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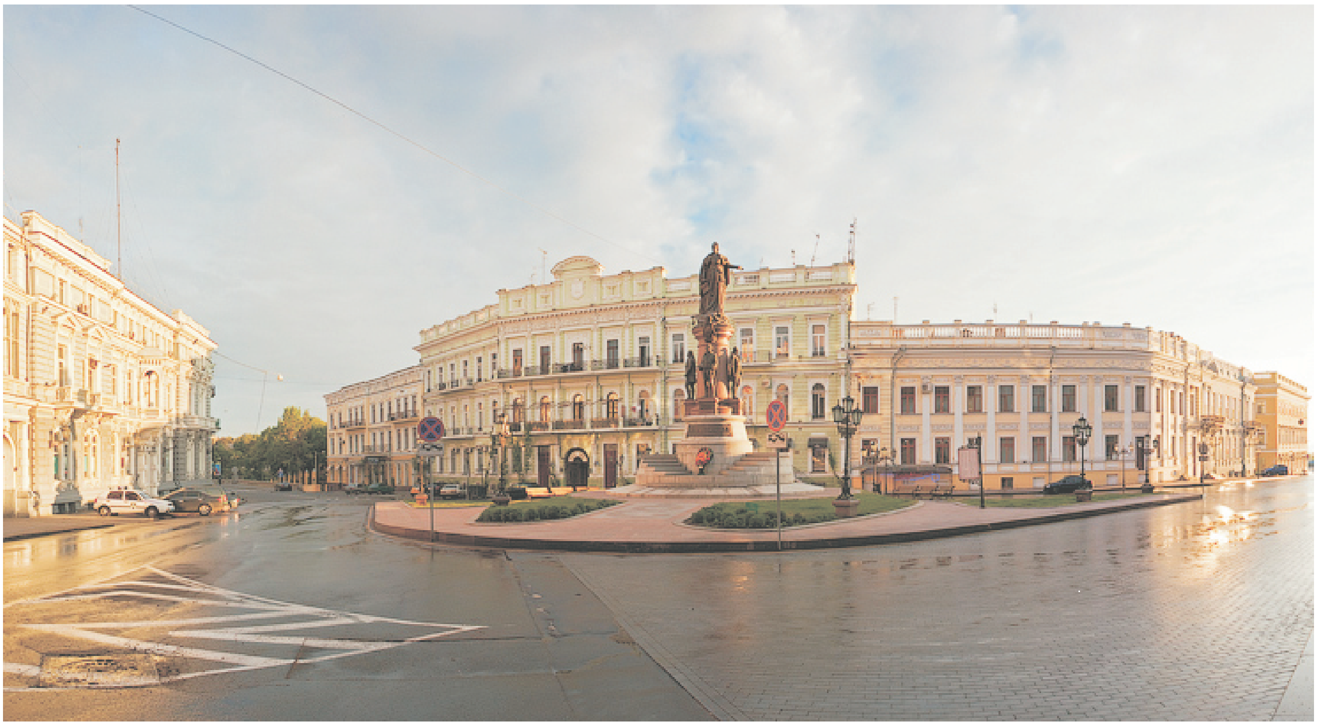
NordForsk /MUSCATEN

INTERNATIONAL YOUNG SCIENTIST SUMMER SCHOOL

ON "INTEGRATED MODELLING OF METEOROLOGICAL AND CHEMICAL TRANSPORT PROCESSES/ IMPACT OF CHEMICAL WEATHER ON NUMERICAL WEATHER PREDICTION AND CLIMATE MODELLING"



ODESSA, UKRAINE
3-9 JULY 2011

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Nordic Network
"Towards Multi-Scale Modelling
of the Atmospheric Environment"

1932

Odessa State
Environmental University

DMI

Danish Meteorological
Institute

INTERNATIONAL
YOUNG SCIENTIST SUMMER SCHOOL

ON "INTEGRATED MODELLING OF METEOROLOGICAL AND CHEMICAL TRANSPORT PROCESSES/ IMPACT OF CHEMICAL WEATHER ON NUMERICAL WEATHER PREDICTION AND CLIMATE MODELLING"

3-9 JULY 2011

ODESSA, UKRAINE

Young Scientists Summer School on topics of Integrated Modelling of Meteorological and Chemical Transport Processes/Impact of Chemical Weather on Numerical Weather Prediction and Climate Modelling", held at Odessa State Environmental University (Odessa, Ukraine) on 3-9 July, 2011

The Young Scientists Summer school is arranged in the framework of cooperation with:

MUSCATEN Nordic Network "Towards Multi-Scale Modelling of the Atmospheric Environment" – a project funded by Nordic Research Board (http://muscaten.ut.ee);

OSEU - Odessa State Environmental University (http://www.odeku.edu.ua);

DMI - Danish Meteorological Institute (http://www.dmi.dk);

the HIRLAM consortia (http://hirlam.org) (on research and development of the Environment - HIgh Resolution Limited Area Model, Enviro-HIRLAM);

COST Action ES1004 – "EuMetChem: European framework for online integrated air quality and meteorology modelling" (http://eumetchem.info);

FP7 EU MEGAPOLI – "Megacities: Emissions, urban, regional and Global Atmospheric POLlution and climate effects, and Integrated tools for assessment and mitigation" (http://megapoli.info);

CEEH - Danish Centre for Energy, Environment and Health (http://ceeh.dk);

EU TEMPUS project QualiMet "Development of Qualification Framework in Meteorology" (http://qualimet.net);

RSHU – Russian State Hydrometeorological University (http://www.rshu.ru/eng)

FP7 EU PBL-PMES "Atmospheric Planetary Boundary Layers: Physics, Modelling Role in Earth System" (http://pbl-pmes.fmi.fi).

The aim of this event is to join young scientists and researches from the numerical weather prediction and air quality communities, University/Academia system in order to elaborate, outline, discuss and make recommendations on the best strategy and practice for further research, developments and applications of the integrated modelling of both meteorological and chemical transport processes into the numerical weather prediction modelling systems, and in particular, the Enviro-HIRLAM/ HARMONIE modelling system. The main emphasis is on multi-scale models applied for chemical weather forecasting and feedback mechanisms between meteorological and atmospheric pollution processes.

Content

International organizing committee:

Alexander Baklanov (Chairman)	Danish Meteorological Institute (Denmark)
Sergey Stepanenko (Co-chairman)	Odessa State Environmental University (Ukraine)
Alexander Mahura	Danish Meteorological Institute (Denmark)
Sergey Ivanov	Odessa State Environmental University (Ukraine)
Julia Palamarchuk	Odessa State Environmental University (Ukraine)
Rein Room	University of Tartu (Estonia)
Marko Kaasik	University of Tartu (Estonia)
Sergej Zilitinkevich	University of Helsinki (Finland)
Michael Gauss	Norwegian Meteorological Institute (Norway)
Sergey Smyshlyaev	Russian State Hydrometeorological University (Russia)
Eduard Podgaiskiy	Russian State Hydrometeorological University (Russia)
Andrey Belotserkovskiy	Tver State University (Russia)
Eigil Kaas	University of Copenhagen (Denmark)
Laura Rontu	Finnish Meteorological Institute (Finland)
Jeanette Onvlee	Nederlands Meteorologisch Institute (the Netherlands)
Sander Tijm	Nederlands Meteorologisch Institute (the Netherlands)

1. Information Letter

MUSCATEN Summer School on
"Integrated Modelling of Meteorological and Chemical Transport Processes / Impact of Chemical Weather on Numerical Weather Prediction and Climate Modelling"

Odessa, Ukraine, 3-9 July 2011

Introduction

The MUSCATEN (Towards Multi-Scale Modelling of the Atmospheric Environment; http://muscaten.ut.ee) networking project announces the 2nd young scientist summer school (YSSS) on topics of integrated modelling of meteorological and chemical transport processes to understand the impact of chemical weather on numerical weather prediction and climate modelling.

The aim of this event is to join young scientists and researches from the numerical weather prediction and air quality communities, University/ Academia system in order to elaborate, outline, discuss and make recommendations on the best strategy and practice for further research, developments and applications of the integrated modelling of both meteorological and chemical transport processes into the numerical weather prediction modelling systems, and in particular, the Enviro-HIRLAM/ HARMONIE modelling system. The main emphasis is on multi-scale models applied for chemical weather forecasting and feedback mechanisms between meteorological and atmospheric pollution processes.

The school is arranged in the framework of cooperation with the HIRLAM consortia (http://hirlam.org) (on research and development of the Environment - HIgh Resolution Limited Area Model, Enviro-HIRLAM); COST Action ES1004 – "EuMetChem: European framework for online integrated air quality and meteorology modelling" (http://eumetchem.info), FP7 EU MEGAPOLI – "Megacities: Emissions, urban, regional and Global Atmospheric POLlution and climate effects, and Integrated tools for assessment and mitigation" (http://megapoli.info); CEEH - Danish Centre for Energy, Environment and Health (http://ceeh.dk); OSEU - Odessa State Environmental University (http://www.odeku.edu.ua); EU TEMPUS project QualiMet "Development of Qualification Framework in Meteorology" (http://qualimet.net); and FP7 EU PBL-PMES "Atmospheric Planetary Boundary Layers: Physics, Modelling and Role in Earth System" (http://pbl-pmes.fmi.fi), and the Danish Meteorological Institute (http://www.dmi.dk).

The school will take place in the city of Odessa (Ukraine) at the premises of the Odessa State Environmental University (OSEU) from 3 till 9 July 2011. The local organizer and host is the OSEU (http://www.odeku.edu.ua).

Organizers of the summer school welcome all interested participants from countries and associated members of the HIRLAM consortia (http://www.hirlam.org) and University/ Academia system of any country.

Young Scientist Summer School, YSSS-2011 (3-9 July 2011)

During the summer school the main lecture topics will include general introduction to aspects of meteorological modelling (numerical weather prediction (NWP), parameterizations and physics, numerics, advection, land-use, radiation, clouds, aerosols, urbanization); off-line vs. on-line atmospheric chemical transport (ACT) modelling; possible feedbacks, direct and indirect effects, and their impact from ACT on short- and long-term/-range atmospheric circulation models; etc.

Soon, details about the YSSS-2011 school programme (i.e. list of scheduled lectures and topics of practical exercises) will became available at the MUSCATEN website (http://muscaten.ut.ee). You may also see materials/ examples from the 1st YSSS-2008 summer school (Jul 2008; Zelenogorsk, Russia) at http://netfam.fmi.fi/YSSS08 organized by the Nordic Network on Fine-scale Atmospheric Modelling, NetFAM (http://netfam.fmi.fi).

