13th Asian Conference on Occupational Health (ACOH) and 3rd Conference of South-East Asian Ergonomics Society (SEAES) on the Theme of The Role of Occupational Health and Ergonomics in Asia and the World. Bangkok, Thailand.
25 – 27 November 1991.
Information: Secretariat - ACOH/SEAES, Occupational Health Department, Faculty of Public Health, Mahidol University, 420/1 Rajvidhi Road, Bangkok 10400, Thailand.
Tel: 662-245-7793, 662-245-5521, 662-245-7195, 662-246-1258, ext. 259, 260, 261, 331.
Fax: 662-246-7765.

One Day Symposium on Indoor Air Quality in Asia. Bangkok, Thailand.
28 – 29 November 1991.
Information: Dr B.R. Reverent, Philippine Refining Company Inc., P.O. Box 1176, 1351 United Nations Avenue, Manila, Philippines.
Tel: 632-521-3951.
Fax: 632-521-7259.
or: Dr Malinee Wongphanich, c/o C C E (Thailand), P.O. Box 10-163, Ladphrao, Bangkok 10310, Thailand.
Tel: 662-538-5332.
Fax: 662-538-5332.

IUPAC CHEMRAWN VII: World Conference on The Chemistry of the Atmosphere: Its Impact on Global Change. Baltimore, Maryland, U.S.A.
2 – 6 December 1991.
Information: CHEMRAWN VII Secretariat, c/o American Chemical Society, Room 205, 1155 16th Street, N.W., Washington, D.C. 20036, U.S.A.

3rd National Conference: Polmet '91. 'The Environmentally Friendly City' (Pollution in the Metropolitan and Urban Environment). Hong Kong.
9 – 13 December 1991.
Information: Mrs Hazel Nugent, Conference Secretary, Hong Kong Institution of Engineers, Room 1001 10/fl, Island Centre, 1 Great George Street, Causeway Bay, Hong Kong.
Tel: 895-4446.
Fax: 577-7791.

1992

European Association for the Science of Air Pollution (EURASAP) 4th International Symposium on Highway Pollution. Spain.
May 1992.
Information: Dr R. S. Hamilton, School of Applied Science, Middlesex Polytechnic, Queensway, Enfield, Middlesex EN3 4SF, U.K.

11th International Conference on Clouds and Precipitation. Montreal, Canada.
17 – 21 August 1992.
Information: Professor Peter V. Hobbs, Atmospheric Sciences, AK-40, University of Washington, Seattle, WA 98185, U.S.A.
Tel: (206) 543-6027.
Fax: (206) 543-0308.
Telex: 4740096 UWUI.
or: 11th ICCP, McGill Conference Office, 3450 University Street, Montreal, Canada H3A 2A7.
Tel: (514) 398-3880.
Fax: (514) 398-4854.
Telex: 05 268510.

Conference on Visibility and Fine Particles. University of Vienna, Austria.
15 – 18 September 1992.
Information: H. Horvarth, Institute of Experimental Physics, University of Vienna, Boltzmanngasse 5, A-1090 Vienna, Austria.
Tel: 43-1-342-630-269.
Fax: 43-1-310-2338.
Telex: 11 622.

CONFERENCE REPORT

18TH INTERNATIONAL TECHNICAL MEETING OF NATO-CCMS ON AIR POLLUTION MODELLING AND ITS APPLICATION

H. van Dop, World Meteorological Organization, Case Postale No. 2300, CH-1211 Genève, Switzerland, *R.L. Dennis*, U.S. Environmental Protection Agency, Atmospheric Sciences Modelling Division, Mail Drop 80, Research Triangle Park, NC 27711, U.S.A., *J.C.R. Hunt*, University of Cambridge, Department of Applied Mathematics and Theoretical Physics, Silver Street, Cambridge CB3 9EW, U.K., *G. Kallos*, Laboratory of Meteorology, University of Athens, Department of Applied Physics, 33, Ippocratous Street, 10680 Athens, Greece, *G. McBean*, The University of British Columbia, Department of Geography, 217–1984 West Mall, Vancouver, B.C. V6T JW5, Canada, *T.R. Oke*, The University of British Columbia, Department of Geography, 217–1984 West Mall, Vancouver, B.C. V6T JW5, Canada, *F.A. Schiermeier*, U.S.Environmental Protection Agency, Meteorology Division, Mail Drop 80, Research Triangle Park, NC 27711, U.S.A., *J.D. Shannon*, Argonne National Laboratory, Environmental Research Division, 9700 South Cass Avenue, Argonne, IL 60439, U.S.A.

1. INTRODUCTION

The 18th ITM was held in Vancouver from 13 to 17 May 1990. Twenty countries were represented by 130 participants. There is still a lively interest in air pollution studies in the mesoscale range. The majority of the papers was devoted to modelling on this scale. Increased computer resources make it possible to study air pollution dispersion in situations with complex topography using PCs.

