Preface

This special issue of the *International Journal of Environment and Pollution* contains papers that were presented at two kinds of international meeting:

- Most of the papers were presented at the special session on 'Large-scale Environmental Modelling' organized within the 4th International Conference on Large-scale Scientific Computations, which was held in Sozopol (Bulgaria), 4–8 June 2003. The conferences in Sozopol (a small resort town at the coast of the Black Sea) are well-established forums where specialists from all areas of scientific computing present their results. Mini-symposia on 'Large-scale Computations in Environmental Modelling' were organized within each of the previous four conferences. The next conference in Sozopol will be held in June 2005. There are plans to organize a similar mini-symposium within the next conference.

- The remainder of the papers were presented at annual meetings of GLOREAM (Global and Regional Atmospheric Modelling). Nearly all well-established European scientific groups working in the area of large-scale air pollution modelling participate in GLOREAM. GLOREAM was a sub-project of a EURECA project, EUROTRAC-2, which unites many groups in Europe who are engaged in different tropospheric studies. The EUROTRAC-2 project was active in the period 1996–2003. The last annual meetings of GLOREAM were held in Ischia (Italy), Cottbus (Germany), Wengen (Switzerland), Aveiro (Portugal) and Cologne (Germany).

Air pollution, especially the reduction of the air pollution to acceptable levels, is a highly relevant environmental problem, which is becoming more and more important. This problem can successfully be studied only when high-resolution comprehensive mathematical models are developed and used on a routine basis. However, such models are very time-consuming, even when modern high-speed computers are available. The models need a great amount of input data (meteorological, chemical and emission data). Furthermore, the models produce huge files of output data, which have to be stored for future uses (for visualization and animation of the results). Finally, huge sets of measurement data (normally taken at many stations located in different European countries) have to be used in the efforts to validate the model results. The necessity to handle efficiently large-scale air pollution models on modern high-speed computers in order to be able to resolve a series of important environmental tasks is discussed in most of the papers included in this special issue.

The control of air pollution in different highly developed regions of Europe and North America (and also in any other highly industrialized regions of the world) is an important task for modern society. The need to establish reliable control strategies for air pollution will become even more important in the 21st century. Large-scale air pollution models can successfully be used to design reliable control strategies. Many different tasks must be solved before starting to run operationally an air pollution model. The following seven actions are most important in the efforts to develop a reliable model:

- Describe in an adequate way all important physical and chemical processes;
- Apply fast and sufficiently accurate numerical methods in the different parts of the model;

- Ensure that the model runs efficiently on modern high-speed computers (and, first and foremost on different types of parallel computer);

- Use high quality input data (both meteorological and emission data) in the runs;

- Verify the model results by comparing them with reliable measurements taken in different parts of the space domain of the model;

- Carry out some sensitivity experiments to check the response of the model to changes of different key parameters;

- Visualize and animate the output results to make them easily understandable also for non-specialists.

Many different issues related to the recent development of many of the large-scale air pollution models currently existing in Europe and to the solutions of the tasks listed above are discussed in the papers in this special issue.

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Guest Editors