

Preface

During the past decade remarkable advances have been made in our understanding of the dynamics, physics, and chemistry of the middle atmosphere. Much of the observational and theoretical research that has led to this progress was stimulated by fears that human activities might adversely affect the ozone layer. The advances in our understanding of the chemistry of the stratosphere that have occurred during this period are quite well known. The parallel advances in our understanding of the dynamics of the middle atmosphere have been no less significant but are less widely appreciated. It is these that provide the primary motivation for the present book. The middle atmosphere cannot be properly understood without considering the complex interactions among dynamics, chemistry, and radiation. Because the chemical aspects of middle atmosphere science have been treated in depth elsewhere, the discussion of chemistry in the present work is limited to those aspects essential for a basic understanding of the ozone layer. A careful treatment of radiative heating and cooling processes is essential for an understanding of many of the features of the structure of the middle atmosphere. Since standard texts on atmospheric radiation devote very little space to aspects of the subject essential for middle atmosphere studies, we have included a much more complete treatment of radiative processes than is usually found in dynamics texts.

Middle Atmosphere Dynamics is intended for use in graduate courses on middle atmosphere dynamics for students with some background in dynamic meteorology or fluid dynamics. It will be useful to all research workers in meteorology, aeronomy, and atmospheric chemistry who are involved in any aspect of the study of the middle atmosphere. Furthermore, many of the basic dynamical and physical processes discussed also have broad applicability in other branches of atmospheric dynamics and will be of interest to those studying such areas as climate dynamics and planetary atmospheres.

We have not attempted to provide an exhaustive bibliography of original literature. References have been kept to a minimum within the text. Annotated lists of useful original papers, reviews, and monographs (organized by section headings) are given at the ends of the chapters. To avoid duplication, works cited within the text are not generally included in these lists. References are identified by author and year; complete citations are given in the bibliography at the end of the book.