# FOREWORD

This book contains the lectures and problems from the 1-semester course *Introduction to Atmospheric Chemistry* which I have taught at Harvard since 1992. The course is aimed at undergraduates majoring in the natural sciences or engineering and having had one or two years of college math, chemistry, and physics. My first objective in the course is to show how one can apply simple principles of physics and chemistry to describe a complex system such as the atmosphere, and how one can reduce the complex system to build models. My second objective is to convey a basic but current knowledge of atmospheric chemistry, along with an appreciation for the process of research that led to this knowledge.

The book tries to cover the fundamentals of atmospheric chemistry in a logical and organized manner, as can reasonably be done within a 1-semester course. It does not try to be comprehensive; several excellent books are already available for that purpose, and some suggestions for further reading are given at the end of individual chapters. Because lecture time is limited, I leave the applications of many concepts to problems at the end of the chapters. The problems are thus an essential part of the course and I encourage students to work through as many of them as possible. They generally try to tell important stories (many are based on research papers for which reference is given). Numerical solutions are provided at the end of the book. Detailed solution sets are available upon request.

The choice of topics reflects my view of priorities for an undergraduate course. The emphasis is squarely on the major environmental issues that motivate atmospheric chemistry research. I do not use the course as a vehicle to teach physical chemistry, and chapter 9 ("chemical kinetics") is for now rather cursory. I used to teach chapter 5 ("the continuity equation") but have since decided that it is more suited for a graduate rather than an undergraduate course. I have left it in the book anyhow. I hope to include in future editions additional topics that I would cover in a graduate-level course such as aerosol microphysics and chemistry, deposition processes, or the sulfur cycle.

Atmospheric chemistry is very much an observational science but this book does not do justice to the importance of field observations. Although I spend a lot of time in lectures presenting experimental data, only a few of these data have been included in the book. The limitation was largely self-imposed as I tried to keep the text focused on essential concepts. Restriction on publication of color graphics was also a factor. A Web complement to the book would be a good vehicle for overcoming both limitations. This is again a goal for future editions!

There are many people whom I want to thank for helping me with the course and with this book. First is Michael McElroy, with whom I co-taught my first atmospheric course in 1987 and who showed me how it should be done. This book is heavily imprinted with his influence. Next are my Teaching Fellows: chronologically Denise Mauzerall (1992), Larry Horowitz (1993), David Trilling (1993), Adam Hirsch (1994), Yuhang Wang (1994, 1996), Allen Goldstein (1995), Doug Sutton (1995), Nathan Graf (1996, 1997), Amanda Staudt (1997, 1998), Brian Fehlau (1998), Arlene Fiore (1998). Many thanks to Hiram Levy II, Martin Schultz, Michael Prather, Ross Salawitch, and Steven Wofsy for providing me with valuable comments. Thanks to Jack Repcheck of Princeton University Press for visiting my office three years ago and encouraging me to write up my lecture notes. Thanks to Michael Landes for his outstanding help with figures. I look forward to suggestions and comments from readers.

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