IV INTERNATIONAL ANTARCTIC CONFERENCE
«III INTERNATIONAL POLAR YEAR 2007-2008:
RESULTS AND OUTLOOKS»

May 12–14, 2009

Resolution

The IV International Antarctic Conference **(**IV IAC-2009) organized by the National Antarctic Scientific Center, Ministry of Education and Science of Ukraine, National Academy of Sciences of Ukraine, and III IPY Ukrainian Coordination Committee was held in Kyiv, May 12-14, 2009,

116 submissions were collected. At the Conference 69 oral and 28 posters were presented by 178 authors. 126 scientists from Ukraine and Russia participated in the Conference. All participants recognized a wide spectrum of research fields presented at the Conference, a high level of papers, as well as activity of the Conference participants in discussion of results presented in papers.

While discussing papers the Conference participants summarized the main results of the III International Polar Year, namely:

1. Geology-geophysical studies

New data about Antarctic internal structure have been obtained for the period of III International Polar Year and Antarctic Electronic Atlas was created using the gravimetric tomography method. Complex geology-geophysical data have been used to investigate the West Antarctic lithosphere structure, and geo-electrical model was created for the Antarctic Peninsula. The model for evolution of Meso-Kainosoic Antarctic geodynamic situation has been worked out on the basis of paleomagnetic reconstructions. Mineral-resources potential has been studied for the Antarctic Peninsula continental outlying districts.

The fundamental interdisciplinary theme “Construction of evolutional models for the West Antarctic, definition of its basic structural elements and connection with regional mineral-resource potential” should be raised at the near-term outlook. The efforts must be directed to creation of barely expensed investigations of Antarctic natural resources, using new elaborations of Ukrainian Institutes relating to altimetry data: electro-resonance and polariton sounding.

The absence of home scientific research vessel (SRV) complicates the Antarctic studying. So, the section supports NASC efforts in organization of ecology-geophysical testing area for studying of dynamics of both the environmental situation and processes in regional Antarctic crust and proposes to make a request to the government about SRV construction.

To consider the broadening of West Antarctic researches directed to the study of both the regional Antarctic deep structure and mineral-raw materials base.

2. Physical studies

Quasi-periodical variations of surface atmospheric pressure over the Antarctic Peninsula and geomagnetic field at Ukrainian Antarctic Station were analyzed, mechanisms of magnetic hydraulic dynamo and inversions of the Earth's magnetic field were proposed, and particularities of the Earth's energy active areas were found. New methods and facilities of detecting of space emitting of ultrahigh energy in the Antarctica are implemented, physicotechnical and engineering concepts of principally new autonomous ultra deep equipment (geosounds) were developed.

Seismoacoustic, geopolariton, geomagnetic fields and radon emanations are monitored. Complex monitoring of geophysical fields and parameters of Antarctic atmosphere was introduced at the station for conduction of experimental and theoretical physical investigations by means of realization in Antarctica of economically competitive physical technologies and experimental tools. It will enable to solve fundamental problems of modern physics: to study the nature of underground georeactor energy processes in the Earth's core, mantle, and crust in order to forecast catastrophic earthquakes and specify models of the Earth's polar geospheres; as well as implement energy balance model of the Earth's global climate in accordance with information on comprehensive monitoring of parameters of the Antarctic atmosphere and ultrahigh energy space rays.

3. Meteorological studies

Atmospheric circulation over the Southern Hemisphere and regional circulation at West Antarctic sector forming climate at the Antarctic Peninsula and in the region Ukrainian Vernadsky base are studied.

Spatial distribution of ozone in Antarctica is shown; peculiarities of snow cover in Antarctica are studied. Regions of katabatic winds formation are identified and their frequency is studied. Influence of weather conditions to the accuracy of photometric observations in Antarctica is studied. Long-range forecast method for the Antarctic Peninsula is proposed. Model of Earth's global climate is considered.

4. Oceanography studies

Seasonal and interannual variability of sea ice distribution in Antarctica is studied; interannual variability of the Southern ocean surface temperature has been analyzed, as well as variability of its main fronts. The model of ocean circulation and processes of the deep water formation in the Weddell Sea is presented.

5. Biological Investigations

Modern generalizing methods of GIS-analysis are used for studying of structure and functions of microbial communities. Results of investigation of taxonomic diversity, ecophysiological role, adaptation mechanisms and strategy of survival of

microorganisms in extreme Antarctic conditions are organized to subject topographic maps and stereometric 3D-models of natural region and biogeographical polygon. These models present system databases, which characterize structural-functional relations of communities of typical Antarctic biotopes.

Biodiversity and adaptive strategies on Argentine Islands are studied. On the basis of these data description of species diversity of invertebrates, mosses, algae, plant viruses and bacteriophages is created and basic regulations of concept for preservation and rational biodiversity use at the presented territory are worked out. Identification of plant viruses is carried out by EIA and PCR methods. Also molecular genetic identification of algae cultures and bryophytes is carried out.

Detailed investigation of features of biologically active substances, producers of which are Antarctic pigmented microorganisms, allows developing substrata for new pharmacological preparations with cytoprotective, antitumor, antiradiation and antistress actions. These preparations will be competitive at the pharmacological market and will be promising for introduction to medicine as medical and preventive preparation for peptic ulcer, stomach cancer, duodenum cancer and other illnesses of alimentary organs.

Introduction of preparations on the basis of biologically active substances into agriculture is very important. These preparations can increase resistance of agriculture animals and preserve pigs' population during ablactation.