The summer school will start on Sunday, 3 Jul 2008 and last during a week. The school includes lectures (from 9.00 till 15.00) and practical exercises (from 15.00 till 18.00+) as small scale research projects continuing during the full week. The exercises will be arranged within groups/ teams of students (3-5 persons).

At the last day of the school (Saturday, 9 Jul 2011) students will jointly present results of the completed research projects to audience/ colleagues. The YSSS diploma will be officially issued to all students whom have attended the full programme/ lectures of the school, completed practical exercises and successfully defended their short-term research projects.

On Saturday 2 Jul 2011, arrived YSSS participants (students and lectors) will be accommodated by the host/ OSEU.

Meals (breakfast, lunch and dinner) and coffee/ tea (twice a day) breaks will be served daily starting from Sunday, 3 Jul 2011 till Saturday, 9 Jul 2011.

The Ice-Breaking Party is planned on evening of Sunday, 3 Jul 2011.

The Poster Presentations (showing recently completed or on-going research/ thesis at home institution) will be given by students during special 2 hour poster session (note, all posters should be displayed from the 1st day of the school) on Monday, 4 Jul 2011,

The Odessa city excursion (in evening time) will be arranged for the YSSS participants on Tuesday, 5 Jul 2011.

The Official Final Dinner is planned on evening of Friday, 8 Jul 2011.

The departure days are Saturday, 9 Jul 2011 (starting 2nd part of the day) and Sunday, 10 Jul 2011.

Participation and Deadlines

In order to participate in the YSSS-2011 School, please, download and fill out the summer school application form (including motivation letter, CV/resume, and list of recent presentations/publications) and send as attachment files by e-mail to Alexander Mahura, DMI (ama@dmi.dk) till deadline: 31 March 2011. Note, all received applications from candidates will be evaluated after deadline by the responsible organizers (DMI and OSEU representatives) of the school and all accepted participants will be informed by e-mail in the beginning of April 2011.

There is no registration fee for the summer school.

The working language of the summer school is English.

Information about visa requirements will be distributed by the OSEU Department of International Relations for only approved participants of the school.

Note, the limited support for travel expenses (including travel, accommodation, and meals) is available for the MUSCATEN Baltic and Nordic countries participants (see MUSCATEN web-site for the list of institutions from these countries).

Organizers

International organizing committee:

Alexander Baklanov (Chairman) and Alexander Mahura (Danish Meteorological Institute, DMI – http://www.dmi.dk);

Sergey Stepanenko (Co-chairman), Sergey Ivanov, and Julia Palamarchuk (Odessa State Environmental University, OSEU - http://www.odeku.edu.ua);
Rein Room and Marko Kaasik (University of Tartu; MUSCATEN - http://muscaten.ut.ee);

Sergej Zilitinkevich (University of Helsinki, UH - http://www.helsinki.fi/university);

Michael Gauss (Norwegian Meteorological Institute, Met.no - http://met.no);

Sergey Smyshlyaev and Eduard Podgaiskiy (Russian State Hydrometeorological University, RSHU – http://www.rshu.ru);

Andrey Belotserkovskiy (Tver State University, TSU – http://university.tversu.ru);

Eigil Kaas (University of Copenhagen, UoC - http://www.gfy.ku.dk);

Laura Rontu (Finnish Meteorological Institute, FMI – http://www.fmi.fi);

Jeanette Onvlee and Sander Tjim (Koninklijk Nederlands Meteorologisch Instituut, KNMI - http://www.knmi.nl).

Host/ OSEU local organizing committee:

Sergey Stepanenko (rector@ogmi.farlep.odessa.ua) - OSEU Local Committee Chairman

Sergey Ivanov (svvivo@te.net.ua) - School organizer from OSEU

Julia Palamarchuk (j_pal@ukr.net) - Assistant to school organizer (school programme, practical exercises and lectures)

Inna Khomenko (innchom@mail.ru) - Assistant to school organizer (school programme, poster session and publications)

Oleg Shabliy (oleg.shabliy@gmail.com) - Visa, invitation and travel information (contact with the OSEU International Relations Office)

Maria Krachkovskaya (social@ogmi.farlep.odessa.ua) - Accommodation information

Katerina Guseva (kate.gusyeva@gmail.com) – Visa, invitation and travel information

Valentina Bondarenko (finance@ogmi.farlep.odessa.ua) – Accommodation information

Anna Belinskaya (money1@ogmi.farlep.odessa.ua) – Accommodation information

2. Work Programme of the Summer School

Programme of Lectures, Practical Exercises, and Social Events for the 2nd Young Scientist Summer School on "Integrated Modelling of Meteorological and Chemical Transport Processes / Impact of Chemical Weather on Numerical Weather Prediction and Climate Modelling"

The idea with the lectures at the Summer School is that the students get an understanding of the basic components that are included in integrated meteorological-chemical-aerosol-cloud-transport models. These include both the physical/chemical components and how these components numerically can be realised and implemented into these models.

All lectures are 45 minutes long followed by a 15 min. break.

Day 1: Sunday, 3 July 2011

08:00 – 09:00: **Breakfast**

08:00 – 09:30: **Registration**

09:30 – 09:45: **Official Opening**
(Prof. Sergey Stepanenko, OSEU, Ukraine)

09:45 – 10:00: **Welcoming Speech**
(Prof. Lev Karlin, RSHU, Russia)

10:00 – 10:15: **Welcome + Arrangements**
(Dr. Sergey Ivanov, OSEU, Ukraine)

- Programme details, lectures, exercises, poster session, rules, meals, accommodation, etc
- What is required from the students to receive a diploma from the School?

10:15 – 11:00: **Introduction Lecture**
(Prof. Alexander Baklanov, DMI, Denmark)

Introduction to Integrated Modelling of Meteorological and Chemical Transport Processes
Meteorological modelling, integration of gases and aerosols, on-line versus off-line coupling, chemistry/ aerosol feedbacks, etc. Objective: what will be the basic subjects of the school, short overview of all these subjects.

Block 1: Meteorological Modelling *(8 Lectures)*

11:15 – 12:00: **Lecture 1**
(Prof. Sergey Stepanenko, OSEU, Ukraine)

General Introduction into the Atmosphere and Atmospheric Motions
Definitions, chemical composition, vertical structure, layers of the atmosphere, main meteorological characteristics/variables (importance for Numerical Weather Prediction (NWP)), basic forces, basic dynamics, thermodynamics, etc. Temporal and spatial scales of atmospheric motions. Basic system of equations for atmospheric motions (continuity, temperature, momentum).

12:15 – 13:00: **Lecture 2**
(Dr. Laura Rontu, FMI, Finland)

Numerical Weather Prediction (NWP) and HIRLAM
NWP – general introduction (briefly – climate modelling).
versions of HIRLAM and HARMONIE with respect to horizontal and vertical resolutions, time steps, applications for different tasks/activities, etc.

Overall general introduction.

- Equations briefly (based on Lecture 2).
- Numerics/methods for solution.
- Input/Output HIRLAM data.
- Physics – generally (radiation, clouds and condensation, surface (incl. SURFEX) and soil processes, orography effects, etc.)
- Data assimilation and initialization.

13:00 – 14:00: Lunch

14:00 – 14:45: Lecture 3
(Dr. Laura Rontu, FMI, Finland)

Atmospheric radiation, precipitation, clouds
Definitions, spatial and temporal variability, +briefly approach and parameterizations used in HIRLAM: STRACO, Rasch-Kristjansson, Kain-Fritsch, etc. Approaches in HIRLAM.

- Atmospheric radiation: general – definitions, sun vs. Earth, balance, spatial and temporal variability;
- Clouds: general – definitions, classification, spatial and temporal distribution (focus on troposphere),
- Precipitation: general – definitions, water phase changes in atmosphere, CCN, humidity, spatial and temporal variability (focus on ABL);

15:00 – 15:45: Lecture 4
(Prof. Eigil Kaas, Univ of Copenhagen, Denmark)

Numerical schemes, Advection
Definition, different numerical approaches and numerical schemes.

- The basic concept of advection. The Lagrangian and the Eulerian approach.
- Relationship between advection equation (for mixing ratio or specific concentration) and the mass continuity equation.
- Numerical methods and challenges for solving the continuity/advection equation in ACTM's.
- Numerical dissipation / dispersion, and numerical diffusion or antidiffusion.
- Monotonic and positive definite filters and techniques.

16:00 – 18:00: Exercises

At the beginning, students in groups shall discuss the outcome of their home reading assignments with teacher of the exercise and prepare short oral presentation of planned research activities for the upcoming exercises. This presentation should include the main goal, objectives, practical way of realisation of the exercise, etc. Each group should give prepared presentation (max 5 minutes and followed by questions) for all participants of the school.
Familiarization with booklet

18:00 – 19:00: Dinner

19:00 – 21:00: Ice Breaking Party

Day 2: Monday, 4 July 2011

08:00 – 09:00: Breakfast

09:00 – 09:45: Lecture 5
(Prof. Eigil Kaas, Univ of Copenhagen, Denmark)

Numerical schemes, Advection
Continuation of lecture 4 - Definition, different numerical approaches and numerical schemes.

- Extension from two to three dimensions.
- Integration of chemical schemes in NWP/Climate models.
- The wind/mass inconsistency.
- Mass conservation.

10:00 – 10:45: Lecture 6
(Dr. Alexander Mahura, DMI, Denmark)

Treatment of Land-use and Urbanization
Land-use, classification, datasets, land surface schemes, urban classification.
Urbanization approaches, anthropogenic heat flux, roughness, albedo; building effects parameterizations; soil model for submesoscales; city districts (centre, high buildings, industrial commercial, residential); examples.

11:00 – 11:45: Lecture 7
(Prof. Sergey Zilitinkevich, FMI/UH, Finland)

Turbulence and planetary boundary layers (PBLs): recent developments in physics and parameterization in atmospheric models
Definitions, spatial and temporal variability, classification. ABL definition, surface layer; spatial structure, temporal diurnal evolution; classes-types (SBL, CBL, UBL, etc.; parameterizations in NWP; on turbulence closure; EFB closure model further advances

12:00 – 12:45: Lecture 8
(Prof. Sergey Zilitinkevich, FMI/UH, Finland)

PBL height / mixing height
Importance for extreme weather events (heats or colds) and air pollution; physics; models; problems

13:00 – 14:00: Lunch

Block 2: Atmospheric Chemical Transport Modelling *(9 Lectures)*

14:00 – 14:45: Lecture 1
(Prof. Alexander Baklanov, DMI, Denmark)

General Introduction to the Physical and Chemical Atmospheric Processes & Physical Atmospheric Processes, characteristics of atmospheric composition and air quality, model evaluation.
The basic Atmospheric Chemical Transport Modelling (ACTM) processes are shortly introduced. This includes: advection, diffusion, deposition, emission, chemistry, aerosols, and clouds. These processes will be handled in more details in the following lectures. Definitions, turbulent diffusion, deposition and land use. How are they solved in CTM. Different numerical treatments. Means of characterization of atmospheric composition, appropriate measures and consequences for the CTM evaluation.

