

# AURORAL PLASMA PHYSICS

# Space Science Series of ISSI

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Volume 15

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*The titles published in this series are listed at the end of this volume.*

# AURORAL PLASMA PHYSICS

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# Foreword

The present 15th volume of the ISSI Space Science Series is devoted to Auroral Plasma Physics. The aurora is arguably the most intriguing phenomenon in space plasma physics. Not only is it the most spectacular manifestation of the Sun-Earth connection chain, but the underlying plasma processes are expected to be ubiquitous in the plasma universe. Recognizing the enormous progress made over the last decade in the understanding of the physics of the auroral acceleration processes, it seemed timely to write a comprehensive and integrated book on the subject. Recent advances concern the clarification of the nature of the acceleration process of the electrons that are responsible for the visible aurora, the recognition of the fundamental role of the large-scale current systems in organizing the auroral morphology, and of the interplay between particles and electromagnetic fields.

The project began in March 1999, as a natural follow-up of the project on Magnetospheric Plasma Sources and Losses that resulted in volume 6 of this series, with a planning meeting by a core-group that coordinated the project. The group consisted of J. E. Borovsky, Los Alamos National Laboratory; C. W. Carlson, University of California, Berkeley; G. Haerendel, Max-Planck-Institut für extraterrestrische Physik, Garching; B. Hultqvist, Swedish Institute of Space Physics, Kiruna; H. E. J. Koskinen, Finnish Meteorological Institute, Helsinki; W. Lotko, Dartmouth College, Hanover, New Hampshire; K. A. Lynch, University of New Hampshire, Durham and G. Marklund, Royal Institute of Technology, Stockholm. G. Paschmann, ISSI, Bern, was the project leader.

The work was organized through three major workshops, with nearly 30 invited attendants, followed by a series of smaller meetings that concentrated on writing and editing of the manuscript. While the core-group carried much of the work load, as authors, chapters editors and reviewers, a total of 32 authors finally contributed to the book. The team members must be thanked for their spirit of collaboration and dedication, highlighted by the fact that they all agreed that their names would not appear prominently, but instead would be hidden in a strictly al-

phabetical list. Thanks are also due to C.-G. Fälthammar, R. Nakamura and J. Vogt for valuable comments on some of the chapters.

This book is intended to be used both as a learning tool for graduate students, and as a reference for auroral researchers. It must be stressed that while scientific understanding of the aurora is advancing rapidly, much remains to be learned. This book represents a snapshot of our current understanding, with emphasis on those aspects that are related to particle acceleration processes. Attempts have been made throughout to indicate those topics for which there are significant gaps in our understanding.

All chapters in this book were written in L<sup>A</sup>T<sub>E</sub>X, and all figures, more than 200, were provided as encapsulated PostScript files. BibTeX was used for the references. The index includes the acronyms and abbreviations used in the book.

V. Manno, B. Fasler, G. Indermühle, X. Schneider, D. Taylor, and S. Wenger of the ISSI staff provided the infrastructure for the many meetings of the project team. B. Mory at MPE Garching helped with many of the figures.

The book is dedicated to the memory of Yuri Galperin, whose insight and enthusiasm contributed much to the spirit and success of the project, but who did not live to see its completion.

Bern in July 2002

G. Paschmann, S. Haaland, R. Treumann

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