On the base of investigation of self-sustained populations of marine mammals and birds of Argentine Islands and Petermann Island and their resource role for other organisms polyfunctional assessment of ecosystem of Argentine Islands Archipelago is carried out. In perspective it can help to preserve biological and landscape values.

Monitoring data of biota observation in the region of Argentine Islands are the evidence of rapid and very rapid transformation of Antarctic ecosystems. These transformations are connected with climatic changes and biological invasions. Climatic changes break normal functioning of Antarctic ecosystems and create new areas for colonization (and thereby create conditions for increase of Antarctic ecosystems production). Biological invasions can be conditioned by climatic changes, anthropogenic factors and unknown factors, which affect marine ecosystems transformation and in particular affect fish resources.

The foreground direction on a level with the highest world standards is the development of new effective, profitable and environmentally safe biotechnologies for waste disposal.

6. Medical and physiological studies

It is shown that a long influence of Antarctic factors on a person is negative for adaptation processes dynamics causing psychophysical, neurohumoral, neuroimmunal, metabolic, tissue, and cellular dysfunctions, growth of stress syndrome symptoms and exhaustion of adaptation mechanism reserves. Besides, it is found that during long Antarctic expedition, adaptation and dysadaptation changes of human functional systems have an alternation of typical stages: initial adaptation, functional stress,

relative stabilization, and depression. For the first time it is shown that adaptation and dysadaptation changes of human functional systems in the Antarctica depend on polymorphism HIF-1α (replacement of cytosine (C) by thymine (T) in the 1772nd position of gene) opening prospects to study genetic mechanisms of individual stability and adaptation of human organism to extreme conditions. A key mechanism of winterers' adaptation is primarily a deregulation of homeostasis of integration systems with further development of changes of respiratory, hemodynamic, hemic mechanisms of regulation of organism oxygen control and symptoms of oxidation stress.

It is positive for the biomedical section that young scientists, doctors-winterers, students and teachers take an active part in studies and discussions of results, contributing to introduction of new capabilities of statistic analysis of scientific material, its mathematics processing, data interpretation, estimation of functional state of winterers and forecasts.

The section results state a due progress of recent scientific achievements, prove relevance of studies, and outline advanced research.

The principal prospective challenge of medico physiological studies is science-based development of modern technologies of health and working ability of participants of Antarctic expeditions according to study of fundamental and applied aspects of human adaptation and dysadaptation while staying for a long time at the Antarctic.

At the final plenary session of the Conference the following decisions were adopted:

1. To approve the work of the Ministry of Education and Science of Ukraine, the National Academy of Sciences of Ukraine, National Antarctic Scientific Center, the III IPY Ukrainian Coordination Committee, and the National Aviation University regarding organization of the IV International Antarctic Conference "III International Polar Year 2007-2008: Results and Outlooks".

2. Based on papers results presented at the Conference, to recognize the huge potential of the studies and to endorse reasonability of further development and deepening of research in relevant scientific fields, defined by the State Program of Ukraine for research in Antarctica for 2002-2010.

3. In order to create a united technological complex for studying the Earth's interior both in Antarctica and Ukraine it is recommended:

- to introduce the fundamental interdisciplinary theme "Development of evolutional models in the West Antarctica lithosphere, designation of its main structural elements and their relationship to mineral resources potential of the region";
- to direct efforts for creation informative low-cost complex of geological and geophysical studies to explore Antarctic natural resources using new developments in Ukrainian institutions in the part of altimetric satellite data and technology of electro-resonance and polaritonic sounding.

4. To create a complex working group of the atmospheric physics, ocean physics and geo-space physics.

5. To consider it to be necessary to develop and rise the level of bio-resources research in Antarctica.

6. To address to the Government of Ukraine with the request to build a modern scientific vessel to perform the State Goal-Oriented Scientific Research Program in Antarctica for 2011-2020.

7. To compete the work on naming geographical objects in Ukraine research area in Antarctica.

8. To intensify efforts on establishing National Antarctic Data Center in Ukraine.

9. To improve the involvement of graduate students to Ukrainian research in Antarctica. To mention specially following reports: student Babiy S., Physics and Mathematics Department, Dragomanov National Pedagogical University, "Structure's peculiarities of energy-active zones of the Earth"; postgraduate Shilin S. "Microbiological Analysis of Ground Antarctic Biotopes", and postgraduate Tashyreva A. "Identification of Heterotrophic Antarctic Bacteria Polyresistant to Toxic Metals".

10. To solve the issue regarding establishment goal-oriented postgraduate study to complete theses in the field of NASC research activities.

11. It is suggested to the Conference participants to submit their papers online for further editing until June 30, 2009.

12. To publish plenary reports in *Ukrainian Antarctic Journal*. To ask the Heads of the Conference Sections to designate papers from each section for publishing in *Ukrainian Antarctic Journal*. In accordance with publishing requirements the Conference participants should submit the recommended papers until August 1, 2009.

13. To consider it to be reasonable to disseminate information about the Conference through the mass media and in future to involve broad sections of Ukrainian and foreign scientists.

14. To approve the work of both the Scientific Committee and Organizing Committee to the IV International Antarctic Conference.

15. The Conference organizers express their gratitude to all participants for their activity.

Chairman
Conference Scientific Committee **P.F. Gozhyk**

Secretary
Conference Scientific Committee **G.I. Patlashenko**