15:00 – 18:00: Exercises

Each group will give a short summary of the problem they will look at and how they will solve it (max. 5 min). Afterwards will the students continue their exercise in groups.

18:00 – 19:00: Dinner

19:00 – 21:00: Poster Session

Day 3: Tuesday, 5 July 2011

08:00 – 09:00: Breakfast

Chemistry Block

09:00 – 09:45: Lecture 2
(Prof. Sergey Smyshlyaev, RSHU, Russia)
Fundamentals of Atmospheric Gas-Phase Chemistry
State of the art and future challenges (where are improvements of our knowledge needed)

10:00 – 10:45: Lecture 3
(Prof. Sergey Smyshlyaev, RSHU, Russia)
Development of Chemical Gas-Phase Mechanisms for Air Quality Modelling
How do we treat gas-phase chemistry in ACTM. Development of lumped mechanisms.
11:00 – 11:45: Lecture 4
(Prof. Sergey Smyshlyaev, RSHU, Russia)

Liquid Phase Chemistry
Basic reactions, differences between cloud and aerosol chemistry.

12:00 – 12:45: Lecture 5
(Dr. Roman Nuterman, DMI, Denmark/ Prof. Sergey Smyshlyaev, RSHU, Russia)

Implementation of Chemistry in ACTM
Numerical treatment (Gear solver versus fast solvers), applications of Air Quality Models to Assessment and Forecasting, how is chemistry treated in Enviro-HIRLAM and other ACTMs

13:00 – 14:00: Lunch

Aerosol Block

Objective: giving the basic knowledge of physical and chemical properties of the aerosol particles in the atmosphere, the description of the major physical processes which influence these properties, the interaction between aerosols and clouds and their numerical treatment in the models.

14:00 – 14:45: Lecture 6
(Dr. Elisabetta Vignati, Joint Research Centre, Italy)

Aerosol particle properties
Physical and chemical characteristics of aerosol particles in ACTM:
- chemical components and their importance with the spatial scales
- particle dimension and the concept of size distributions (number, surface and mass) and their mathematical description (as size bins, as log-normal modes)
- aerosol-cloud interaction: chemical and physical properties of cloud condensation nuclei

15:00 – 17:00: Exercises
The students continue their exercise.

17:00 – 18:00 – Dinner

18:00 – 20:00 – Odessa City Excursion

Day 4: Wednesday, 6 July 2011

08:00 – 09:00: Breakfast

09:00 – 09:45: Lecture 7
(Dr. Elisabetta Vignati, Joint Research Centre, Italy)

Aerosol Physics
The physical processes which determine aerosol number and mass concentrations in the atmosphere and their parameterizations in ACTM:
- Aerosol dynamics: nucleation, coagulation and condensation
- Emissions, wet and dry deposition

10:00 – 10:45: Lecture 8
(Dr. Elisabetta Vignati, Joint Research Centre, Italy)

Aerosol Physics
Continued lecture - aerosol dynamics, emissions and deposition

11:00 – 11:45: Lecture 9
(Dr. Elisabetta Vignati, Joint Research Centre, Italy)

Cloud physics
Aerosol-cloud interaction: formation and growth of clouds and their parameterisations in ACTM. Biological Air Quality Block: sub-Micronics and pauci-Micronics biological particles. Relationship with other pollutants. Health impacts. Pollen allergy. Pollen dispersion modelling. Pollen Grains as Biological Particles Involved in Different Aerobiological Processes

Block 3: Possible Feedbacks of Gases, Aerosols, Clouds on Climate and Meteorological Models *(7 Lectures)*

Objective: description of the main feedback mechanisms of the chemical weather (atmospheric green-house gases and aerosols) impact on NWP and climate processes, in order to understand how important it is to include feedbacks from gases, aerosols, clouds, etc. in NWP and climate models. The goal is to give an orientation/understanding of which feedback processes are the most important: impact of feedbacks from gases, aerosols (direct, semi-direct, indirect effects), clouds, etc. on short and long time-range meteorological models. This subject is the main focus of the school. First part focuses on physical processes behind these feedbacks, second - on model examples.

12:00 – 12:45: Lecture 1
(Prof. Alexander Baklanov, DMI, Denmark)

Physical description
Possible aerosol feedback processes on meteorology (radiation, clouds, ABL, etc.) in integrated models.

• Direct effect decreases solar/ thermal-IR radiation and visibility;
  - warming: GHGs, BC, OC, Fe, Al, polycyclic/nitrated aromatic compounds
  - cooling: water, sulfate, nitrate, most OC (scattering, absorption, refraction, etc.)
• Semi-direct effects: affect atmospheric boundary layer (ABL) meteorology and photochemistry;
• First indirect effect influences cloud drop size, number, reflectivity, and optical depth via CCN;
• Second indirect effect: influences cloud liquid water content, lifetime, and precipitation;
• Chain of all aerosol effects (nonlinear interactions).

13:00 – 14:00: Lunch

14:00 – 14:45: Lecture 2
(Prof. Sergey Smyshlyaev, RSHU, Russia)

Physical description
Possible feedback processes of gases in online coupled atmospheric chemical transport and climate models.

15:00 – 18:00: Exercises
The students continue their exercise.

18:00 – 19:00: Dinner

Day 5: Thursday, 7 July 2011

08:00 – 09:00: Breakfast

09:00 – 09:45: Lecture 3
(Prof. Alexander Baklanov, DMI, Denmark)

Model examples
The importance of feedbacks on NWP and climate models based on model examples: scales (time and space), gases, aerosols, important of different mechanisms, prioritization of different tasks, etc.

10:00 – 10:45: Lecture 4
(Prof. Sergey Smyshlyaev, RSHU, Russia)
Model examples

11:00 – 11:45: Lecture 5
(Prof. Sergey Ivanov, OSEU, Ukraine)
Model examples

12:00 – 12:45: Lecture 6
(Iratxe Gonzalez-Aparicio, Tecnalia, Spain & Adomas Mazeikis (LHMS, Lithuania)

Model examples

13:00 – 14:00: Lunch

14:00 – 14:45: Lecture 7
(Prof. Eigil Kaas, Univ of Copenhagen, Denmark)

Applications of models to different integrated systems and studies
Applications of ACTM, NWP, Climate, Health Impact and other models within different integrated systems for environmental risk, impact assessments and optimization studies (e.g. CEEH integrated modeling chain of the Danish Center for Energy, Environment and Health, etc.).

15:00 – 18:00: Exercises
The students continue their exercise.

18:00 – 19:00 – Dinner

Day 6: Friday, 8 July 2011

08:00 – 09:00: Breakfast

09:00 – 13:00: Exercises

10:00 – 13:00: Meeting for NWP+ACT Integrated Modeling strategy & Enviro-HIRLAM/HARMONIE activities, research and development
(lead by Alexander Baklanov and Laura Rontu)

13:00 – 14:00: Lunch

14:00 – 17:00: TEMPUS meeting
(lead by Sergey Zilitinkevich, Lev Karlin and Andrey Belotserkovskiy)
14:00 – 18:00: Exercises

Finalization of the exercise and oral presentation by research groups

19:00 – 21:00: Final Official Dinner

Day 7: Saturday, Thursday, 9 July 2011

08:00 – 09:00: Breakfast

09:00 – 11:00: Oral Presentations (max 15 minutes per group) from the student groups.
(lead by Alexander Mahura)

11:15 – 12:30: Awarding Diplomas of the School + Joint Photo

12:30 – 13:00: Official Closure of the Summer School

13:00 – 14:00: Lunch

14:00 – 15:00: Meeting on Publication of Student Lecture-Textbook and Workbook, Video and Web-materials

15:00: Starting departure of the school participants.

3. Basic Information on Practical Exercises

Most of practical exercises will be based on the Enviro-HIRLAM (Environment – High Resolution Limited Area Model) modelling system. The Enviro-HIRLAM is an on-line integrated numerical weather prediction (NWP) and atmospheric chemical transport (ACT) modelling system originally developed at the Danish Meteorological Institute (DMI) since 1999 and now expanded with international collaboration within the HIRLAM Community and University system. Enviro-HIRLAM will be installed and tested at computers at the summer school venue.

All students (accepted for the summer school) have been evaluated and were grouped into teams (assigned with different exercises) consisted of 3-5 persons taking into account their educational background and skills.

At initial preparation stage, before the summer school has started, the students have been required to contact with the Teacher of the Exercise and make a relevant literature research about the subject of the exercise.

During the first day of the exercises (3 July 2011, Sunday) the students in groups shall discuss the outcome of their home reading assignments with teacher of the exercise and prepare short oral presentation of planned research activities for the upcoming exercises. This presentation should include the main goal, objectives, practical way of realisation of the exercise, etc. On the next day (4 July 2011, Monday), each group should give prepared presentation (max 5 minutes and followed by questions) for all participants of the school.

List of exercises for students of the summer school:

- (AEROSOL) **-** The Impact of Aerosols Effects on Meteorology;
- (URBAN) **-** The Influence of Metropolitan Areas on Meteorology;
- (SURFEX-TEB) **-** Surface externalisee, Town Energy Balance model;
- (COASTAL) **-** The Coastal Effects (& Cities) Effects on Meteorology;
- (AQ-CHEM) **-** Air Quality Sensitivity to Temperature Variability.

The exercises have been distributed among the summer school students.

In total, there are 5 different exercises and 6 groups of the students.

The **teachers** – Laura Rontu (FMI), Sergey Ivanov (OSEU), Sergey Smyshlyaev (RSHU), Roman Nuterman (DMI), and Alexander Mahura (DMI) – will assist (from Sunday, 3 Jul till Friday, 8 Jul) students with practical exercises and guidance.

The **teacher assistants** – Ekaterina Khoreva (RSHU), Iratxe Gonzalez-Aparicio (Tecnalia), Adomas Mazeikis (Univ Vilnius), Andres Luhumaa (Univ Tartu), Suleiman Mostamandy (RSHU), Julia Palamarchuk (OSEU) – will assist (from Sunday, 3 Jul till Friday, 8 Jul) students in groups with practical issues and share own experience with Enviro-HIRLAM.

