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Turbulence cascades in the solar wind MIRIAM FORMAN, Stony Brook University, JESSE COBURN, CHARLES SMITH, BERNARD VASQUEZ, University of New Hampshire, JULIA STAWARZ, University of Colorado — The solar wind is the one astrophysical plasma we can observe in situ in exquisite detail with many spacecraft in it. It is clear that turbulence in the magnetic field is what makes this collisionless plasma act more-or-less like a simple fluid. Also, that the magnetic turbulence couples superthermal ions to the main "fluid" allowing them to feel the flow and be accelerated, confined and modulated. Understanding the detailed nature and structure of the magnetic turbulence in collisionless plasma is essential to understanding particle acceleration and other aspects of their interaction with astrophysical plasmas. However, the turbulence in the magnetic field is intimately coupled to the turbulence in the plasma velocity, in what is called magnetohydrodynamic (MHD) turbulence. This work will describe recent results about MHD turbulence in the solar wind. From the fluid+ Maxwell equations, the interaction of the two Elsasser fields $Z^{\pm}$ =V+/- $B/(\mu\rho)^{1/2}$ best describes the non-linear term in the MHD equations. If either is zero, there is no cascade. In theory, the turbulent heating rate is given by the linear scaling of certain mixed third moments of fluctuations in $Z^{\pm}$. Solar wind data shows the linear scaling, confirming the theory in the solar wind, but the two cascades are highly variable and tend to have opposite signs. This may be intermittency.

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