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Quantifying the locality of nonlinear interactions in MHD turbulence J.A. DOMARADZKI, University of Southern California, B. TEACA, D. CARATI, Universite Libre Bruxelles — The locality functions introduced by Kraichnan give the fraction of the energy flux across a given cutoff wavenumber k_c that is due to nonlinear interactions with wavenumbers k smaller than the cutoff (the infrared locality function) or greater than the cutoff (the ultraviolet locality function). Previous analysis of DNS data for hydrodynamic turbulence confirmed the theoretical scaling exponent of $n = 4/3$ in the wavenumber ratio and in the limit of the infinite inertial range. We have extended the analysis to DNS data for MHD turbulence. Out of four nonlinear terms contributing to the energy transfer, two dominant ones, $b \cdot \nabla b$ and $b \cdot \nabla u$, lead to the locality functions that exhibit behavior that can be characterized by scaling exponents in the infrared. The extend of the inertial range is insufficient to determine the exponents uniquely but the data are indicative of values between 1/2 and 2/3, i.e., much less than for hydrodynamic turbulence. Therefore, the nonlinear energy transfer is significantly more nonlocal in MHD turbulence, with potential implications for theory and modeling.

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