Geophysical Research Abstracts
Vol. 19, EGU2017-13260, 2017
EGU General Assembly 2017

On the properties of energy transfer in solar wind turbulence.

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Spacecraft observations have shown that the solar wind plasma is heated during its expansion in the heliosphere. The necessary energy is made available at small scales by a turbulent cascade, although the nature of the heating processes is still debated. Because of the intermittent nature of turbulence, the small-scale energy is inhomogeneously distributed in space, resulting for example in the formation of highly localized current sheets and eddies. In order to understand the small-scale plasma processes occurring in the solar wind, the global and local properties of such energy distribution must be known. Here we study such properties using a proxy derived from the Von Karman-Howart relation for magnetohydrodynamics. The statistical properties of the energy transfer rate in the fluid range of scales are studied in detail using WIND spacecraft plasma and magnetic field measurements and discussed in the framework of the multifractal turbulent cascade. Dependence of the energy dissipation proxy on the solar wind conditions (speed, type, solar activity...) is analysed, and its evolution during solar wind expansion in the heliosphere is described using Helios II and Ulysses measurements. A comparison with other proxies, such as the PVI, is performed. Finally, the local singularity properties of the energy dissipation proxy are conditionally compared to the corresponding particle velocity distributions. This allows the identification of specific plasma features occurring near turbulent dissipation events, and could be used as enhanced mode trigger in future space missions.