2. WAVE/MEAN-FLOW INTERACTION AND NONINTERACTION

(An example of the First Kind)

REVIEW OF THE CONTINUOUS CASE

Quasi-geostrophic vorticity and thermodynamic equations

(Friction and diabatic effects omitted.)

$$\left(\frac{\partial}{\partial t} + \mathbf{v}\cdot\nabla\right)(\zeta + f) - f_0\frac{\partial\omega}{\partial p} = 0 \quad (1)$$

$$\left(\frac{\partial}{\partial t} + \mathbf{v}\cdot\nabla\right)\theta - \sigma\,\omega = 0 \quad \Rightarrow \quad \left(\frac{\partial}{\partial t} + \mathbf{v}\cdot\nabla\right)\frac{\partial}{\partial p}\left(\frac{f_0}{\sigma}\theta\right) - f_0\frac{\partial\omega}{\partial p} = 0 \quad (2)$$

where $\sigma \equiv -\dfrac{\partial\theta_0}{\partial p}$

where $\dfrac{\partial\mathbf{v}}{\partial p}\cdot\nabla\theta = 0$ for geostrophic **v** has been used.

Quasi-geostrophic potential vorticity equation, (1) - (2)

$$\frac{\partial q}{\partial t} + \mathbf{v}\cdot\nabla q = 0$$

$$q \equiv f + \zeta - \frac{\partial}{\partial p}\left(\frac{f_0}{\sigma}\theta\right)$$