Advances in Air Pollution Modeling for Environmental Security
NATO Science Series

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Series IV: Earth and Environmental Series – Vol. 54
Advances in Air Pollution Modeling for Environmental Security

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preface</td>
<td>ix</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>xi</td>
</tr>
<tr>
<td>Artash Aloyan and Vardan Arutyunyan: Mathematical modeling of the</td>
<td>1</td>
</tr>
<tr>
<td>regional-scale variability of gaseous species and aerosols in the</td>
<td></td>
</tr>
<tr>
<td>atmosphere</td>
<td></td>
</tr>
<tr>
<td>Katalin Balla, Sándor Márton and Tamás Rapcsák: Air pollution</td>
<td>11</td>
</tr>
<tr>
<td>modeling in action</td>
<td></td>
</tr>
<tr>
<td>Ekaterina Batchvarova and Sven-Erik Gryning: Advances in urban</td>
<td>23</td>
</tr>
<tr>
<td>meteorology modelling</td>
<td></td>
</tr>
<tr>
<td>László Bozó: Modelling studies on the concentration and deposition of</td>
<td>33</td>
</tr>
<tr>
<td>air pollutants in East-Central Europe</td>
<td></td>
</tr>
<tr>
<td>Hristo Chervenkov: Estimation of the exchange of sulphur pollution in</td>
<td>41</td>
</tr>
<tr>
<td>Southeast Europe</td>
<td></td>
</tr>
<tr>
<td>David P. Chock, Margaret J. Whalen, Sandra L. Winkler and Pu Sun:</td>
<td>51</td>
</tr>
<tr>
<td>Implementing the trajectory-grid transport algorithm in an air quality</td>
<td></td>
</tr>
<tr>
<td>model</td>
<td></td>
</tr>
<tr>
<td>Hikmet Kerem Cigizoglu, Kadir Alp and Müge Kömürcü: Estimation of</td>
<td>63</td>
</tr>
<tr>
<td>air pollution parameters using artificial neural networks</td>
<td></td>
</tr>
<tr>
<td>Petra Csomós: Some aspects of interaction between operator splitting</td>
<td>77</td>
</tr>
<tr>
<td>procedures and numerical methods</td>
<td></td>
</tr>
<tr>
<td>Gabriel Dimitriu and Rodica Cuciureanu: Mathematical aspects of data</td>
<td>93</td>
</tr>
<tr>
<td>assimilation for atmospheric chemistry models</td>
<td></td>
</tr>
<tr>
<td>Ivan Dimov, Gerald Geernaert and Zahari Zlatev: Fighting the great</td>
<td>105</td>
</tr>
<tr>
<td>challenges in large-scale environmental modelling</td>
<td></td>
</tr>
<tr>
<td>Ivan Dimov, Tzvetan Ostromsky and Zahari Zlatev: Challenges in using</td>
<td>115</td>
</tr>
<tr>
<td>splitting techniques for large-scale environmental modeling</td>
<td></td>
</tr>
<tr>
<td>Maria de Lurdes Dinis and António Fiúza: Simulation of liberation and</td>
<td>133</td>
</tr>
<tr>
<td>dispersion of radon from a waste disposal</td>
<td></td>
</tr>
</tbody>
</table>
Anatoliy Yu. Doroshenko and Vitaly A. Prusov: Methods of efficient modeling and forecasting regional atmospheric processes .................143

Adolf Ebel, Hermann J. Jakobs, Michael Memmesheimer, Hendrik Elber and Hendrik Feldmann: Numerical forecast of air pollution – Advances and problems ..................................................................................153

Liviu–Daniel Galatchi: Alternative techniques for studying / modeling the air pollution level .............................................................................................................165

Kostadin Ganev, Nikolai Miloshev and Dimitrios Melas: Application of functions of influence in air pollution problems .................................175

Camilla Geels, Jørgen Brandt, Jesper H. Christensen, Lise M. Frohn and Kaj M. Hansen: Long-term calculations with a comprehensive nested hemispheric air pollution transport model ...........................................185

Eugene Genikhovich: Dispersion modelling for environmental security: principles and their application in the Russian regulatory guideline on accidental releases ......................................................................................................................197

Krassimir Georgiev and Svetozar Margenov: Higher order non-conforming FEM up-winding .........................................................................................209

Krassimir Georgiev, Svetozar Margenov and Vladimir M. Veliov: Emission control in single species air pollution problems..........................219

Boglárka Gnadtt: A new operator splitting method and its numerical investigation...........................................................................................................229

Sven-Erik Gryning and Ekaterina Batchvarova: Advances in urban dispersion modelling .................................................................................................243

Kostas Karatzas: Internet-based management of environmental simulation tasks ........................................................................................................253

Mykola Kharytonov, Alexandr Zberovsky, Anatoly Drizhenko and Andriy Babiy: Air pollution assessment inside and around iron ore quarries ......................................................................................................................263

