



Saint Petersburg State University
St. Petersburg Russia



Max Planck Institute for Meteorology
Hamburg, Germany



Nansen International Environmental and Remote Sensing Centre
St. Petersburg Russia



Nansen International Environmental and Remote Sensing Centre
Bergen Norway

SUMMARY REPORT: International Summer School on High Northern Latitude Climate



Sponsored by;



Bergen, Norway



Nansen
Scientific
Society

Bergen, Norway

9 – 13 September 2007
Saint Petersburg State University
Peterhof - Saint-Petersburg, Russia

Incentive

The international summer school was dedicated to the cutting-edge scientific area of climate change with a specific emphasis on a variety of its manifestations in and impacts on the natural environments at high northern latitudes. The major thrust of the summer school course was to present the modern concepts of climate change and associated underpinning mechanisms as well as to highlight the remaining lacunas in knowledge and problems to be solved.

The school provided an opportunity for M. Sc. and Ph. students as well as young scientists (under 35 years) aspiring to enhance both their basic knowledge and awareness of the current developments in this area through attending plenary sessions and participating in dedicated workshops serving as a forum, at which the participants gave oral and poster presentations, and participated in scientific discussions initiated by the invited plenary session lecturers. The latter are both world-wide acknowledged scholars and most successful scientists of the succeeding generation capable of presenting a well-balanced vision of the current state of the art in the area in general but also in its some specific sections. More than 30 people from 7 countries attended the school.

Organizers and benefactors

Among the organizers of the summer school were the Nansen Environmental and Remote Sensing Center in Bergen, Norway and Nansen International Environmental and Remote Sensing Center in St. Petersburg, Russia as well as the Max Planck Institute for Meteorology in Hamburg, Germany who are the 2005 EU Descartes laureates, panel "Earth Sciences". As organizers, these institutions are joined by two universities: the St. Petersburg State University and the University of Bergen. The initiative is also supported by the Russian Ministry of Education and Science.

The Summer School Project realization became possible due to the financial support provided by the Bergen University and the Nansen Scientific Society (Bergen, Norway).

Program Committee:

Prof. Hartmut Grassl, Max Planck Institute for Meteorology, *Hamburg, Germany*
(Chairman)

Prof. Ola M. Johannessen, NERSC/Geophysical Institute, University of Bergen, *Bergen, Norway*

Mr. Lasse H. Pettersson, NERSC, *Bergen, Norway*

Dr. Leonid P. Bobylev, NIERSC, *St. Petersburg, Russia*

Prof. Dmitry V. Pozdnyakov, NIERSC, *St. Petersburg, Russia*

Organizing committee:

Prof. Dmitry V. Pozdnyakov, NIERSC, *St. Petersburg, Russia* **(Chairman)**

Dr. Vladimir A. Volkov, NIERSC, *St. Petersburg, Russia*

Dr. Vladimir N. Kudryavtsev, NIERSC, *St. Petersburg, Russia*

Mr. Lasse H. Pettersson, NERSC, *Bergen, Norway*

Prof. Vladimir N. Troyan, SPbSU, *St. Petersburg, Russia*

Dr. Elizaveta V. Zabolotskikh, NIERSC, *St. Petersburg, Russia*

Mr. Lev V. Zaitsev, NIERSC, *St. Petersburg, Russia*

Ms. Olga I. Babina, NIERSC, *St. Petersburg, Russia*

Ms. Natalia Yu. Piotrovskaya, NIERSC, *St. Petersburg, Russia*

Ms. Tatiana O. Vulfs, NIERSC, *St. Petersburg, Russia*

Ms. Alexandra O. Yarygina, NIERSC, *St. Petersburg, Russia*

Scope

The 2007 summer school lectures and discussions covered a broad spectrum of the Arctic and sub-Arctic climate change issues including such as causal mechanisms of rapid climate shifts in the recent glacial epochs, probability of the ice-free Arctic tracks in summer in the forthcoming decades, the fresh-water budget change and its influence on the global thermohaline circulation, the evolving relationship between the north Atlantic deep water formation and the green-house effect of the atmosphere, permafrost dynamics, the fate of the Greenland ice sheet and the adequacy of current cryospheric models, the expected overall climate change impacts including environmental and socio-economic/human dimensions, the feasibility of monitoring the occurring changes in the atmosphere, ocean and on land by satellites.

