myQG

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1 Model equations

The diagnostic equation for quasi-geostrophic potential vorticity of layer k q_k reads as follows:

$$\partial_t q_k + u_k \partial_x q_k + v_k \partial_y q_k = F_k + D_k \tag{1}$$

The velocity components u_k and v_k are derived by:

$$u_k = -\partial_y \psi_k, \qquad v_k = \partial_x \psi_k. \tag{2}$$

The streamfunction ψ_k can be obtained by inverting the following equation:

$$q_k = \beta y + \nabla^2 \psi_k + \frac{f_0}{H_k} \left(\frac{\psi_{k-1} - \psi_k}{g'_k} - \frac{\psi_k - \psi_{k+1}}{g'_{k+1}} \right) \tag{3}$$

where H_k denotes a constant mean layer width, and g'_k the reduced gravity that can be calculated as follows:

$$g'_k = \frac{g'_1}{\rho_1} (\rho_k - \rho_{k-1}) \tag{4}$$

with $g'_1 = g$ and ρ_k the densitiy of layer k.