An important address was given by Julian Hunt who pleaded to include recent insights in the boundary-layer structure in routine dispersion models, which would require international coordination.

Another issue of increasing importance is modelling on the regional and global scale. Large-scale acidification of the environment of the European and North American continents has led to the development of comprehensive models describing transport, chemical transformation and removal processes on conti-

nental scales. Also on-going modelling activities concerning the Chernobyl accident still significantly contrtibute to the research on this scale. It is expected that in view of the possible climate change due to the continuous increase of concentrations of greenhouse gases the emphasis in modelling in the future will be more strongly on global scale modelling.

Full proceedings of the conference, including a lively discussion will appear (Plenum Press) in early spring 1991.

2.1. *Model assessment and policy implications*

In an invited paper, J. Hunt of the U.K. reviewed developments in modelling for regulatory uses. He maintained that an improved description of the boundary layer was needed for routine use. Wind-flow models that can incorporate the main features of complex flows such as lake/land breezes or mountain/valley circulations while maintaining sufficient simplicity for exercise on a PC are needed. Further work in modelling dispersion in extreme stabilities or in flows decoupled from the surface is desirable.

J. Shannon of the U.S.A. presented simulations of the trend in S deposition in North America since the turn of the century. In much of the north-east, deposition exhibited triple peaks around 1925, 1945, and 1970, with irregular decreases since 1970. R. Mathur of the U.S.A. evaluated the effects of SO_x and NO_x emission reductions. He demonstrated how upwind emissions loading was sufficiently high to mask most of the effect of the local emissions reductions.

S. Mylona of Norway investigated the relationship of S emission and deposition in Europe during 1979–1986 with the EMEP/MSC-W Sulfur model. Her results indicated that the model depicted the overall trend in monitored data well. H.J.A. van Jaarsveld of The Netherlands examined the changes in both S and NO_x–N deposition over a smaller scale (The Netherlands) for a slightly longer period with the TREND model. He found that variability in NO_x–N deposition seemed to be largely a function of meteorological variability.

H.J. van Rheineck Leyssius of The Netherlands evaluated a model of smog episodes in The Netherlands. S.T. Rao of the U.S.A. analysed the ozone trend in and around New York City over the last decade. He found that a reduction of ozone concentration was not seen in the city itself, but rather downwind in Connecticut.

2.2. *Regional acid deposition and oxidant modelling*

This session was devoted to the presentation of results from European and North American regional, Eulerian models. Only one paper was concerned with theory and development of Eulerian models, while the other 13 papers covered: (1) further demonstration and development; (2) diagnosis and sensitivity analysis; (3) model evaluation; and (4) applications results for fully-developed modelling systems.

The application results showed that the episodic, Eulerian modelling systems can provide answers at annual averaging times to questions raised by policy makers. The papers represented a good cross-section of the richness of new results that are expected to increasingly emanate from studies with the new, regional, Eulerian models.

3. REGIONAL SCALE MODELLING

During the last few years, regional and mesoscale models have been used as predictive tools for emergency response and various other operational uses. Such applications can be done in relatively inexpensive but powerful computers, the 'workstations'.

Within the next few years, regional and mesoscale models combined with air pollution models (dispersion–diffusion and photochemical models) are expected to be in wide operational applications and will substitute the current air quality regulatory models.

Alcamo, Bartnicki and Olendrzynski have developed a combined trajectory–climatologic approach to model long-range transport of heavy metals in Europe's atmosphere. The computed total deposition pattern of As, Cd, and Zn shows strong gradients in Europe whereas the Pb pattern is more smooth, probably due to the predominance of mobile sources for Pb.

Uliasz and Pielke contend that the variational formulation of the Eulerian dispersion model allows one to apply both source-oriented and receptor-oriented modelling as complementary tools in air quality studies. This is especially relevant to such applications as emission control from different sources in a region and planning locations of new emissions.

Borrego, Coutinho and Rao described the study of atmospheric dispersion over Portugal for the design of the National Air Quality Network and the determination of optimal control strategies. The paper oulined the preparation work necessary to use an episodic interregional model of medium complexity framed over the Airshed model.

Rojas, Otten and Van Grieken used a mathematical approach based on similarity theory to predict the wind speed, friction velocity and drag coefficient. Deposition velocities were calculated based on airborne sampling of Cu, Cd, Zn, and Pb over the North Sea. Atmospheric input for these heavy metals was also compared with riverine inputs.

Moran, Pielke and McNider reported that atmospheric flows over land commonly process mesoscale time and space scales arising from the diurnal heating cycle, the atmospheric inertial mode, thermal and mechanical forcing, downscale energy transfer from the synoptic scale to mesoscale due to non-linear flow interactions, and mesoscale precipitation systems. Regional-scale pollutant transport and diffusion are affected by these flow scales.

