

Baroclinic Instability for 3D Boussinesq Flows

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The main aim of this talk is to describe the stability and dynamic transitions of a basic shear flow, associated with geophysical baroclinic instability, for the three dimensional (3D) continuously stratified rotating Boussinesq model. The model admits a steady state solution characterizing a shearing motion which, due to the Coriolis forces, must be balanced by a pressure gradient in response to spatially varying density field. We first establish thresholds for the energy stability and linear stability of this basic solution via energy method. Next by numerically computing the center manifold using a spectral method, we establish the reduced equations of the system at the onset of transition and prove the existence of various transition types describing transitions to multiple steady states as well as to spatio temporal oscillations. This is joint work with Shouhong Wang.