

Preface

Advances in space environment turbulence

Current high quality in situ and remote measurements in space plasmas such as of the terrestrial magnetosphere, the magnetosheath, the bow shock, the solar wind and the solar atmosphere provide evidence for a rich nonlinear behavior from coherent structures to developed turbulence spectra. The interpretation of these observations constitutes a real challenge for plasma physicists and experts in nonlinear dynamics. To address these questions, a series of workshops took place in the framework of the activities of the World Institute for Space Environment Research (WISER; <http://www.cea.inpe.br/wiser>). The present special issue of *Nonlinear Processes in Geophysics* consists of the main papers drawn from talks presented at the Alfvén 2004 workshop on Space Environment Turbulence, held in Beaulieu, France, 19–23 April 2004 after they were accepted in the course of the NPG peer review process (Editors: Jörg Büchner, Abraham Chian, Thierry Passot and Pierre-Louis Sulem). The main topics discussed during the meeting, both from observational and theoretical perspectives, include waves and coherent structures, collisionless shocks, collisionless reconnection, acceleration and heating processes, developed turbulence and intrinsic chaos.

The papers collected in this special issue of NPG address the current understanding and the following open questions:

- The origin of magnetic holes, i.e. slow magnetosonic solitons or steepened Alfvén waves, large-amplitude mirror modes, phase space holes and quasi-potential structures.

- Heating of the solar corona originating from microflares, the excitation of kinetic Alfvén waves and auroral return current acceleration structures.
- The influence of kinetic effects on MHD waves and instabilities in homogeneous and stratified plasmas.
- Collisionless reconnection in the presence of strong guide field and chaotic particle motion in inhomogeneous magnetic fields.
- Turbulence in the solar wind and in the interstellar medium with special emphases on the effect of Hall currents, on the dynamo action, on the origin of density fluctuations, intrinsic chaos and intermittency.

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