

Preface

My goal with the publication of this two-volume “Atmospheric and Space Sciences” Springer Briefs series is to contribute toward bridging the gap between the scientific disciplines of meteorology, aeronomy (or space science), and planetary science and, in particular, provide a whole atmosphere systems science approach to Earth’s atmosphere and plasma environment. As such, this environment is a multi-component, complex system that is governed by a nonlinear interplay of physical and chemical processes. Technically, one could speak of the plasma physics, chemistry, electrodynamics, modeling and observation, and hydrodynamics of the atmosphere–ionosphere system. There are separate seminal textbooks out there on each of these aspects of the atmosphere in great detail. My text is not meant to present a comprehensive overview of the entire field. Nevertheless, these volumes are thought to provide a basic and practical introduction to the fundamental physics of atmospheric and ionospheric processes. Specifically, the two volumes of the “Atmospheric and Space Sciences” are

- Volume 1—Neutral Atmospheres
- Volume 2—Plasma Environment

The first volume focuses on the fundamentals of terrestrial and planetary neutral atmospheres. The second volume focuses more on the plasma basics of the terrestrial and planetary atmospheres and, in particular, the thermosphere–ionosphere. In both volumes, some selected research topics are included and relevance to planetary science is highlighted where appropriate.

Overall, these volumes serve as a concise introduction to the basics of atmospheric and space sciences and they highlight some current research activities in these fields. In particular, the physics of internal gravity waves and vertical coupling have extensively been discussed throughout the text because of the interdisciplinary nature of these subjects. Many details have been left out for the interested readers to check in detail themselves. Scientific problems whose solution significantly involves an understanding of Earth’s atmosphere as a whole have brought scientists from different subfields together. Here, I would like to emphasize

that often the expressions of “in the atmosphere” and “in planetary atmospheres” have been used interchangeably in the text.

These volumes are accessible to a broad range of audience. Especially, undergraduate and graduate students, for example in physics, mathematics, and Earth sciences, can greatly benefit from the text. For senior undergraduate science students, these volumes could be very helpful to learn the basics of atmospheric physics. Early career geoscience researchers can use the books to review various topics of interest and develop new ideas. Overall, I envisage that anyone with some appreciation for basic mathematics and geosciences will enjoy reading these volumes.

Fairfax, VA
May 2015

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Atmospheric and Space Sciences: Neutral Atmospheres

Volume 1

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2015, XVII, 110 p. 29 illus., 19 illus. in color., Softcover

ISBN: 978-3-319-21580-8