omega_3^3 + 6\omega_2^3\omega_3^2 + 18\omega_2^3\omega_3 - 7\omega_2^2\omega_3^3 - 7\omega_2^3\omega_3^2 + \omega_2^3\omega_3^3)\frac{\rho v_1 v_2}{6\omega_2^3\omega_3^3}$

$C^{(0),\text{CLBM2}}_{\text{D}_t\text{D}_x\text{D}_y^2 v_2} = C^{(0),\text{CLBM1}}_{\text{D}_t\text{D}_x\text{D}_y^2 v_2}$

coefficient $C^{(0)}_{\text{D}_x^2\text{D}_y^2 \rho}$ **at** $\frac{\partial^4\rho}{\partial x_1^2\partial x_2^2}$:

$C^{(0),\text{SRT}}_{\text{D}_x^2\text{D}_y^2 \rho} = (36\omega v_2^2 cs^2 - 24v_2^2 cs^2 - \omega^3 cs^4 - 84v_1^2\omega v_2^2 + 36v_1^2\omega cs^2 + \omega^3 v_2^2 cs^2 + 10\omega^2 cs^4 - 24\omega cs^4 + 34v_1^2\omega^2 v_2^2 - 14v_1^2\omega^2 cs^2 + 56v_1^2 v_2^2 - 24v_1^2 cs^2 + 16cs^4 - 14\omega^2 v_2^2 cs^2 + v_1^2\omega^3 cs^2 - 3v_1^2\omega^3 v_2^2)\frac{1}{4\omega^3}$

$C^{(0),\text{MRT1}}_{\text{D}_x^2\text{D}_y^2 \rho} = (12\omega_4^2 v_1^2\omega_5^2\omega_2^2\omega_3^2 cs^2 + 10\omega_4^2\omega_5^2 v_2^2\omega_2\omega_3^3 cs^2 + 4\omega_4^2\omega_5^2\omega_2^2\omega_3^2 cs^4 - 3\omega_4\omega_5^2 v_2^2\omega_2^3\omega_3^3 cs^2 + 10\omega_4^2 v_1^2\omega_5 v_2^2\omega_2\omega_3^3\omega_3^2 - 38\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_2\omega_3^3 - 2\omega_4^2\omega_5 v_2^2\omega_2^3\omega_3^2 cs^2 + 4\omega_4^2\omega_5\omega_2^2\omega_3^2 cs^4 + 10\omega_4^2 v_1^2\omega_5\omega_3^3\omega_3^2 cs^2 + 2v_1^2\omega_5^2 v_2^2\omega_2^3\omega_3^2 - 2\omega_4^2\omega_5\omega_2\omega_3^3 cs^4 - 4\omega_4^2\omega_5^2 v_2^2\omega_2^3\omega_3^2 cs^2 - 2\omega_4 v_1^2\omega_5^2\omega_2^2\omega_3^3 cs^2 + 20\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_2\omega_3 - 3\omega_4^2 v_1^2\omega_5 v_2^2\omega_2^3\omega_3^3 - 2\omega_4\omega_5^2\omega_2^2\omega_3^2 cs^4 + \omega_4^2\omega_5 v_2^2\omega_2^3\omega_3^3 cs^2 - 4\omega_5^2 v_2^2\omega_2^3\omega_3^3 cs^2 + 2\omega_4\omega_5 v_2^2\omega_2^3\omega_3^3 cs^2 - 4\omega_4^2 v_1^2\omega_5 v_2^2\omega_2^2\omega_3^2 - \omega_4^2\omega_5^2\omega_2^3\omega_3^3 cs^4 - 4\omega_4^2 v_1^2\omega_5^2\omega_2^3\omega_3^2 cs^2 - 4\omega_4^2\omega_5^2 v_2^2\omega_2\omega_3^2 cs^2 + 10\omega_4^2 v_1^2\omega_5^2\omega_3\omega_3 cs^2 + 4\omega_4^2\omega_5^2\omega_2\omega_3^2 cs^4 - 4\omega_4^2 v_1^2\omega_5 v_2^2\omega_2^3\omega_3 + \omega_4\omega_5^2\omega_2^3\omega_3^3 cs^4 + 2\omega_4^2 v_1^2\omega_5 v_2^2\omega_2^2\omega_3^3 - 4\omega_4\omega_5^2 v_2^2\omega_2\omega_3^3 cs^2 + 4\omega_4 v_1^2\omega_5^2\omega_2^2\omega_3^2 cs^2 + 20\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_3^3 + \omega_4^2\omega_5^2\omega_2\omega_3^3 cs^2 + 4\omega_4^2\omega_5^2\omega_2\omega_2 cs^4 - 4v_1^2\omega_5^2 v_2^2\omega_2^2\omega_3^3 - 4\omega_4^2\omega_5^2 v_2^2\omega_2^3 cs^2 - 3\omega_4^2 v_1^2\omega_5\omega_2^3\omega_3^3 cs^2 - 2\omega_4^2\omega_5\omega_2^3\omega_3^3 cs^4 - 4\omega_4 v_1^2\omega_5^2\omega_2\omega_3^3 cs^2 + 20\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_3^3 cs^2 + 4\omega_4\omega_5^2\omega_2\omega_3^3 cs^4 - 2\omega_4^2\omega_5\omega_3^3 cs^4 - 4\omega_4^2 v_1^2 v_2^2\omega_3^3\omega_3^2 - 4\omega_4^2 v_1^2\omega_5\omega_2^3\omega_3^2 cs^2 + 12\omega_4^2\omega_5^2 v_2^2\omega_2\omega_3^2 cs^2 + 4\omega_4^2 v_1^2\omega_5\omega_2\omega_3^3 cs^2 + 10\omega_4 v_1^2\omega_5^2 v_2^2\omega_2^3\omega_3^3 + 20\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_2\omega_3 - 3\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_2^3\omega_3^3 - 4\omega_4^2 v_1^2\omega_3^3\omega_3^2 cs^2 + 10\omega_4\omega_5^2 v_2^2\omega_2^2\omega_3 cs^2 + 4\omega_4\omega_5 v_2^2\omega_2^2\omega_3^2 cs^2 - 4\omega_4 v_1^2\omega_5^2 v_2^2\omega_2\omega_3^2 - 8\omega_4^2 v_1^2\omega_5^2\omega_2^2\omega_3^2 cs^2 - 12\omega_4^2\omega_5^2\omega_2^2\omega_3^3 cs^4 + 2\omega_4^2 v_1^2 v_2^2\omega_3^3\omega_3^3 - 3\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_2^3\omega_3^3 - 8\omega_4^2\omega_5^2 v_2^2\omega_2^3\omega_3^3 cs^2 - 8\omega_4^2 v_1^2\omega_5^2\omega_2\omega_3^3 cs^2 - 4\omega_4^2 v_1^2\omega_5\omega_3^3\omega_3 cs^2 + 4\omega_4^2\omega_5^2 v_2^2\omega_2^3\omega_3\omega_3 cs^2 + 2\omega_4^2 v_1^2\omega_5\omega_2\omega_3^3 cs^2 + \omega_4^2\omega_5\omega_3^3\omega_3 cs^4 - 2\omega_4\omega_5^2\omega_2^2\omega_3^3 cs^4 + 20\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_3^2 - 36\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_2^2\omega_3^2 - 2\omega_4 v_1^2\omega_5^2\omega_3^2\omega_3 cs^2 + 4\omega_4^2\omega_5^2\omega_2^2\omega_3 cs^4 + \omega_4^2 v_1^2\omega_5^2\omega_3^2\omega_3^3 cs^2 - 4\omega_4^2 v_1^2\omega_5^2\omega_2\omega_3 cs^2 - 2\omega_4^2\omega_5\omega_2\omega_3 cs^4 + 2\omega_4 v_1^2\omega_5^2 v_2^2\omega_3^3\omega_3^2 - 2\omega_2^2\omega_5 v_2^2\omega_2\omega_3^3 cs^2 - 4\omega_4^2 v_1^2\omega_5^2\omega_3^2 cs^2 - 38\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_2^3\omega_3 + 2\omega_4^2 v_1^2\omega_2^3\omega_3^3 cs^2 - 4\omega_4\omega_5^2 v_2^2\omega_2^2\omega_3^2 cs^2 + 2\omega_5^2 v_2^2\omega_2^3\omega_3^3 cs^2 + 20\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_2\omega_3^3)\frac{1}{4\omega_4^2\omega_5^2\omega_2^3\omega_3^3}$

$C^{(0),\text{MRT2}}_{\text{D}_x^2\text{D}_y^2 \rho} = (-2\omega_4 v_1^2 cs^2\omega_5^2\omega_2^2\omega_3^3 - 8\omega_4^2 cs^2\omega_5^2 v_2^2\omega_2^2\omega_3 + \omega_4^2 cs^2\omega_5^2 v_2^2\omega_2\omega_3^3 + 10\omega_4^2 v_1^2\omega_5 v_2^2\omega_2^3\omega_3^2 - 8\omega_4^2 v_1^2 cs^2\omega_5^2\omega_2^3\omega_3^2 - 4\omega_4 cs^2\omega_5^2 v_2^2\omega_2^2\omega_3^2 - 38\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_2\omega_3^3 + \omega_4^2 cs^4\omega_5\omega_3^3\omega_3 - 4\omega_4^2 cs^2\omega_5^2 v_2^2\omega_3^2 - 4\omega_4^2 cs^2\omega_5^2 v_2^2\omega_3^3 + 4\omega_4 v_1^2 cs^2\omega_5^2\omega_2^2\omega_3^2 + 2v_1^2\omega_5^2 v_2^2\omega_2^3\omega_3^3 - 2\omega_4 cs^4\omega_5\omega_3^2\omega_3^2 + 20\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_2\omega_3 + 10\omega_4 cs^2\omega_5^2 v_2^2\omega_2^2\omega_3^2 - 4\omega_4^2 v_1^2 cs^2\omega_5^2\omega_2\omega_3 - 3\omega_4^2 v_1^2\omega_5 v_2^2\omega_2^3\omega_3^3 + \omega_4^2 v_1^2 cs^2\omega_5^2\omega_3^3\omega_3^3 + 4\omega_4^2 cs^4\omega_5^2\omega_2\omega_3^2 - 2\omega_4^2 cs^4\omega_5\omega_2\omega_3^3 + 12\omega_4^2 v_1^2 cs^2\omega_5^2\omega_2^2\omega_3^2 - 4\omega_4^2 v_1^2\omega_5 v_2^2\omega_2\omega_3^3 + 2\omega_4 cs^2\omega_5^2 v_2^2\omega_2^3\omega_3^2 + 4\omega_4^2 cs^2\omega_5^2 v_2^2\omega_2\omega_3^3 + \omega_4 v_1^2 cs^2\omega_5^2\omega_3^3\omega_3^3 - 8\omega_4^2 cs^2\omega_5^2 v_2^2\omega_2^2\omega_3 + 10\omega_4^2 v_1^2 cs^2\omega_5^2\omega_3^3\omega_3 - 4\omega_4^2 v_1^2\omega_5 v_2^2\omega_2\omega_3 - 3\omega_4 cs^2\omega_5^2 v_2^2\omega_2^3\omega_3^3 - 4\omega_4^2 v_1^2 cs^2\omega_5^2\omega_2^3\omega_3 + 2\omega_4^2 v_1^2\omega_5 v_2^2\omega_2\omega_3^3 + 4\omega_4^2 cs^4\omega_5\omega_2\omega_3^2 - 2\omega_4 cs^4\omega_5\omega_2\omega_3 + 12\omega_4 cs^2\omega_5^2 v_2^2\omega_2\omega_3^2 + 20\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_3 - 4v_1^2\omega_5^2 v_2^2\omega_2^2\omega_3 - 2\omega_4 v_1^2 cs^2\omega_5^2\omega_2^3\omega_3 - 4\omega_4 v_1^2\omega_5^2 v_2^2\omega_2\omega_3 + 4\omega_4^2 v_1^2 cs^2\omega_5^2\omega_2\omega_3 - 4\omega_4^2 v_1^2 cs^2\omega_5\omega_2\omega_3 + 20\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_2\omega_3 + 4\omega_4^2 cs^4\omega_5^2\omega_2^3\omega_3 - 2\omega_4^2 cs^4\omega_5\omega_2^3\omega_3 + 2cs^2\omega_5^2 v_2^2\omega_2^3\omega_3 + 4\omega_4\omega_5^2 v_2^2\omega_2^2\omega_3 - 4\omega_4^2 cs^2\omega_5^2 v_2^2\omega_2\omega_3 - 4\omega_4^2 v_1^2 v_2^2\omega_3^3\omega_3 + 10\omega_4 v_1^2\omega_5^2 v_2^2\omega_2^3\omega_3 + 2\omega_4^2 v_1^2 cs^2\omega_5^2\omega_3^3 - 4\omega_4^2 v_1^2 cs^2\omega_5^2\omega_3 + \omega_4^2 cs^2\omega_5 v_2^2\omega_2^3\omega_3 + 20\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_3 - 12\omega_4^2 cs^4\omega_5^2\omega_2^2\omega_3 - 3\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_3^3\omega_3 + 2\omega_4^2 v_1^2 cs^2\omega_5\omega_2\omega_3 - 4\omega_4 v_1^2 cs^2\omega_5 v_2^2\omega_2\omega_3 - 8\omega_4^2 v_1^2 cs^2\omega_5^2\omega_2\omega_3 - 4\omega_4^2 v_1^2 cs^2\omega_3^2\omega_3 - 2\omega_4^2 cs^2\omega_5 v_2^2\omega_2\omega_3 - 4\omega_4 v_1^2\omega_5^2 v_2^2\omega_2^2 + 2\omega_4 v_1^2 v_2^2\omega_3^3\omega_3 - 2\omega_4 cs^4\omega_5^2\omega_2^2\omega_3 + 10\omega_4^2 cs^2\omega_5^2 v_2^2\omega_2\omega_3 - 3\omega_4 v_1^2\omega_5^2 v_2^2\omega_2^3\omega_3 - 2\omega_4^2 cs^2\omega_5 v_2^2\omega_2^2\omega_3 - 2\omega_4 cs^4\omega_5^2\omega_3^3\omega_3 - \omega_4^2 cs^4\omega_5^2\omega_3^2\omega_3 + 20\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_3 - 36\omega_4^2 v_1^2\omega_5^2 v_2^2\omega_2^2 - 4cs^2\omega_5^2 v_2^2\omega_2\omega_3 + 4\omega_4^2 cs^4\omega_5^2\omega_2^2\omega_3 + 10\omega_4^2 v_1^2 cs^2\omega_5\omega_2\omega_3 - 4\omega_4 cs^2\omega_5^2 v_2^2\omega_2\omega_3 + \omega_4 cs^4\omega_5^2\omega_2^2\omega_3 + 4\omega_4^2 cs^2\omega_5 v_2^2\omega_2^2\omega_3 + 2\omega_4 v_1^2\omega_5^2 v_2^2\omega_2^2\omega_3 -$

