Introduction

Atmospheric aerosol research has a long tradition in Austria. From instrumental development to measurements and to health impact studies, Austrian researchers contributed to the development of the science. Milestones of the early work are described in the volume "History of Aerosol Science" by Preining and Davis (2000). Since then, the highly recognized work continued. This compendium illustrates the scientific progress performed at Austrian research institutions and field sites during the past decade.

Atmospheric aerosol research in Austria never developed as the domain of any individual institution. Instead, several groups have been very active in pursuing innovative and internationally renowned science in this field, forming a well-established network, which together provide a coherent total of a "virtual institute of aerosol science". The Clean Air Commission (Kommission für Reinhaltung der Luft, KRL) of the Austrian Academy of Sciences served as a focal point and as a panel for stimulating atmospheric aerosol research. The key achievement of the KRL was its support of the interdisciplinary cooperation among scientists from the different fields of aerosol research. This included scientists in aerosol physics, aerosol chemistry, epidemiology, forestry and agriculture, ecology, environmental technology, meteorology, as well as applied air pollution research. The support of the KRL helped bring together and coordinate research activities. While lacking the focus of a single institution, this way of implementation more than made up for it by allowing and inspiring collaboration across disciplinary boundaries.

The role of the KRL as a platform for scientific exchange has also been used to compile this overview. While KRL members formed the core of the team of authors, the coverage of this work extends beyond and also describes relevant work performed in Austria in general, providing an overview on activities representing more than 270 scientific papers cited involving one or more authors in Austrian affiliations. Thus the compendium is proof of the competence and complementarity of the research performed and its significant international impact.

The volume starts out with an overview on assessing the release of aerosols to the atmosphere in general (Winiwarter, pp. 4 ff) and continues describing approaches for emission abatement (Höflinger, pp. 16 ff) based on theoretic foundations, specific for "fugitive" dust sources. The next chapters deal with methodological development of measuring aerosols, first of all regarding the distinct physical parameters (Hitzenberger, pp. 24 ff) but also concerning optical and chemical characteristics (Hitzenberger and Bauer, pp. 32 ff) followed by the distinctive properties of bioaerosols (Bauer, pp. 47 ff).

Two sections present efforts to unravel specific atmospheric processes associated with aerosol – its scavenging behaviour (Kasper-Giebl, pp. 58 ff) and its response to air mass changes (Berner and Hitzenberger, pp. 65 ff). The latter also is an example of research on aerosol climatology. Model results on aerosol transport and dispersion along wind fields and resulting assignments of PM load shares to source sectors are presented by Sturm et al. (pp. 68 ff) while Puxbaum (pp. 85 ff) concludes from atmospheric measurements to the sources directly via source apportionment.

The next papers focus on health effects. Neuberger (pp. 103 ff) describes studies that link aerosol exposure and human health impacts (epidemiology), while Haluza (pp. 116 ff) reviews the Austrian toxicological studies. Integrating health effects, atmospheric dispersion and formation with emission and emission abatement modelling into a single policy tool is performed in integrated assessment modelling (Amann, pp. 121 ff). At a global application also climate effects of aerosols are considered. Finally, an overview of a major overarching study is presented, the internationally acclaimed AUPHEP project performed under KRL's coordination, which demonstrated the level of interdisciplinary working collaboration achieved (Hauck, pp. 130 ff). An outlook containing aspects for future research potentials and needs (Winiwarter, pp. 136 ff) concludes this compendium.

The overall scheme in this volume thus covers, for aerosols, the entire fate of trace compounds in the atmosphere, from their release in form of emissions via dispersion and transformation towards removal processes. Furthermore it includes the response of substrates, specifically regarding human health. While the respective processes characterize the change of atmospheric conditions, exactly the conditions in form of atmospheric concentrations can be observed directly. Some of the processes (emissions) can be influenced by humans and thus are responsive to policy actions, others are given naturally (specifically the dispersion processes) nevertheless decisively influence the impacts in combination and simultaneously.

For this reason, emissions and ambient air concentrations need to be assessed independently to describe an air quality situation. An adequate description has been provided in terms of a budget considerations and a budget approach, on global scale, in a separate activity of the KRL. The respective contribution on aerosol budgets has been outlined by Jaenicke (2005). The fact that this work derived from a KRL sponsored activity again points to their central role in the Austrian aerosol science.

References

Jaenicke, R. 2005. "Global aerosols." In *Observed Global Climate*, edited by M. Hantel. Vol. 6 of Landolt-Börnstein, New Series (Group V: Geophysics), pp. 8-1–8-9. Berlin: Springer.

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