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Instability in the rotating differentially heated annulus via asymptotic reduction of the Navier Stokes equations MICHAEL WATSON, KEITH JULIEN, University of Colorado at Boulder — The differentially heated rotating annulus has served as a canonical model for studying the baroclinic instability in the atmosphere for nearly 5 decades, yet numerical simulations of this experiment have difficulty reaching the low Rossby number (rapid rotation) regime. This occurs because the numerical models are based upon discretizations of the incompressible Navier Stokes equations, which necessarily resolve boundary layers and all fast dynamics. I will present a new set of governing equations for the baroclinic annulus based on an asymptotic analysis of the incompressible Navier Stokes which can be used to efficiently study the low Rossby number regime of parameter space. These equations can then be used to characterize the transition from steady to unstable dynamics in this rapid rotation limit through a linear stability analysis.

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