$3\omega_4^2 v_1^2 cs^2 \omega_5 \omega_2^3 \omega_3^3 - 38\omega_4^2 v_1^2 \omega_5^2 v_2^2 \omega_2^3 \omega_3 + 20\omega_4^2 v_1^2 \omega_5^2 v_2^2 \omega_2^2 \omega_3^3 + 4\omega_4^2 cs^4 \omega_5^2 \omega_2^3 \omega_3^3) \frac{1}{4\omega_4^2 \omega_5^2 \omega_2^3 \omega_3^3}$

$C_{D_x^2 D_y^2 \rho}^{(0),\text{CLBM1}} =$

$(-2\omega_4^2 \omega_5 \omega_3^2 cs^4 \omega_2^2 + 4\omega_4^2 \omega_5^2 \omega_2^2 cs^4 \omega_3^3 - 4\omega_4 \omega_5^2 v_2^2 \omega_2^2 cs^2 \omega_3^2 - 10\omega_4^2 v_1^2 \omega_5 v_2^2 \omega_2^3 \omega_3^2 + 4\omega_4 \omega_5^3 \omega_2^2 cs^4 \omega_3^2 - 14\omega_4^2 v_1^2 \omega_5^2 v_2 \omega_2 \omega_3^3 - \omega_4 v_1^2 \omega_5^2 \omega_3^2 cs^2 \omega_3^2 + \omega_4^2 \omega_5 \omega_3^2 cs^4 \omega_3^3 - 12\omega_4^2 \omega_5^2 \omega_2^2 cs^4 \omega_3^3 + 10\omega_4^2 v_1^2 \omega_5^2 \omega_2^3 cs^2 \omega_3 - 2v_1^2 \omega_5^2 v_2^2 \omega_2^3 \omega_3^3 + 2\omega_4 v_1^2 \omega_5^2 \omega_3^2 cs^2 \omega_2^2 + 12\omega_4^2 v_1^2 \omega_5^2 v_2^2 \omega_2^2 \omega_3^3 - 2\omega_4 \omega_5^2 \omega_2^2 cs^4 \omega_3^3 + 3\omega_4^2 v_1^2 \omega_5 v_2^2 \omega_2^3 \omega_3^3 + 10\omega_4 \omega_5^2 v_2^2 \omega_2^2 cs^2 \omega_3^3 - 4\omega_4^2 \omega_5 v_2^2 \omega_2^2 cs^2 \omega_3^3 + 4\omega_4^2 v_1^2 \omega_5 v_2^2 \omega_2^2 \omega_3^3 - 4\omega_4^2 v_1^2 \omega_2^2 cs^2 \omega_3^2 - 8\omega_4^2 v_1^2 \omega_5^2 \omega_3^2 cs^2 \omega_3^2 + 4\omega_4^2 \omega_5^2 \omega_2^2 cs^4 \omega_3 + 2\omega_4^2 v_1^2 \omega_5 \omega_2^2 cs^2 \omega_3^2 - 8\omega_4^2 \omega_5^2 v_2^2 \omega_2^2 cs^2 \omega_3^2 + 4\omega_4^2 v_1^2 \omega_5 v_2^2 \omega_2^3 \omega_3 + 2\omega_5^2 v_2^2 \omega_2^3 cs^2 \omega_3^2 + 2\omega_4^2 v_1^2 \omega_2^3 cs^2 \omega_3^2 - 2\omega_4^2 v_1^2 \omega_5 v_2^2 \omega_2^2 \omega_3^3 + 2\omega_4 \omega_5 v_2^2 \omega_2^2 cs^2 \omega_3^3 + 4\omega_4^2 v_1^2 \omega_5^2 \omega_2^3 \omega_3^3 + 8\omega_4^2 \omega_5^2 v_2^2 \omega_2^2 cs^2 \omega_3^3 + 4v_1^2 \omega_5^2 v_2^2 \omega_2^3 \omega_3^3 + \omega_4^2 v_1^2 \omega_5^2 \omega_3^2 cs^2 \omega_3^3 - 4\omega_4^2 v_1^2 \omega_5 \omega_2^2 cs^2 \omega_3^2 + 4\omega_4 v_1^2 \omega_5^2 v_2^2 \omega_2 \omega_3^3 - 4\omega_4 v_1^2 \omega_5^2 \omega_2^2 cs^2 \omega_3^2 + 14\omega_4^2 v_1^2 \omega_5^2 v_2^2 \omega_2^3 \omega_3^3 - 3\omega_4 \omega_5^2 v_2^2 \omega_2^3 cs^2 \omega_3^3 + \omega_4 \omega_5^2 \omega_3^2 cs^4 \omega_3^3 - 4\omega_4^2 \omega_5^2 \omega_3^2 cs^2 \omega_3 - 2\omega_4 \omega_5 \omega_3^2 cs^4 \omega_3^3 + 10\omega_4^2 \omega_5^2 v_2^2 \omega_2 \omega_2 cs^2 \omega_3^3 + 4\omega_4^2 v_1^2 v_2^2 \omega_2^3 \omega_3^3 - 10\omega_4 v_1^2 \omega_5^2 v_2^2 \omega_2^2 \omega_3^3 + 12\omega_4^2 v_1^2 \omega_5^2 v_2^2 \omega_2 \omega_3^3 - 2\omega_4 \omega_5^2 \omega_3 cs^4 \omega_3^2 - 3\omega_4^2 v_1^2 \omega_5^2 v_2^2 \omega_2^3 \omega_3^3 + 2\omega_4 \omega_5^2 v_2^2 \omega_2^3 cs^2 \omega_3^2 + 2\omega_4 v_1^2 \omega_5^2 \omega_2^2 cs^2 \omega_3^3 + 4\omega_4 v_1^2 \omega_5^2 v_2^2 \omega_2^2 \omega_3^2 - 4\omega_4^2 \omega_5^2 v_2^2 \omega_2 \omega_2 cs^2 \omega_3^2 - 2\omega_4^2 v_1^2 v_2^2 \omega_2^3 \omega_3^3 - 4\omega_4^2 v_1^2 \omega_5^2 \omega_2^3 cs^2 - \omega_4^2 \omega_5^2 \omega_3^2 cs^4 \omega_3^3 - 4\omega_4^2 v_1^2 \omega_5 \omega_3^2 cs^2 \omega_3 + 4\omega_4^2 \omega_5 \omega_2^2 cs^4 \omega_3^2 + 3\omega_4 v_1^2 \omega_5^2 v_2^2 \omega_2^3 \omega_3^3 - 2\omega_4^2 \omega_5^2 v_2^2 \omega_2^3 cs^2 \omega_3^2 - 2\omega_4^2 \omega_5^2 \omega_2 cs^4 \omega_3^3 + 10\omega_4^2 v_1^2 \omega_5 \omega_3^2 cs^2 \omega_3^2 - 2\omega_4^2 v_1^2 \omega_5^2 \omega_2^2 cs^2 \omega_3^3 - 4\omega_5^2 v_2^2 \omega_2^2 cs^2 \omega_3^3 + 4\omega_4^2 v_1^2 \omega_5^2 v_2^2 \omega_2^2 - 28\omega_4^2 v_1^2 \omega_5^2 v_2^2 \omega_2^2 \omega_3^3 - \omega_4^2 \omega_5 v_2^2 \omega_2^3 cs^2 \omega_3^3 - 3\omega_4^2 v_1^2 \omega_5 \omega_3^2 cs^2 \omega_3^3 + 8\omega_4^2 v_1^2 \omega_5^2 \omega_2^2 cs^2 \omega_3^3 - 2\omega_4^2 \omega_5^2 \omega_3 cs^4 \omega_3 + 4\omega_4^2 \omega_5 \omega_2 cs^4 \omega_3^3 - 2\omega_4 v_1^2 \omega_5^2 v_2^2 \omega_2^3 \omega_3^3 - 4\omega_4^2 \omega_5^2 v_2 cs^2 \omega_3^3 + \omega_4^2 \omega_5 v_2^2 \omega_2^3 cs^2 \omega_3^3 + 2\omega_4^2 \omega_5 v_2^2 \omega_2^2 cs^2 \omega_3^2 - 4\omega_4 \omega_5^2 v_2^2 \omega_2 cs^2 \omega_3^3 - 14\omega_4^2 v_1^2 \omega_5^2 v_2^2 \omega_2^3 \omega_3 + 14\omega_4^2 v_1^2 \omega_5^2 v_2^2 \omega_2^2 \omega_3) \frac{1}{4\omega_4^2 \omega_5^2 \omega_2^3 \omega_3^3}$

