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Reconnection, turbulence, and intermittency in coronal-hole jets

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Extreme-ultraviolet and X-ray jets occur in magnetically open coronal holes on the Sun, especially at high solar latitudes. We have performed a detailed statistical analysis of such a jet simulated with an adaptively refined magnetohydrodynamics model (Karpen et al., ApJ 2016). The results confirm the generation and persistence of three-dimensional, reconnection-driven magnetic turbulence in the simulation. We calculate the spatial correlations of magnetic fluctuations within the jet and find that they agree best with the Müller-Biskamp scaling model including intermittent current sheets of various sizes coupled via hydrodynamic turbulent cascade. The anisotropy of the magnetic fluctuations and the spatial orientation of the current sheets are consistent with an ensemble of nonlinear Alfvén waves generated by an untwisting magnetic field. These properties also reflect the overall collimated jet structure imposed by the geometry of the magnetic reconnection driving the jet. A comparison with Ulysses observations shows a quantitative agreement with turbulence in the fast solar wind.