Intl. Symposium on Air Pollution
Monterrey, Mexico
23-25 February 1993

CC6

THE APPLICATIONS OF NEW TECHNOLOGIES TO MODELING MESOSCALE DISPERSION IN COASTAL ZONES AND COMPLEX TERRAIN

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Over the past two decades, a wide variety of methodologies have been developed to simulate dispersion of primary air pollutants from existing or proposed sources. Especially in the regulatory and emergency response arenas, modeling techniques have tended to use the Gaussian plume approach, or its various segmented plume and puff advection progeny. Such approaches were adopted for a variety of reasons, including: (1) limited requirements for meteorological input data, (2) conceptual simplicity, (3) modest computational requirements allowing use of affordable mini- and personal computers and (4) for emergency response, the ability to return results within the very short time frames mandated.

Concurrently, other more sophisticated approaches were being developed and tested in research laboratories. Among these were prognostic mesoscale numerical models (MNMs) for simulating complex, three-dimensional time-dependent meteorological fields. In addition to predicting horizontal and vertical wind components, turbulence and mixing depths in quasi-homogeneous terrain, these codes were well suited for application to mesoscale systems in coastal zone and complex terrain. Driven by the output of MNMs, dispersion estimates using Lagrangian particle modeling (LPM) techniques have been increasingly utilized. The MNM and LPM codes, however, require substantial computational resources. Until recently their application typically required access to a mainframe supercomputer. Over the past several years there have emerged high performance "super workstations" which can provide throughput rivalling that of a supercomputer, but at the merest fraction of the cost. In addition, on-board high resolution graphics and visualization software allow the user to access, interpret and interact with the model results in a highly efficient manner. The combination of MNMs, LPMs and high performance work stations are beginning to change the way in which air quality professionals approach dispersion modeling.

This paper will review several applications of these new technologies. The Regional Atmospheric Modeling System (RAMS) has been employed in a variety of simulations of lake and sea breezes, flows over mountainous terrain, and regional weather systems. RAMS drives several Lagrangian particle models as part of a flexible system for simulating dispersion from

point, line and area sources. An advanced LPM, called the Hybrid Particle and Concentration Model (HYPACT), is a state-of-the-art dispersion modeling system that combines the best features of the Lagrangian and Eulerian dispersion modeling approaches. These have been implemented on a super workstation (a 25 MFLOP IBM RS/6000-550). Visualization of results are accomplished using conventional NCAR graphics, AVS-based routines, and an advanced visualization package called savi3D (supercomputer animation, visualization, initialization in three dimensions).

Examples included in this review will include (1) design and testing prototypes for real-time emergency response systems for use in coastal zones, (2) plume dispersion in complex terrain, (3) providing meteorological input to photochemical grid models for multi-day ozone episodes in the Lake Michigan basin and (4) designing tracer release and monitoring experiments for dispersion model evaluation in a coastal zone.

Model performance evaluated against SF6 tracer releases is presented for a release into a lake breeze front and for up and down valley flows in complex terrain. Various qualitative and statistical measures used in the model evaluation process will be described.

A central theme in all the simulations is the critical role of regions of organized mesoscale vertical motions in determining plume transport. The mesoscale W field is extremely difficult to measure. Its accurate computation using numerical models is strongly dependent upon the horizontal and vertical mesh sizes employed. Typically model horizontal mesh sizes need to be on the order of 3000 meters or less. Various considerations in configuring the RAMS code for mesoscale dispersion simulations will be detailed.

- Model Evaluation
- Policy Making
- Indoor Air Pollution
- Available Software
- Information Management
- Risk Assessment
- Emergency Response
- Toxic Pollutants
- Urban Areas
- Global Problems

CALL FOR PAPERS

Papers are invited on the topics outlined above and other topics which will fit within the general scope of the Conference. Abstracts should be submitted to the Conference Secretariat as soon as possible but no later than 24 April 1992.

Abstracts should clearly state the purpose, results and conclusions of the work described in the final paper and the category designation from the list of topics. Final acceptance will be based upon review of the full length paper which must be received by 23 October 1992.

CONFERENCE PROCEEDINGS

The Proceedings of the conference will be published to a high standard by Computational Mechanics Publications, UK and will be available to delegates at the conference. In addition, the proceedings will be widely distributed on the international book trade.

EXHIBITION

An exhibition will be held in conjunction with the Conference for equipment manufacturers, computer software developers and other industries and organisations interested in air pollution. Software developers are encouraged to demonstrate their codes as part of the Exhibition.

Please contact the Conference Secretariat for details of charges and facilities.