$C_{D_x^2 D_y^2 \rho}^{(0),\text{CLBM2}} =$

$(-2\omega_4^2 \omega_5^2 v_2^2 \omega_2^3 \omega_3^2 cs^2 - 2\omega_4^2 \omega_5^2 \omega_2 \omega_3^3 cs^4 + 10\omega_4^2 v_1^2 \omega_5 \omega_2^3 \omega_3^2 cs^2 + 4\omega_4^2 \omega_5 \omega_2^2 \omega_3^2 cs^4 - 10\omega_4^2 v_1^2 \omega_5 v_2^2 \omega_2^3 \omega_3^2 - 2\omega_4 \omega_5^2 \omega_3^3 \omega_3^2 cs^4 - 14\omega_4^2 v_1^2 \omega_5^2 v_2^2 \omega_2 \omega_3^3 + 2\omega_4 v_1^2 \omega_5^2 \omega_2^3 \omega_3^3 cs^2 + 4\omega_4^2 \omega_5^2 \omega_2^3 \omega_3^2 cs^4 + 8\omega_4^2 v_1^2 \omega_5^2 \omega_2^2 \omega_3^2 cs^2 + 10\omega_4^2 \omega_5^2 v_2^2 \omega_2 \omega_3^3 cs^2 - 2v_1^2 \omega_5^2 v_2^2 \omega_2^3 \omega_3^3 + 12\omega_4^2 v_1^2 \omega_5^2 v_2^2 \omega_2 \omega_2 \omega_3^3 + 2\omega_4^2 \omega_5 v_2^2 \omega_2^3 \omega_3^2 cs^2 - 3\omega_4 \omega_5^2 v_2^2 \omega_2^3 \omega_3^2 cs^2 + 3\omega_4^2 v_1^2 \omega_5 v_2^2 \omega_2^3 \omega_3^3 - 4\omega_4 \omega_5^2 v_2^2 \omega_2 \omega_3^3 cs^2 - 4\omega_4 v_1^2 \omega_5^2 \omega_2^2 \omega_3^2 cs^2 + 4\omega_4^2 v_1^2 \omega_5 v_2^2 \omega_2^2 \omega_3^3 + \omega_4 \omega_5^2 \omega_3^3 \omega_3^3 cs^4 - 2\omega_4^2 \omega_5 \omega_2^2 \omega_3^2 cs^4 - 3\omega_4^2 v_1^2 \omega_5 \omega_2^3 \omega_3^3 cs^2 - 4\omega_4^2 \omega_5^2 v_2^2 \omega_2^3 \omega_3^2 cs^2 + 4\omega_4^2 \omega_5^2 \omega_2 \omega_2 \omega_3^2 cs^4 + \omega_4^2 \omega_5^2 v_2^2 \omega_2^3 \omega_3^3 cs^2 + 2\omega_4 \omega_5^2 v_2^2 \omega_2^3 \omega_3^2 cs^2 - 4\omega_5^2 v_2^2 \omega_2^3 \omega_3^3 cs^2 + 4\omega_4^2 v_1^2 \omega_5 v_2^2 \omega_2^3 \omega_3 - 2\omega_4^2 v_1^2 \omega_5 v_2^2 \omega_2^2 \omega_3 - \omega_4^2 \omega_5 v_2^2 \omega_2^3 \omega_3^3 cs^2 + 4\omega_4^2 v_1^2 \omega_5^2 v_2^3 \omega_3 + 4\omega_4^2 \omega_5^2 \omega_2 \omega_2 cs^4 + 10\omega_4^2 v_1^2 \omega_5^2 \omega_2^3 \omega_3 cs^2 + 4v_1^2 \omega_5^2 v_2^2 \omega_2^3 \omega_3 + 4\omega_4 v_1^2 \omega_5^2 v_2^2 \omega_2 \omega_3^3 - 2\omega_4^2 v_1^2 \omega_5^2 \omega_2^2 \omega_3^3 cs^2 - 4\omega_4^2 \omega_5^2 v_2^2 \omega_2 \omega_2 \omega_3^3 cs^2 - \omega_4^2 \omega_5 \omega_3^3 \omega_3^3 cs^4 - 4\omega_4 \omega_5 v_2^2 \omega_2^2 \omega_3^2 cs^2 + 14\omega_4^2 v_1^2 \omega_5^2 v_2^2 \omega_2^3 \omega_3 - 4\omega_4^2 v_1^2 \omega_2^3 \omega_3^2 cs^2 + 10\omega_4 \omega_5^2 \omega_2^2 \omega_2^2 \omega_3^3 cs^2 - 12\omega_4^2 \omega_5^2 \omega_2^2 \omega_3^2 cs^4 - 8\omega_4^2 v_1^2 \omega_5^2 \omega_2^3 \omega_3^2 cs^2 + 4\omega_4^2 v_1^2 v_2^2 \omega_2^3 \omega_3^3 - 10\omega_4 v_1^2 \omega_5^2 v_2^2 \omega_2^2 \omega_3^3 + 4\omega_4 \omega_5^2 \omega_2^2 \omega_3 cs^4 + 12\omega_4^2 v_1^2 \omega_5^2 v_2^2 \omega_2 \omega_3 - 3\omega_4^2 v_1^2 \omega_5^2 v_2^2 \omega_2^3 \omega_3^3 - \omega_4 v_1^2 \omega_5^2 \omega_2^3 \omega_3^3 cs^2 + 8\omega_4^2 \omega_5^2 \omega_2^2 \omega_2^3 cs^2 + 4\omega_4 v_1^2 \omega_5^2 v_2^2 \omega_2^2 \omega_3^2 - 2\omega_4^2 v_1^2 v_2^2 \omega_2^3 \omega_3^3 - 4\omega_4^2 v_1^2 \omega_5 \omega_2^3 \omega_3^2 cs^2 - 2\omega_4^2 \omega_5 \omega_2^3 \omega_3^2 cs^4 + 3\omega_4 v_1^2 \omega_5^2 v_2^2 \omega_2^3 \omega_3^3 - 2\omega_4^2 \omega_5 \omega_2^3 \omega_3^3 cs^4 - 4\omega_4^2 v_1^2 \omega_5^2 \omega_2 cs^2 + \omega_4^2 v_1^2 \omega_5^2 \omega_2^3 \omega_3^3 cs^2 + 4\omega_4^2 \omega_2^2 \omega_2^3 cs^4 + 4\omega_4^2 v_1^2 \omega_5^2 v_2^2 \omega_2^3 - 4\omega_4^2 v_1^2 \omega_5^2 \omega_2 cs^2 - 28\omega_4^2 v_1^2 \omega_5^2 v_2^2 \omega_2^2 \omega_3^3 + 2\omega_4^2 v_1^2 \omega_2^3 \omega_3^3 cs^2 + 2\omega_5^2 v_2^2 \omega_2^3 \omega_3^3 cs^2 - 4\omega_4 \omega_5^2 v_2^2 \omega_2^2 \omega_3^2 cs^2 + 2\omega_4^2 \omega_5 v_2^2 \omega_2^2 \omega_3^3 cs^2 + \omega_4^2 \omega_5 \omega_2^3 \omega_3^3 cs^4 + 2\omega_4^2 v_1^2 \omega_5 \omega_2^2 \omega_3^3 cs^2 - 8\omega_4^2 \omega_5^2 v_2^2 \omega_2^2 \omega_3^3 cs^2 - 4\omega_4^2 v_1^2 \omega_5 \omega_2^3 \omega_3 cs^2 - 2\omega_4 v_1^2 \omega_5^2 v_2^2 \omega_2^3 \omega_3^2 + 2\omega_4 v_1^2 \omega_5^2 \omega_2^2 \omega_3^3 cs^2 - 2\omega_4 \omega_5^2 \omega_2^2 \omega_3^3 cs^4 - 14\omega_4^2 v_1^2 \omega_5^2 v_2^2 \omega_2^2 \omega_3 + 14\omega_4^2 v_1^2 \omega_5^2 v_2^2 \omega_2^2 \omega_3) \frac{1}{4\omega_4^2 \omega_5^2 \omega_2^3 \omega_3}$

coefficient $C_{D_x^2 D_y^2 v_1}^{(0)}$ **at** $\frac{\partial^4 v_1}{\partial x_1^2 \partial x_2^2}$:

$C_{D_x^2 D_y^2 v_1}^{(0),\text{SRT}} = (-48cs^2 + 84v_2^2 - 126\omega v_2^2 + 72\omega cs^2 + 50\omega^2 v_2^2 - 26\omega^2 cs^2 + \omega^3 cs^2 - 4\omega^3 v_2^2) \frac{\rho v_1}{12\omega^3}$

$C_{D_x^2 D_y^2 v_1}^{(0),\text{MRT1}} = (48\omega_5^2 v_2^2 \omega_2^3 + 24\omega_5^2 v_2^2 \omega_2^2 \omega_3 - 4\omega_5^2 v_2^2 \omega_2^3 \omega_3 - 14\omega_5^2 \omega_2^3 \omega_3^2 cs^2 - 12\omega_5^2 \omega_2^3 cs^2 + 34\omega_5^2 v_2^2 \omega_2^3 \omega_3^2 + 6\omega_2^3 \omega_3^3 cs^2 + 6\omega_5^2 \omega_2 \omega_3^3 cs^2 + \omega_5^2 \omega_2^3 \omega_3^3 cs^2 - 12v_2^2 \omega_2^3 \omega_3^3 - 78\omega_5^2 v_2^2 \omega_2^3 \omega_3 + 22\omega_5^2 v_2^2 \omega_2^2 \omega_3^3 - 12\omega_5 \omega_2 \omega_3^3 cs^2 - 12\omega_5 \omega_2^3 \omega_3 cs^2 + 6v_2^2 \omega_2^3 \omega_3^3 - 48\omega_5^2 v_2^2 \omega_2^2 \omega_3^3 - 12\omega_2^3 \omega_3^3 cs^2 + 24\omega_5 \omega_2^3 \omega_3^3 cs^2 + 24\omega_5^2 v_2^2 \omega_2 \omega_3^3 - 6\omega_5 v_2^2 \omega_2^3 \omega_3^3 + 12\omega_5^2 v_2^2 \omega_3^3 + 12\omega_5^2 \omega_2^2 \omega_3^3 cs^2 + 24\omega_5 v_2^2 \omega_2^3 \omega_3^3 - 30\omega_5^2 v_2^2 \omega_2 \omega_3^3 - 12\omega_5 v_2^2 \omega_2^3 \omega_3 - 6\omega_5 \omega_2^3 \omega_3^3 cs^2 - 6\omega_5^2 \omega_2 \omega_3^3 cs^2 + 24\omega_5^2 \omega_2 \omega_3 cs^2) \frac{\rho v_1}{12\omega_5^2 \omega_2^3 \omega_3^3}$

$C_{D_x^2 D_y^2 v_1}^{(0),\text{MRT2}} = (48\omega_5^2 v_2^2 \omega_2^3 + 24\omega_5^2 v_2^2 \omega_2^2 \omega_3 - 4\omega_5^2 v_2^2 \omega_2^3 \omega_3 - 12cs^2 \omega_5^2 \omega_2 \omega_3 - 12cs^2 \omega_5 \omega_2^3 \omega_3 + 6cs^2 \omega_5^2 \omega_2 \omega_3 + 34\omega_5^2 v_2^2 \omega_2^3 \omega_3^2 - 12v_2^2 \omega_2^3 \omega_3^3 + 6cs^2 \omega_2^3 \omega_3^3 - 12cs^2 \omega_5^2 \omega_2 - 6cs^2 \omega_5 \omega_2^3 \omega_3 - 78\omega_5^2 v_2^2 \omega_2^3 \omega_3 + 22\omega_5^2 v_2^2 \omega_2^2 \omega_3^3 - 12cs^2 \omega_2^3 \omega_2^3 + 6v_2^2 \omega_2^3 \omega_3^3 - 48\omega_5^2 v_2^2 \omega_2^2 \omega_3^3 + 24cs^2 \omega_5 \omega_2^3 \omega_3^3 + 24\omega_5^2 v_2^2 \omega_2 \omega_3^3 + cs^2 \omega_5^2 \omega_2^3 \omega_3^3 - 6\omega_5 v_2^2 \omega_2^3 \omega_3^3 + 12\omega_5^2 v_2^2 \omega_3^3 - 14cs^2 \omega_5^2 \omega_2^3 \omega_3^3 + 24\omega_5 v_2^2 \omega_2^3 \omega_3^3 - 30\omega_5^2 v_2^2 \omega_2 \omega_3^3 - 12\omega_5 v_2^2 \omega_2^3 \omega_3 + 24cs^2 \omega_5^2 \omega_2^3 \omega_3 - 6cs^2 \omega_5^2 \omega_2^3 \omega_3 + 12cs^2 \omega_5^2 \omega_2^3) \frac{\rho v_1}{12\omega_5^2 \omega_2^3 \omega_3^3}$