Monika Krysta, Marc Bocquet, Olivier Isnard, Jean-Pierre Issartel and Bruno Sportisse: Data assimilation of radionuclides at small and regional scale ...........................................................................................................275
Dimitrios Melas, Ioannis Kioustioukis and Mihalis Lazaridis: The impact of sea breeze on air quality in Athens area .......................................................... 285

Clemens Mensink, Filip Lefebre and Koen De Ridder: Developments and applications in urban air pollution modelling ........................................... 297

Anton Planinsek: Demands for modelling by forecasting ozone concentration in Western Slovenia ................................................................. 309

Ion Sandu, Constantin Ionescu and Marian Ursache: A pilot system for environmental impact assessment of pollution caused by urban development and urban air pollution forecast ........................................ 317

R. San José, Juan L. Pérez and Rosa M. González: The use of MM5-CMAQ air pollution modelling system for real-time and forecasted air quality impact of industrial emissions ................................................... 327

Roland Steib: Regulatory modelling activity in Hungary ........................................ 337

Dimiter Syrakov, Hristina Kirova and Maria Prodanova: Creation and testing of flux-type advection schemes for air pollution modeling application ........................................................................................................ 349

Dimiter Syrakov, Maria Prodanova and Kiril Slavov: Bulgarian emergency response system: description and ENSEMBLE performance ........................................................................................................ 361

Elisabetta Vignati, Maarten Krol and Frank Dentener: Global and regional aerosol modelling: a picture over Europe ............................. 373

Dimiter Yordanov, Maria Kolarova and Dimiter Syrakov: The ABL models YORDAN and YORCON – top-down and bottom-up approaches for air pollution applications ......................................................... 383

Zahari Zlatev, Adolf Ebel, István Faragó and Krassimir Georgiev: Major conclusions from the discussions ......................................................... 395

List of the participants .................................................................................. 401

Subject index .............................................................................................. 405
PREFACE

The protection of our environment is one of the major problems in the society. More and more important physical and chemical mechanisms are to be added to the air pollution models. Moreover, new reliable and robust control strategies for keeping the pollution caused by harmful compounds under certain safe levels have to be developed and used in a routine way. Well based and correctly analyzed large mathematical models can successfully be used to solve this task. The use of such models leads to the treatment of huge computational tasks. The efficient solution of such problems requires combined research from specialists working in different fields.

The aim of the NATO Advanced Research Workshop (NATO ARW) entitled “Advances in Air Pollution Modeling for Environmental Security” was to invite specialists from all areas related to large-scale air pollution modeling and to exchange information and plans for future actions towards improving the reliability and the scope of application of the existing air pollution models and tools. This ARW was planned to be an interdisciplinary event, which provided a forum for discussions between physicists, meteorologists, chemists, computer scientists and specialists in numerical analysis about different ways for improving the performance and the quality of the results of different air pollution models.

The NATO ARW was held at Borovetz (Bulgaria), in the period 8-12 June, 2004. The participants were partly outstanding specialists with international reputation, partly very talented young researchers who will once belong to the first category. About 46 delegates from 17 NATO member countries and partner countries actively participated in the workshop. (In addition to the above NATO participants, there were ten further participants, supported by BULAIR.)

The main objectives of this meeting were the following:
(a) improving the abilities of air pollution models to calculate reliable predictions of the pollution levels in a given domain and in real time by using adequate description of the physical and chemical processes,
(b) implementation of advanced numerical methods and algorithms in the models,
(c) efficient utilization of up-to-date computer architectures,
(d) development of mechanisms for studying particles (including here fine and ultra-fine particles), biogenic emissions, etc.
(e) optimization techniques in the study of the pollution levels, etc.

Plans for developing more advanced and more reliable air pollution models were also discussed. The adaptation of the existing and new models to the new generation of computers was one of the major topics of this meeting.

There were 45 plenary talks given. In the first working day we organized a discussion “Running comprehensive air pollution models on different kinds of computers architectures”, while on the next day we had a discussion on “Emission control in air pollution problems”. On the third day we organized a discussion about “Data assimilation and solving big optimization problems”.

We hope that the participants of the meeting have got new motivation to further applications of the existing results with possible cooperation with specialists from different NATO countries. The exchange of the experience and knowledge of the specialists in air pollution modeling, numerical mathematics, optimal control and parallel computing could facilitate very much the further activities on this area. The participants could present their latest results in the area of air pollution modeling and – as long-term benefits – they will do cooperative research towards reducing the trans-boundary transport of air pollution. It is expected that new collaborations between the NATO and Partner countries institutions and new teams for joint research will be established. The exchange of knowledge, ideas and tools for treatment of the air pollution models for environmental security and the optimal control of emissions can be used for an improvement of the existing models and the development of new ones in the near future.

The editors
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xi
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The editors