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Multiscale Analysis of Rapidly Rotating Dynamo Simulations RYAN ORVEDAHL, MICHAEL CALKINS, NICHOLAS FEATHERSTONE, Univ of Colorado - Boulder — The magnetic field of the planets and stars are generated by dynamo action in their electrically conducting fluid interiors. Numerical models of this process solve the fundamental equations of magnetohydrodynamics driven by convection in a rotating spherical shell. Rotation plays an important role in modifying the resulting convective flows and the self-generated magnetic field. We present results of simulating rapidly rotating systems that are unstable to dynamo action. We use the pseudo-spectral code Rayleigh to generate a suite of direct numerical simulations. Each simulation uses the Boussinesq approximation and is characterized by an Ekman number (Ek = $\nu/\Omega L^2$) of 10⁻⁵. We vary the degree of convective forcing to obtain a range of convective Rossby numbers. The resulting flows and magnetic structures are analyzed using a Reynolds decomposition. We determine the relative importance of each term in the scale-separated governing equations and estimate the relevant spatial scales responsible for generating the mean magnetic field.

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