$C_{D_x^2 D_y^2 v_1}^{(0),\text{CLBM1}} = (24\omega_5^2 v_2^2 \omega_2^2 \omega_3 - 4\omega_5^2 v_2^2 \omega_2^3 \omega_3^3 - 12\omega_5 \omega_2^3 \omega_3^2 cs^2 \omega_3 + 22\omega_5^2 v_2^2 \omega_2^3 \omega_3^2 + 12\omega_5^2 \omega_2^2 cs^2 \omega_3^2 - 6\omega_5 \omega_2^3 cs^2 \omega_3^3 + 12v_2^2 \omega_2^3 \omega_3^3 - 18\omega_5^2 v_2^2 \omega_2^3 \omega_3 + 22\omega_5^2 v_2^2 \omega_2^2 \omega_3^3 - 6v_2^2 \omega_2^3 \omega_3^3 - 12\omega_5^2 \omega_2^3 cs^2 - 6\omega_5^2 \omega_2^2 cs^2 \omega_3^3 + 24\omega_5 \omega_2^3 cs^2 \omega_3^3 - 48\omega_5^2 v_2^2 \omega_2^2 \omega_3^3 + 24\omega_5^2 \omega_2^3 cs^2 \omega_3 - 12\omega_5 \omega_2 cs^2 \omega_3^3 + 24\omega_5^2 v_2^2 \omega_2 \omega_3^3 - 12\omega_2^3 cs^2 \omega_3^3 + 6\omega_5 v_2^2 \omega_2^3 \omega_3^3 + 12\omega_5^2 v_2^2 \omega_3^3 + 6\omega_5 \omega_2 cs^2 \omega_3^3 - 24\omega_5 v_2^2 \omega_2^3 \omega_3^3 + 6\omega_5^2 cs^2 \omega_3^3 - 30\omega_5^2 v_2^2 \omega_2 \omega_3^3 + 12\omega_5 v_2^2 \omega_2^3 \omega_3 + \omega_5^2 \omega_2^3 cs^2 \omega_3^3 - 14\omega_5^2 \omega_2 cs^2 \omega_3^2) \frac{\rho v_1}{12\omega_5^2 \omega_2^3 \omega_3^3}$

$C_{D_x^2 D_y^2 v_1}^{(0),\text{CLBM2}} = (24\omega_5^2 v_2^2 \omega_2^2 \omega_3 - 12\omega_5^2 \omega_2^2 cs^2 + 6\omega_2^3 \omega_3^3 cs^2 - 4\omega_5^2 v_2^2 \omega_2^3 \omega_3^3 + 6\omega_5^2 \omega_2 \omega_3^3 cs^2 + 22\omega_5^2 v_2^2 \omega_2^3 \omega_3^2 - 14\omega_5^2 \omega_2^3 \omega_3^3 cs^2 + 12v_2^2 \omega_2^3 \omega_3^3 - 12\omega_5 \omega_2 \omega_3^3 cs^2 - 12\omega_5 \omega_2^3 \omega_3 cs^2 - 18\omega_5^2 v_2^2 \omega_2^3 \omega_3 + 22\omega_5^2 v_2^2 \omega_2^2 \omega_3^3 - 12\omega_2^3 \omega_3^3 cs^2 + \omega_5^2 \omega_2^3 \omega_3^3 cs^2 - 6v_2^2 \omega_2^3 \omega_3^3 - 48\omega_5^2 v_2^2 \omega_2^2 \omega_3^3 + 12\omega_5^2 \omega_2^2 \omega_3^3 cs^2 + 24\omega_5^2 v_2^2 \omega_2 \omega_3^3 + 6\omega_5 v_2^2 \omega_2^3 \omega_3^3 + 12\omega_5^2 v_2^2 \omega_3^3 + 24\omega_5 \omega_2^3 \omega_3^3 cs^2 - 24\omega_5 v_2^2 \omega_2^3 \omega_3^3 - 30\omega_5^2 v_2^2 \omega_2 \omega_3^3 + 12\omega_5 v_2^2 \omega_2^3 \omega_3 + 24\omega_5^2 \omega_2 \omega_3 cs^2 - 6\omega_5^2 \omega_2 \omega_3^3 cs^2 - 6\omega_5 \omega_2^3 \omega_3^3 cs^2) \frac{\rho v_1}{12\omega_5^2 \omega_2^3 \omega_3^3}$

coefficient $C_{D_x^2 D_y^2 v_2}^{(0)}$ **at** $\frac{\partial^4 v_2}{\partial x_1^2 \partial x_2^2}$:

$C_{D_x^2 D_y^2 v_2}^{(0),\text{SRT}} = (-48cs^2 + 72\omega cs^2 + 50v_1^2 \omega^2 - 4v_1^2 \omega^3 - 26\omega^2 cs^2 + \omega^3 cs^2 - 126v_1^2 \omega + 84v_1^2) \frac{\rho v_2}{12\omega^3}$

$C_{D_x^2 D_y^2 v_2}^{(0),\text{MRT1}} =$

$(-6\omega_4^2 \omega_2^3 \omega_3^2 cs^2 + 24\omega_4^2 v_1^2 \omega_2 \omega_2 \omega_3^2 - 6\omega_4 v_1^2 \omega_2^3 \omega_3 + 6\omega_2^3 \omega_3^3 cs^2 + 24\omega_4^2 \omega_2 \omega_3^3 cs^2 - 78\omega_4^2 v_1^2 \omega_2 \omega_3^3 + 12\omega_4^2 v_1^2 \omega_3^2 - 12\omega_4^2 \omega_2^3 \omega_3 cs^2 + 24\omega_4 v_1^2 \omega_2^3 \omega_3^3 +$

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$$\omega_4^2\omega_2^3\omega_3^3 cs^2 + 24\omega_4\omega_2^3\omega_3^3 cs^2 + 24\omega_4^2 v_1^2\omega_2^3\omega_3 - 4\omega_4^2 v_1^2\omega_2^3\omega_3^3 - 12\omega_2^3\omega_3^3 cs^2 + 12\omega_4^2\omega_2^3\omega_3^2 cs^2 - 12\omega_4 v_1^2\omega_2\omega_3^3 + 22\omega_4^2 v_1^2\omega_2\omega_3^2 - 12\omega_4\omega_2\omega_3^3 cs^2 - 12v_1^2\omega_2^2\omega_3^3 -$$
$$6\omega_4\omega_2^3\omega_3^3 cs^2 - 30\omega_4^2 v_1^2\omega_2^3\omega_3 + 34\omega_4^2 v_1^2\omega_2^2\omega_3^3 + 48\omega_4^2 v_1^2\omega_3^3 + 6v_1^2\omega_2^3\omega_3 - 12\omega_4^2\omega_3^3 cs^2 - 48\omega_4^2 v_1^2\omega_2^2\omega_3 + 6\omega_4^2\omega_2^3\omega_3 cs^2 - 14\omega_4^2\omega_2^3\omega_3 cs^2)\frac{\rho v_2}{12\omega_4^2\omega_2^3\omega_3^3}$$

$C_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2}^{(0),\mathrm{MRT2}} =$
$$(-6\omega_4^2 cs^2\omega_2^3\omega_3^2 - 12\omega_4 cs^2\omega_2\omega_3^3 - 12cs^2\omega_2^3\omega_3^3 + 24\omega_4^2 v_1^2\omega_2\omega_3^2 - 6\omega_4 v_1^2\omega_3^3\omega_3^3 - 12\omega_4^2 cs^2\omega_2^3\omega_3 + \omega_4^2 cs^2\omega_2^3\omega_3^3 - 12\omega_4^2 cs^2\omega_3^3 - 78\omega_4^2 v_1^2\omega_2\omega_3^3 + 12\omega_4^2 v_1^2\omega_2^3 +$$
$$24\omega_4 v_1^2\omega_2^3\omega_3 + 6cs^2\omega_2^3\omega_3^3 + 12\omega_4^2 cs^2\omega_2^3\omega_3^2 + 6\omega_4^2 cs^2\omega_2^3\omega_3 - 14\omega_4^2 cs^2\omega_2^3\omega_3 + 24\omega_4^2 v_1^2\omega_2^3\omega_3 - 4\omega_4^2 v_1^2\omega_3^3\omega_3^3 + 24\omega_4^2 cs^2\omega_2\omega_3^3 - 12\omega_4 v_1^2\omega_2\omega_3^3 +$$
$$22\omega_4^2 v_1^2\omega_2^3\omega_3^2 - 6\omega_4 cs^2\omega_2^3\omega_3^3 - 12 v_1^2\omega_2^3\omega_3 - 30\omega_4^2 v_1^2\omega_2^3\omega_3 + 34\omega_4^2 v_1^2\omega_2^2\omega_3^3 + 48\omega_4^2 v_1^2\omega_3^3 + 6v_1^2\omega_2^3\omega_3 + 24\omega_4 cs^2\omega_2^3\omega_3 - 48\omega_4^2 v_1^2\omega_2^2\omega_3)\frac{\rho v_2}{12\omega_4^2\omega_2^3\omega_3^3}$$

$C_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2}^{(0),\mathrm{CLBM1}} =$
$$(-12\omega_2^2 cs^2\omega_3^3 + 24\omega_4 v_1^2\omega_2\omega_3^2 + 6v_1^2\omega_2^3\omega_3^3 - 12\omega_4\omega_2 cs^2\omega_3^3 - 18\omega_4^2 v_1^2\omega_2\omega_3^3 - 12\omega_4^2\omega_2^2 cs^2\omega_3 + 12\omega_4^2 v_1^2\omega_2^3 - 24\omega_4 v_1^2\omega_2^2\omega_3^3 - 6\omega_4\omega_2^2 cs^2\omega_3^3 +$$
$$12\omega_4^2\omega_2^2 cs^2\omega_3^2 - 14\omega_4^2\omega_2^2 cs^2\omega_3^3 - 12\omega_4^2 cs^2\omega_3^3 + 24\omega_4^2 v_1^2\omega_2\omega_3 - 4\omega_4^2 v_1^2\omega_2^3\omega_3^3 + 6\omega_4^2\omega_2^2 cs^2\omega_3 + 12\omega_4 v_1^2\omega_2\omega_3^3 + 22\omega_4^2 v_1^2\omega_2^3\omega_3^2 + 24\omega_4^2\omega_2 cs^2\omega_3^3 +$$
$$6\omega_2^3 cs^2\omega_3^3 + 12v_1^2\omega_2^3\omega_3^3 + \omega_4^2\omega_2^3 cs^2\omega_3^3 - 30\omega_4^2 v_1^2\omega_2^3\omega_3 + 22\omega_4^2 v_1^2\omega_2^2\omega_3^3 - 6v_1^2\omega_2^3\omega_3^3 - 48\omega_4^2 v_1^2\omega_2^2\omega_3 - 6\omega_4^2\omega_2^3 cs^2\omega_3^2 + 24\omega_4\omega_2 cs^2\omega_3^3)\frac{\rho v_2}{12\omega_4^2\omega_2^3\omega_3^3}$$

$C_{\mathrm{D}_x^2\mathrm{D}_y^2 v_2}^{(0),\mathrm{CLBM2}} =$
$$(6\omega_2^3\omega_3^3 cs^2 + 24\omega_4^2 v_1^2\omega_2\omega_3^2 + 24\omega_4^2\omega_2\omega_3^3 cs^2 + 6\omega_4 v_1^2\omega_3^3\omega_3^3 - 18\omega_4^2 v_1^2\omega_2\omega_3^3 - 6\omega_4^2\omega_3^3\omega_3^2 cs^2 + 12\omega_4^2 v_1^2\omega_3 - 24\omega_4 v_1^2\omega_2^2\omega_3^3 + 24\omega_4\omega_2\omega_3^3 cs^2 +$$
$$\omega_4^2\omega_2^3\omega_3^3 cs^2 - 12\omega_4^2\omega_2^2\omega_3 cs^2 + 24\omega_4^2 v_1^2\omega_2\omega_3 - 12\omega_4\omega_2\omega_3^3 cs^2 - 4\omega_4^2 v_1^2\omega_2^3\omega_3^3 + 12\omega_4^2\omega_2^2\omega_3^2 cs^2 + 12\omega_4 v_1^2\omega_2\omega_3^3 + 22\omega_4^2 v_1^2\omega_2^3\omega_3^2 - 12\omega_2^3\omega_3^3 cs^2 +$$
$$12 v_1^2\omega_2^3\omega_3^3 - 12\omega_4^2\omega_3^3 cs^2 - 14\omega_4^2\omega_2^2\omega_3^3 cs^2 + 6\omega_4^2\omega_2\omega_3 cs^2 - 30\omega_4^2 v_1^2\omega_2\omega_3 + 22\omega_4^2 v_1^2\omega_2^2\omega_3^3 - 6v_1^2\omega_2^3\omega_3 - 48\omega_4^2 v_1^2\omega_2^2\omega_3 - 6\omega_4\omega_2^3\omega_3^3 cs^2)\frac{\rho v_2}{12\omega_4^2\omega_2^3\omega_3^3}$$

coefficient $C_{\mathrm{D}_t\mathrm{D}_y^3 v_2}^{(0)}$ **at** $\frac{\partial^4 v_2}{\partial t \partial x_2^3}$:

