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The Spaghetti Model of the Turbulent Solar Wind: Implications for the Scaling of Anisotropic Magnetic Fluctuations and Transport A. BHATTACHARJEE, C. SMITH, B. VASQUEZ, Center for Integrated Computation and Analysis of Reconnection and Turbulence, University of New Hampshire — There has been a steady accumulation of observational evidence that the solar wind may be thought of as spaghetti: 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], which incorporates the effect of background spatial inhomogeneities, to describe such structures. We revisit the model equations, showing their relation to recent work by Hunana and Zank [2010]. For a model of interchange-instability driven turbulence, we then use the 1998 model equations to make predictions for the beta scaling of the anisotropic magnetic fluctuation spectra (the so-called variance anisotropy) observed by ACE, and show that the predictions bracket the observations well. We also predict the scaling of the anisotropic transport coefficients for particles and thermal energy.

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