The **consultants (lectors)** – Laura Rontu (FMI), Elisabetta Vignati (JRC), Alexander Baklanov (DMI), Eigil Kaas (Univ Copenhagen) - will be also presented (from Monday, 4 Jul till Thursday, 7 Jul) during the time of exercises and can be also asked by students on different theoretical topics/ issues.

3.1. AEROSOL - The Impact of Aerosols Effects on Meteorology

Model used: **Enviro-HIRLAM**

Read, the general description of the HIRLAM (HIgh Resolution Limited Area Model) model at the HIRLAM official website at:
http://hirlam.org/index.php?option=com_content&view=article&id=64&Itemid=101
See for more details the scientific documentation on the HIRLAM model at:
http://hirlam.org/index.php?option=com_docman&task=doc_download&gid=270&Itemid=70
Teacher: **Roman Nuterman** (DMI, Denmark)
Teacher Assistant: **Iratxe Gonzalez-Aparicio** (Spain), **Ekaterina Khoreva** (Russia)

Introduction Background:
The atmosphere is heavily polluted by anthropogenic sources (from urban agglomerations/ megacities) with accumulation mode aerosols which affect cloud formation and precipitation development. Consequently, continental clouds generally include more cloud droplets (by two orders of magnitude) than marine clouds. An increased number of small droplets in warm clouds will lead to an increase in cloud reflectance and also affects cloud lifetime.
A megacity is characterized by large emissions of primary and secondary pollutants such as NO_x, O_3, organic compounds as well as particles of different sizes. However, the direct influence of the emissions is not the only way the city affects air quality. In particular, the interaction between soluble particles and clouds may be of importance. Particles may be transported downwind with the urban plume into clouds where they can activate and contribute to an increase in cloud droplet number concentration (CDNC). Such an increase leads to enhanced cloud-top reflectance through the first aerosol indirect effect and modification of precipitation development through the second aerosol indirect effect. The interaction between anthropogenic aerosols and regional weather has been investigated using the on-line integrated Enviro-HIRLAM model (Environment - High Resolution Limited Area Model; *Korsholm, 2008*). The aerosol feedbacks were implemented in the modified Soft TRAnsition COndensation (STRACO) scheme (*Sundqvist et al., 1989*) and radiation scheme (*Savijärvi, 1990*). The feedbacks induced changes in meteorological parameters and in chemical reactions have been preliminary analyzed and evaluated for specific case studies (*Korsholm, 2009*).

Main Goal:
Study influence of the anthropogenic emissions from selected metropolitan area on a formation of meteorological/ chemical fields in the urban area and surroundings due to inclusion of aerosols feedback mechanisms in the Enviro-HIRLAM model by analysis of temporal and spatial variability of diurnal cycle for meteorological/chemical variables of key importance.

Specific Objectives:
1) Modify the Savijärvi and STRACO schemes of Enviro-HIRLAM model by including (a) the calculation of the activated anthropogenic aerosol number concentration, (b) wet deposition in the condensation scheme, (c) parameterization of the effect of the Cloud Condensation Precipitation Evaporation processes (CCEP) and (d) dry deposition;
2) Perform simulations for selected specific cases/dates (meteorological conditions with convective regimes and typical wind conditions) in two modes - the control run and the modified run (with feedbacks included);
3) Evaluate diurnal cycle variability for – (a) air temperature, (b) sensible heat flux, (c) latent heat flux, (d) surface temperature, (e) cloud reflectivity, and etc. – for two types of runs; estimate the impact of anthropogenic aerosols from metropolitan area, magnitude and signs of changes due to feedbacks, etc.;
4) Summaries findings and results of the exercise in a form of an oral presentation (max 15 minutes).

Literature List:
Before the Summer School, the students should read, at least, the first 2 required publications; the three other papers are highly recommended to read to be useful for the discussions/talks; the additional readings might be useful too.

REQUIRED READINGS

Korsholm U.S., A. Baklanov, A. Gross, A. Mahura, B.H. Sass and E. Kaas, **2008**: Online coupled chemical weather forecasting based on HIRLAM – overview and prospective of Enviro-HIRLAM. *HIRLAM Newsletter, **54**: 1-17.*

Korsholm U.S., **2009**: Scientific Report 09-01, PhD thesis: Integrated modeling of aerosol indirect effects, http://www.dmi.dk/dmi/sr09-01.pdf

RECOMMENDED READINGS

Boucher O., Lohmanmn U., **1995**: The sulfate-CCN-cloud albedo effect, a sensitivity study with two general circulation models. *Tellus*, 47B, 281-300.

Savijärvi H., **1990**. Fast radiation parameterization schemes for mesoscale and short-range forecast models. *J. Appl. Meteor.*, 29, 437-447.

Sundqvist H., Berge E., Kristjánsson J., **1989**: Condensation and Cloud Parameterization Studies with a Mesoscale Numerical Weather Prediction Model, *Mon. Wea. Rev.*, 117, 1641-1657.

ADDITIONAL READINGS:

Albrecht B., **1989**: Aerosols, Cloud Microphysics, and Fractional Cloudiness. *Science*, 245, 1227-1230.

Satheesh S.K., Moorthy K.K., **2005**: Radiative effects of natural aerosols: A review. *Atm. Env.*, 39, 2089-2110.

Stevens B., Feingold G., **2009**: Untangling aerosol effects on clouds and precipitation in a buffered system, *Nature*, 461, 607-613.

3.2. URBAN - The Influence of Metropolitan Areas on Meteorology

Model used: **Enviro-HIRLAM**

Read, the general description of the HIRLAM (HIgh Resolution Limited Area Model) model at the HIRLAM official website at:
http://hirlam.org/index.php?option=com_content&view=article&id=64&Itemid=101

See for more details the scientific documentation on the HIRLAM model at:
http://hirlam.org/index.php?option=com_docman&task=doc_download&gid=270&Itemid=70

Teacher: **Alexander Mahura** (DMI, Denmark)
Teacher Assistant: **Adomas Mazeikis** (Lithuania), **Iratxe Gonzalez-Aparicio** (Spain)

Introduction Background:
Recently, the urbanization is considered as one of the important steps for improvement of the numerical weather forecasts in the metropolitan areas and surroundings. These steps have been also included into the Enviro-HIRLAM model (*Korsholm et al., 2008*) developments, because due to rapidly extending urban areas, the impact of cities on the formation of meteorological fields became more evident. Since the urban areas change diurnal cycles of temperature, wind characteristics, humidity, etc., and hence, these influence the quality of forecasts from the numerical weather prediction (NWP) models.
To improve forecasting, modifications of the land surface scheme of the model are required and for Enviro-HIRLAM these modifications include the following:

- Changes in anthropogenic heat flux, roughness, and albedo (AHF+R+A) characteristics in urban areas can be used for grid cells of modelling domain which are attributed to urban areas (*Baklanov et al., 2005; Mahura et al., 2008*);
- Effects of buildings and street canyons can be implemented through the building effect parameterization (BEP) module (*Martilli et al., 2002*);

- Re-classified land-use with respect to urban types of surfaces (such as buildings, artificial surfaces with/without vegetation, etc.) and urban districts with detailed morphological characteristics can be included through the soil model for sub-meso scales urban version (SM2-U) module (*Dupont et al., 2006ab*).

These mentioned approaches (to study possible urban effects on meteorological patterns) have been preliminary tested and evaluated for the model for both specific case studies (related to low, typical, and high winds conditions) and long-term simulations (*Mahura et al., 2005; 2008*).

Main Goal:

Study influence of the selected metropolitan area on a formation of meteorological fields above the urban area and surroundings due to modification of the land surface scheme of the numerical weather prediction (NWP) model by analysis of temporal and spatial variability of diurnal cycle for meteorological variables of key importance

Specific Objectives:

1. Modify the land surface scheme of the Enviro-HIRLAM model:
   - by changing the AHF+R+A **-** (a) anthropogenic heat flux, (b) roughness, and (c) albedo for urban grid cells;
   - by implementation the BEP (Building Effects Parameterization) module;
2. Perform simulations for selected specific cases/dates (meteorological conditions with dominating low and typical wind conditions over the metropolitan area and surroundings) in two modes - the control run and the modified run (with changes: AHF+R+A vs. BEP);
3. Evaluate diurnal cycle variability for – (a) air temperature, (b) wind velocity, (c) relative humidity, (d) sensible heat flux, (e) latent heat flux, and etc. – for two types of runs; estimate extension and direction of boundaries under influence of metropolitan areas, magnitude and signs of changes due to urban areas, etc.;
4. Summaries findings and results of the exercise in a form of an oral presentation (max 15 minutes).

Literature List:

Before the Summer School, the students should read, at least, the first 3 required papers; the three other papers are highly recommended to read to be useful for the discussions/talks; the additional readings might be useful too.

REQUIRED READINGS

Korsholm U.S., A. Baklanov, A. Gross, A. Mahura, B.H. Sass and E. Kaas, **2008**: Online coupled chemical weather forecasting based on HIRLAM – overview and prospective of Enviro-HIRLAM. *HIRLAM Newsletter, **54**: 1-17.*

Korsholm U.S. **2009**: Integrated modeling of aerosol indirect effects. http://www.dmi.dk/dmi/sr09-01.pdf

Baklanov A., Mahura A., Nielsen N.W., C. Petersen, **2005**: Approaches for urbanization of DMI–HIRLAM NWP model. *HIRLAM Newsletter* **49**: 61-75.

Mahura A., Petersen C., Baklanov A., B. Amstrup, U.S. Korsholm, K. Sattler, **2008**: Verification of long-term DMI–HIRLAM NWP model runs using urbanization and building effect parameterization modules. *HIRLAM Newsletter* **53**: 50-60.

RECOMMENDED READINGS

Martilli, A., Clappier, A., and Rotach, M. W., **2002**: An Urban Surface Exchange Parameterisation for Mesoscale Models, *Boundary-Layer Meteorol*. 104: 261-304.