Rodriguez and Cederwall used measured concentrations from the 1989 Across North America Tracer Experiment (ANATEX) to judge the ability of a diagnostic, three-dimensional, particle-in-cell transport and diffusion model based. An alteration in the manual of interpolation of near-surface winds is critical and proper specifications of mixing heights are essential.

Scheffe and Gipson exercised the Urban Airshed Model to conclude that inclusion of biogenic emissions increases the level of anthropogenic reactive organic gases control required to reduce peak ozone levels. NO_x base control approaches may be more effective in reducing peak ozone. However, aggresive NO_x control can potentially offset benefits resulting from control of reactive organic gases.

Wakamatsu, Uno and Wadden applied the Urban Airshed Model to the Tokyo area. Mis-specification of the NMHC/NOx emission inventory can also lead to major differences between observed and calculated ozone concentrations.

4. GLOBAL SCALE DISPERSION STUDIES

The session opened with an invited review paper by Brost, who discussed the parameterization of the vertical motion at the top of the boundary layer. After reviewing estimates from models and from thunderstorm counting, he concluded that the maximum zonal average mass flux must be a few (2–3) $gm^{-2}s^{-1}$. The results of an Eulerian model simulation of CO, which included explicit chemistry was the subject of a presentation by Saylor. Comparison of model results with MAPS satellite data showed that the error was always less than 50%, and usually much less. Feichter found that interhemispheric exchange of freon was somewhat too large in simulations with the Hamburg climate model but the vertical profiles of radon were reasonable. Prelimi-

nary results of an observational study of the importance of long-range transport of NO_x, O_3 and sand dust to local air quality were described by Carmichael. For the Pacific Rim, dust is important in the spring. The Eulerian model of Gillani demonstrated the effects of subgridscale variations in emissions on the results and in the comparison with observations. On a smaller scale, Laube's model showed how rapid the vertical transport of pollutants in clouds can be. He found that the fully developed stage of the cloud was most important for vertical transport. Kitada also examined cloud transports, with emphasis on detailed representation of the cloud physics. The importance of microphysical processes was further emphasized by Roelofs. It was shown that the acidity of the cloud drops changed as different processes are incorporated and drop sizes evolve. De Valk took the opposite approach in developing a simple model with low computing requirements; good agreement (except for pH) was found in comparison with the more complicated models.

Walcek carried out a comparison of three formulations of regional scale tropospheric chemistry models. Scavenging processes were a major cause of differences between models but the existing observations are not adequate enough to distinguish between the models. Chaumerliac ended the session by considering a model of frontal rain. Numerical simulations of moist frontogenesis showed that wet scavenging is as important as vertical transport.

Overall the session provided an interesting group of examinations of vertical transport and other cloud processes in the redistribution of pollutants in the atmosphere.

5. ACCIDENTAL RELEASES INCLUDING RADIOACTIVITY AND DENSE GAS DISPERSION

The organisation of this Poster–Discussion session was similar to that at the 17th meeting in Cambridge in 1988. There was a 1 h period from 1500 to 1600 h to view the posters when the paper presenters were standing at their posters and answered questions. Also there was one video presentation. From 1600 to 1800 h there was a plenary discussion session in the main lecture theatre at which 22 presenters of posters and the video briefly described their main point in 1.5–2 min with the aid of a single viewgraph. There was time for about 2–3 min discussion of each paper; for several papers the discussions had to be stimulated by the chairman. There were new and interesting results on dispersion of radioactivity from Chernobyl, dense gas flow (including new studies of complex terrain effects), regulatory air pollution modelling problems, stochastic modelling as an improvement on Gaussian plume models, and modelling of two-phase releases. The procedure was a success and enabled a large number of papers to be presented to the whole conference, without the need for parallel sessions.

6. NEW DEVELOPMENTS IN DISPERSION MODELLING AND THEORY

This session included a wide range of topics and all papers included novel and/or controversial aspects so it kept the audience challenged and interested and the discussions were lively.

Venkatram provided an excellent and sobering assessment of the ability of comprehensive models to simulate the complex system governing the fate of air pollutants. He stressed that physical understanding alone often cannot be translated into an operational tool unless there is something approaching a 'symbiotic' relationship with the development of the computer code. This insight dictates a new kind of model development team if such models are to graduate successfully to operational status.

New developments in plume and other dispersion research covered a wide range of topics including the incorporation of uncertainty in estimates, modelling plume rise as a continuum, the sporadic nature of dispersion in the stable case, modelling dispersion and chemistry in street canyons, whole urban areas and coastal areas. These represent some of the more difficult questions and environments facing those working in atmospheric disturbance and indicates a willingness of the community to grapple with 'knotty' and real world problems. There was also a refreshingly common insistence on testing model formulations with field data.