At practical seminars, the participants were given the opportunity to learn about pathways to the climate modeling access as well as advanced programmes for climatic data statistical processing.

The list of lecturers encompasses:

- Prof. Ola M. Johannessen (Director, Nansen Environmental and Remote Sensing Centre / Geophysical Institute, University of Bergen, Bergen, Norway),
- Prof. Hartmut Grassl (Ex-Director, World Climate Research Programme of WMO; Director Emeritus, Max Planck Institute for Meteorology, Hamburg, Germany),
- Dr. Vladimir Kattsov (Director, Main Geophysical Observatory, St. Petersburg, Russia),
- Mr. Dag Johan Steinskog (Ph.D. student, Nansen Environmental and Remote Sensing Centre, University of Bergen, Bergen, Norway),
- Prof. Genrikh Alexeyev (Head of Department, Arctic and Antarctic Research Institute, St. Petersburg, Russia),
- Prof. Valentine Meleshko (Ex-Director, Main Geophysical Observatory, St. Petersburg, Russia),
- Prof. Helge Drange (Director, G.C. Rieber Climate Institute; Nansen Environmental and Remote Sensing Centre/Geophysical Institute, University of Bergen, Bergen, Norway),
- Prof. Sergey Zilitinkevich (Marie Curie Chair, Helsinki University, Helsinki, Finland),

- Prof. Vladimir Troyan (Head of Department, St. Petersburg University),
- Prof. Dmitry Pozdnyakov (Research Director, Nansen International Environmental and Remote Sensing Centre, St. Petersburg, Russia),
- Dr. Svetlana Kuzmina (Senior Scientist, Nansen International Environmental and Remote Sensing Centre, St. Petersburg, Russia).

List of students:

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Working language

The working language of the Summer school was English.

Venue

The school was held in Russia on the campus of the St. Petersburg State University located in the resort area, Peterhoff, the royal country residence, a town that is world-wide famous for its fabulous museums/palaces, parks and the picturesque rivieras of the Gulf of Finland.

Summer School materials dissemination

The relevant materials (plenary lectures, oral and poster presentations) were made available for the summer school participants. CD ROMs with the summer school materials can also be ordered by any interested scientists.

Summer School Programme and Content

Day 1 – Sunday, September 9th

The summer school started on 9 September 2007 with a suite of social activities: a sightseeing tour to the famous Peterhoff Palace and Park and an Icebreaker Party. Thus, from the very beginning, the attendees of the school have had the opportunity to get acquainted with each other and start exchanging their vision of the climate change problems and personal experience in associated studies.

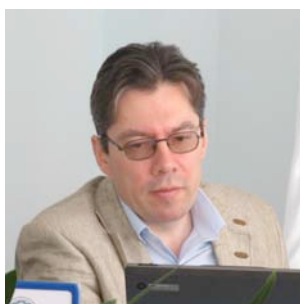
Day 2 – Monday, September 10th



The school was officially opened on the 10th of September by the Chairman of the Local Organizing Committee Prof. Dmitry Pozdnyakov, NIERSC Scientific Director. He welcomed the participants of the Summer School and passed the word to Prof. Hartmut Grassl, Max-Planck Institute for Meteorology (Hamburg, Germany), who explained the incentives of convening the Summer School and outlined the major foci of its Programme.



The first lecture entitled “**Causes of Natural Climate Shifts**” was delivered by Prof. Hartmut Grassl. It was focused on variety of positive and negative feedbacks in the climate system variability driven by natural mechanisms.



Next two lectures were given by Prof. Vladimir Kattsov, the Voeikov Main Geophysical Observatory (St. Petersburg, Russia). In the first of them, named “**Intergovernmental Panel on Climate Change: the forth Assessment Report**”, the lecturer presented the essentials of the 4th IPCC report. Prepared by Prof. Valentin Meleshko, the Voeikov Main Geophysical Observatory (who couldn’t present it himself) and delivered by Prof. Vladfimir Kattsov, the second lecture on “**Climate change expected for the territory of Russia in the current century**” gave an overview of both the current and anticipated climate changes across the territory of the Russian Federation.



