systems

November 8, 2018

$v_1(x,y,t) = u(x,y,t)\hat{i} + v(x,y,t)\hat{j}$ is the baroclinic velocity. T is temperature (in energy units). Q is an unknown radiation parameter. The rest of the quantities are known constants.

System 1

$$\partial_t u - fv + \epsilon_1 u = -\kappa \frac{\partial T}{\partial x}$$
$$\partial_t v - fu + \epsilon_1 v = -\kappa \frac{\partial T}{\partial y}$$
$$\hat{A}_1 \partial_t T + M_{s1}\left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y}\right) = Q$$

System 2

$$\partial_t u - fv + \epsilon_1 u = -\kappa \frac{\partial T}{\partial x}$$
$$\partial_t v - fu + \epsilon_1 v = -\kappa \frac{\partial T}{\partial y}$$
$$\hat{A}_1 \partial_t T + a_T\, v \frac{\partial T}{\partial y} + M_{s1}\left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y}\right) = Q$$

Initial conditions for systems 1,2

$$u(x,y,0) = \cos(x+y)$$
$$v(x,y,0) = \cos(x) + \cos(y)$$
$$T(x,y,0) = \sin(x+y)$$

System 3

$$\partial_t v + \epsilon_1 v = -\kappa \frac{\partial T}{\partial y}$$
$$\hat{A}_1 \partial_t T + a_T\, v \frac{\partial T}{\partial y} + M_{s1} \frac{\partial v}{\partial y} = Q$$

Initial conditions for system 3

$$v(x,0) = x, \quad T(x,0) = \cos(x)$$