Geophysical Research Abstracts,
Vol. 10, EGU2008-A-02478, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-02478
EGU General Assembly 2008

The observed scaling properties of turbulent fluctuations in the turbulent solar wind: anisotropy and anomalous scaling due to MHD.

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The solar wind provides a natural laboratory for observations of MHD turbulence over extended temporal scales. We quantify the 'macroscopic' scaling seen in extended intervals of solar wind by testing for scaling in the Probability Density Functions (PDF) of fluctuations in the timeseries both directly and via structure function analysis. In practice there are statistical limitations presented by a finite length time series which we will first discuss. The anisotropic nature of solar wind fluctuations can be accessed by decomposing the vector velocity linearly into two coexistent components perpendicular and parallel to the local average magnetic field. These show distinct scaling which we quantify via the intermittency free exponents. That of the perpendicular fluctuations is consistent with recent predictions for anisotropic MHD. That of the parallel fluctuations is close to the scaling which we find in the number and magnetic energy density, and Poynting flux. One interpretation of the co- existence of these scalings in the solar wind is that they reflect both local and nonlocal phenomenologies, with implications for our understanding of the evolving solar wind. Intriguingly, a more detailed analysis of magnetic energy density reveals a solar cycle dependence, and at solar maximum, self affine rather than multifractal scaling, suggesting the scaling is of solar origin. An important question is then the nature of the interaction between these processes.