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Flux-Tube Texture of the Solar Wind: Implications for the Scaling of Anisotropic Magnetic Fluctuation Spectra A. BHATTACHARJEE, C.-S. NG, C.W. SMITH, B. VASQUEZ, Space Science Center, 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. As early as 1963, Parker referred to these tubes as magnetic and plasma "filaments," and the picture has undergone several refinements since then [Bartley et al. 1966, Marliani et al. 1973, Tu and Marsch 1990, Bruno et al. 2001], culminating in the recent work of Borovsky [2008] who has suggested that these are fossil structures that originate at the solar surface. We use the weakly compressible MHD turbulence model [Bhattacharjee et al., 1998] to characterize the anisotropic magnetic fluctuation spectra observed by ACE. For a model of pressure-driven interchange turbulence in a generic solar wind flux tube, we use the Invariance Principle approach [Connor and Taylor 1977], to calculate explicitly the scaling of magnetic field fluctuations with plasma beta and other background plasma parameters. The theory predicts precise scaling laws for the magnetic fluctuation spectra parallel and perpendicular to the background magnetic field. We calculate the beta scaling of the variance anisotropy for electrostatic and electromagnetic pressure-driven turbulence in the solar wind, and demonstrate that they bracket well recent ACE observations.

Amitava Bhattacharjee
University of New Hampshire

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