



Planetary geostrophic equations for the atmosphere with barotropic component of the flow

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Atmospheric motions on the planetary scale are described by the planetary geostrophic equations (PGEs). These equations consist of the geostrophic and hydrostatic balance, a three-dimensional divergence constraint and an advection equation for the temperature. Equations of this type are implemented in the atmospheric module of some earth system models of intermediate complexity. The PGEs are not closed, since the barotropic component of the flow has to be specified. Here we present numerical simulations of the PGEs on the sphere with a closure derived in Dolaptchiev & Klein 2013. The effect of the closure will be analyzed and a normal mode analysis for a sheared background flow shown.

Dolaptchiev, S. I. and Klein, R., 2013, A multi-scale model for the planetary and synoptic motions in the atmosphere, *J. Atmos. Sci.*, 70, 2963-2981