$$\frac{\partial u}{\partial t} + u\frac{\partial u}{\partial x} + v\frac{\partial u}{\partial y} + w\frac{\partial u}{\partial z} - 2\Omega v sin\phi + 2\Omega w cos\phi = -\frac{1}{\rho}\frac{\partial P}{\partial x} + F_{rx}$$

$$\frac{\partial v}{\partial t} + u\frac{\partial v}{\partial x} + v\frac{\partial v}{\partial y} + w\frac{\partial v}{\partial z} + 2\Omega u sin\phi = -\frac{1}{\rho}\frac{\partial P}{\partial y} + F_{ry}$$

$$\frac{\partial w}{\partial t} + u\frac{\partial w}{\partial x} + v\frac{\partial w}{\partial y} + w\frac{\partial w}{\partial z} - 2\Omega u cos\phi = -\frac{1}{\rho}\frac{\partial P}{\partial z} - g + F_{rz}$$

$$\frac{\partial \rho}{\partial t} + u\frac{\partial \rho}{\partial x} + v\frac{\partial \rho}{\partial y} + w\frac{\partial \rho}{\partial z} + \frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z} = 0$$

$$\frac{\partial \theta}{\partial t} + u\frac{\partial \theta}{\partial x} + v\frac{\partial \theta}{\partial y} + w\frac{\partial \theta}{\partial z} = \frac{\kappa}{C_p}J$$

$$\frac{\partial \theta}{\partial t} = -u\frac{\partial \theta}{\partial x} - v\frac{\partial \theta}{\partial y} - w\frac{\partial \theta}{\partial z} + \frac{\kappa}{C_p}J$$

$$\frac{\partial \rho q_i}{\partial t} + u\frac{\partial \rho q_i}{\partial x} + v\frac{\partial \rho q_i}{\partial y} + w\frac{\partial \rho q_i}{\partial z} = \sum_{k=1}^{N} P_k$$

$$w\frac{\partial \theta}{\partial z} = \frac{\kappa}{C_p}$$

$$\frac{\partial u}{\partial t} + u\frac{\partial u}{\partial x} + v\frac{\partial u}{\partial y} + w\frac{\partial u}{\partial z} - 2\Omega v sin\phi + 2\Omega w cos\phi = -\frac{1}{\rho}\frac{\partial P}{\partial x} + F_{mixing} + F_{cum.} + F_{GWD}$$

$$\frac{\partial \theta}{\partial t} + u\frac{\partial \theta}{\partial x} + v\frac{\partial \theta}{\partial y} + w\frac{\partial \theta}{\partial z} = \frac{\kappa}{C_p}\Big(J_{cum.} + J_{mixing} + J_{micro.} + J_{rad.} + J_{LSM}\Big)$$

$$\iint_A \Big(\nabla \cdot \vec{\mathbf{V}}\Big) dA = \oint \Big(\vec{\mathbf{V}} \cdot \hat{n}\Big) dS$$