The last event for the first day was a *Workshop I* “**Exploratory tools for the analysis of extreme weather and climate events in gridded datasets**” conducted by Mr. Dag Johan Steinskog, NERSC (Norway). This workshop introduced new tools based on the Extreme Value Theory for the analysis of extreme weather and climate events in gridded data. The tools allow exploratory analysis of spatial patterns of extremes in order to elucidate the relationships between the revealed extremes and potentially controlling factors. The presented tools are shown to be also instrumental in analysis of temporal clustering of extremes, and also in studying of teleconnection patterns of extremes.

Day 3 – Tuesday, September 11th



The second day of the summer school, 11 September, started with the lecture on “**Change of Freshwater Content in the Arctic Ocean and its Impact on Thermohaline Circulation**” delivered by Prof. Genrikh Alekseev, Arctic and Antarctic Research Institute (St. Petersburg, Russia). The lecture covered the following topics: global and Arctic water cycle, accumulation of freshwater (FW) in the Arctic, mean FW influxes into the Arctic Ocean Basin and FW outflow into the Northern Atlantic, freshwater content (FWC) in the Arctic waters and its changes, forcing mechanisms of FWC changes, and the impact of FW outflow from the Arctic on the North Atlantic.



The next lecture “**Climate forcing and Marine Ecosystems: a Contemporary Study**” was given by Prof. Dmitry Pozdnyakov, NIERSC (Russia). The lecturer gave a detailed definition of an aquatic ecosystem and its components, generalized aquatic food chain, and manifestations of climate warming impact on aquatic ecosystems. Results of a contemporary study of the White Sea ecosystem reaction to climate change were presented and discussed.



The third lecture on “**The North Atlantic Sub-Polar Gyre as a Regulator for the Decadal-Scale Climate and Ecosystem Variability in the Region**” was delivered by Dr. Helge Drange, G.C. Rieber Climate Institute/NERSC (Norway). The lecture covered such topics as the central processes governing the Atlantic Meridional Overturning Circulation (MOC), observed changes in the North Atlantic, response of the North Atlantic Subpolar Gyre to a persistent positive NAO forcing and some other relevant issues.



The lecture on “**Polar atmospheric boundary layer: specific features and the role in weather and climate**” was given by Prof. Sergey Zilitinkevich, Helsinki University/NERSC (Finland, Norway). It was focused on the processes governing the formation and stratification of the atmospheric boundary layer and its interactions with the water surface and water column.

Workshop II included oral presentations of the summer school attendees. During the first part of the workshop nine young scientist delivered their presentations on the attained scientific results:

1. Mikhail Itkin, the Russian State Hydrometeorological University (Russia), “**Atmospheric temperature and humidity vertical profiles retrieval from remotely sensed data**”;
2. Natalia Ivanova, NERSC/Russian State Hydrometeorological University (Norway/Russia), “**Satellite Synthetic Aperture Radar Detection of Oil Spills on Water Surface**”;
3. Kirill Bulgakov, the Voeikov Main Geophysical Observatory (Russia), “**On sensitivity of climate model to radiative forcing**”;
4. Gabrielle Gascon, McGill University (Canada), “**Major Precipitation Events in the Eastern Canadian Arctic: A Focus on Iqaluit**”;
5. Jackie Dee Grom, McGill University (Canada), “**Retrogressive Thaw Slump Process and Geomorphology, Eureka Sound Lowlands, Ellesmere Island, Canada**”;
6. Julie Veillette, Laval University, Centre d’Études Nordiques (Canada), “**Aquatic Indicators of Environmental Changes in the Canadian High Arctic**”;
7. Matthew B. Alkire, the Oregon State University (USA), “**The partial return and retreat of Pacific water in the upper layers of the central Arctic Ocean**”;
8. Kanukhina Anna, the Russian State Hydrometeorological University (Russia), “**Climatic variability of dynamics in the winter stratosphere**”;
9. Steinar Orre, NERSC (Norway), “**Dispersion properties of simulated radioactive tracers in the Nordic Seas**”;

Day 4 – Wednesday, September 12th



The first lecture on 12 September “**Simultaneous Ozone and Climate Variability**” was given by Sergey Smyshlyaev, the Russian State Hydrometeorological University (St. Petersburg, Russia). The lecture covered the following topics: global ozone and temperature long term variability, tropospheric warming and stratospheric cooling, the role of natural and anthropogenic factors in variations of the stratospheric ozone layer thickness.