Dupont S., P. Mestayer, **2006a**: Parameterization of the Urban Energy Budget with the Submesoscale Soil Model. *J. of Appl. Meteor. and Climat., 45: 1744-1765.*

Dupont S., P.G. Mestayer, E. Guilloteau, E. Berthier, H. Andrieu, **2006b**: Parameterization of the Urban Water Budget with the Submesoscale Soil Model. *J. of Appl. Meteor. and Climat., 45: 624-648.*

ADDITIONAL READINGS:

Baklanov A., P. Mestayer, A. Clappier, S. Zilitinkevich, S. Joffre, A. Mahura, N. W. Nielsen, **2008**: Towards improving the simulation of meteorological fields in urban areas through updated/advanced surface fluxes description. *Atmos. Chem. Phys., 8: 523-543.*

Mahura A., S. Leroyer, P. Mestayer, I. Calmet, S. Dupont, N. Long, A. Baklanov, C. Petersen, K. Sattler, N. W. Nielsen, **2005**: Large eddy simulation of urban features for Copenhagen metropolitan area. *Atmos. Chem. Phys. Discuss*., 5: 11183–11213.

3.3. SURFEX-TEB: Surface externalisee, Town Energy Balance model

Model used: **SURFEX-TEB**

Read, the general description of the SURFEX-TEB
http://www.cnrm.meteo.fr/surfex

Teacher: **Laura Rontu** (FMI, Finland)
Teacher Assistant: **Andres Luhumaa** (Estonia)

General info on exercise

During the exercise we will get to know the framework of surface parameterizations for NWP models and stand-alone use, SURFace EXternalisee (SURFEX; http://www.cnrm.meteo.fr/surfex) from Meteo France. We will focus on the Town Energy Balance (TEB) parameterizations. Our aim is to understand how different atmospheric forcing and different definition of the town properties, compared with the properties of natural landscape, influence in the forecast results, mainly in terms of the surface energy balance and radiation fluxes.

We will aim at cooperation and comparisons with the URBAN groups running Enviro-HIRLAM for selected towns. The details of intercomparisons and cooperation will be defined during preparation of the group work. More information to help participants to prepare for the course will be made available in May-June.

For the TEB group we will have at our disposal
- SURFEX stand-alone model v.6.1 installed in laptops and all related documentation
- observational data and surface definitions from the town Helsinki, Finland, with documentation
- (grads) tools to analyse the SURFEX results

Literature List:
Before the Summer School, the students should read, at least, the first 2 required publications; the two other papers are highly recommended to read to be useful for the discussions/talks; the additional readings are for interested/advanced students whom might be already interested in joining Enviro-HIRLAM research and development activities.

REQUIRED READINGS

http://www.cnrm.meteo.fr/surfex/training_course/01_2009_Surfex_general.pdf
http://www.cnrm.meteo.fr/surfex/training_course/12_TEB_v1.pdf
SURFEX is written in Fortran-90, thus, basic knowledge of Fortran is useful although we may not modify the model code so much as the namelist definitions. Guidance for the use of the Grid Analysis and Display System (GrADS), used for the display and analysis of the results can be found at the web site: http://grads.iges.org/grads.

RECOMMENDED READINGS

relevant parts of the Scientific documentation and User guide of SURFEX:
http://www.cnrm.meteo.fr/surfex/doc_exter/surfex_scidoc.pdf
http://www.cnrm.meteo.fr/surfex/doc_exter/surf.v5.pdf

ADDITIONAL READINGS:

articles from the list: http://www.cnrm.meteo.fr/surfex/doc_exter/Biblio_surfex.htm
material from the page of Helsinki university NumLab09 course on SURFEX:
http://www.atm.helsinki.fi/~jaraisan/numlab2009/NumLab09.html
For those interested in SURFEX chemistry:
http://www.cnrm.meteo.fr/gmapdoc/IMG/pdf_14_Surfex_chimie_stage.pdf
http://www.aemet.es/documentos/es/divulgacion/conferencias/prediccion/Ewglam/PHY_VMasson.pdf

3.4. COASTAL – The Coastal Effects (& Cities) Effects on Meteorology

Model used: **Enviro-HIRLAM**

Read, the general description of the HIRLAM (HIgh Resolution Limited Area Model) model at the HIRLAM official website at:
http://hirlam.org/index.php?option=com_content&view=article&id=64&Itemid=101
See for more details the scientific documentation on the HIRLAM model at:
http://hirlam.org/index.php?option=com_docman&task=doc_download&gid=270&Itemid=70

Teacher: **Serguei Ivanov** (OSEU, Ukraine)
Teacher Assistant: **Julia Palamarchuk** (Ukraine)

Introduction Background:
The modelling of the mesoscale atmospheric flow over various types of underlying surface in a coastal region is a rather complicated task. A difference in the respond to radiative forcing due to various heat capacities of water and land causes strong temperature and pressure gradients within the atmospheric boundary layer. These thermodynamical features generate local circulation in the middle latitude coastal zone usually known as a sea/land breeze. The breeze is a major mechanism regulating air quality in coastal cities, in particular during summer anticyclonic patterns. The proper simulation of breeze characteristics including variability of corresponding meteorological fields in space and time provides reliable tool for numerical weather forecasts as well as diagnosis of transport and evolution of atmospheric pollutants. The Enviro-HIRLAM model appears as a valuable instrument for investigating the breeze circulation and provides the comprehensive analysis for the meteorological fields such as pressure, temperature, humidity and wind.

Main Goal:
(i) to study principal mechanisms forming the breeze circulation;
(ii) to show spatial and temporal variability in meteorological fields associated with the breeze circulation;
(iii) to elucidate the impact of the breeze circulation during summer anticyclonic patterns on (re-)distribution of pollutants within the coastal zone.

Specific Objectives:
1. Practical exercises in technical manipulation with the model code.
2. Implementation of graphical tools/packages to the model output to display up breeze features in diurnal variations of air temperature, wind direction, humidity, heat fluxes, etc. as well as describe redistribution of emission concentration.
3. Consolidation of simulation results in a form of an oral presentation (max 15 min).

3.5. AQ-CHEM – Air Quality Sensitivity to Temperature Variability

Model used: **Enviro-HIRLAM**

Read, the general description of the HIRLAM (HIgh Resolution Limited Area Model) model at the HIRLAM official website at:
http://hirlam.org/index.php?option=com_content&view=article&id=64&Itemid=101
See for more details the scientific documentation on the HIRLAM model at:
http://hirlam.org/index.php?option=com_docman&task=doc_download&gid=270&Itemid=70
Teacher: **Sergey Smyshlayev** (RSHU, Russia)
Teacher Assistant: **Suleiman Mostamandy** (Russia)

Motivation:

Temperature variability may cause changes in the rate of chemical reactions and lead to variations in the gaseous composition of atmosphere both in urban and rural areas. In turn, changes in the chemical composition may lead to variations in the atmospheric heating and cooling, temperature and circulation, giving rise to the possibility of positive or(and) negative feedbacks between chemistry, radiation and dynamics. The importance of such feedbacks at the regional scale may be studied with integrated NWP/Air Quality models.

Goal:

To test the impact of observed and expected temperature variations on the chemical composition of the urban and rural regions.

Objectives:

To study the impact of temperature changes on rates of temperature-dependent chemical reactions governing chemical composition in the urban areas; (ii) To test the impact of temperature variations on the photolysis rates through temperature-dependent cross-section variability; (iii) To define gases which are more sensitive to temperature variability; (iv) To compare gas composition temperature dependence in urban and rural areas.

Methodology of the exercises:

Numerical experiments with chemical code prepared to be used in the integrated Enviro-Hirlam NWP/Air quality model. A baseline experiment will be run for background temperature specified for urban and rural areas taking into account differences in gas-phase chemistry for these regions. The sensitivity runs will be perform for forced temperature based on observation for extremely hot and extremely cold weather conditions. Additional experiments will be run to separate the role of temperature impact on the temperature-dependent chemical reaction rates and photolysis cross-sections.

4. Abstracts of Poster Presentations

P-01: Achim Drebs

Air Temperature Gradient Studies in Helsinki Metropolitan Area during 2002 – 2006

Achim Drebs, Andrea Vajda, Heikki Tuomenvirta

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Due to the climatic control of the sea, the Helsinki Metropolitan Area (HMA) has special features of temperature variation moving from the coastline towards the inland. Since August 2002, a network of up to 25 air temperature measurement points has been built up on a line from the coast line of the Baltic Sea to approximately 20 km to the inland. Based on this network it is possible to monitor the spatial variation of temperature under different mesoscale air mass circulation patterns in densely built-up urban and in less dense suburban area for all four seasons. By comparing the 2-minute air temperature measured at the network points with air temperature, relative humidity, and wind speed and direction measured on three observations sites of the Finnish Meteorological Institute, FMI, we can define the local impacts into temperature patterns. The results presented in this poster show the basics of urban climate and the genesis of the urban heat island Helsinki and can be used as an input to local forecasting models and other local area weather applications.

P-02: Anatolii Anisimov

The Impact of the Black Sea on Regional Climate

Anatolii Anisimov, Vladimir Efimov

Marine Hydrophysical Institute, 2, Kapitanskaya St., Sevastopol, 99011, Ukraine
e-mail: anisimov1@mail.ru

Regional climate modeling is an essential tool for studying regional climate processes, especially for the areas with coarse observational network. The territory of Ukraine and the Black sea area is the case. The lack of long observational records, as well as insufficient meteorological data above the sea surface before satellite data became available makes using regional models for reconstructing past climates even more convenient, as well as applying it to downscale future climate projections from global models.

Hadley Centre's HadRM3P model (PRECIS) was applied to the region comprising the whole territory of Ukraine, the Black Sea, Caucasus, Turkey and the Southern part of European Russia. The spatial resolution is 25 × 25 km, model has 17 atmospheric levels. Series of model simulations were produced, including a regional reanalysis for the period of 1958 – 2001 with input conditions from ERA-40. The other experiments are model simulations with input conditions from HadAM3P global model, intended to downscale future climate projections for the region. The model showed good performance in downscaling reanalysis data, without adding biases to them. The results were validated through comparison with CRU (Climatic Research Unit) datasets. Monthly temperature and precipitation fields were assessed, as well as precipitation extremes and interannual variability.

The analysis of regional wind circulation was performed for the model reanalysis run. Climatic wind fields were estimated, as well as their spatial structure and seasonal variability. Mesoscale areas of cyclonic and anticyclonic vorticity associated with edge effect and orography are discussed, as well as large-scale regional features of above-sea wind in different seasons. Numerical estimates of vorticity and stress of wind speed are given. As the structure of climatic wind field above the Black sea is dependent on many physical factors, their isolated and joint impacts have been assessed. One of the most important factors is monsoon mechanism, associated with seasonal changes in land-sea buoyancy contrasts. To isolate the effects, induced by this mechanism, numerical experiments on sensitivity of regional model to changes in land-sea temperature contrasts were produced. Two experiments were performed with perturbed SST of Black Sea, in one of them the sea was "warmed" by 2K, and "cooled" in the other. It is shown that the influence of monsoon effects is limited to the lower part of the atmosphere. The orography effects associated with airflow around Caucasus and Pontic mountains are shown to be the main contributors to the annual cyclonic circulation above the sea. Large annual averages of vorticity, comparable with seasonal variation, show that wind circulation is responsible for the generation of not only seasonal variation (as considered earlier) but also of annual cyclonic water circulation in the Black Sea.

