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A quasi-geostrophic thermally driven model for rapid dynamics in Earths core MEREDITH PLUMLEY, ANDREW JACKSON, ETH Zurich, STEFANO MAFFEI, University of Leeds — Simulating the physics of Earths core remains an elusive challenge that precludes numerical solution of the full governing equations. Model reduction must be embraced to study the dynamics occurring in the core. One alternative for rotating flows is to adopt a columnar approximation for the velocity field, sometimes referred to as the quasi-geostrophic approximation. This technique is used to derive acompletely newmodel for the rapid dynamics in thermally driven convection on the equatorial plane by using axial averages. We show that the onset of thermal convection found using local theory applied to this model agrees quantitatively with the values found in full numerical investigationsand with asymptotic theory. Time evolution results from this model can provide insight into the dynamics on short timescales in the core.We investigate the scaling laws of supercritical convection in parameter regimes unachievable in 3-D models.

Meredith Plumley
ETH Zurich

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