Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Transport Velocities in the Convection Zone of the Sun Are Anomalously Weak[1] KATEPALLI SREENIVASAN, New York University, SHRAVAN HANASOGE, Princeton University, THOMAS DUVALL, JR., NASA Goddard Space Flight Center — Understanding the dynamo action in the Sun, the process by which its magnetic fields are created and sustained, remains a major challenge. Our current understanding of interior convective turbulence, thought to play a critical role in regulating the dynamo, is derived solely from phenomenology and simulation, neither of which addresses the appropriate parameter regime. Here, we seismically constrain transport velocity magnitudes as a function of spherical-harmonic degree ℓ and depth in the convection zone to be 20 - 100 times lower than predictions from the current simulation methodologies and mixing length models. These bounds are obtained by isolating waves that propagate to specific depths and searching for statistical evidence for deviations in their travel times due to advection by convective flows. Turbulence on scales $\ell \leq 60$ persists in a strongly rotationally-dominated regime of *geostrophy* since the Rossby numbers at $r/R_\odot = 0.96$, where $R_\odot$ is the solar radius, are less than $\sim 10^{-2}$.

[1]Computing was done on NASA Ames machines, Schirra and Pleiades.

Katepalli Sreenivasan
New York University

Date submitted: 03 Aug 2011 Electronic form version 1.4