Foreword to the draft 2nd edition

Introduction to Atmospheric Chemistry

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I am regularly posting and updating on my education website the draft chapters of a long-awaited (at least by me!) second edition of my *Introduction to Atmospheric Chemistry* textbook published in 1999. This textbook is aimed at undergraduate and beginning graduate students in science or engineering. It is based on my experience teaching the undergraduate course in atmospheric chemistry at Harvard for many years, and it is complemented by my lecture slides updated every year and available from my education website. The draft chapters are password-protected but I will give the password to instructors; send me an email and I will send you the password. The lecture slides are not password-protected.

This second edition is a thorough revision of the first, and not much of the original text from the first edition has remained. I would like to think that I am much wiser now, thanks to many more years of research and teaching. Atmospheric chemistry as a field has also progressed quite a bit over the past 25 years.

Many readers have commented favorably on the conciseness of the first edition and I have tried to keep it that way. The general flow of the book is the same as in the first edition but I have removed and added several chapters. Gone are Chapter 5 on the continuity equation, which I don't think is needed for an intro book; Chapter 8 on aerosols, which was embarrassingly skeletal; Chapter 12 on ozone pollution, now merged with the chapter on tropospheric oxidant chemistry because it's more logical that way; and Chapter 13 on acid rain, now merged with the new aerosol chemistry chapter. I have added a mercury chapter. I have added boxes in the text for primers and side material of likely interest to some readers but that would burden the main text. I have added exercises with answers throughout the text for quick computational applications of concepts as they are introduced.

I have tried to emphasize the fundamentals of the field, as opposed to showing lots of data, in part for conciseness but also to increase the shelf life of the book. This may make the text seem dry, considering that atmospheric chemistry is such an observationally driven and newsy field. But the fundamentals are slower to change than the latest hot topics, and covering the fundamentals is where a textbook is most useful. Readers will find the latest data in my lecture slides, updated every year, and these data are indeed an important complement to the book to convey atmospheric chemistry as a living field and to emphasize societal relevance.

The questions and problems at the end of each chapter are intended to make readers think about the material they have just learned and to uncover new perspectives. Quantitative problems have simple analytical solutions designed to reveal relationships between variables and to teach the importance of back-of-the-envelope calculations. I have replaced most questions and problems from the first edition with new ones, largely taken

from my *Supplemental Problems to the first edition* (again, on my educational website). Answers are available to instructors upon request and upon certification of instructor status.

This book is intended to be an introduction to atmospheric chemistry, not a reference book. I try to present the fundamentals succinctly and clearly but I do not try to be comprehensive. The classic reference book for atmospheric chemistry is *Atmospheric Chemistry and Physics* by J.H. Seinfeld and S.N. Pandis, which I strongly recommend to professionals in the field. How could I not also strongly recommend *Modeling of Atmospheric Chemistry* by G.P. Brasseur and D.J. Jacob, which contains all that you might possibly want to know about modeling atmospheric chemistry and so much more.

As I prepare this second edition, I want to renew the expression of my gratitude to Michael McElroy, with whom I co-taught my first course in atmospheric chemistry at Harvard and who showed me how it should be done. The book is imprinted with his wisdom. I am grateful to my great Teaching Assistants over the years for their feedback. I am grateful to the readers of the first edition for their comments and corrections.

I would like to thank you for using this living draft of the second edition and I would be extremely grateful for your corrections, comments, and suggestions. I am already grateful to Dan Cohan, Sarah Hancock, Colette Heald, Chris Holmes, Luis Aguilar Suarez, and Bo Zheng for their comments on earlier drafts.

Happy learning and teaching!

Daniel Jacob
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