The Long-Range Atmospheric Transport of Natural and Contaminant Substances

The Long-Range Atmospheric Transport of Natural and Contaminant Substances

edited by

Anthony H. Knap

Bermuda Biological Station for Research,
Inc., Ferry Reach, Bermuda

and

Mary-Scott Kaiser

Technical Editor

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Participants

Richard Arimoto
Roger Atkinson
Elliot L. Atlas
Leonard A. Barrie
Terry Bidleman
Bernard Bonsang
Patrick Buat-Ménard
Katheryn Burns
Renato A. C. Carvalho
Thomas M. Church
Antonio Cruzado
Frank Dehairs
Jan Duinker
Francois Dulac
Manfred Ehrhardt
Anton Eliassen
Bernard E. A. Fisher
James N. Galloway
Krystyna Gorzelska
Robert Harriss

Donald R. Hastie
Neils Z. Heidam
Ruprecht Jaenicke
Timothy D. Jickells
William C. Keene
Anthony H. Knap
Hiram Levy, II
Leon Mart
John Miller
Jennie L. Moody
Joseph M. Prospero
Jochen Rudolph
Alexey G. Ryaboshapko
Dennis L. Savoie
Lothar Schutz
William T. Sturges
Shinsuke Tanabe
Douglas M. Whelpdale
William H. Zoller

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PREFACE

We have been increasingly aware of the role of long-range atmospheric transport in the transfer of man-made and natural substances around the globe. The nuclear accident at Chernobyl highlighted the fact that one nation's atmospheric emissions may profoundly affect its neighbor. Over the past few years, we have gained insight into the processes governing long-range atmospheric transport. Many international and interdisciplinary research groups are already working to unravel the many problems in this field and several new global research programs have just begun (such as, the Joint Global Ocean Flux Study [JGOFS], the World Ocean Circulation Experiment [WOCE], and the International Geosphere/Biosphere Program [IGBP]). It was, therefore, timely to organize a workshop where-in those presently working in the field could assess the present knowledge in the field of long-range transport, identify the gaps in our knowledge, and make recommendations for future research.

The NATO Advanced Research Workshop, 'The Long-Range Atmospheric Transport of Natural and Contaminant Substances from Continent to Ocean and Continent to Continent,' was held at the Bermuda Biological Station for Research, Inc., in St. Georges, Bermuda, from 10-17 January 1988. Thirty-nine scientists best known for their work in the field attended the workshop. This volume contains the background papers, case studies, and findings of this group of world-reknown scientists. The workshop was organized along the lines of the successful NATO ARW entitled 'The Biogeochemical Cycling of Sulfur and Nitrogen in the Remote Atmosphere' that was held at the Bermuda Biological Station in 1984.

Scientists worked in groups according to compound classes of acids, trace elements, organics, and mineral aerosols. Each group was charged with assessing the present knowledge about emissions, transport, transformation, and deposition; the aim was to focus on long-range transport (i.e., transport over 1,000 km). Approximately three months before the workshop, a background paper written by the chairman of each working group was sent to each participant. At the workshop, background papers were presented on the atmospheric processes that govern large-scale transport; case histories were also presented. Four synthesis chapters containing the summaries of each subgroup's deliberations and consensus, a concluding chapter, and a chapter on the gaps and recommended research have been added to these papers to complete this volume.

This book should be of interest to those scientists who wish to understand some of the complexities of long-range transport and to those who wish to gain an overall assessment of our present knowledge of the problems involved. Individuals or agencies concerned with the scientific and political policy of how one country's emissions can affect another country should also be interested in reading this publication.

The main support for our workshop was supplied by the Scientific Affairs Division of the North Atlantic Treaty Organization with supplemental funding from the U. S. National Oceanic and Atmospheric Administration, the EXXON Corporation, the Bermuda Biological Station for

Research, Inc., the Bermuda Government, and the W. Alton Jones Foundation.

As director of this workshop, I sincerely thank the Organizing Committee--E. L. Atlas, T. M. Church, J. N. Galloway, J. M. Prospero, and D. M. Whelpdale--for its hard work and diligence. We greatly appreciated all the help provided by the staff of the Bermuda Biological Station for Research, Inc., as well as by Brenda Morris and Louise Cruden; their attention and industry enabled our week to be especially productive. My thanks to our illustrator, Barbara Wallace, for her major effort. The Organizing Committee and I also thank Mary-Scott Kaiser for her organizational help and for keeping everything and everyone straight as well as for her efforts as the technical editor of this book. I am most indebted to J. E. B. for continual support during this project. One last point: The weather played as incredible a role this time as it did for the previous NATO ARW meeting in 1984. It was so stormy that there was no choice but to meet and write--no one got a Bermuda tan!!

Anthony H. Knap
Ferry Reach, Bermuda

ABSTRACT

Thirty-nine experts in the fields of long-range transport and meteorology agreed to participate actively in a workshop on the long-range atmospheric transport of natural and contaminant substances from continent to ocean and continent to continent. The four major compound classes addressed were trace metals, trace organics, nitrogen and sulfur compounds, and mineral aerosol. After an in-depth briefing covering the meteorological considerations required for an understanding of the long-range atmospheric transport, the state of knowledge concerning the emission, transport, transformation, and deposition of each compound was extensively discussed. Each participant was asked to bring his or her own data to the workshop. These data were discussed in the individual group meetings before being incorporated into the group-discussion chapters--sometimes as case histories, others as a general overview of the field. Gaps in our present knowledge and directions for future research were agreed to in the plenary sessions. A synthesis of the ''state of the art'' at the time was produced at the end of the workshop.