Geophysical Research Abstracts, Vol. 8, 03331, 2006
SRef-ID: 1607-7962/gra/EGU06-A-03331

Cross-scale couplings in turbulent space plasmas

Z. Vörös (1), W. Baumjohann (1), M. Leubner (2), R. Nakamura (1)

(1) Space Research Institute, Graz, Austria, (2) Institute of Astrophysics, Innsbruck, Austria (zoltan.voeroes@oeaw.ac.at / Phone: +43-316-4120-593)

A special case of cross-scale coupling in space plasmas is represented by MHD turbulence which results in an intermittent redistribution and dissipation of energy over a broad range of spatial and temporal scales. We review some of the recent approaches proposed to address the problem of multi-scale turbulence in the solar wind and in the Earth's plasma sheet. The traditional explanation of intermittent turbulence based on spectral transfer of energy between neighbouring scales is now complemented with further mechanisms, such as interaction processes between multi-scale flux tube-like coherent structures and direct coupling between separated scales due to the presence of large-scale boundaries or scalar gradient fields. We demonstrate that each scenario is supported by in situ measurements in the solar wind and in the Earth's plasma sheet. Therefore, each approach represents a complementary way of looking at cross-scale coupling in turbulence. We also argue that the manifold of nonlocal interactions in space plasma turbulence requires to introduce a general probabilistic description which can be formulated within the context of non-extensive thermo-statistics in the simplest cases.