P-03: Sergei Artamonov

Large Eddy Simulation of Neutrally Stratified Planetary Boundary Layer

Sergei Artamonov

Marine Hydrophysical Institute, 2, Kapitanskaya St., Sevastopol, 99011, Ukraine
e-mail: Sartr14@yandex.ua

A large eddy simulation (LES) technique is gradually becoming a popular tool to investigate turbulent environmental flows. The LES code is based on filtered Navier-Stokes equations, which describe motions of incompressible, Boussinesq fluid at high Reynolds numbers. The code computes directly large-scale, non-universal turbulence in the PBL whereas small-scale, universal turbulence is parameterized by a dynamic mixed subgrid closure.
In present work results of simulation of neutrally stratified planetary boundary layer are given. The dependencies of boundary layer structure on Rossby number are obtained: drag coefficient, cross isobaric angle, velocity profiles, momentum fluxes profiles, turbulent kinetic energy, variances of vertical and horizontal velocity components.

P-04: Taras Belyi

Numerical Simulation of Cloud and Precipitation Evolution and Its Connection with Anomaly Gravity Fields

Taras Belyi

Ukraine Institute of geophysics NAS of Ukraine, Palladin av. 32, Kiev, 03680, Ukraine
e-mail: tbelyi@mail.ru

Numerical simulation of atmospheric phenomena connected with atmospheric fronts and their cloud systems that caused the damages in frame aircrafts, agriculture, transport etc have been fulfilled for several synoptic situations. Present work continues theoretical studies of heavy precipitation caused floods and damages in mountain regions of Ukraine.
The three-dimension diagnostic and prognostic models with non-elastic dynamics at detail microphysics have been adapted for theoretical interpretation of the investigated phenomena. There is proposed research methodology based on numerical integration of dynamic and thermodynamic full equation jointly with kinetic equation for cloud particles distribution function.
A series of numerical experiments was performed to investigate the effect of anomalies of the gravitational field on the development of clouds. Including of the gravitational field anomalies is taken into account in the form of additional terms in the equations. The calculations showed, the addition terms of the tangential force gravity gn in the equations was the order of 10-2-10-3 cm/s2. It is comparable with the pressure gradient.

P-05: Svetlana Didkivska

Recent Developments of Decision Support System Rodos: Application for Fukushima Accident

Svetlana Didkivska[1], Ievgen Ievdin[1], Ivan Kovalets[1], Dmytro Trybushnyi[2], Aleksandr Khalchenkov[1], Mark Zheleznyak[1]

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[2] Karlsruhe Institute of Technology, Kaiserstraße 12, 76131 Karlsruhe, Germany
E-mail: sveta@ucewp.kiev.ua

11th of March 2011 recorded tsunami crushed Japanese eastern coast, leaving Fukushima nuclear power plant without its cooling system. The JRodos system is designed to provide decision support when nuclear emergencies happen on different locations of the world not necessarily within Europe. Two models integrated into JRodos system LSMC and EMERSIM are responsible for the calculation of nuclear release atmospheric dispersion with estimation of potential doses and early countermeasures effectiveness (evacuation, relocation, distribution of iodine tablets). These models require a set of geographical data and actual numerical weather prediction data, where the latter should be updated regularly.

The regularly updated numerical meteorological forecast data has been suggested by the two sources:

- Institute for Meteorology and Climate Research Atmospheric Environmental Research (IMK-IFU) – part of Karlsruhe Institue of Technology (KIT);
- Institute of Mathematical Machines and System Problems (IMMSP), Environmental Modelling Department.

Both organizations use mesoscale numerical weather prediction system WRF as a Meteorological software, reading boundary and initial conditions data of Global Forecast Model from a US public ftp. The data is provided by National Centers for Environmental Prediction (NCEP).

A standard WRF model output is produced in the form of binary NetCDF files. Before the accident only a special ASCII or GRIB1 data could be used as the source for numerical weather prediction data. Following the WRF demands a special parser has been created based on the open source NetCDF Java library. The new features are highly appreciated by the JRodos Users community (e.g. CIEMAT, Spain; RIVM, the Netherlands; Umwelbundesamt, Austria).

Karlsruhe Institute of Technology is using the improved JRodos customized for Japan for producing daily prognosis maps of a tracer source-term. The results are put on the web server together with analysis of the models from JRodos system, update on the current state of the reactor, sourceterm estimation (if available) etc.

As it usually appears during heavy nuclear accidents in early phase the uncertainty in source term dominates all other sources of uncertainties. Therefore it is very difficult to provide reliable forecasts of nuclear dispersion and fallout. In such a case the conservative estimates should be made on the basis of available information. Estimate (http://www.dw-world.de/dw/article/0,,14938445,00.html) are mostly related to the 16th of March and the following days when partial fuel meltdown occurred. Fortunately during those days the wind dispersed radioactivity mainly to the ocean. However due to high risk of the new accidents the same values of source term were used by JRodos as to provide forecast of atmospheric dispersion following hypothetical accident.

We shows the consequences of such hypothetical scenario of release of 3*1016 Bq of Cs-137 and 3*1017 of I-131 during 1-3 April 2011. The wind transported a radioactive cloud to the south in direction of Tokyo. However the predicted countermeasure involved mainly iodine tablets for children and those countermeasures didn't reach Tokyo. The region of iodine tablets for adults was much less (not shown) and spread up to 50 km from reactor to the south.

P-06: Oksana Dranicher

The Main Characteristics and Space Distribution of Urban Heat Island over Odessa

Oksana Dranicher, Igor Marinin

Odessa State Environmental University, 15, Lvivska st., Odessa, Ukraine
e-mail: kadicheva@yandex.ru

The evaluation of main features of urban heat island over Odessa is performed. The object of study is the data of surface temperature from 15 stations, while 9 stations locate within the city boundaries. The lenght rows is 45 months. The general peculiarities of seasonal and spatial temperature distributions are described in terms of monthly averaged surface temperature maps over the investigation period.

Thus, we show that the urban heat island over Odessa formed mainly through the change of the underlying surface characteristics in the city. The quantitative characteristics of urban heat islands conform with the published data.

P-07: Iratxe González

Urban Scale Modelling for a Megacity and a Medium Size City: Evaluating Sulphate Aerosol Indirect Effects

Iratxe González[1,2], Roman Nuterman[2,3], Ulrik Korsholm[2], Alexander Mahura[2], Julia Hidalgo[4] and Alexander Baklanov[2]

[1] Environmental Unit, TECNALIA research and innovation, Bilbao, Spain
[2] Danish Meteorological Institute, Lyngbyvej 100, 2100 Copenhagen, Denmark
[3] Tomsk State University, 36 Lenin Prospekt, Tomsk, 634050, Russia
[4] Le Centre National de Recherches Météorologiques, Météo-France, 42, avenue Gaspard Coriolis F-31057 Toulouse Cedex 1, France
e-mail: iratxe.gonzalez@tecnalia.com

Sulphate aerosols affect climate and air pollution in urban areas by altering clouds and precipitation properties and radiation.

To assess such aerosol effects, both the first and second aerosol indirect effects are analysed together with the influence of the urban area itself (heat island, etc). This impact was evaluated for two metropolitan areas: Paris (11 million inhabitants) located inland of France over a semi-flat terrain, and Bilbao (0.875 million inhabitants) located in a coastal area, north of the Iberian Peninsula and surrounded by complex terrain.
High resolution simulations were carried out employing the Enviro-HIRLAM (Environment – High Resolution Limited Area Model) which is an online coupled numerical weather prediction and atmospheric chemical transport modelling system. The Interaction Soil-Biosphere-Atmosphere (ISBA) land surface scheme was modified to include urban effects using the Building Effect Parameterization (BEP) module and Anthropogenic Heat Fluxes (AHF) extracted from the LUCY model (which considers energy fluxes from traffic, metabolism and energy consumption). In addition, the urban areas were divided into different types of districts with few specific thermo-dynamical characteristics (height of buildings, street width, wall building temperature, specific heat, etc). Four types of simulations were carried out for both metropolitan areas: 1) control run: i.e., without any modifications; 2) run considering the nfluence of the urban area only (BEP and AHF); 3) run only with aerosol effects implemented in STRACO (Soft TRAnsition COndensation) scheme; 4) and runs including the BEP, AHF and aerosol effects. Short and long-term runs corresponding to the summer 2009 period were performed under different meteorological conditions for both the Paris and Bilbao metropolitan areas. The modelled output was validated versus data collected during the MEGAPOLI (Paris) and K-EGOKITZEN (Bilbao) summer 2009 campaigns.
The influence of the urban areas on formation of 3D meteorological fields was analysed in details. For example, in Bilbao during 12th August 2009, on average, for temperature at 2 m the difference between urban and control runs was 1.3ºC (with a maximum of 2.1 ºC between 05:00 and 06:00 UTC). For wind at 10 m difference was 1.1 m/s (with a maximum 1.4 m/s at 5-6 UTC). The impact of the sulphate aerosols in urban areas on formation of key meteorological fields such as air temperature, wind, cloudiness, cloud liquid water content and precipitation and the assessment of each city influence on the aerosol atmospheric dispersion, transport and deposition will be presented.

