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Convective Motion of Fluid Mass Due to an Instantaneous Point Source of Heat

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In this Paper, the equations should be read as follows;

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Equation (8)

1st equation

$$\frac{\partial U}{\partial X}+\frac{\partial V}{\partial Y}+\frac{\partial W}{\partial Z}=0$$

4th equation

$$(U-X)\frac{\partial W}{\partial X}+(V-Y)\frac{\partial W}{\partial Y}+(W-Z)\frac{\partial W}{\partial Z}-W=\frac{\sigma}{2}\nabla^2 W+\frac{\sigma^2 G}{4}\Theta$$

5th equation

$$(U-X)\frac{\partial \Theta}{\partial X}+(V-Y)\frac{\partial \Theta}{\partial Y}+(W-Z)\frac{\partial \Theta}{\partial Z}-3\Theta=\frac{1}{2}\nabla^2\Theta$$

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Equation (11)

1st equation

$$\frac{\partial V_R}{\partial R}+\frac{2}{R}V_R+\frac{1}{R}\frac{\partial V_\vartheta}{\partial \vartheta}+\frac{\cot\vartheta}{R}V_\vartheta=0$$

2nd equation

$$(V_R-R)\frac{\partial V_R}{\partial R}+\frac{V_\vartheta}{R}\frac{\partial V_R}{\partial \vartheta}-\frac{V_\vartheta^2}{R}-V_R-Z_0\cos\vartheta$$

$$=\frac{\sigma}{2}\left(\frac{\partial^2 V_R}{\partial R^2}+\frac{2}{R}\frac{\partial V_R}{\partial R}+\frac{1}{R^2}\frac{\partial^2 V_R}{\partial \vartheta^2}+\frac{\cot\vartheta}{R^2}\frac{\partial V_R}{\partial \vartheta}-\frac{2}{R^2}V_R\right.$$

$$\left.-\frac{2}{R^2}\frac{\partial V_\vartheta}{\partial \vartheta}-\frac{2\cot\vartheta}{R^2}V_\vartheta\right)+\frac{\sigma^2 G}{4}\Theta\cos\vartheta$$

3rd equation

$$(V_R-R)\frac{\partial V_\vartheta}{\partial R}+\frac{V_\vartheta}{R}\frac{\partial V_\vartheta}{\partial \vartheta}+\frac{V_R V_\vartheta}{R}-V_\vartheta+Z_0\sin\vartheta$$

$$=\frac{\sigma}{2}\left(\frac{\partial^2 V_\vartheta}{\partial R^2}+\frac{2}{R}\frac{\partial V_\vartheta}{\partial R}+\frac{1}{R^2}\frac{\partial^2 V_\vartheta}{\partial \vartheta^2}+\frac{\cot\vartheta}{R^2}\frac{\partial V_\vartheta}{\partial \vartheta}\right.$$

$$\left.+\frac{2}{R^2}\frac{\partial V_R}{\partial \vartheta}-\frac{V_\vartheta}{R^2\sin^2\vartheta}\right)-\frac{\sigma^2 G}{4}\Theta\sin\vartheta$$

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Equation (14)

1st equation

$$\frac{\partial^2 V_R}{\partial R^2}+2\left(\frac{1}{R}+\frac{R}{\sigma}\right)\frac{\partial V_R}{\partial R}+2\left(\frac{1}{\sigma}-\frac{1}{R^2}\right)V_R+\frac{2}{\sigma}Z_0+\frac{\sigma G}{2}\Theta=0$$