The lecture on “**Methods of geophysical data processing**” was delivered by Prof. Vladimir Troyan, SpbU (Russia). Such methods as Fourier Transform, Wiener and Calman Filtering, Coherence Functions, Multifactor and Wavelet Analysis were presented along with the recommendations of their employment for analysis of specific geophysical processes.



The next lecture on “**Future Perspectives for the Arctic Region**” was presented by Prof. Ola Johannessen, NERSC/Mohn-Sverdrup Center (Bergen, Norway). He outlined several problems related to climate change such as a remarkable decrease of the arctic sea ice extent, increase of sea surface temperature and variations of the index of Atlantic Multidecadal Oscillation. Observation evidence of a high correlation between CO₂ concentration and sea ice extent was given. The presentation triggered a very interesting discussion among Prof. Ola Johannessen, Prof. Hartmut Grassl, Dr. Helge Drange and other school participants.



The next presenter, Dr. Svetlana Kuzmina, NIERSC (St. Petersburg, Russia), delivered a lecture on “**High northern latitude surface air temperature gridded datasets**” and conducted workshop III “**Practical aspects of the application of the modeling results in climate studies**”. The lecturer performed a comparison of the existing high-latitude temperature datasets and estimated the differences between them and the potential implications for assessing climate variability and change. Also a new spatially- and temporally-improved gridded surface air temperature dataset for high northern latitudes was presented.

Workshop III included such topics as “General Guidelines for The Use of Scenario Data for Climate Impact and Adaptation Assessment”, “Climate Model Outputs”, “General Circulation Model Outputs”, “Data Availability”, “Data Visualisation Tools”.

Day 5 – Thursday, September 13th

On 13 September, the last day of the school, the second part of Workshop II was organized. Four young scientists gave their presentations:

1. M. Christopher Fuller, University of Calgary (Canada), “**Parameterization of Snow Cover Characteristics in a Discontinuous Snow Covered Region using Active Polarimetric Remote Sensing**”;
2. Anton A. Korosov, NIERSC/NERSC (Russia, Norway), “**An advanced algorithm for operational retrieval of water quality from satellite data in the visible and its applications**”;
3. Claire Kaufman, Queen’s University (Canada), “**Reconstructing late Holocene climate dynamics in southwest Alaska**”;
4. Morten W. Hansen, NERSC (Norway), “**An Automatic Procedure for Ice Drift Estimation in the Fram Strait Region**”.

Assessment and Closure of the Summer School

During the General Discussion that followed Workshop II the participants pointed out several positive and negative aspects of the Summer School organization. The following issues were considered as the most important:

- + The summer school provided a very good general overview of the contemporary state of the global and Arctic Basin climate system, its variability, and the driving mechanisms
- + International discussions and communication are essential and were well organized at the school.
- + A lot of important references to book publications/ scientific journals and data sources were given in the presentations.
- + The school program was very good – almost all lectures are very interesting for all participants, despite lacking any US lecturers
- Improvement of some logistic issues is desirable (e.g. arranging of informal discussions with the lecturers during supper or afterwards, provision with better information about registration at the hostel and at the SPbU Department of foreign affairs, accommodation and food).
- Peterhof is a bit too remotely located to Saint Petersburg, using the NIERSC premises in Saint Petersburg would have been a better option.
- Accommodation of students and lecturers at the same place to foster informal evening discussions and joint activities.
- Arranging the programme in a way that presentations by attendees be clustered around the lectures on the relevant topics. Some presentations were partly on the side of the general topic of the summer school
- The programme should envisage some special time for perusing the exposed posters and discussion at the stands (time was allocated to the students oral presentations).
- A more interactive communication and discussions with the lecturers is recommendable during the intervals.

The participants also suggested to make the school periodic and to carry it out biennially.

All school attendees expressed their satisfaction and gratitude to the school organizers.

A certificate of participation will be issued to all participants.

The school was officially closed by the Chairman of the Local Organizing Committee Prof. Dmitry Pozdnyakov.

After the closing ceremony, the students of the Summer School went for a sightseeing excursion about St. Petersburg and a boat trip along the rivers and canals of the city.