$C_{\mathrm{D}_t\mathrm{D}_y^3 v_2}^{(0),\mathrm{SRT}} = (-36 + 60cs^2 + 72v_2^2 + 54\omega - 108\omega v_2^2 - 20\omega^2 - 90\omega cs^2 + \omega^3 + 42\omega^2 v_2^2 + 34\omega^2 cs^2 - 2\omega^3 cs^2 - 3\omega^3 v_2^2)\frac{\rho}{12\omega^3}$

$C_{\mathrm{D}_t\mathrm{D}_y^3 v_2}^{(0),\mathrm{MRT1}} =$
$$(12\omega_3^2 cs^2 + 12\omega_5^2\omega_3 + 24\omega_5\omega_3 cs^2 + 48\omega_5 v_2^2\omega_3 + 25\omega_5^2\omega_3 cs^2 - 60\omega_5 v_2^2\omega_3^2 + \omega_5^2\omega_3^3 - 6\omega_3^3 cs^2 - 11\omega_5^2\omega_3^3 + 15\omega_5 v_2^2\omega_3^3 - 2\omega_5^2\omega_3^3 cs^2 + 6\omega_3^3 + 36\omega_5\omega_3^2 +$$
$$27\omega_5^2 v_2^2\omega_3^2 - 6v_2^2\omega_3^3 - 3\omega_5^2 v_2^2\omega_3^3 + 9\omega_5\omega_3^3 cs^2 - 9\omega_5\omega_3^3 - 12\omega_3^2 + 12v_2^2\omega_3^3 + 24\omega_5^2 cs^2 - 48\omega_5^2\omega_3 cs^2 + 12\omega_5^2 v_2^2 - 24\omega_5\omega_3 - 36\omega_5\omega_3^2 cs^2 - 42\omega_5^2 v_2^2\omega_3)\frac{\rho}{12\omega_5^2\omega_3^3}$$

$C_{\mathrm{D}_t\mathrm{D}_y^3 v_2}^{(0),\mathrm{MRT2}} =$
$$(9cs^2\omega_5\omega_3^3 + 12\omega_5^2\omega_3 - 36cs^2\omega_5\omega_3^2 + 48\omega_5 v_2^2\omega_3 - 60\omega_5 v_2^2\omega_3^2 + \omega_5^2\omega_3^3 + 24cs^2\omega_5\omega_3 - 11\omega_5^2\omega_3^3 + 15\omega_5 v_2^2\omega_3^3 + 24cs^2\omega_5^2 + 6\omega_3^3 + 36\omega_5\omega_3^2 - 6cs^2\omega_3^3 +$$
$$27\omega_5^2 v_2^2\omega_3^2 - 6v_2^2\omega_3^3 - 3\omega_5^2 v_2^2\omega_3^3 + 12cs^2\omega_3^3 - 9\omega_5\omega_3^3 - 12\omega_3^2 - 48cs^2\omega_5^2\omega_3 + 12v_2^2\omega_3^3 + 25cs^2\omega_5^2\omega_3^3 + 12\omega_5^2 v_2^2 - 2cs^2\omega_5^2\omega_3^3 - 24\omega_5\omega_3 - 42\omega_5^2 v_2^2\omega_3)\frac{\rho}{12\omega_5^2\omega_3^3}$$

$C_{\mathrm{D}_t\mathrm{D}_y^3 v_2}^{(0),\mathrm{CLBM1}} =$
$$(12\omega_5^2\omega_3 - 36\omega_5 cs^2\omega_3^2 + 72\omega_5 v_2^2\omega_3 + 9\omega_5 cs^2\omega_3^3 - 108\omega_5 v_2^2\omega_3^2 + \omega_5^2\omega_3^3 - 11\omega_5^2\omega_3^3 + 24\omega_5 cs^2\omega_3 + 27\omega_5 v_2^2\omega_3^3 + 6\omega_3^3 + 36\omega_5\omega_3^2 + 15\omega_5^2 v_2^2\omega_3^2 - 18v_2^2\omega_3^3 -$$
$$3\omega_5^2 v_2^2\omega_3^3 - 9\omega_5\omega_3^3 - 48\omega_5^2 cs^2\omega_3 - 12\omega_3^2 + 36v_2^2\omega_3^3 - 6cs^2\omega_3^3 - 36\omega_5^2 v_2^2 + 25\omega_5^2 cs^2\omega_3^3 + 12cs^2\omega_3^3 - 24\omega_5\omega_3 - 2\omega_5^2 cs^2\omega_3^3 + 24\omega_5^2 cs^2 + 18\omega_5^2 v_2^2\omega_3)\frac{\rho}{12\omega_5^2\omega_3^3}$$

$C_{\mathrm{D}_t\mathrm{D}_y^3 v_2}^{(0),\mathrm{CLBM2}} =$
$$(12\omega_5^2\omega_3 + 25\omega_5^2\omega_3^2 cs^2 + 12\omega_3^2 cs^2 + 72\omega_5 v_2^2\omega_3 + 24\omega_5\omega_3 cs^2 - 108\omega_5 v_2^2\omega_3^2 - 2\omega_5^2\omega_3^3 cs^2 + \omega_5^2\omega_3^3 - 11\omega_5^2\omega_3^3 + 27\omega_5 v_2^2\omega_3^3 - 6\omega_3^3 cs^2 + 6\omega_3^3 + 36\omega_5\omega_3^2 +$$
$$9\omega_5\omega_3^3 cs^2 + 15\omega_5^2 v_2^2\omega_3^2 + 24\omega_5^2 cs^2 - 18v_2^2\omega_3^3 - 3\omega_5^2 v_2^2\omega_3^3 - 9\omega_5\omega_3^3 - 12\omega_3^2 + 36v_2^2\omega_3^3 - 36\omega_5^2 v_2^2 - 36\omega_5\omega_3^2 cs^2 - 24\omega_5\omega_3 - 48\omega_5^2\omega_3 cs^2 + 18\omega_5^2 v_2^2\omega_3)\frac{\rho}{12\omega_5^2\omega_3^3}$$

coefficient $C_{\mathrm{D}_x\mathrm{D}_y^3 \rho}^{(0)}$ **at** $\frac{\partial^4 \rho}{\partial x_1 \partial x_2^3}$:

$C_{\mathrm{D}_x\mathrm{D}_y^3 \rho}^{(0),\mathrm{SRT}} = (24 - 120cs^2 - 36\omega + 14\omega^2 + 180\omega cs^2 - \omega^3 - 72\omega^2 cs^2 + 6\omega^3 cs^2)\frac{v_1 v_2}{6\omega^3}$

$C_{\mathrm{D}_x\mathrm{D}_y^3 \rho}^{(0),\mathrm{MRT1}} = (24\omega_5^2 v_2^2\omega_2^2 + 12\omega_5^2 v_2^2\omega_2^2\omega_3 + 6\omega_5\omega_2^3\omega_3^3 - 48\omega_5^2\omega_2^3\omega_3^2 cs^2 - 36\omega_5^2\omega_2^2 cs^2 + 6\omega_5^2 v_2^2\omega_2^2\omega_3^2 + 6\omega_2^3\omega_3^3 cs^2 - 12\omega_5\omega_2^2\omega_3^3 cs^2 - 21\omega_5\omega_2^3\omega_3^2 +$
$6\omega_5^2\omega_2\omega_3^2 cs^2 + 6\omega_5^2\omega_2\omega_3^3 cs^2 - 12v_2^2\omega_2^3\omega_3^3 - 24\omega_5^2\omega_2^2\omega_3 cs^2 + 12\omega_5\omega_2\omega_3 - 3\omega_5\omega_2^2\omega_3^3 - 30\omega_5^2 v_2^2\omega_2\omega_3 + 6\omega_5^2 v_2^2\omega_2^2\omega_3 - 12\omega_5\omega_2\omega_3^2 cs^2 +$
$6\omega_5\omega_2^2\omega_3^2 - 24\omega_5\omega_3^2\omega_3 cs^2 + 6v_2^2\omega_2^3\omega_3^3 + 6\omega_5\omega_2^3\omega_3^3 cs^2 - 12\omega_5^2 v_2^2\omega_2^2\omega_3 - 12\omega_2^3\omega_3^2 cs^2 + \omega_5^2\omega_2^3\omega_3^3 + 42\omega_5\omega_2^3\omega_3^2 cs^2 - 6\omega_5^2\omega_2^3\omega_3 + 6\omega_5^2 v_2^2\omega_2\omega_3^2 -$
$12\omega_5 v_2^2\omega_2^3\omega_3 + 6\omega_5^2 v_2^2\omega_3^3 + 42\omega_5^2\omega_2^2\omega_3 cs^2 - 3\omega_5^2\omega_2^2\omega_3^3 + 42\omega_5 v_2^2\omega_2^2\omega_3^3 - 12\omega_5^2 v_2^2\omega_2\omega_3^3 - 24\omega_5 v_2^2\omega_2^2\omega_3^3 + 6\omega_2^3\omega_3^3 + 6\omega_5 v_2^2\omega_2^2\omega_3^3 - 12\omega_5\omega_2^3\omega_3^3 cs^2 -$
$\omega_5^2\omega_2^3\omega_3^3 - 12\omega_5 v_2^2\omega_2^2\omega_3^3 - 3\omega_2^3\omega_3^3 + 7\omega_5^2\omega_2^3\omega_3^3 - 12\omega_5^2\omega_2^3\omega_3^3 cs^2 + 78\omega_5^2\omega_2^3\omega_3 cs^2)\frac{v_1 v_2}{6\omega_5^2\omega_2^2\omega_3^3}$

$C_{\mathrm{D}_x\mathrm{D}_y^3 \rho}^{(0),\mathrm{MRT2}} = (24\omega_5^2 v_2^2\omega_2^2 + 12\omega_5^2 v_2^2\omega_2^2\omega_3 + 6cs^2\omega_5\omega_2^2\omega_3^3 - 12cs^2\omega_5^2\omega_2\omega_3 - 24cs^2\omega_5\omega_2^3\omega_3 + 6\omega_5\omega_2^3\omega_3^3 + 6cs^2\omega_5^2\omega_2\omega_3 - 12cs^2\omega_5\omega_2^2\omega_3^2 +$
$6\omega_5^2 v_2^2\omega_2^2\omega_3^2 - 21\omega_5\omega_2^3\omega_3^2 - 12v_2^2\omega_2^3\omega_3^3 + 12\omega_5\omega_2^3\omega_3 + 6cs^2\omega_2^3\omega_3^3 - 3\omega_5\omega_2^2\omega_3^3 - 36cs^2\omega_5^2\omega_3^2 - 12cs^2\omega_5\omega_2^3\omega_3 - 30\omega_5^2 v_2^2\omega_2\omega_3 + 6\omega_5^2 v_2^2\omega_2^2\omega_3 -$
$12cs^2\omega_2^3\omega_3^2 + 6\omega_5\omega_2^2\omega_3^2 + 6v_2^2\omega_2^3\omega_3^3 - 12\omega_5^2 v_2^2\omega_2^2\omega_3 + 42cs^2\omega_5\omega_2^2\omega_3^3 + \omega_5^2\omega_2^3\omega_3^3 - 6\omega_5^2\omega_2^3\omega_3 + 6\omega_5^2 v_2^2\omega_2\omega_3^2 - 24cs^2\omega_5^2\omega_2^2\omega_3 + 6cs^2\omega_5\omega_2^3\omega_3^3 -$
$12\omega_5 v_2^2\omega_2^3\omega_3 + 6\omega_5^2 v_2^2\omega_3^3 - 3\omega_5^2\omega_2^2\omega_3^3 - 48cs^2\omega_5^2\omega_2^3\omega_3^3 + 42\omega_5 v_2^2\omega_2^3\omega_3^3 - 12\omega_5^2 v_2^2\omega_2\omega_3^3 - 24\omega_5 v_2^2\omega_2^3\omega_3 + 6\omega_2^3\omega_3^3 + 78cs^2\omega_5^2\omega_2^3\omega_3 + 6\omega_5 v_2^2\omega_2^2\omega_3^3 -$
$12cs^2\omega_5^2\omega_2^2\omega_3 - \omega_5^2\omega_2^3\omega_3^3 - 12\omega_5 v_2^2\omega_2^2\omega_3^3 + 42cs^2\omega_5\omega_2^2\omega_3 - 3\omega_2^3\omega_3^3 + 7\omega_5^2\omega_2^3\omega_3^3)\frac{v_1 v_2}{6\omega_5^2\omega_2^2\omega_3^3}$

