Geophysical Research Abstracts
Vol. 13, EGU2011-8092, 2011
EGU General Assembly 2011

Magnetic turbulence in the magnetospheric environment: highlights from multi-spacecraft missions

Gaetano Zimbardo (1), Antonella Greco (1), Luca Sorriso-Valvo (2), Silvia Perri (3), Zoltan Voeroes (4), Giorgi Aburjania (5), Khatuna Chargazia (5), and Olga Alexandrova (6)

(1) University of Calabria, Department of Physics, Ponte P. Bucci, Cubo 31C, 87036 Rende, Italy, (zimbardo@fis.unical.it, +39 0984 494401), (2) LICRYL Laboratory, IPCF-CNR, Rende, Italy, (3) International Space Science Institute, Hallerstrasse 6, CH-3012 Bern, Switzerland, (4) Institute of Astro- and Particle Physics, University of Innsbruck, Austria, (5) Tbilisi State University, Nodia Institute of Geophysics, Tbilisi, Georgia, (6) LESIA, Observatoire de Paris, CNRS, UPMC, Universite Paris Diderot, 5 place J. Janssen, 92190 Meudon, France

Magnetic turbulence is found in most space plasmas, including the Earth's magnetosphere and the interaction region between the magnetosphere and the solar wind. Recent observations of magnetic turbulence in the ion foreshock, in the magnetosheath, in the polar cusp regions, in the magnetotail, and in the high latitude ionosphere will be reviewed [1]. Many interesting features can be investigated with the use of Geotail, Cluster, and THEMIS data. Indeed, multi-spacecraft missions allow to assess the spatial structure and spatial evolution of the observed turbulence. It is found that: 1. A large share of magnetic turbulence in the geospace environment is generated locally, as due for instance to the reflected ion beams in the ion foreshock, to temperature anisotropy in the magnetosheath and the polar cusp regions, and to velocity shear in the magnetosheath and magnetotail. 2. Spectral indices close to the Kolmogorov value can be recovered for low frequency turbulence when long enough intervals at relatively constant flow speed are analyzed in the magnetotail, or when fluctuations in the magnetosheath are considered far downstream from the bow shock. 3. For high frequency turbulence, a spectral index $\alpha \simeq 2.3$ or larger is observed in most geospace regions, in agreement with what is observed in the solar wind. 4. Further studies are needed to gain an understanding of turbulence dissipation in the geospace environment, also keeping in mind that the strong temperature anisotropies which are observed show that wave particle interactions can be a source of wave emission rather than of turbulence dissipation. 5. Coordinated multi-spacecraft observations show the existence of conjugate vortices in the magnetotail and in the ionosphere, so that they may have a primary role in the turbulent injection and evolution.

The influence of such a turbulence on the plasma transport, dynamics, and energization will be described, also using the results of numerical simulations.

[1] Zimbardo et al., Space Sci. Rev., DOI 10.1007/s11214-010-9692-5