УКРАЇНСЬКИЙ АНТАРКТИЧНИЙ
ЖУРНАЛ
УАЖ № 8, 32-38 (2009)

УДК:001.83(99)

SCIENTIFIC RESEARCH IN THE ANTARCTIC TREATY SYSTEM

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Abstract. The report highlights the most important initiatives put forward by SCAR in the Concept "Antarctic Science in the XXI century". Taking into consideration that the Antarctic Science becomes increasingly complex and expanding in the geographical dimension, in the XXI century the international cooperation and partnership will be required in areas, such as:

Joint infrastructure and logistics;

Expanding of the geographical presence;

Joint research, technology, standardization of methods and measurement, international data bases and research results archives.

The examples are given in what way the Antarctic Scientific Programs, in particular, of United States, Great Britain, Argentina, Ecuador ensure the national interests of these states in Antarctica and in the Antarctic Treaty System.

The correlation is pointed between national (Ukrainian) Antarctic Programs with the research main orientations of the SCAR Concept for examples both of the State Program of Ukrainian Researches in Antarctic in 2002-2010 and the Concept draft of the new State Scientific-Technical Program of the Ukrainian Researches in Antarctica in 2011-2020.

Key words: International Polar Year, Scientific Plans, Scientific Strategy, Scientific Committee on Antarctic Research (SCAR)

In November, 2008, the Scientific Committee on Antarctic Research (SCAR) has published the Concept draft named "Antarctic Science in the XXI century" to initiate a community-wide dialogue on the role of international cooperation in the optimization of national efforts in Antarctic Science. Undoubtedly SCAR has the necessary experience and potential to do so as the leader and the coordinator of the international Antarctic scientific activities. At the same time there are a few of reasons as an impetus for this step, such as:

the global financial crisis of 2008 which brought in the focus of attention the economic requirements in the matters of the international coordination by the carrying out of scientific programs;

the improved coordination and partnerships which could decrease the impact on the Antarctic environment and favor the preservation of Antarctica.

The advance of new technologies, focus shifts in the scientific activity and a progress in the knowledge are likely to change logistical needs and the mix of support required to conduct science in Antarctica. A clearer view and understanding of trends in Antarctic science will allow national programs and operators to plan for the future and allocate limited resources in anticipation of these developments. The growing demands of Antarctic science bring operational challenges for all nations but the opportunities for mutually beneficial partnerships and coordination are still great.

What are the long-term directions of Antarctic science?

The answer on this question is a difficult business because the every country decides a

contribution to development of science in the different ways. However, one can analyze trends and extrapolate them and it is possible to be more or less determined in this matter.

The questions being asked by scientists and the society are becoming more complex and are requiring of the interdisciplinary efforts unification. It reflects a common Earth system science approach and the recognition that far from being isolated Antarctica and its surrounding ocean are integral parts of the Earth System. And what is more, researches in Antarctica reflect the co-dependence and linkages amongst physical and living Systems.

The third International Polar Year (IPY) 2007-2008 has identified the major scientific issues which are contained and developed in an extensive portfolio of projects. The IPY portfolio provides an unique "window" on the future of Antarctic science. The obtained results in many scientific directions defined the course for Antarctic science on comings years.

International Program Committee by the IPY preparing and carrying out systematized the offered projects at the place of their implementation: Antarctica, the Arctic, and bipolar. The amount of projects which were executed in the Antarctic region or in both polar regions is 76 (among them 34 Antarctic projects and 42 bipolar projects).

The ratio of the projects amounts which were executed by the different components of Earth System is:

Atmosphere – 15%;
Ice – 16%;
Land – 21%;
Oceans – 30%;
Space – 11%;
People – 7%.

Systematization of projects by the SCAR classification:

Geo Sciences – 18%;
Life Sciences – 30%;
Physical Sciences – 52%. (In the SCAR classification the climate and the glaciology are Physical Sciences accounting for the large percentage of projects in this topical area).

