

*Preface*

**New perspectives in magnetospheric dynamics:  
chaos, fractals, multiscale turbulence and criticality**

The historical approach to magnetospheric dynamics has been essentially based on magnetohydrodynamics (MHD) concepts. However, although in the last century significant progress has been achieved in the understanding of magnetospheric phenomena from a classical MHD approach, it has recently been realised that the coupling of processes on a range of scales, from kinetic to MHD is fundamental to magnetospheric dynamics. For example, the highly intermittent character of the magnetotail dynamics seems to be better described in terms of multiscale phenomena, encompassing several physical processes ranging over micro- to meso- and macro-scales and involving space-time cross-scale coupling and changes in the magnetic field topology in the geotail regions. This novel approach tries to find the multiscale links, and the imprints of small-scale particle kinetics on large-scale properties of dynamical magnetospheric state. In the last decade, several theoretical, as well as, observa-

tional works were devoted to the role that chaos, turbulence and criticality might have in the framework of the magnetospheric dynamics. These studies suggested that chaos, sporadic fluctuations, nonlinear processes, scaling features, and turbulence are highly relevant for plasma transport. Moreover, new ideas based on complex system physics opened new perspectives for the study of magnetospheric dynamics.

In this special issue, a collection of papers contributed by some authoritative experts in this new framework and dealing with some of the aforementioned aspects of the magnetospheric dynamics is presented. Some of the papers were based on the presentations given by the authors at the 2001 International Association of Geomagnetism and Aeronomy held in Hanoi, Vietnam. We thank the referees for their expert advice. Special thanks to the Editor-in-Chief, Prof. A. R. Osborne and to Ms. Katja Gänger of the NPG Editorial Office for handling the editorial details.