TIME SCHEDULE

Return Reply Form
As soon as possible

Submit Abstract (300 words)
As soon as possible and not later than 24 April 1992

Submit Final Paper
23 October 1992

Final Acceptance
23 November 1992

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CALL FOR PAPERS

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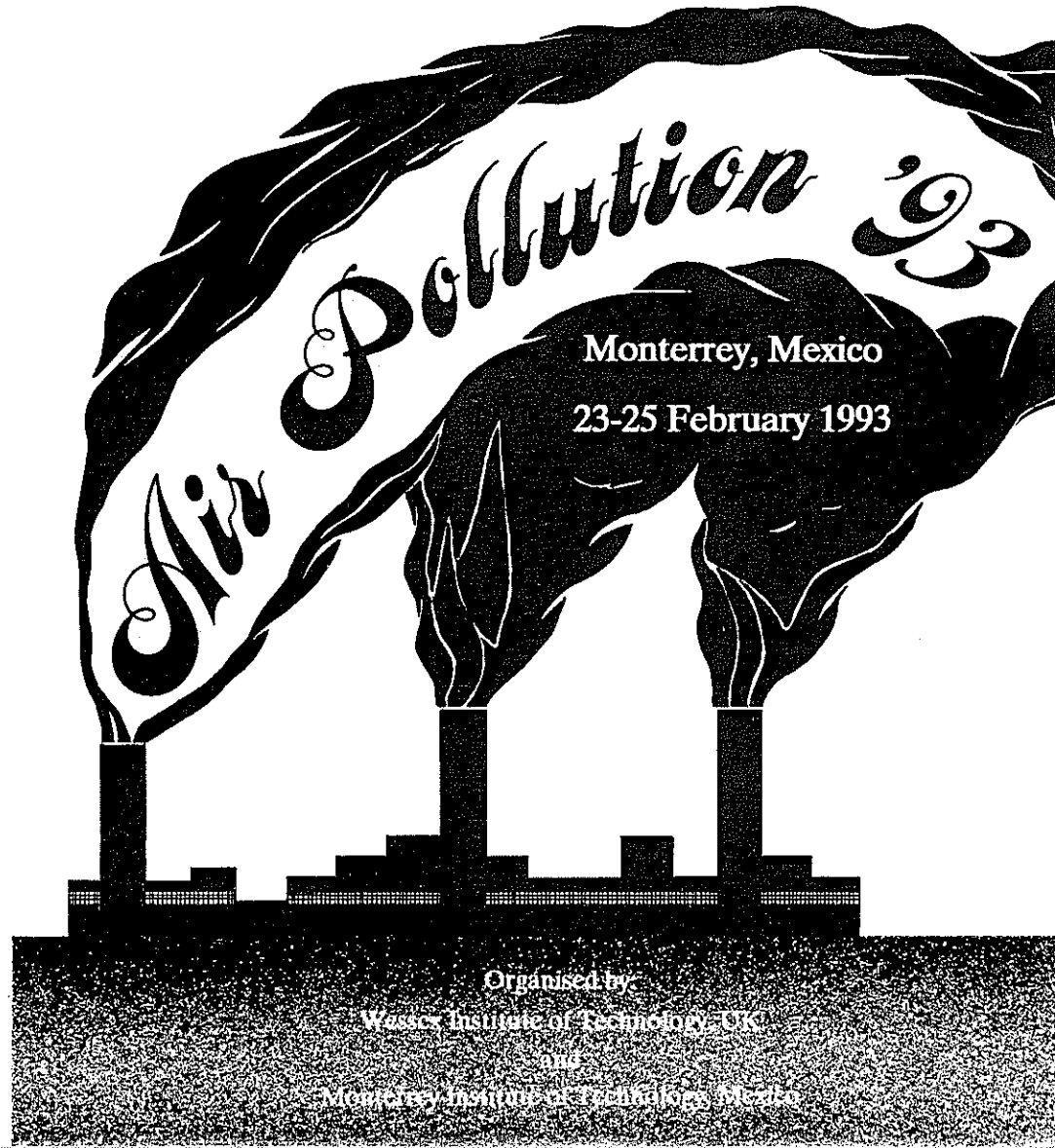

OBJECTIVES

This conference aims to bring together scientists working in industry, research organisations and government on monitoring, simulation and management of air pollution problems.
The emphasis will be on the integration of advanced experimental and computational techniques as tools for taking decisions and formulating solutions. Case studies will be presented and discussed in detail.
The meeting will provide a forum for discussion and cross fertilization among the different people working on air pollution topics and, especially, to exchange information between air pollution control manufacturers and policy makers, between industrialists and environmentalists.

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LOCATION

The Conference will be held at the Monterrey Institute of Technology, Mexico on 23 - 25 February 1993.

CONFERENCE TOPICS

The topics below give a guideline for possible contributions. Papers on other related topics will also be accepted if they fall within the objectives of the conference:

- Monitoring Networks
- Simulation Modelling
- Laboratory Modelling

continued overleaf

ENQUIRY FORM

AIR POLLUTION 93

23-25 February 1993
Monterrey, Mexico

☐ I intend to participate in the conference.

☐ I intend to submit a paper to the conference and present i

☐ Abstract (300 words) attach

☐ I am interested in the exhibition. Please send details of charges.

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