

ESE 133:

Homework 2 (due May 23):

Consider a rotating shallow-water layer with a free surface over a flat bottom boundary.

1. *Inertia-gravity waves*. Assume uniform rotation with a constant Coriolis parameter $f = f_0$.
 - (a) Linearize the shallow-water equations about a state of rest and find the dispersion relation of the waves.
 - (b) Sketch the trajectories of particle motion in the waves.
2. *Rossby waves*. Make the quasigeostrophic (QG) approximation with Coriolis parameter $f = f_0 + \beta y$.
 - (a) Linearize the QG potential vorticity equation about a uniform zonal flow and find the dispersion relation of the waves.
 - (b) Discuss the qualitatively different mechanisms of wave propagation for waves that are longer and/or shorter than the Rossby deformation radius $\lambda = \sqrt{gH_0}/f_0$.