Specific scientific problems which were developed in the indicated projects include:

Climate change and global warming (weather, UV radiation, and ozone depletion);
Ecosystem structure and functioning (pelagic, benthic, terrestrial, marine, and microbial);
Census of living resources and biodiversity (mammals, birds, penguins, vegetation, and fish);
Astronomy and near-Earth Space Science;
Recovery of paleo-climate records (sediments and ice cores);
Ice and sea level (sea ice, ice sheets, and ice shelves);
Satellite observations;
Southern Ocean and coastal oceanography;
Sub-glacial environments and hydrology;
Biogeochemistry, and
Geophysical remote sensing and mapping of the continent above and below the ice.

Accordingly in the IPY projects the requirements were formulated for the logistic support and for the infrastructure elements for the carrying out of scientific researches:

Ships – icebreakers, ice strengthened research vessels, marine research vessels (including deployment and recovery of buoys), inflatable boats, and ship-based drilling capabilities;

Field stations – utilization of existing stations and new stations;

Air transportation – fixed wing aircraft for transport and geophysical surveys and helicopters;

Land transport – snow terrain vehicles and inland traverse support;

Drilling capability – ice and sediment drilling;

Observatories – multi-instrumented platforms, automated weather stations, air monitoring networks, self-contained land vehicles, submarines, satellites, and rockets;

Others – fuel depots, GPS facilities, and radars.

The importance of any researches themes or topics undoubtedly will depend on national priorities and capabilities. The following are examples of important scientific initiatives on the horizon which will be realized in the near future:

Assessing the stability of the West Antarctic Ice Sheet;

Obtaining the longest possible ice core record of climate history (>1 myr);

Determining detailed regional and temporal variability in Antarctic climate;

Entry and sampling of sub-glacial environments;

Establishing atmospheric and oceanic observing networks for forecasting the behavior of the coupled ocean-ice-atmosphere system;

Discovering the nature and history of the sub-ice basement geology in East Antarctica;

Investigating the relationships of upper atmosphere physics, the Earth's climate system over Antarctica and the Polar Vortex;

Refining the pre-Pleistocene history of Antarctic climate from drill and piston cores;

Determining ice sheet mass balance, stability, and its relationship to global sea level now, in the past and in the future;

Recovering unique geological samples and paleo-records in the interior of Antarctica;

Understanding evolution and biodiversity in the Antarctic;

Investigating how life maintains and thrives in the cold and dark;

Inventorying and mapping biological habitats, ecosystems and organism distributions in Antarctica and the Southern Ocean.

In this connection we will dwell on the principal items of the policy in Antarctic such, in particular, states as Argentina, Great Britain, USA, and Ecuador to be founded on the materials of the proper Web-sites and of the Antarctic Treaty Consultative Meetings.

Thus **the basic tasks of scientific strategy of researches of Argentina** in Antarctic Region are [1]:

To conduct and/or to coordinate scientific researches, observations and long-term monitoring, as well as cartography works in the Argentine Antarctic Sector (the sector comprised between meridians 25° and 74° West and from parallel 60° South until the South Geographic Pole) (here and further it is marked out by authors);

To promote the sustainable national development through Antarctic scientific researches and technological developments;

To promote the Community knowledge about the Argentine Antarctic Sector and

about the development of new Antarctic technologies, to create in the Community an awareness of belonging of the Argentine Antarctic Sector through the promotion of the Antarctic science and technology;

To represent the interest of the Argentine Republic in Antarctica through the Science and the Technology, by consolidating and increasing the titles that support Argentine claim of sovereignty.

The strategic priorities in scientific activity of Argentina in Antarctic Region are:

To address the efforts in pursuit of reaching the political aims that Argentina has on Antarctica, in particular, the recognition of sovereignty on the Argentine Antarctic Sector;

To head and/or to coordinate national and international research projects to be carried out on the Argentine Antarctic Sector;

To focus the work around the priorities and needs of Argentina in the field of science and technology in general and in the National Antarctic Politics in particular;

To recompose a highly qualified staff of specialists in Antarctic matters being able to represent the country in international discussion forums on Antarctic matters and to counsel the different powers of the National Government on matters concerning their speciality and safeguarding the national interest on Antarctica;

To achieve the excellence in Antarctic scientific matters;

To maintain the Argentine scientific presence in Antarctica.