$$C_{\mathrm{D}_x\mathrm{D}_y^3\rho}^{(0),\mathrm{CLBM1}} = (6\omega_5\omega_2^3\omega_3^3 - 24\omega_5\omega_2^3cs^2\omega_3 - 6\omega_5^2v_2^2\omega_2^3\omega_3 - 12\omega_5^2\omega_2^2cs^2\omega_3 - 21\omega_5\omega_2^3\omega_3^2 + 36\omega_5^2\omega_2^2cs^2\omega_3^2 - 24\omega_5\omega_2^3cs^2\omega_3^3 + 12v_2^2\omega_2^3\omega_3^2 + 12\omega_5\omega_2^3\omega_3 -$$
$$3\omega_5\omega_2^2\omega_3^3 + 12\omega_5^2v_2^2\omega_2^3\omega_3 + 6\omega_5^2v_2^2\omega_2^3\omega_3 + 6\omega_5\omega_2^3\omega_3^3 - 6v_2^2\omega_2^3\omega_3^3 - 12\omega_5^2\omega_2^3cs^2 - 12\omega_5^2\omega_2^2cs^2\omega_3^3 + 72\omega_5\omega_2^3cs^2\omega_3^2 - 6v_2^2\omega_2^2\omega_2^3 + \omega_5^2\omega_2^2\omega_3^3 +$$
$$36\omega_5^2\omega_2^3cs^2\omega_3 - 6\omega_5\omega_2^3\omega_3 - 12\omega_5^2\omega_2cs^2\omega_3^2 + 6\omega_5^2v_2^2\omega_2\omega_3 - 36\omega_2^3cs^2\omega_3^2 + 6\omega_5^2v_2^2\omega_3 + 6\omega_5^2\omega_2cs^2\omega_3 - 3\omega_5^2\omega_2^3\omega_3 + 12\omega_5v_2^2\omega_2^3\omega_3^2 + 18\omega_3^3cs^2\omega_3 -$$
$$12\omega_5^2v_2^2\omega_2\omega_3 - 24\omega_5v_2^2\omega_2^3\omega_3 + 6\omega_3^3\omega_3^2 - \omega_5^2\omega_2^3\omega_3^3 - 24\omega_5\omega_2^2cs^2\omega_3^3 + 6\omega_5^2\omega_2^3cs^2\omega_3^3 - 3\omega_2^3\omega_3^3 + 12\omega_5\omega_2^2cs^2\omega_3^3 + 7\omega_5^2\omega_2^3\omega_3^3 - 36\omega_5^2\omega_2^3cs^2\omega_3^3)\frac{v_1v_2}{6\omega_5^2\omega_2^3\omega_3^3}$$

$$C_{\mathrm{D}_x\mathrm{D}_y^3\rho}^{(0),\mathrm{CLBM2}} = (-12\omega_5^2\omega_3^3cs^2 + 18\omega_3^3\omega_3^3cs^2 + 6\omega_5^2\omega_2\omega_3^3cs^2 + 6\omega_5\omega_2^3\omega_3^3 - 24\omega_5\omega_2^2\omega_3^2cs^2 - 6\omega_5^2v_2^2\omega_2^3\omega_3^2 - 36\omega_5^2\omega_2^3\omega_3^2cs^2 - 21\omega_5\omega_2^3\omega_3^2 +$$
$$12\omega_5\omega_2^2\omega_3^3cs^2 + 12v_2^2\omega_2^3\omega_3^2 + 12\omega_5\omega_2^3\omega_3 - 12\omega_5\omega_2\omega_3^3cs^2 - 24\omega_5\omega_2^3\omega_3cs^2 - 3\omega_5\omega_2^2\omega_3^3 + 12\omega_5^2v_2^2\omega_2^3\omega_3 + 6\omega_5^2v_2^2\omega_2^3\omega_3 - 36\omega_2^3cs^2\omega_3^2 - 12\omega_5^2\omega_2\omega_3cs^2 +$$
$$6\omega_5\omega_2^2\omega_3^3 + 6\omega_5^2\omega_2\omega_3^3cs^2 - 6v_2^2\omega_2^3\omega_3^3 - 6\omega_5^2v_2^2\omega_2^2\omega_3 + \omega_5^2\omega_2^2\omega_3^3 + 36\omega_5^2\omega_2^3\omega_3^2cs^2 - 6\omega_5^2\omega_2^3\omega_3 + 6\omega_5^2v_2^2\omega_2\omega_3 + 6\omega_5^2v_2^2\omega_3 + 72\omega_5\omega_2^3\omega_3^2cs^2 - 3\omega_5^2\omega_2^2\omega_3^3 +$$
$$12\omega_5v_2^2\omega_2^3\omega_3^2 - 12\omega_5^2v_2^2\omega_2\omega_3 - 24\omega_5v_2^2\omega_2^3\omega_3 + 6\omega_3^3\omega_3^2 + 36\omega_5^2\omega_2^3\omega_3cs^2 - \omega_5^2\omega_2^3\omega_3^3 - 12\omega_5^2\omega_2\omega_3^3cs^2 - 3\omega_2^3\omega_3^3 - 24\omega_5\omega_2^3\omega_3cs^2 + 7\omega_5^2\omega_2^3\omega_3^3)\frac{v_1v_2}{6\omega_5^2\omega_2^3\omega_3^3}$$

coefficient $C_{\mathrm{D}_x\mathrm{D}_y^3v_1}^{(0)}$ **at** $\frac{\partial^4 v_1}{\partial x_1\partial x_2^3}$**:**

$$C_{\mathrm{D}_x\mathrm{D}_y^3v_1}^{(0),\mathrm{SRT}} = (36 - 96cs^2 - 36v_2^2 - 54\omega + 54\omega v_2^2 + 20\omega^2 + 144\omega cs^2 - \omega^3 - 20\omega^2 v_2^2 - 56\omega^2 cs^2 + 4\omega^3 cs^2 + \omega^3 v_2^2)\frac{\rho v_2}{12\omega^3}$$

$$C_{\mathrm{D}_x\mathrm{D}_y^3v_1}^{(0),\mathrm{MRT1}} = (-12\omega_3^2cs^2 - 12\omega_5^2\omega_3 - 36\omega_5\omega_3cs^2 - 36\omega_5v_2^2\omega_3 - 44\omega_5^2\omega_3^2cs^2 + 48\omega_5v_2^2\omega_3^2 - \omega_5^2\omega_3^3 + 6\omega_3^3cs^2 + 11\omega_5^2\omega_3^2 - 12\omega_5v_2^2\omega_3^3 + 4\omega_5^2\omega_3^3cs^2 - 6\omega_3^3 -$$
$$36\omega_5\omega_3^2 - 8\omega_5^2v_2^2\omega_3^2 + 6v_2^2\omega_3^3 + \omega_5^2v_2^2\omega_3^3 - 12\omega_5\omega_3^3cs^2 + 9\omega_5\omega_3^3 + 12\omega_3^3 - 12v_2^2\omega_3^3 - 48\omega_5^2cs^2 + 90\omega_5^2\omega_3cs^2 + 12\omega_5^2v_2^2 + 24\omega_5\omega_3 + 48\omega_5\omega_3^2cs^2)\frac{\rho v_2}{12\omega_5^2\omega_3^3}$$

$$C_{\mathrm{D}_x\mathrm{D}_y^3v_1}^{(0),\mathrm{MRT2}} =$$
$$(-12cs^2\omega_5\omega_3^3 - 12\omega_5^2\omega_3 + 48cs^2\omega_5\omega_3^2 - 36\omega_5v_2^2\omega_3 + 48\omega_5v_2^2\omega_3^2 - \omega_5^2\omega_3^3 - 36cs^2\omega_5\omega_3 + 11\omega_5^2\omega_3^2 - 12\omega_5v_2^2\omega_3^3 - 48cs^2\omega_5^2 - 6\omega_3^3 - 36\omega_5\omega_3^2 +$$
$$6cs^2\omega_3^3 - 8\omega_5^2v_2^2\omega_3^2 + 6v_2^2\omega_3^3 + \omega_5^2v_2^2\omega_3^3 - 12cs^2\omega_3^3 + 9\omega_5\omega_3^3 + 12\omega_3^3 + 90cs^2\omega_5^2\omega_3 - 12v_2^2\omega_3^3 - 44cs^2\omega_5^2\omega_3 + 12\omega_5^2v_2^2 + 4cs^2\omega_5^2\omega_3^3 + 24\omega_5\omega_3)\frac{\rho v_2}{12\omega_5^2\omega_3^3}$$

$$C_{\mathrm{D}_x\mathrm{D}_y^3v_1}^{(0),\mathrm{CLBM1}} =$$
$$(-12\omega_5^2\omega_3 + 96\omega_5cs^2\omega_3^2 - 60\omega_5v_2^2\omega_3 - 30\omega_5cs^2\omega_3^3 + 48\omega_5v_2^2\omega_3^2 - \omega_5^2\omega_3^3 + 11\omega_5^2\omega_3^2 - 36\omega_5cs^2\omega_3 - 6\omega_5v_2^2\omega_3^3 - 6\omega_3^3 - 36\omega_5\omega_3^2 - 14\omega_5^2v_2^2\omega_3^2 -$$
$$6v_2^2\omega_3^3 + \omega_5^2v_2^2\omega_3^3 + 9\omega_5\omega_3^3 + 18\omega_5^2cs^2\omega_3 + 12\omega_3^3 + 12v_2^2\omega_3^3 + 30cs^2\omega_3^3 + 12\omega_5^2v_2^2 - 26\omega_5^2cs^2\omega_3^3 - 60cs^2\omega_3^2 + 24\omega_5\omega_3 + 4\omega_5^2cs^2\omega_3^3 + 12\omega_5^2v_2^2\omega_3)\frac{\rho v_2}{12\omega_5^2\omega_3^3}$$

$$C_{\mathrm{D}_x\mathrm{D}_y^3v_1}^{(0),\mathrm{CLBM2}} = (-12\omega_5^2\omega_3 - 26\omega_5^2\omega_3^2cs^2 - 60\omega_3^3cs^2 - 60\omega_5v_2^2\omega_3 - 36\omega_5\omega_3cs^2 + 48\omega_5v_2^2\omega_3^2 + 4\omega_5^2\omega_3^3cs^2 - \omega_5^2\omega_3^3 + 11\omega_5^2\omega_3^2 - 6\omega_5v_2^2\omega_3^3 + 30\omega_3^3cs^2 - 6\omega_3^3 -$$
$$36\omega_5\omega_3^2 - 30\omega_5\omega_3^3cs^2 - 14\omega_5^2v_2^2\omega_3^2 - 6v_2^2\omega_3^3 + \omega_5^2v_2^2\omega_3^3 + 9\omega_5\omega_3^3 + 12\omega_3^3 + 12v_2^2\omega_3^3 + 12\omega_5^2v_2^2 + 96\omega_5\omega_3^2cs^2 + 24\omega_5\omega_3 + 18\omega_5^2\omega_3cs^2 + 12\omega_5^2v_2^2\omega_3)\frac{\rho v_2}{12\omega_5^2\omega_3^3}$$

coefficient $C_{\mathrm{D}_x\mathrm{D}_y^3v_2}^{(0)}$ **at** $\frac{\partial^4 v_2}{\partial x_1\partial x_2^3}$**:**

$$C_{\mathrm{D}_x\mathrm{D}_y^3v_2}^{(0),\mathrm{SRT}} = (12 - 96cs^2 - 12v_2^2 - 18\omega + 18\omega v_2^2 + 8\omega^2 + 144\omega cs^2 - \omega^3 - 12\omega^2 v_2^2 - 56\omega^2 cs^2 + 4\omega^3 cs^2 + 3\omega^3 v_2^2)\frac{\rho v_1}{12\omega^3}$$

