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Preface

PREFACE TO THE FIRST EDITION

The upper polar atmosphere sets the scene for one of the nature's most beautiful celestial phenomena, the aurora borealis or the northern lights. The colourful, dynamical and airy forms are the end product and the most spectacular of a long chain of plasma processes initiated by particle eruptions on the Sun. Such plasma processes are thought to be of fundamental importance all over the universe. Therefore the polar atmosphere is a natural laboratory in which we can study physical processes that give us insight into the understanding of similar light phenomena at other planets and celestial bodies. In fact, the polar atmosphere is the nearest laboratory in space from which we can expand our knowledge into the most remote places in our environment.

This book tries to follow the chain of processes which take place when the stream of particles (the solar wind) leaves the Sun, travels through interplanetary space and ends up as energetic particle beams producing the spectacular auroral forms in the polar sky.

This book has been made possible through encouragements from colleagues and students, and I will in particular thank Professor Leroy C. Cogger and Professor Nobuo Matuura who made it possible for me to spend extended visits at the universities of Calgary and Nagoya during which I was able to work on this book. I am also grateful to valuable discussions with Professor Yoshuke Kamide, Dr. Satonori Nozawa, and my Norwegian colleagues Professor Alv Egeland, Dr. Chris Hall, and Dr. Jøran Moen. Special thanks go to my students Trygve Sparr and Mårten Blixt. My secretary Liv Larssen who has typed the manuscript over and over again and who has supplied many of the illustrations in the book is greatly acknowledged for her patience.

Without the support of my wife who took all the extra loads during my many trips away from home this book would never have been a reality.

Tromsø, August 1996

PREFACE TO THE SECOND EDITION

The motivation for revising this book, *Physics of the Upper Polar Atmosphere*, which was first published in 1997, is first of all to meet modern syllabus demands in university courses at the master of science and doctor of science levels in upper-atmospheric physics. Therefore, large sections dealing with detailed descriptions of the motion of electrically charged particles in magnetic fields and the Størmer calculations are left out as these matters can be found in today's more fundamental textbooks.

Another motivation has been to correct the many errors that have been disclosed through the years of active use. In this respect I am very grateful to many of my students and colleagues who have given me advice and proposed improvements, and I owe a special debt of gratitude to Professor Takashi Okuzawa and Dr. Susume Saito for their very conscientious and careful reading of the book.

I am also grateful to Professor Takeiko Aso of the National Institute of Polar Research (NIPR) in Japan and Professor Ryoichi Fujii of the Solar Terrestrial Environment Laboratory (STEL) at Nagoya University for inviting me to spend extended visits to their institutes which allowed me to devote myself to this work during my sabbatical leave of absence from my home institution at the University of Tromsø.

Last but not least I am extremely grateful to my secretary Liv Larssen who again has helped me extensively in rewriting the text as well as redrawing some of the figures.

The picture on the cover was kindly presented to me by Professor Cesar La Hoz who took the photograph.

Tromsø, October 2011
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