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Spatial variation of angular momentum transport in turbulent spherical Couette flow.[1] DANIEL ZIMMERMAN, SANTIAGO TRIANA, DANIEL LATHROP, University of Maryland — Turbulent shear flow between two concentric rotating spheres of radius ratio $\eta = 0.35$ is studied up to 56 million Reynolds number. The dimensionless differential rotation as expressed by the Rossby number $Ro = (\Omega_i - \Omega_o)/\Omega_o$ is an important parameter in setting the observed large scale flow state and the angular momentum flux through the system at a given Reynolds number $Re = (\Omega_i - \Omega_o)L^2/\nu$. Here we consider the case where the inner sphere super-rotates in the range $0 < Ro < 62$. Using torque measurements on the inner sphere and local wall shear stress measurements on the outer sphere, we infer a high latitude concentration of azimuthal wall shear stress peaking around $Ro = 7$ that coincides with a minimum in the dimensionless torque relative to that for the flow at $Ro = \infty$ (outer sphere at rest). Intermittent transitions between different states of large scale flow and system-scale waves show similar anti- correlation between the local shear stress on the outer sphere and the torque on the inner sphere, and we discuss the interpretation of these dynamics and possible implications for other rotating shear flows, like Taylor-Couette flow.

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