

Preface

The International School for Space Simulations (ISSS) was established in the early 1980's by M. Ashour-Abdalla, R. Gendrin, H. Matsumoto and T. Sato to promote science and technology related to space plasma physics via computer simulations. The series of ISSSs were held at Kyoto in Japan (1982), Hawaii in U.S.A. (1985), La Londe-les-Maures/Beaulieu-sur-Mer in France (1987), Kyoto / Nara in Japan (1990), Uji, Kyoto in Japan (1996), and Garching in Germany (2001). They have greatly contributed not only to promotion and advancement of space simulations, but also to education of young scientists and students.

In March 2005 the seventh ISSS (ISSS-7) was held at Kyoto, Japan. The present book was inspired by ISSS-7, and it is a collection of extended lecture notes of the tutorials given at ISSS-7 by the invited lecturers who have been actively involved in computer simulation techniques in space plasma physics.

The aim of this book is to provide the information on the latest advanced methods for space plasma simulations to those who have been investigating space plasma science by numerical simulations. The present book treats a wide variety of issues on advanced techniques of space simulations. The book contains lecture notes on advanced schemes of PIC (Particle-In-Cell) simulation newly incorporated in the full particle model and the hybrid model, advanced simulations such as the Delta-f model, adaptive PIC model, Vlasov simulation, and discrete-event simulation. In association with space simulations, techniques on unstructured mesh generation and advanced visualization are described. Some simulation codes are included in the text at the end of the book.

Before the reader studies the advanced methods in the present book, we recommend that the readers first study basic space simulation techniques published in earlier textbooks or WEB sites (e.g. "Computer Space Plasma Physics: Simulation Techniques and Software" edited by H. Matsumoto and Y. Omura. The contents of the book are now available at <http://www.terrapub.co.jp/e-library/cspp/index.html>).

The editors are grateful not only to the immense efforts made by the lecturers who prepared the extended manuscripts of the lecture notes, but also to the referees who contributed to the improvement of the manuscripts.

Finally, on the retirement of Professor Hiroshi Matsumoto from the professorship at Kyoto University in 2005, we would like to express our hearty gratitude to him for his dedicated contribution to the progress of computer simulations in space plasma physics and space engineering through ISSS for more than 20 years.

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