$$C_{\mathrm{D}_x\mathrm{D}_y^3v_2}^{(0),\mathrm{MRT1}} = (24\omega_5^2v_2^2\omega_2^2 + 3\omega_5^2v_2^2\omega_2^3\omega_3^3 + 3\omega_5\omega_2^3\omega_3^3 - 32\omega_5^2\omega_2^3\omega_3^2cs^2 - 12\omega_5^2\omega_2^3cs^2 + 6\omega_2^3\omega_3^3cs^2 - 24\omega_5\omega_2^2\omega_3^2cs^2 - 6\omega_5\omega_2^3\omega_3^2 + 6\omega_5^2\omega_2\omega_3^3cs^2 +$$
$$4\omega_5^2\omega_2^3\omega_3^3cs^2 - 12v_2^2\omega_2^3\omega_3^2 - 24\omega_5^2\omega_2^3\omega_3cs^2 - 6\omega_5\omega_2^3\omega_3^3 - 30\omega_5^2v_2^2\omega_2^3\omega_3 - 12\omega_5^2\omega_2\omega_3cs^2 + 12\omega_5\omega_2^3\omega_3 - 12\omega_5\omega_2^3\omega_3cs^2 + 6v_2^2\omega_2^3\omega_3^3 + 12\omega_5\omega_2^3\omega_3^2cs^2 +$$
$$12\omega_5^2v_2^2\omega_2^2\omega_3 - 12\omega_2^3\omega_3^2cs^2 + 2\omega_5^2\omega_2^2\omega_3^3 + 36\omega_5\omega_2^3\omega_3^2cs^2 - 12\omega_5v_2^2\omega_2^3\omega_3 + 12\omega_5^2v_2^2\omega_3 + 48\omega_5^2\omega_2^3\omega_3^2cs^2 - 6\omega_5^2\omega_2^2\omega_3 + 36\omega_5v_2^2\omega_2^3\omega_3^2 -$$
$$18\omega_5^2v_2^2\omega_2\omega_3^3 - 12\omega_5v_2^2\omega_2^3\omega_3 + 12\omega_5v_2^2\omega_2^2\omega_3^3 - 12\omega_5\omega_2^3\omega_3cs^2 - \omega_5^2\omega_2^3\omega_3^3 - 24\omega_5v_2^2\omega_2^2\omega_3^2 + 3\omega_5^2\omega_2^3\omega_3^3 - 12\omega_5^2\omega_2^3\omega_3^3cs^2 + 36\omega_5^2\omega_2^3\omega_3cs^2)\frac{\rho v_1}{12\omega_5^2\omega_2^3\omega_3^3}$$

$$C_{\mathrm{D}_x\mathrm{D}_y^3v_2}^{(0),\mathrm{MRT2}} = (24\omega_5^2v_2^2\omega_2^3 + 3\omega_5^2v_2^2\omega_2^3\omega_3^3 + 12cs^2\omega_5\omega_2^3\omega_3^3 - 12cs^2\omega_5^2\omega_2\omega_3^3 - 12cs^2\omega_5\omega_2^3\omega_3^3 + 3\omega_5\omega_2^3\omega_3^3 + 6cs^2\omega_5^2\omega_2\omega_3^3 - 24cs^2\omega_5\omega_2^2\omega_3^2 - 6\omega_5\omega_2^3\omega_3^2 -$$
$$12v_2^2\omega_2^3\omega_3^2 + 6cs^2\omega_2^3\omega_3^3 - 6\omega_5\omega_2^3\omega_3 - 12cs^2\omega_5^2\omega_3 - 12cs^2\omega_5\omega_2^3\omega_3^3 - 30\omega_5^2v_2^2\omega_2^3\omega_3 - 12cs^2\omega_2^3\omega_3^2 + 12\omega_5\omega_2^3\omega_3 + 6v_2^2\omega_2^3\omega_3^3 + 12\omega_5^2v_2^2\omega_2^2\omega_3 +$$
$$36cs^2\omega_5\omega_2^3\omega_3^2 + 2\omega_5^2\omega_2^2\omega_3^3 - 24cs^2\omega_5^2\omega_2\omega_3 + 4cs^2\omega_5^2\omega_2^3\omega_3^3 - 12\omega_5v_2^2\omega_2^3\omega_3^3 + 12\omega_5^2v_2^2\omega_3 - 6\omega_5^2\omega_2^2\omega_3 - 32cs^2\omega_5^2\omega_2^3\omega_3^2 + 36\omega_5v_2^2\omega_2^3\omega_3^2 -$$
$$18\omega_5^2v_2^2\omega_2\omega_3^3 - 12\omega_5v_2^2\omega_2^3\omega_3 + 36cs^2\omega_5^2\omega_2^3\omega_3 + 12\omega_5v_2^2\omega_2^2\omega_3^3 - 12cs^2\omega_5^2\omega_2^3\omega_3 - \omega_5^2\omega_2^3\omega_3^3 - 24\omega_5v_2^2\omega_2^2\omega_3^2 + 48cs^2\omega_5^2\omega_2^3\omega_3^2 + 3\omega_5^2\omega_2^3\omega_3^3)\frac{\rho v_1}{12\omega_5^2\omega_2^3\omega_3^3}$$

$$C_{\mathrm{D}_x\mathrm{D}_y^3v_2}^{(0),\mathrm{CLBM1}} = (-24\omega_5^2v_2^2\omega_2^3 + 3\omega_5^2v_2^2\omega_2^3\omega_3^3 + 3\omega_5\omega_2^3\omega_3^3 - 12\omega_5\omega_2^3cs^2\omega_3 - 12\omega_5^2v_2^2\omega_2^3\omega_3 - 24\omega_5^2\omega_2^2cs^2\omega_3^3 - 6\omega_5\omega_2^3\omega_3^3 + 48\omega_5^2\omega_2^2cs^2\omega_3^2 -$$
$$12\omega_5\omega_2^3cs^2\omega_3^3 + 12v_2^2\omega_2^3\omega_3^2 - 6\omega_5\omega_2^3\omega_3 + 30\omega_5^2v_2^2\omega_2^3\omega_3 + 12\omega_5\omega_2^3\omega_3 - 6v_2^2\omega_2^3\omega_3^3 - 12\omega_5\omega_2^3cs^2 - 12\omega_5\omega_2^2cs^2\omega_3^3 + 36\omega_5\omega_2^3cs^2\omega_3^2 + 12\omega_5^2v_2^2\omega_2^2\omega_3 +$$
$$2\omega_5^2\omega_2^2\omega_3^3 + 36\omega_5^2\omega_2^3cs^2\omega_3 - 12\omega_5\omega_2cs^2\omega_3^2 - 12\omega_2^3cs^2\omega_3^2 + 12\omega_5^2v_2^2\omega_3 + 6\omega_5^2\omega_2cs^2\omega_3 - 6\omega_5^2\omega_2^2\omega_3 - 12\omega_5v_2^2\omega_2^3\omega_3 + 6\omega_3^3cs^2\omega_3 - 18\omega_5^2v_2^2\omega_2\omega_3 +$$
$$12\omega_5v_2^2\omega_2^3\omega_3 + 12\omega_5v_2^2\omega_2^2\omega_3 - \omega_5^2\omega_2^3\omega_3 - 24\omega_5\omega_2^2cs^2\omega_3^2 + 4\omega_5^2\omega_3^3cs^2\omega_3 - 24\omega_5v_2^2\omega_2^2\omega_3 + 12\omega_5\omega_2cs^2\omega_3 + 3\omega_5^2\omega_2^3\omega_3^3 - 32\omega_5^2cs^2\omega_3^2)\frac{\rho v_1}{12\omega_5^2\omega_2^3\omega_3^3}$$

$$C_{\mathrm{D}_x\mathrm{D}_y^3v_2}^{(0),\mathrm{CLBM2}} = (-24\omega_5^2v_2^2\omega_2^3 - 12\omega_5^2\omega_3^3cs^2 + 6\omega_3^3\omega_3^3cs^2 + 3\omega_5^2v_2^2\omega_2^3\omega_3^3 + 6\omega_5\omega_2\omega_3^3cs^2 + 3\omega_5\omega_2^3\omega_3^3 - 24\omega_5\omega_2^2\omega_3^2cs^2 - 12\omega_5^2v_2^2\omega_2^3\omega_3^2 - 32\omega_5^2\omega_2^3\omega_3^2cs^2 -$$
$$6\omega_5\omega_2^3\omega_3^2 + 12\omega_5\omega_2^2\omega_3^3cs^2 + 12v_2^2\omega_2^3\omega_3^2 - 12\omega_5^2\omega_2\omega_3^2cs^2 - 12\omega_5\omega_2^3\omega_3cs^2 - 6\omega_5\omega_2^2\omega_3 + 30\omega_5^2v_2^2\omega_2^3\omega_3 - 12\omega_2^3\omega_3cs^2 - 24\omega_5^2\omega_2\omega_3cs^2 +$$
$$12\omega_5\omega_2^2\omega_3 + 4\omega_5^2\omega_2^3\omega_3^3cs^2 - 6v_2^2\omega_2^3\omega_3^3 + 12\omega_5^2v_2^2\omega_2^2\omega_3 + 2\omega_5^2\omega_2^2\omega_3^3 + 48\omega_5^2\omega_2^3\omega_3^2cs^2 + 12\omega_5^2v_2^2\omega_3 + 36\omega_5\omega_2^3\omega_3^2cs^2 - 6\omega_5^2\omega_2^2\omega_3 - 12\omega_5v_2^2\omega_2^3\omega_3^2 -$$
$$18\omega_5^2v_2^2\omega_2\omega_3 + 12\omega_5v_2^2\omega_2^3\omega_3 + 12\omega_5v_2^2\omega_2^2\omega_3^3 + 36\omega_5^2\omega_2^3\omega_3cs^2 - \omega_5^2\omega_2^3\omega_3^3 - 12\omega_5^2\omega_2^3\omega_3^2cs^2 - 24\omega_5v_2^2\omega_2^2\omega_3^2 - 12\omega_5\omega_2^3\omega_3cs^2 + 3\omega_5^2\omega_2^3\omega_3^3)\frac{\rho v_1}{12\omega_5^2\omega_2^3\omega_3^3}$$

coefficient $C^{(0)}_{\mathrm{D}^4_y\rho}$ **at** $\frac{\partial^4\rho}{\partial x_2^4}$:

$C^{(0),\mathrm{SRT}}_{\mathrm{D}^4_y\rho} = (-24cs^2 + 216\omega v_2^2 cs^2 + 72v_2^2 - 144v_2^2 cs^2 + 3\omega^3 v_2^4 - 3\omega^3 cs^4 - 108\omega v_2^2 + 36\omega cs^2 + 6\omega^3 v_2^2 cs^2 + 30\omega^2 cs^4 - 42\omega^2 v_2^4 - 72\omega cs^4 + 108\omega v_2^4 + 42\omega^2 v_2^2 - 14\omega^2 cs^2 - 72v_2^4 + 48cs^4 - 84\omega^2 v_2^2 cs^2 + \omega^3 cs^2 - 3\omega^3 v_2^2)\frac{1}{24\omega^3}$

$C^{(0),\mathrm{MRT1}}_{\mathrm{D}^4_y\rho} = (-48\omega_5^2\omega_3 cs^4 + 3\omega_5^2 v_2^4\omega_3 + 156\omega_5^2 v_2^2\omega_3 cs^2 - 24v_2^2\omega_3 - 24\omega_5\omega_3 cs^2 - 12\omega_5 v_2^2\omega_3 cs^2 - 24\omega_5\omega_3 cs^4 - 24\omega_5^2 v_2^4\omega_3 + 48\omega_5 v_2^2\omega_3 + 12v_2^4\omega_3 - 8\omega_5^2\omega_3 cs^2 - 72\omega_5 v_2^2\omega_3^2 - 96\omega_5^2 v_2^2 cs^2 + 24\omega_5^2 v_2^4\omega_3 + 18\omega_5 v_2^2\omega_3^3 + \omega_5^2\omega_3^3 cs^2 + 24\omega_5^2 cs^4 + 6\omega_5\omega_3 cs^4 + 48\omega_5 v_2^2\omega_3 cs^2 - 24v_2^2\omega_3 cs^2 + 24\omega_5^2 v_2^2\omega_3^2 - 48\omega_5 v_2^4\omega_3 - 12v_2^2\omega_3^3 - 24\omega_5 v_2^2\omega_3 cs^2 - 3\omega_5^2 v_2^2\omega_3^3 - 6\omega_5\omega_3 cs^2 + 6\omega_5^2 v_2^2\omega_3 cs^2 + 24v_2^2\omega_3^2 - 3\omega_5^2\omega_3^3 cs^4 + 24\omega_5\omega_3 cs^4 - 18\omega_5 v_2^4\omega_3^3 + 12\omega_5^2\omega_3 cs^2 + 12v_2^2\omega_3^3 cs^2 + 72\omega_5 v_2^2\omega_3^3 + 24\omega_5^2\omega_3 cs^4 - 72\omega_5^2 v_2^2\omega_3^3 cs^2 + 24\omega_5\omega_3^2 cs^2 - 24\omega_5^2 v_2^2\omega_3)\frac{1}{24\omega_5^2\omega_3^3}$

