

Peter Borrell: *Atmospheric Science – Yes- But a Handbook?* RSC Environmental Chemistry Group Bulletin, January 2005, 22-23 (Book Review).

Book Review

Atmospheric Science – yes – but a handbook?

Handbook of Atmospheric Science; Principles and Applications; editors C.N. Hewitt and Andrea Jackson, Blackwell, Oxford, 2003.

This is a nicely produced collection of well-written essays by acknowledged experts, mainly on the varied aspects of atmospheric chemistry. However it is disappointing as a handbook – and there is one serious omission from the topics covered.

The book, as the title suggests, should be a good desk book for a practitioner in the field, allowing him or her to check up on areas peripheral to his or her main interest. It should also make a good reference work for someone on the periphery, or for a library.

The first part of the book comprises twelve chapters on the principles of atmospheric science. The initial chapters set the scene, dealing with the evolution of the atmosphere (Wayne), the structure of the atmosphere and atmospheric energy (Coe and Webb), the Earth's climates (Lockwood), biogeochemical cycles and residence lifetimes (Shalcross, Wang and Dimmer) and sources of pollution (Jackson). Pollution is, as it should be, a recurring topic throughout the book.

Then come five more detailed chapters on tropospheric photochemistry (Monks), stratospheric chemistry and transport (Mackenzie), tropospheric aqueous phase chemistry (Brimblecombe) and on atmospheric particulate matter and aerosols (Baltensperger, Nyeki and Kalberer). The first section concludes with chapters on meteorological aspects: atmospheric dispersion and air pollution meteorology (Carruthers), synoptic scale meteorology (Parker) and wet and dry deposition (Hall). The text is copiously supported with clear diagrams and well set-out equations. It is nice to see a willingness to repeat chemical equations to avoid constant thumbing back and forth when trying to follow the argument over several pages. There are a few oddities such as the CLAW hypothesis and the QG theory and potential vorticity (PV) which are discussed at length but for which definitions are either not given or are hard to find.

The second part of the book is concerned with problems, tools and applications. It opens with three chapters on air pollution: on global (Jain and Hayhoe), regional (Halsall) and urban scales (Fenger). Two chapters follow on monitoring techniques (Robinson) and emission inventories (Hutchinson). There are then modelling chapters for each end of the scale – pollutant dispersion (Vawda) and climate (Lahoz). The book concludes with two chapters on management: critical levels and critical loads (de Vries and Posch) and air quality management (Fisher). An effort is made throughout to break away from the European bias and consider problems in other regions. However the final management chapter is confined just to the UK, although summer smog episodes in south-eastern England almost always involve the whole of north-western Europe. Since the UK is a party to the CRTAP convention and adheres to EU directives, some mention of the EU directives and the CAFÉ initiatives would have been welcome, together with the role of the EEA and the interaction with EMEP.

The level of approach is reasonably uniform throughout and each chapter would provide a good start for a new research student. Each is self-contained with its own references and in

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some cases has a conclusion. Although the first chapter leaves the reader 300M years before the present, there are in fact references up to the year 2000.

So why the fuss about a handbook? In what is essentially a reference work, an excellent index, and cross referencing within chapters is needed to be able to find things easily, particularly in areas with which one is less familiar. The book has a nice contents list but a poor index; so, much of the book is inaccessible to all but those who know the areas well.

For example you won't find the ozone hole or summer smog or the QG theory or potential vorticity, even though they are dealt with at length in the text – or the weekend or titration effects or the CLRTAP, which perhaps ought to have been both discussed and mentioned. Initials and chemical formulae are eschewed, which is crippling in a field where they are common. Surely abbreviations and acronyms, such as IPCC, EMEP, NO_x, AOT40 and POPs, are part of the language of the field now - they are mentioned as such in the text. And if one insists on avoiding them in the index, then perhaps a comprehensive glossary would have helped, provided it was correlated with the index. As well as the omissions, it is hard to discern the philosophy behind the index: some section heads are included, some aren't; some items are included for one chapter but not for another. So following up ozone chemistry for example will take you to the nice discussion in chapter 14 but not to the definitive account in chapter 6. In short you cannot find all the references to the subjects mentioned – essential where there is no internal cross-referencing. Having had to do such indexing myself, I realise that it costs a lot of effort – but it is essential to provide access for the potential users.

And what of the serious omission: well apart from a brief section in chapter 14, there is nothing about regional and synoptic scale modelling. Chemical Transport Models (CTM) attempt to encapsulate our knowledge and understanding of the behaviour of trace substances in the atmosphere, and they provide the basis for the appreciation and regulation of tropospheric air pollution. But here we learn nothing about distinctions between Lagrangian and Eulerian models, and their uses in interpreting data, or their support through the EMEP and RAINS models for the EU directives on ozone, NO_x, VOC and other pollutants. And there is no discussion of the problems of such models – the science and skill needed to construct spatial and temporal emission estimates; the parameterisation of turbulence and the necessary simplifications of the chemistry schemes. Nor is there any mention of the gradual progress in incorporating observations from disparate sources into model calculations on these scales which, many believe, will underpin future regional and global monitoring and forecasting.

In conclusion: although I liked the book and the presentation, there is a major omission and the book is not as useful as the content deserves. One final thought: if the editors commissioned a modelling chapter, encouraged the authors to include cross referencing in the individual chapters (easier now that it is written) and provided a first class index, they could make use of the present excellent material to produce a worthwhile second edition.

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The reviewer: Dr Peter Borrell is deputy coordinator of two ACCENT themes concerned with the use of satellite instrumentation to monitor the troposphere and the transport and transformation of pollutants in the troposphere. He is also co-editor of the newly published IGACO report promoting the establishment of a global observation system for the atmosphere. Earlier he was Executive Secretary of the EUREKA environmental project EUROTRAC. See: <http://www.luna.co.uk/~pborrell/>.

