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Energy and Cross-helicity cascades in driven magnetohydrodynamic turbulence[1] JEAN C. PEREZ, STANISLAV BOLDYREV, University of Wisconsin-Madison — Magnetohydrodynamic (MHD) turbulence has been invoked to explain the observed power law scaling of the energy spectrum of fluctuations in the solar wind. Observations have also shown that turbulence consists of Alfvénic fluctuations that predominantly propagate away from the sun, indicating that the turbulence possesses cross-helicity, one of three MHD ideal invariants that cascades from large to small scales in the turbulent state. Moreover, there have been recent evidence from theory and numerical simulations that cross helicity plays a more fundamental role in determining the structure of the spectrum of magnetohydrodynamic turbulence, even when no overall cross-helicity is present. In order to elucidate the role of cross-helicity in the turbulence, we perform high resolution numerical simulations of MHD turbulence with and without cross-helicity. Based on our results, we propose that in the imbalanced case the Elsasser energy spectra have different amplitudes, nevertheless, their scaling is the same and consistent with the Iroshnikov-Kraichnan scaling, also observed in the balanced case.

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