Preface

Atmospheric thermodynamics is often the first quantitative atmospheric science course encountered by new meteorology majors. This is not surprising, as it serves as the natural bridge between the generic principles of physics and calculus (energy and work, differentiation and integration) acquired in the lower division years and the more specialized knowledge and methods associated with atmospheric dynamics and the analysis of weather systems. For these reasons, there are also special pedagogical challenges in the teaching of atmospheric thermodynamics — one must give due attention not only to the core subject matter but also provide meteorological context and further reinforce newly acquired math and physics skills.

This book is therefore not *just* about atmospheric thermodynamics, and that is perhaps the most important distinction from other excellent texts on the subject. It also gives new majors a basic grounding in the observed composition and structure of the atmosphere as well as how routine meteorological measurements are made. Wherever possible, it attempts to show connections between abstract theoretical concepts and the observable properties and behavior of the atmosphere. Last but not least, it includes a substantial, self-contained appendix devoted to "mature" problem solving skills in the physical sciences, something students are often exposed to in a hit-and-miss way in earlier science courses.

Notwithstanding the above ways in which I have *added* to the scope of a traditional thermodynamics text, I have consciously resisted the temptation to include whole chapters on topics whose connection to real-world meteorology is more tenuous. Relatively few undergraduate meteorology majors will have occasion later in their careers to ponder the meaning of entropy or the efficiency of heat engines. I therefore introduce these and similar topics only in passing, usually as a waypoint to something more "useful," such as the Clausius-Clapeyron equation. Those students requiring a more sophisticated understanding will undoubtedly have another

shot at it in graduate school.

Above all, my goal has been to write this book not for instructors but for *students*. It is intentionally not a scholarly monograph but rather an attempt to make a limited set of basic concepts and skills as accessible — and useful — as possible to those seeing them for the first time, including many who may still feel a bit insecure in their understanding of physics and calculus.

Homework problems are interspersed throughout each chapter rather than being grouped at the end in the traditional manner. These are designed not to stump the student but rather to facilitate his/her internalization of the immediately preceding material. Boxed equations highlight key results or relationships that deserve special attention. The appearance of a dagger (†) after a chapter or section heading warns of more advanced material that may be skipped in an undergraduate-level course.

As was the case for my first book, *A First Course in Atmospheric Radiation*, I intend to undertake revisions and corrections with each new print run, following a model that more nearly resembles that of regular software updates rather than traditional textbook publishing. Comments, corrections and suggestions for future revisions are therefore encouraged and may be sent to the author c/o Sundog Publishing (see contact information on copyright page). Errata, as well as supplemental resources, will be posted on the publisher website at `www.sundogpublishing.com`.

GRANT W. PETTY

One should write not to be understood, but rather so as to make it impossible to be misunderstood. - Marcus Fabius Quintilianus