P-08: Kokkatil Gopalkrishnan

Flexible Atmospheric Model (Flamo): a New 3D Atmospheric Model To Study Atmospheric Processes in the Planetary Boundary Layer

Kokkatil Gopalkrishnan, Michael Boy, Henri Vuollekoski, Sampo Smolander and Timo Vesala

University of Helsinki, P.O.Box 64, FI-00014, Finland
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Nucleation is one of several scientific phenomena which are presently under investigation. A lot of complex chemical processes occur in the Atmospheric Boundary Layer (ABL) and it is essential to have a thorough understanding of these processes. This actually defines the chemistry and the aerosol dynamics in the atmospheric boundary layer (ABL). To do so we have developed a spatial and temporal high resolution 3 dimensional model FLAMO (Flexible Atmospheric Model) which attempts to reconstruct the emissions, transport and chemistry and aerosol processes in the mixed layer. FLAMO integrates a meteorological module, an emission module, a chemical kinetics module and an aerosol dynamics module.
Emissions from the canopy are simulated using the Model of Emissions of Gases and Aerosols from Nature (MEGAN). The chemistry which accounts for most of the simulation time is taken from the Master Chemical Mechanism (MCM). FLAMO uses the University of Helsinki Multicomponent Aerosol model (UHMA) for implementing aerosol dynamics. The meteorological module will be a hydrostatic meteorological model used to simulate the meteorological conditions in the subscribed area. This atmospheric module will be infused with a canopy model so as to simulate the canopy conditions for neutral, stable and unstable atmospheric stratification.
FLAMO will utilize parallel computing using MPI (Message Passing Interface). It will be possible to run the code on multi-core clusters and thus reducing the time per simulation, which gives us the possibility for long-term investigations with reasonable computational costs. The main focus will be to study various nucleation theories (e.g. binary nucleation of sulphuric acid and water) in and above the ABL for the SMEAR II in Hyytiälä, Finland.

Further we will study the chemical processes and feedback mechanisms crucial for aerosol formation and nucleation processes.

P-09: Elena Katerusha

Estimation of Bioclimatic Resources of Odessa Region

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The evaluation of the complex influence of some meteorological parameters (air temperature, relative humidity and wind speed) on human heat feeling at a time in different seasons in Odessa region using bioclimatic indices showed the following:

1. Human body usually doesn't feel interdaily temperature variability in Odessa region (0-2 ˚C). Maximum repeatability of these values is observed, as a rule, in coastal areas. In January and October at 64% and 73% of the stations respectively interdaily variability exceeds 12 ˚ C which is irritable to a human. In April repeatability of such values is much lower (only 36% of stations), and in July it is generally minimal (18%).
2. In January, comfortable humidity conditions prevail throughout the region. However, often the relative humidity is above 80%. In April comfortable by hygrometric characteristics air preponderates in the coastal districts of Odessa region. In the rest of the area dry conditions prevail. In July comfortable conditions usually occur in Belgorod-Dniestrovsky, Odessa, lllichevsk and Vilkovo. In October comfortable humidity conditions dominate entire Odessa region (repeatability 61-74%).
3. The same heat feeling can be perceived at different combinations of air temperature, relative humidity and wind speed. In this work we used one of the most popular complex bioclimatic indices - NEET – normal equivalent-effective temperature. In January very cool conditions predominate throughout the region. In April heat feeling "very cool" prevails in Odessa, lllichevsk, Belgorod-Dniestrovsky. In other areas dominates "cool" heat feeling. The most comfortable conditions are in the southern territories and Serbka. In July heat feeling can vary from "very cool" to "severe thermal loadings". The most comfortable conditions are observed in July in Odessa. In October in most cases cool conditions occur. In the southern areas "moderately warm comfortable" heat feeling is observed usually.
4. Analysis of results of the calculations showed that the most comfortable and most favorable conditions for recreation in Odessa region among four central months observed are in July and October.

P-10: Eva-Stina Kerner

An Updated Method for Estimating of Surface-Layer Scaling Parameters from Routine Ground-Based Meteorological Data

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I present a method for rough estimation of Monin-Obukhov length from routine meteorological measurements made in ground-based stations. The method is based on bilateral relations of Pasquill stability classes with (i) wind and insolation on one hand and with (ii) estimatesurface roughness and Monin-Obukhov length on the other hand. The independent variables are wind velocity, cloud amount and solar elevation. Surface roughness is estimated from measurement at two heights. Both relations (i, ii) are made continuous through an interpolation procedure as well as the discrete net radiation index (NRI) is replaced with a continuous function of solar elevation, corrected with cloud cover. As the first step, NRI is expressed as a continuous function of solar elevation and corrected with cloud amount. Then the Pasquill class is expressed as a continuous "Pasquill function" P of NRI and wind speed u. Then L is expressed as a function of P and zo. The result enables us to build up stability scaling of surface-layer for utilizing in a local dispersion model. I validated the resulting atmospheric stratification estimations in a case study based on radio sounding profiles and also meteomast data collected during three years in Tallinn, Estonia. Practical need for that method appeared due to preprocessing of meteorological data series for a bi-Gaussian model AERMOD (Cimorelli et al., 2005), version 6, for environmental impact assessment purposes.

P-11: Andres Luhamaa

High Resolution Re-analysis for the Baltic Sea Region During 1965-2005 Period

Andres Luhamaa

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Regional reanalysis database BaltAn65+ comprising meteorological data for Baltic Sea region for the time period 1965-2005 is described. For observational data assimilation and hindcasts, the numerical weather prediction model HIRLAM 7.1.4 is applied, with 11 km horizontal and 60-layer vertical resolution. Reanalysis includes three-dimensional weather analysis data. Standard surface observations and meteorological soundings together with ship and buoy measurements from WMO observational network are used in analysis. Boundary fields are obtained from ECMWF ERA-40 global re-analysis. The BaltAn65+ can be considered as a regional refinement of ERA-40 for Baltic Sea region, providing the historical weather and climate data with enhanced spatial resolution.

P-12: Andrea Mues

Impact of the Extreme Meteorological Conditions during the Summer 2003 in Europe on Air Quality – an Observation and Model Study

Andrea Mues[1], Astrid Manders[2], Martijn Schaap[2], Peter Builtjes[1,2], Rainer Stern[1]

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A changing climate may have a significant impact on the dynamical and chemical processes in the atmosphere and therefore also on air quality. One method to investigate the effect of a changing climate on the concentration of pollutants is to analyze a synoptic situation in the past which is expected to occur more often in the future. The summer 2003 is often taken as an example for an extreme summer which is expected to occur more frequently in the future in Europe. It was characterized by heat waves with high temperature, stagnation and little precipitation over large parts of Europe. In order to investigate whether the meteorological conditions in the summer 2003 have a clear effect on the concentration of total PM10 and its components, the observations of the EMEP network in Europe of the summer 2003 were compared to the average of the summers of a five year period (2003-2007). The availability of measurements of pollutants gives also the opportunity to analyze whether state-of-the-art chemistry transport models are able to reproduce the observed concentrations during this episode. Therefore simulation runs were performed with the German model REM/Calgrid and the Dutch model LOTOS-EUROS in this study.

The synoptic situation in summer 2003 indeed had an effect on the observed concentration of total PM10. The models however did not reproduce the observed high total PM10 concentrations on most of the stations during the summer 2003 to the same extent. The correlation of PM10 concentrations to meteorological parameters, taken from the ECMWF and a diagnostic meteorology on different stations for the years 2003-2007, showed that observed total PM10 concentrations increase during conditions with high daily maximum temperature. However, the models are not able to reproduce this relationship, they underestimate the observed high total PM10 concentrations. For the secondary inorganic components this relation depends on the component and station and is well reproduced by the models. But the secondary inorganic components only contribute to a small extent to the high concentration of total PM10 during the summer 2003 on most stations.

Weak transport and low wet deposition, but also higher emissions of primary components and of precursors for secondary organic components as a result of meteorological conditions as observed in summer 2003, lead to an accumulation of pollutants and to high total PM10 concentrations. Both models underestimate the primary components and secondary organic components because of missing species and emission sources and because changes of emissions due to meteorological conditions are not taken into account in the models.

The implementation of further primary components, secondary organic components and important emission sources as well as a

good description of the dynamical transport are an important issue for the simulation during such extreme conditions and are also important in view of reliable simulation results of a coupled climate – air quality model system.

P-13: Adomas Mažeikis

Modelling of Urban Territories Influence on Meteorological Parameters that Affect Air Pollution Dispersion Using ENVIRO-HIRLAM: Vilnius Case Study

Adomas Mažeikis

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The study concentrates on the spatial and temporal effect of urban territories surface parameters on bound-ary layer meteorological fields that are important for evaluating air pollution dispersion. The Enviro-HIRLAM numerical weather prediction with the urbanization of used surface parameters is used for the study. The modifications are made to anthropogenic heat flux, surface roughness and albedo. Three different cases are taken and two different domains are used. The effect is evaluated by comparing control and modified model runs. 9 simulation runs were done including the control runs. Differences between control and modified runs wind speed and temperature can be clearly seen and in some cases they reach up to 1.4°C and 2.7m/s.

P-14: Dragoş Niculescu

Risks and vulnerabilities of the Romanian Black Sea coast

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Morphological measurement surveys were made at the Romanian Black Sea coast that shows the grave state of the coast due to erosion. A considerable amount of the Romanian coast especially in the south part, is currently eroding despite the development of a wide range of measures to protect shorelines from eroding and flooding. A problem that is affecting the natural ecosystems and even the socio-economical systems. The costal dynamics in the south region of the Romanian coast are made by natural factors: meteorological by wind and hydrological by waves, current and sea level that is rising quicker do to the global warming, and some anthropic reasons like the diminishing sand quantities that is being transported by the Danube river to the Black Sea, the hydro-technical constructions that are changing the marine currents and so the coastline.

P-15: AlinaSemergei-Chumachenko

Low level jets over Ukraine

Alina Semergei-Chumachenko

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Interest in recent years is the study of cases strong winds in the lower 2 km layer. Low level jet (LLJ) is a direct danger, because there are suddenly formed a relatively narrow stream of air at a speed of more than 15 m/s, limited upper and lower streams with lower speeds.
Strong wind jet in the lower atmosphere frequently observed everywhere and relatively rare - 2 to 15% of radio-sounding in year. Over Ukraine, LLJ typically maintained for 1-2 sounding terms, and only in rare cases - 24 hours or more. Existence low jet determined by the type and duration synoptic situation. The record of duration this phenomenon - more than 4 days (102 hours) observed over Simferopol in 1979 in a stationary anticyclone, which was kept during this period.
Seasonal distribution of activity formation LLJ over Ukraine has not changed during last 30 years – most of all they formed at cold season, especially in January. The summer observed minimal quantity of jets.
The width of low jets over Ukraine ranges from 200 to 300 m at summer and 500-600 m at winter. Intensity LLJ varies from 16-17 m/s at summer to 18-19 m/s at winter. Most low-level jets are located on 400-500 m, depending on the terrain. In the past decade low jet located 100 m higher than the average for the cold and warm seasons.
During the study period prevailed over Odessa LLJ formed under the influence of cyclonic circulation, especially in April - 71% of the total number of jets.

