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The Effect of Magnetic Turbulence Energy Spectral Scaling on the Heating of the Solar Wind[1] D. MUNSI, C.S. NG, A. BHATTACHARJEE, P.A. ISENBERG, Center for Integrated Computation and Analysis of Reconnection and Turbulence, Center for Magnetic Self-Organization, University of New Hampshire — Recently, a phenomenological solar wind heating model based on a turbulent energy cascade prescribed by the Kolmogorov theory has produced reasonably good agreement with observations on proton temperatures out to distances of the order of 70 AU, provided the effect of turbulence generation due to pickup ions is included in the model. Without the inclusion of pickup ions, the Kolmogorov scaling law appears to predict a proton temperature profile that drops off too rapidly with radial distance from the Sun. In this study, we have incorporated in the heating model the energy cascade rate based on Iroshnikov-Kraichnan (IK) scaling, derivable from incompressible magnetohydrodynamics. We show that the model can produce significantly higher proton temperatures, within the range of observations, with or without the inclusion of pickup ions. Moreover, the turbulence correlation lengths prescribed by IK scaling seem to follow better the trend of observations, as compared with previous results based on Kolmogorov scaling, which showed a qualitatively different trend.

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