Preface

The *Swarm* satellite mission was selected in 2004 as the fifth Earth Explorer mission in ESA's Living Planet Programme (http:/www.esa.int/esaLP/). *Swarm* comprise a constellation of three satellites in near-polar low orbits and is scheduled for launch in 2010. The mission aims at providing the best ever survey of the geomagnetic field and its temporal evolution and is expected to lead to new insights into the Earth system by improving our understanding of the Earth's interior and its effect on Geospace, the vast region around the Earth where electrodynamic processes are influenced by the Earth's magnetic field.

As part of feasibility Phase A of the mission, scientific studies were carried out, with the aim of analyzing the key mission requirements, particularly with respect to the number of satellites and their orbits in relation to the science objectives. This special issue is a collection of twelve articles from many disciplines, and summarizes the results of a variety of research efforts that have been conducted recently as part of the *Swarm* mission preparation.

A general introduction to the *Swarm* mission concept and its scientific objectives is given in the paper by Friis-Christensen, Lühr and Hulot, who are the lead and co-proposer of the mission to ESA. The following four papers report on the outcome of the Phase A research activities regarding determination of the magnetic field of the core and lithosphere. Besides modelling these Earth interior components, electromagnetic induction studies using simulated *Swarm* magnetic data are discussed in the following two papers providing an additional insight into the Earth interior, especially the mantle. The use of the *Swarm* constellation for studying electric currents in the ionosphere and their connection to the magnetosphere is reported in the three papers thereafter. The last two contributions present new approaches for modelling the lithospheric field.

This documentation of study results related to the mission objectives and expected capabilities of *Swarm*, reflected at this early stage of the mission, hopefully encourages scientist from the Earth observation and space science communities to cooperate and to inspire them to think about new ideas related to this unique constellation concept.

We gratefully acknowledge the authors and reviewers for their time and efforts to make this special issue of Earth, Planet and Space possible. We also would like to thank ESA and NASA, as well as the institutions involved in the *Swarm* science studies, for their support. Finally we express words of gratitude to Terra Scientific Publishing Company for allowing the presentation of this international effort in Earth, Planets and Space.

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