P-16: Antonina Sirenko

The Use of Discrimination Function in the Ice Regime Forecasts for the Rivers of Ukraine

Antonina Sirenko

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The existing ice regime forecasts provide using of subjective rules, and limit quantity predictors. In modern conditions of science development have the mathematical modeling and statistical methods of information which allow to get deeply into physical bases of the hydrometeorological phenomena, and also to define the majority of the factors influencing for these phenomena.

The modern method of the multidimensional statistical analysis offered by us in the form of discrimination function opens new possibilities in search of a dividing rule for mode forecasts ice. The use of discrimination function allows more thoroughly describing the process of ice formation on the river and getting the scientifically grounded classified rule at the prognosis of the explored phenomenon.

Objects of our researches are the rivers Dnestrs and Tiligul during observations since 1960 till today. Taking into account importance of hydrological prognoses of the ice mode for the country, a question about the detailer study of changes of dynamics of atmosphere was become the actual. To that end it was used NAO. The annual atmospheric circulation indexes (North-Atlantic oscillation, NAO) closely coupled annual temperature of air after 1981 year of Ukraine. The correlation coefficient rose from 0.2 (1965-1980) until 0.65(1981-2006). The air temperature increase affects changes in temperature and ice regime of river. Water temperature considerably increased in winter months. The transferred changes influence on the duration of the ice phenomena on the rivers Dniester and Tiligul.

The indexes of the North Atlantic Oscillation are characterized by changes pressures at the sea level, which the most considerable variations of global temperatures and global climate are related to, and also, that is important for territory of Ukraine regional climatic anomalies.

P-17: Anastasia Revokatova

Possibilities of Short-Term Forecast of Air Pollutants' Concentrations over theCenter of the European Part of Russia on the Basis of Chemical-Transport Model

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To predict the air pollutants' concentration over the centre of the European part of Russia we consider the possibility of using a state-of-the-art chemical-transport model which includes a meso-scale nonhydrostatic meteorological model as well as a model system describing chemical processes in the atmosphere. We have run model over the European part of Russia and compare our results with observations. The results of the numerical experiments show that the model is able to simulate adequately the spatial-temporal features of concentration fields.

P-18: Hüseyin Toros

Assessment of HIRLAM and HARMONIE Numerical Weather Prediction Model: a Case Study on Air Pollution Episode in Istanbul

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The main aim of this study is to evaluate the performance of operational versions of the numerical weather prediction model HIRLAM and HARMONIE in severe air pollution atmospheric conditions in Istanbul in 18-20 November of 2009. The assessment has been performed for selected relevant meteorological parameters, such as temperature, inversion height, pressure, wind speed and relative humidity. During the episode time, there was a high pressure system over northwest of Turkey including Istanbul, leading to the formation of an exceptionally strong ground-based temperature inversion. The observed values are compared with forecasts produced by HIRLAM and HARMONIE.

P-19: Sebastian Traud

Emission of Trace Gases and Their Atmospheric Transport above Southern and Eastern Asia

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MOPITT satellite measurement data of carbon monoxide (CO) for the years 2005 and 2006 on the pressure levels of 850 hPa and 250 hPa has been analysed and evaluated by several methods. The results show distinct high CO concentrations above Eastern and Southeastern Asia on both levels. Furthermore, a clear seasonal cycle of pollution patterns is indicated in the visualization of the data. Despite of the found seasonal variations, Eastern Asia contributes continously throughout the years – even in comparisions on the global scale – to a huge extent to the CO pollution in the lower and upper troposphere. From the analysed data set it can be concluded that the main contributing sources to the CO maxima in Eastern Asia are industrialized urban areas, especially along the coast of Eastern China and high rates of biomass burning (i.e. on the Indochinese Peninsula). The result that Eastern and Southern Asia have become the main contributers to global CO pollution goes with the fact of the vast economical upswing and rapidly changing industrial and society structure, which is still going on in this region.
The presentation also deals with the CARIBIC concentration data of trace gases in the upper troposphere from 2006 collected along the flight route of civil aircrafts from Frankfurt via Guangzhou to Manila and back. In order to identify proper sources and to estimate current atmospheric residential times of trace gases, calculated hydrocarbon enhancement ratios are taken into account in the evaluation of that data set. Surprisingly, additionally to the regular high pollution near the urbanized areas in Eastern Asia, even above the rural regions in Western China and Central Asia high rates of several trace gases are often observed. But that pollution can be characterized by totally different signatures of trace gas ratios. It is shown that usually pollution above Western and Eastern China stems from different sources and source regions.
As a concrete example a case study (based on CARIBIC data of the flights on 19./20. October 2006) illustrates how vertical transport to the upper troposphere occurs. It is shown that the upper troposphere over Western China is influenced by polluted air masses which have been subjected to long range transport, in that case transport of pollution originating from biomass burning in Northern India and subsequent deep convection to the upper troposphere.

P-20: Yuliya Vystavna

Monitoring and Flux Determination of Trace Metals in Rivers of the Seversky Donets basin (Ukraine) Using DGT Passive Samplers

Vystavna Yuliya

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The research reports the results of the in situ application of diffusive gradients in thin-films (DGT) passive samplers for trace metals (Cd, Co, Cr, Cu, Ni, Pb and Zn) monitoring in transboundary rivers of the Seversky Donets watershed in the Kharkiv region (Ukraine), which has a long history of industrial development. The study discusses potential sources of DGT-measured labile metals in water and seasonal variations. Our results demonstrate the application of DGT for identifying and measuring labile metal concentrations in contrasted climate conditions (cold snowy winter and hot summer) and appropriateness of such a tool for continuous water monitoring with the presence of an ice cover. Results show that DGT-measured concentrations of most of trace metals were much higher downstream of the wastewater treatment plants discharges than upstream; thus wastewater treatment plants seem not able to reduce or to remove trace metals contaminations and become major sources of pollutants in the studied rivers. The calculation of the average metal fluxes based on the DGT-measured concentrations confirmed that the urban wastewater discharges significantly contribute to the metal fluxes into the Udy and the Lopan rivers during both low-flow and high-flow periods.

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COMMENTS:

***1st column**: Summer school status : S – student, TA – teacher assistant, T – teacher, L – lector; LOC – Local Organizing Committee*

6. MUSCATEN: Nordic Network "Towards Multi-Scale Modelling of the Atmospheric Environment"

MUSCATEN is a Nordic Project funded by

norden

NordForsk / MUSCATEN

(Nordic Research Board)
and to be implemented during 2010 – 2012.
This project is a successor of Nordic Network on Fine-scale Atmospheric Modelling (NetFAM; 2005-2009; http://netfam.fmi.fi)

Scientific and operational developments in both numerical weather prediction (NWP) and atmospheric chemistry transport (ACT) modelling for air pollution assessments have so far been mainly performed by separate communities, with different sources of funding and different practical goals. The current integration of atmospheric sciences driven by common concerns on climate change, potential increased impact of hydro-meteorological hazards and the recognition by policy-makers of the important role of atmospheric sciences for environmental planning and management has generated the need for a closer collaboration, integration and synergies between these communities. The MUSCATEN (http://muscaten.ut.ee) aims principally at creating a scientific and training platform towards these needs and objectives, taking on board, the expertise reached by Nordic countries on these various topics to deepen, broaden, and promote it.

MUSCATEN National Teams: 11 national teams, each representing different institutes of its country

Denmark	Danish Meteorological Institute	http://www.dmi.dk/
	Department for Geophysics, University of Copenhagen	http://www.gfy.ku.dk/ gfy_welcome_eng.html
Estonia	Estonian Meteorological and Hydrological Institute	http://www.emhi.ee/
	Laboratory of Atmospheric Physics at the University of Tartu	http://meteo.physic.ut.ee/kkfi
Finland	Finnish Meteorological Institute	http://www.fmi.fi/en/
	Division of Atmospheric Sciences, University of Helsinki	http://www.geophysics.helsinki.fi
France	National Research Center, Meteo France	http://www.cnrm.meteo.fr/
	Department of Aerology, University of Toulouse	http://www.aero.obs-mip.fr/
Latvia	Institute of Mathematical Sciences and Information Technologies, University of Liepaja	http://www.liepu.lv/
	Transport and Telecommunication Institute	http://www.tsi.lv/
Lithuania	Department of Hydrology & Climatology, University of Vilnius	http://www.vu.lt/en/
	Siauliai University	http://www.su.lt/
	Lithuanian Hydrometeorological Service	http://www.meteo.lt/
Norway	Norwegian Meteorological Institute	http://met.no/
	Nansen Environmental and Remote Sensing Center	http://www.nersc.no/
	Department for Geosciences at the University of Oslo	http://www.mn.uio.no/geo/
Russia	Russian State Hydrometeorological University	http://www.rshu.ru/eng/
	Main Geophysical Observatory / Air Pollution Modelling and Forecasting Laboratory	http://voeikovmgo.ru/
	North-Western Roshydromet	http://www.meteo.nw.ru/
Sweden	Swedish Meteorological and Hydrological Institute	http://www.smhi.se/
	Department of Meteorology at the University of Stockholm	http://www.misu.su.se/
	epartment of Earth Sciences at the University of Uppsala	http://www.geo.uu.se/luva/
Ukraine	Odessa State Environmental University	http://www.odeku.edu.ua/
Iceland	Company Horfur, Laboratory for Climate and Sea-Ice studies	http://theyr.tv/

Наукове видання

Програма та тези літньої школи молодих вчених

„СУМІСНЕ МОДЕЛЮВАННЯ МЕТЕОРОЛОГІЧНИХ ТА ХІМІЧНИХ ПРОЦЕСІВ"

м. Одеса, Україна,
3–9 липня 2011 р.

Англійською мовою

Підп. до друку	Формат	Папір
Умовн. друк. арк.	Тираж	Зам. №

Надруковано з готового оригінал-макета

Одеський державний екологічний університет
65016, Одеса, вул.Львівська, 15

Young Scientists Summer School on topics of Integrated Modelling of Meteorological and Chemical Transport Processes/Impact of Chemical Weather on Numerical Weather Prediction and Climate Modelling", held at Odessa State Environmental University (Odessa, Ukraine) on 3-9 July, 2011

The aim of this event is to join young scientists and researches from the numerical weather prediction and air quality communities, University/Academia system in order to elaborate, outline, discuss and make recommendations on the best strategy and practice for further research, developments and applications of the integrated modelling of both meteorological and chemical transport processes into the numerical weather prediction modelling systems, and in particular, the Enviro-HIRLAM/ HARMONIE modelling system. The main emphasis is on multi-scale models applied for chemical weather forecasting and feedback mechanisms between meteorological and atmospheric pollution processes.