Editorial

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Biographical notes: Zahari Zlatev received his MSc from the Sofia University, Bulgaria and PhD from St. Petersburg University, Russia. He is a Senior Scientist at the Department of Environmental Science, Aarhus University, Denmark. He developed, together with several co-workers, the unified Danish Eulerian model (http://www.dmu.dk/AtmosphericEnvironment/DEM). His major areas of interest include numerical analysis, scientific computing, applied mathematics and environmental modelling. He has six monographs, an editor of 21 volumes with scientific papers, and 324 papers in journals and proceedings. He has organised five international conferences and 18 mini-symposia, and was an invited speaker at 67 conferences and in the organising committee of many workshops and conferences.

Hristo Chervenkov received his MSc from the Sofia University 'St. Kliment Ohridski', Bulgaria in 1997 and PhD in 2007 with a thesis about the numerical simulation of the transboundary air pollution over SE Europe. He works as a Senior Scientist in the Department of Meteorology at NIMH-BAS and has many international specialisations. His research interests are climatology, numerical modelling, air pollution and planetary boundary layer dynamics. He has been involved in international projects and has published more than 45 papers in reviewed journals and proceedings of international conferences.

Ágnes Havasi obtained her PhD in Earth Sciences from the Eötvös Loránd University, Budapest, Hungary, in 2004, and habilitated from Mathematical Sciences at the same university, in 2019. At present, she is teaching Mathematics at the Department of Applied Analysis and Computational Mathematics at Eötvös Loránd University. Her fields of research include the mathematical modelling of air pollution transport processes, operator splitting and Richardson extrapolation. She is an author of two monographs and 71 scientific papers, and has participated as a guest editor in the publication of five special issues of international journals or conference proceedings.

Environmental pollution is causing, or at least may cause in many cases, damaging effects on plants, animals and human beings. Therefore, the attempts to reduce these effects as much as possible are very important for modern society. However, the reduction of the concentrations of the harmful pollutants to some acceptable levels is a very challenging task, because very expensive actions have normally to be carried out in the efforts to resolve the related problems. It is nearly always necessary to minimise the economic cost of the measures that are to be taken in the attempts to prevent damaging effects caused by environmental pollution. The use of mathematical models is a very important means in the efforts to study successfully the harmful effects caused by high pollution levels and to minimise the expenses related to the reduction of the pollution to some acceptable for the society levels. However, the development of an optimal and reliable model is as a rule a very difficult task. It is necessary to take into account different phenomena that are very complex, and it is always desirable to find the balance between the perfect modelling of the involved natural phenomena (this task will, by the way, be impossible in most of the complicated environmental situations) and the achievement of reasonably good results by applying *a simplified but still reliable model*. It is clear that the attempts to solve the problems will always, or at least in the most of the cases, lead to the necessity for obtaining some suitable compromise.

The concept ‘reliable model’ depends on many parameters and very often is changing in time, because some development of the model and/or many improvements of the tools used in its treatment are as a rule gradually but permanently taking place. It is appropriate here to give one example, which will illustrate this important fact. The work on the development of the unified Danish Eulerian model (UNI-DEM) started many years ago by using a very simple model for studying the long-range transport of *only two* chemical species (either sulphur dioxide + sulphate or nitrogen dioxide + nitrate) over Europe and its surroundings. Furthermore, this first version of this model was two-dimensional and the spatial discretisation was achieved by using 1,024 (150 km × 150 km) grid-squares (Zlatev et al., 1983a). A three-dimensional version of the model was developed during the next step (Zlatev et al., 1984b). The third step was based both on a very substantial increase of the chemical species from 2 to 35 and on improving the spatial discretisation by using 9,216 (50 km × 50 km) grid-squares on the surface level of the space domain (Zlatev and Dimov, 2006). Introduction of options for using 56 and 168 chemical species together with application of fine resolution with 230,400 (10 km × 10 km) grid-squares on the surface domain was the next achievement (Zlatev, 1995). It should be strongly emphasised here that the development of this advanced model became possible only because the computers were permanently becoming more and more powerful during the last four decades. Moreover, complicated parallel computer architectures were gradually becoming easily available and the last three-dimensional versions of UNI-DEM can be

successfully run only on such computers. It must be stressed, however, that the use of even more powerful and faster computers is often very desirable but it is nearly always not sufficient, which is, of course, not a very big surprise. This fact was strongly underlined many years ago, in 1984, by Jaffe who wrote:

> "Although the fastest computers can execute millions of operations in one second, they are always too slow. This may seem a paradox, but the heart of the matter is: the bigger and better computers become, the larger are the problems scientists and engineers want to solve."

However, it must also be emphasised that the modern workstations and PCs are rather powerful, and therefore, there exist more and more problems which can efficiently be handled either on workstations or on PCs without any attempt to develop advanced numerical algorithms and to optimise the computational process for parallel calculations.

The important matter is that the scientists are able to take into account some extra and essential properties of the physical phenomena described by them, because the available computers at present are very powerful. This has been done by the authors of the papers submitted to this special issue.

This special issue contains 12 papers. Different topics related to environmental pollution are handled in the accepted papers:

a Parameterisation related to studies of air pollution in large cities.

b Numerical analysis of computational procedures, which can potentially be used in different environmental models.

c Cleaning procedures for waste liquids.

d Investigation of ground-water quality.

e Climate effects on high and potentially dangerous pollution levels.

f Application of stochastic methods in air pollution studies.

g Using complex models to study air pollution levels in a given small area.

h Investigation of physical, biological, sociological and economic aspects of the overall impact of the waste dumping in some sites in India.

i Studying the application of nanotechnology to remove petroleum hydrocarbons, pesticides and metals from contaminated sites.

j Integration of remote sensing and meteorological methods in the efforts to explore the relation between dust storms and atmospheric conditions in a particular season.

k Investigation of the effects of wastewater step-feeding on the performance of horizontal subsurface flow on constructed wetlands.

The readers of this special issue will discover many interesting topics in its articles. Furthermore, many other specialists, who are working in these fields, will get information about the topics discussed in the special issue from the internet (which is more and more used by scientists in our days) and will possibly decide to study some of the 12 articles.

We, the guest editors of this special issue, should like to thank very much the authors of all published papers:

- for accepting our invitation to submit their papers for publication
- for reading carefully the comments of the reviewers
- for taking into account their recommendations in the process of preparation of their revised papers and for submitting the final versions of their manuscripts in time.

We should like also to thank the referees of the papers (including also the referees of the papers that were not accepted for publication) for preparing very carefully their reviews and for the constructive criticism, which resulted in considerable improvements of the quality of the accepted papers.

We should like to thank very much the members of the Editorial Board of the *International Journal of Environment and Pollution* for the kind permission to publish this special issue and for helping us permanently during the whole process of the preparation.

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