Abstract Submitted
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Flux-Tube Texture of the Solar Wind: Weakly Compressible MHD Theory and Direct Numerical Simulations[1] A. BHATTACHARJEE, A. SARKAR, F. EBRAHIMI, Center for Integrated Computation and Analysis of Reconnection and Turbulence, University of New Hampshire — Over the years, there has been a steady accumulation of observational evidence that the solar wind may be thought of as a network of individual magnetic flux tubes each with its own magnetic and plasma characteristics [Bartley et al. 1966, Marliani et al. 1973, Tu and Marsch 1990, Bruno et al. 2001, Borovsky 2008]. The weakly compressible MHD (WC-MHD) model [Bhattacharjee et al., 1998], which incorporates the effect of background spatial inhomogeneities, has been used recently to characterize the anisotropic magnetic fluctuation spectra (the so-called variance anisotropy) observed by ACE spacecraft. For a model of local pressure-driven interchange turbulence in a generic solar wind flux tube, the WC-MHD theory uses the Invariance Principle approach [Connor and Taylor 1997, Bhattacharjee and Hameiri 1988] to calculate explicitly the scaling of magnetic field fluctuations with plasma beta and other background plasma parameters. We test these theoretical predictions by direct numerical simulations of interchange turbulence in a flux tube using the DEBS MHD code. Synthetic variance anisotropy within a generic flux tube is computed in the high-Lundquist-number regime, and shows remarkable similarity with ACE observations.

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