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BOOKS: ATMOSPHERE

A Change in the Air

Michael J. Prather

The development of the field of atmospheric chemistry has been pushed, at least since the 1950s, by environmental change. Haagen-Smit's research on ozone smog was driven by the then obviously deteriorating air quality in the Los Angeles basin. The 1970s brought the imagined threat of supersonic aircraft fleets and the realized threat of chlorofluorocarbons, which focused the field on global patterns and processes. A new book on "global change" conjures numerous questions: How can change be encapsulated in a text? What can be said about the future? And, of course, for how long will such a book be useful? Aiming to produce an atmospheric chemistry text adds further hurdles. One must balance well-established atmospheric physics and chemistry with the many unresolved processes controlling atmospheric composition still under scrutiny. The new volume edited by Guy Brasseur, John Orlando, and Geoffrey Tyndall handles the complexity of atmospheric chemistry well, but trips a little over the hurdles of timeliness and future change.

A first lesson for anyone using this book is that the field has progressed since it was written. Like any text on global change, it is already outdated when published and it will become even more dated as a new generation of graduate students pore through it—as they probably should. The editors should have noted the book's effective date in the preface. Although it includes some 1998 references, I would have included "1996" in the title. Several key events of the past couple years—the slowdown in methane's increase, the peaking of some halocarbons phased out by the Montreal Protocol—are not discussed. Despite this shortcoming, the book provides the widest range of topics in atmospheric chemistry in a framework of global atmospheric change currently available (in 1999).

The volume was written and edited primarily by the community of atmospheric scientists in Boulder, Colorado. Each of the 16 chapters includes a short list of recommended readings (other texts and re-

views) and an independent essay by a well-known scientist. A list of references to scientific papers, tabulations of atmospheric chemistry data, and a sample set of useful problems (not keyed to the chapters) are gathered at the end. The individually written chapters lack the coherence and consistency of notation possible when one author writes the entire text.

The essays work excellently where they present unique or individual historical perspectives. Some of my favorites were McIntyre on dynamics, Schneider on climate, Mégie on measurements, and Albritton on the global perspective. Rodhe's essay on modeling is appropriately dated: "Today (1996)..." These essayists develop interesting viewpoints that are otherwise not found in a current text. The essays work less well where their authors simply review material already covered in the chapter.

When I went through the text with a sharp pencil in hand, I found irritations and inconsistencies. The introductory chapter is daunting—even to this old hand—in the wealth of global change data it presents. I would prefer a more limited set of examples with a clear lesson behind each. More annoying, however, is the sloppy treatment of atmospheric physics. For example, the gravitational acceleration g is given as 9.80665 m s^{-2} , making it appear to be a universal constant independent of location and altitude (g 's magnitude at sea level varies from 9.78 at the equator to 9.83 at the poles). Also, nitrous oxide is not only photolyzed in the stratosphere but reacts with the excited $\text{O}(^1\text{D})$ species, and it is the latter process (unmentioned) that produces the nitrogen oxides. Picking tropospheric ozone trends from a 1992 assessment, and selecting the largest (and possibly incorrect) example of Payerne is misleading. The chapter on photochemical processes suffers similarly.

The discussions of atmospheric lifetimes can be misleading. The implication that methane sources are well enough known (summing to 535 Tg per year) to define the chemical lifetime is incorrect, because methane has many sources, each with significant uncertainty. Estimates of the current lifetime of methane are based on scaling from the empirically derived OH losses for the synthetic gas methyl chloroform. Standard atmospheric profiles and photolysis rates are presented without reference to their source or applicable year (the book is about changing atmospheric chemistry). The volume would also have been improved with the addition of oxygen chemistry (including spectra and energy levels for O_2 and O), more on the physics of the planetary boundary layer, and better discussion of rainfall and scavenging of gases and particles.

Thus *Atmospheric Chemistry and Global Change* is a valuable, if dated, reference, but it cannot be used as a text without substantial instructor oversight. The chapter on measurement techniques is a great and needed addition to books in the field. And the merging of measurements and models into a single scientific strategy—noted in the essays—represents the future of atmospheric chemistry.

Atmospheric Chemistry and Global Change
Guy P. Brasseur,
John J. Orlando, and
Geoffrey S. Tyndall, Eds.
Oxford University Press,
Oxford, 1999. 672 pp.
\$75, £54, ISBN 0-19-
510521-4

BROWSEINGS



Tornado Alley. Monster Storms of the Great Plains. Howard B. Bluestein. Oxford University Press, New York, 1999. 192 pp. \$35, £17.99. ISBN 0-19-510552-4.

Bluestein is renowned for his pioneering field studies of tornadoes and the thunderstorms that produce them. His fascinating account of the origin, effects, and research on these violent whirlwinds incorporates experiences and spectacular photographs from two decades of storm chasing. In a mature supercell, tornadoes tend to be located under a wall cloud (a relatively precipitation-free lowered cloud base located under a rapidly growing convective cloud). But this horseshoe-shaped wall cloud (near Norman, Oklahoma, 20 June 1979) was not associated with any tornadoes.

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