0.1 Basic States

$$\Psi_1 = -U_1 y \qquad \Psi_2 = -U_2 y$$
$$Q_1 = (U_1 - U_2 + \beta) y \qquad Q_2 = (U_2 - U_1 + \beta) y$$

0.2 New States and Perturbations

$$\psi_1 = \Psi_1 + \psi_1' \qquad \psi_2 = \Psi_2 + \psi_2'$$
$$q_1' = \frac{1}{F_1}\nabla^2 \psi_1' - (\psi_1' - \psi_2') \qquad q_2' = \frac{1}{F_2}\nabla^2 \psi_2' - (\psi_2' - \psi_1')$$

0.3 QG Equations

$$0 = \partial_t q_1' + (u_1' + U_1)\partial_x q_1' + v_1' \partial_y (q_1' + Q_1)$$
$$0 = \partial_t q_2' + (u_2' + U_2)\partial_x q_2' + v_2' \partial_y (q_2' + Q_2)$$

0.4 Normal Modes

$$\hat{q_1'} = -\hat{\psi_1'}\left(1 + \frac{K^2}{F_1}\right) + \hat{\psi_2'} \qquad \hat{q_2'} = \hat{\psi_1'} - \hat{\psi_2'}\left(1 + \frac{K^2}{F_2}\right)$$
$$\hat{\psi_1'} = \frac{\left(1 + \frac{K^2}{F_2}\right)\hat{q_1'} + \hat{q_2'}}{1 - \left(1 + \frac{K^2}{F_1}\right)\left(1 + \frac{K^2}{F_2}\right)} \qquad \hat{\psi_2'} = \frac{\hat{q_1'} + \left(1 + \frac{K^2}{F_1}\right)\hat{q_2'}}{1 - \left(1 + \frac{K^2}{F_1}\right)\left(1 + \frac{K^2}{F_2}\right)}$$
$$\hat{u_1'} = -ik\hat{\psi_1'} \qquad \hat{u_2'} = -ik\hat{\psi_2'}$$
$$\hat{u_1'} = -il\hat{\psi_1'} \qquad \hat{u_2'} = -il\hat{\psi_2'}$$
$$K^2 = k^2 + l^2$$