$C^{(0),\mathrm{MRT2}}_{\mathrm{D}^4_y\rho} = (3\omega_5^2 v_2^4\omega_3^3 + 48cs^2\omega_5 v_2^2\omega_3^2 - 6cs^2\omega_5\omega_3^3 + 24cs^4\omega_5\omega_3 - 24v_2^4\omega_3^2 - 24cs^2 v_2^2\omega_3^2 + 24cs^2\omega_5\omega_3^2 - 12cs^2\omega_5 v_2^2\omega_3^3 - 24\omega_5^2 v_2^4\omega_3^2 + 48\omega_5 v_2^2\omega_3 + 12cs^2 v_2^2\omega_3^3 + 12v_2^4\omega_3^3 - 72\omega_5 v_2^2\omega_3^2 + 6cs^4\omega_5\omega_3^3 - 24cs^2\omega_5\omega_3 + 24\omega_5^2 v_2^4\omega_3 - 24cs^4\omega_5\omega_3^2 + 18\omega_5 v_2^2\omega_3^3 - 96cs^2\omega_5^2 v_2^2 - 24cs^2\omega_5 v_2^2\omega_3 + 24cs^4\omega_5^2\omega_3^2 + 24\omega_5^2 v_2^2\omega_3 - 48\omega_5 v_2^4\omega_3 - 12v_2^2\omega_3^3 - 3\omega_5^2 v_2^2\omega_3^3 - 3cs^4\omega_5^3\omega_3 + 12cs^2\omega_5^2\omega_3 + 156\omega_5^2 v_2^2\omega_3 + 24v_2^2\omega_3^2 - 8cs^2\omega_5^2\omega_3 - 72cs^2\omega_5^2 v_2^2\omega_3 - 18\omega_5 v_2^4\omega_3^3 + 24cs^4\omega_5^2 + 72\omega_5 v_2^2\omega_3^3 + 6cs^2\omega_5^2 v_2^2\omega_3 + cs^2\omega_5^2\omega_3^3 - 48cs^4\omega_5^2\omega_3 - 24\omega_5^2 v_2^2\omega_3)\frac{1}{24\omega_5^2\omega_3^3}$

$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}^4_y\rho} =$
$(3\omega_5^2 v_2^4\omega_3^3 - 12\omega_5^2 v_2^2 cs^2\omega_3^2 - 48\omega_5^2 cs^4\omega_3 + 24\omega_5 cs^2\omega_3^2 - 72v_2^4\omega_3^2 + 6\omega_5^2 v_2^2 cs^2\omega_3^3 + 24\omega_5^2 cs^4 - 12\omega_5^2 v_2^4\omega_3^2 + 36v_2^4\omega_3^3 - 6\omega_5 cs^2\omega_3^3 - 72\omega_5 v_2^2\omega_3^2 + 108v_2^2 cs^2\omega_3^3 - 3\omega_5 cs^4\omega_3^3 - 24\omega_5 cs^2\omega_3 - 216v_2^2 cs^2\omega_3^2 + 30\omega_5 v_2^2\omega_3^3 - 36\omega_5^2 v_2^2 cs^2\omega_3 + 24\omega_5^2 cs^4\omega_3^2 + 12\omega_5^2 v_2^2\omega_3^2 - 36v_2^2\omega_3^3 + 6\omega_5 cs^4\omega_3^3 + 144\omega_5 v_2^2 cs^2\omega_3^2 - 3\omega_5^2 v_2^2\omega_3^3 + 12\omega_5^2 cs^2\omega_3^2 - 72\omega_5 v_2^2 cs^2\omega_3^3 - 24\omega_5 cs^4\omega_3^2 + 72v_2^2\omega_3^2 + 24\omega_5 cs^4\omega_3 - 30\omega_5 v_2^2\omega_3^3 - 8\omega_5^2 cs^2\omega_3^3 + 72\omega_5 v_2^2\omega_3^3 + 72\omega_5 v_2^2 cs^2\omega_3 + \omega_5^2 cs^2\omega_3^3)\frac{1}{24\omega_5^2\omega_3^3}$

$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}^4_y\rho} = (-24\omega_5\omega_3^2 cs^4 - 72\omega_5 v_2^2\omega_3^3 cs^2 + 3\omega_5^2 v_2^4\omega_3^3 - 72v_2^4\omega_3^2 - 8\omega_5^2\omega_3^2 cs^2 - 36\omega_5^2 v_2^2\omega_3 cs^2 - 48\omega_5^2\omega_3 cs^4 - 12\omega_5^2 v_2^4\omega_3^2 + 36v_2^2\omega_3^3 - 24\omega_5\omega_3 cs^2 - 72\omega_5 v_2^2\omega_3^2 + 24\omega_5^2 cs^4 + \omega_5^2\omega_3^3 cs^2 + 144v_2^2\omega_3^2 cs^2 + 6\omega_5\omega_3^3 cs^4 + 30\omega_5 v_2^2\omega_3^3 - 6\omega_5\omega_3^3 cs^2 + 12\omega_5^2 v_2^2\omega_3^2 - 36v_2^2\omega_3^3 - 3\omega_5^2\omega_3^3 cs^4 + 6\omega_5^2 v_2^2\omega_3^2 cs^2 - 3\omega_5^2 v_2^2\omega_3^3 - 216v_2^2\omega_3^2 cs^2 + 72v_2^2\omega_3^2 + 72\omega_5 v_2^2\omega_3 cs^2 - 12\omega_5^2 v_2^2\omega_3^3 cs^2 + 24\omega_5^2\omega_3 cs^4 - 30\omega_5 v_2^4\omega_3^3 + 24\omega_5\omega_3 cs^2 + 72\omega_5 v_2^4\omega_3^2 + 24\omega_5\omega_3 cs^4 + 108v_2^2\omega_3^3 cs^2 + 12\omega_5^2\omega_3 cs^2)\frac{1}{24\omega_5^2\omega_3^3}$

coefficient $C^{(0)}_{\mathrm{D}^4_y v_2}$ **at** $\frac{\partial^4 v_2}{\partial x_2^4}$:

$C^{(0),\mathrm{SRT}}_{\mathrm{D}^4_y v_2} = (24 - 48cs^2 - 36v_2^2 - 36\omega + 54\omega v_2^2 + 14\omega^2 + 72\omega cs^2 - \omega^3 - 22\omega^2 v_2^2 - 26\omega^2 cs^2 + \omega^3 cs^2 + 2\omega^3 v_2^2)\frac{\rho v_2}{12\omega^3}$

$C^{(0),\mathrm{MRT1}}_{\mathrm{D}^4_y v_2} =$
$(-12\omega_3^2 cs^2 - 6\omega_5^2\omega_3 - 12\omega_5\omega_3 cs^2 - 12\omega_5 v_2^2\omega_3 - 20\omega_5^2\omega_3^2 cs^2 + 24\omega_5 v_2^2\omega_3^2 - \omega_5^2\omega_3^3 + 6\omega_3^3 cs^2 + 8\omega_5^2\omega_3^2 - 6\omega_5 v_2^2\omega_3^3 + \omega_5^2\omega_3^3 cs^2 - 6\omega_3^3 - 24\omega_5\omega_3^2 - 16\omega_5^2 v_2^2\omega_3^2 + 6v_2^2\omega_3^3 + 2\omega_5^2 v_2^2\omega_3^3 - 6\omega_5\omega_3^3 cs^2 + 6\omega_5\omega_3^3 + 12\omega_3^3 - 12v_2^2\omega_3^3 - 24\omega_5^2 cs^2 + 42\omega_5^2\omega_3 cs^2 - 12\omega_5^2 v_2^2 + 12\omega_5\omega_3 + 24\omega_5^2\omega_3 cs^2 + 24\omega_5^2 v_2^2\omega_3)\frac{\rho v_2}{12\omega_5^2\omega_3^3}$

$C^{(0),\mathrm{MRT2}}_{\mathrm{D}^4_y v_2} =$
$(-6cs^2\omega_5\omega_3^3 - 6\omega_5^2\omega_3 + 24cs^2\omega_5\omega_3^2 - 12\omega_5 v_2^2\omega_3 + 24\omega_5 v_2^2\omega_3^2 - \omega_5^2\omega_3^3 - 12cs^2\omega_5\omega_3 + 8\omega_5^2\omega_3^2 - 6\omega_5 v_2^2\omega_3^3 - 24cs^2\omega_5^2 - 6\omega_3^3 - 24\omega_5\omega_3^2 + 6cs^2\omega_3^3 - 16\omega_5^2 v_2^2\omega_3^2 + 6v_2^2\omega_3^3 + 2\omega_5^2 v_2^2\omega_3^3 - 12cs^2\omega_3^3 + 6\omega_5\omega_3^3 + 12\omega_3^3 + 42cs^2\omega_5^2\omega_3 - 12v_2^2\omega_3^3 - 20cs^2\omega_5^2\omega_3^2 - 12\omega_5^2 v_2^2 + cs^2\omega_5^2\omega_3^3 + 12\omega_5\omega_3 + 24\omega_5^2 v_2^2\omega_3)\frac{\rho v_2}{12\omega_5^2\omega_3^3}$

$C^{(0),\mathrm{CLBM1}}_{\mathrm{D}^4_y v_2} =$
$(6\omega_5^2\omega_3 + 72\omega_5 cs^2\omega_3^2 + 60\omega_5 v_2^2\omega_3 - 24\omega_5 cs^2\omega_3^3 + 24\omega_5 v_2^2\omega_3^2 - \omega_5^2\omega_3^3 + 2\omega_5^2\omega_3^2 - 12\omega_5 cs^2\omega_3 - 24\omega_5 v_2^2\omega_3^3 - 18\omega_3^3 - 24\omega_5\omega_3^2 + 2\omega_5^2 v_2^2\omega_3^2 + 42v_2^2\omega_3^3 + 2\omega_5^2 v_2^2\omega_3^3 + 12\omega_5\omega_3^3 - 30\omega_5^2 cs^2\omega_3 + 36\omega_3^3 - 84v_2^2\omega_3^3 + 30cs^2\omega_3^3 - 12\omega_5^2 v_2^2 - 2\omega_5^2 cs^2\omega_3^3 - 60cs^2\omega_3^3 - 12\omega_5\omega_3 + \omega_5^2 cs^2\omega_3^3 + 24\omega_5^2 cs^2 - 12\omega_5^2 v_2^2\omega_3)\frac{\rho v_2}{12\omega_5^2\omega_3^3}$

$C^{(0),\mathrm{CLBM2}}_{\mathrm{D}^4_y v_2} = (6\omega_5^2\omega_3 - 2\omega_5^2\omega_3^2 cs^2 - 60\omega_3^2 cs^2 + 60\omega_5 v_2^2\omega_3 - 12\omega_5\omega_3 cs^2 + 24\omega_5 v_2^2\omega_3^2 + \omega_5^2\omega_3^3 cs^2 - \omega_5^2\omega_3^3 + 2\omega_5^2\omega_3^2 - 24\omega_5 v_2^2\omega_3^3 + 30\omega_3^3 cs^2 - 18\omega_3^3 - 24\omega_5\omega_3^2 - 24\omega_5\omega_3^3 cs^2 + 2\omega_5^2 v_2^2\omega_3^3 + 24\omega_5^2 cs^2 + 42v_2^2\omega_3^3 + 2\omega_5^2 v_2^2\omega_3^3 + 12\omega_5\omega_3^3 + 36\omega_3^3 - 84v_2^2\omega_3^3 - 12\omega_5^2 v_2^2 + 72\omega_5\omega_3^2 cs^2 - 12\omega_5\omega_3 - 30\omega_5^2\omega_3 cs^2 - 12\omega_5^2 v_2^2\omega_3)\frac{\rho v_2}{12\omega_5^2\omega_3^3}$

References

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