

Preface to the English Edition

This book is an English edition of a Japanese book with the same title. A new chapter, “Space Plasma Environment,” written by Prof. Tohru Hada, has been added in this edition to cover the plasma flow influenced by the Lorentz force that was not included in the Japanese edition.

This English edition is supported by the advanced graduate program in Global Strategy for Green Asia at Kyushu University. We would like to express our sincere gratitude to all those people who have supported this publication.

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Preface to the Original Japanese Edition

This book introduces the fundamental concepts of environmental fluid dynamics. It is intended for use by students, researchers, and specialists working in the research fields of geophysical fluids (such as atmosphere or ocean) and general fluid environment. Because the Earth is covered by atmosphere and oceans and is exposed to solar wind, the knowledge of fluid motion is essential for tackling its environmental issues. Although fundamental fluid mechanics is found in many existing textbooks, few of them clearly describe all the essential ideas, from the fundamentals of fluid dynamics to environmental science, with a careful explanation of the governing mathematics. This book has been developed to bridge that gap.

In recent years, with an improvement in the educational setting for environmental science, many students graduating from various university departments choose a career in environment-related fields and undertake specialized researches. Under these circumstances, many students have probably never acquired a fundamental knowledge of fluid mechanics before engaging in such research. The present book will be an invaluable resource for such students. Meanwhile, students who have previously studied fluid dynamics will come to realize that certain aspects of environmental fluid dynamics, such as stratification or rotation effects, are not truly covered by general fluid mechanics. Furthermore, general fluid dynamics treats flows around objects, whereas in environmental fluid dynamics, flows inside boundaries are also important. To accommodate these needs, fluid dynamics “repackaged for environmental sciences” should be learned again. Considering these issues, this book takes the reader from the derivation of the fundamental fluid dynamics equations through to environmental science in eight chapters. Intermediate calculations are carefully demonstrated, and fundamental concepts are explained as comprehensively as possible. Using this book, readers will acquire plentiful knowledge about the dynamics of fluid motion, which will assist them in their more advanced research of environmental science and technology. A home page related to this book will be established at <http://www.esst.kyushu-u.ac.jp/textbook/>, which allows the interaction of the authors and the readers of this book.

This book is based on a series of actual lectures, which are compulsory for obtaining a master’s degree in the Department of Earth System Science and

Technology, Kyushu University. This fact is reflected in the selection of contents. Gravitational and Coriolis forces are given as early examples of external forces, although advanced electromagnetic flow under the Lorentz force is excluded in the present edition. Each chapter was written by the corresponding course instructor in FY2000. During the editing process, predicates and symbols, which may vary across disciplines, have been unified wherever possible. References are provided as footnotes within the text, while more general materials accessed while writing the text are compiled as a bibliography at the end of the book.

In addition to sincerely thanking the authors of the book, we offer sincere thanks to many staff who participated in the planning and operating of these lectures. We also express the heartfelt thanks to Seizando-Shoten Publishing Co., Ltd., for their valuable support in publishing this book.

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