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Bi-Stable Turbulent Spherical Couette DANIEL S. ZIMMERMAN, SANTIAGO ANDRÉS TRIANA, DANIEL P. LATHROP, University of Maryland College Park — We study the turbulent shear flow between differentially rotating concentric spheres of radius ratio $\eta = r_\mathrm{i}/r_\mathrm{o} = 0.35$ in the University of Maryland three meter spherical Couette device. We impart rapid overall rotation and reach a region of parameter space of Ekman number $\nu/\Omega_\mathrm{o}(r_\mathrm{o}-r_\mathrm{i})^2$ of $10^{-6} < E < 10^{-7}$ with Rossby number $\Delta\Omega/\Omega_\mathrm{o}$ of $0.05 < Ro < 5$. We present direct flow measurement data including wall shear, wall pressure, local flow velocity and driving torques. We observe a rich variety of phenomena including inertial wave excitation and bi-stablity. The flow in bi-stable parameter regions exhibits spontaneous transitions between global mean flow states on time scales very long compared to the typical fluctuation time scales. This has interesting consequences for angular momentum transport including non-monotonicity of the driving torques with increasing differential rotation rate.

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