By this the priority directions scientific activity of Argentina in the Antarctic Region are:

Study of the Global Change phenomena, its causes and consequences on Antarctic systems and its impact on national productive systems;

Knowledge and conservation of the Antarctic Natural Resources and associated Areas;

Development of the alternative energies sources;

Geographic knowledge of the Argentine Antarctic Sector.

The basic task of Great Britain on the period of 2002–2012 in Antarctica is "the carrying out of a world-class programme of scientific research, survey and long-term observations, and the sustaining for the UK an active and influential regional presence and a leadership role in Antarctic affairs" [2].

The Great Britain strategic scientific priorities in Antarctica are:

Focus the work on relevant key global or basic science issues;

Lead national and international science partnerships;

Achieve worldwide public recognition for excellence;

Maintain a British presence in the Antarctic;

Minimisation a British effects on the environment;

Build a top-quality, professional workforce;

Achieve excellence in delivering science using best practice.

By this the priority directions scientific activity of Great Britain in Antarctic are concentrated in eight research programmes:

1. ACES – Antarctic Climate and the Earth System.
2. BIOFLAME – Biodiversity, Function, Limits and Adaptation from Molecules to Ecosystems.

3. CACHE – Climate and Chemistry: Forcings, Feedbacks and Phasings in the Earth System.
4. COMPLEXITY – Natural Complexity Programme.
5. DISCOVERY 2010 – Integrating Southern Ocean Ecosystems into the Earth System.
6. GEACEP – Greenhouse to Ice-House Evolution of the Antarctic Cryosphere and Palaeoenvironment.
7. GRADES – Glacial Retreat in Antarctica and Deglaciation of the Earth System.
8. SEC – Sun Earth Connections.

Long-term monitoring and survey activities link to all programmes:

LTMS – Long-Term Monitoring and Survey.

The United States nation's policy for Antarctica has developed steadily and consistently over the years. It is based on four principles [3]:

The U.S. recognizes no foreign territorial claims;

The U.S. reserves the right to participate in any future uses of the region;

Antarctica shall be used for peaceful purposes only;

There shall be free access for scientific investigation and other peaceful pursuits.

In 1995 and 1996, the National Science and Technology Council (NSTC) at the direction of the U.S. Congress has reviewed the policy guidelines for the United States Antarctic Program (USAP). Emphasizing that the United States should maintain an active and influential presence in the Antarctica, NSTC concluded that "USAP is cost effective in advancing American scientific and geopolitical objectives, and, from a science perspective at the current level of investment".

In 1970 and again in 1976 National Security Decision Memoranda 71 and 318 reaffirmed the "importance of maintaining an active and influential United States presence in the Antarctic" that is "responsive to United States scientific, economic, and political objectives."

1. Antarctic Aeronomy and Astrophysics Program.
2. Antarctic Earth Sciences Program.
3. Antarctic Glaciology Program.
4. Antarctic Integrated System Science.
5. Antarctic Ocean and Atmospheric Sciences.
6. Antarctic Organisms and Ecosystems.

Ecuador's National Foreign Policy Plan 2006–2020 (PLANEX 2020) includes, as one of its strategic guidelines, the coordination of the Ecuador's presence in Antarctica, through active participation in bodies of the Antarctic Treaty and the execution of the scientific research programs in Antarctica [4].

The Ecuador's concept of the National Policy in Antarctica is expounded in an official organ (to the newspaper) in 2004 and realized Department of National Defense, which forms and supports the geopolitical point of view of country and supports the permanent participating of Ecuador in scientific researches in Antarctic Region.

The Ecuador's concept of a National Policy for Antarctica runs as follows:

"The national policy for Antarctic matters is based on affirming and maintaining the presence of Ecuador in Antarctica, in the promotion of, participation and cooperation in scientific research, in

preserving and protecting the Antarctic environment, and in evaluating and using its resources in accordance with the guidelines, considerations, and commitments established for the area of the Antarctic Treaty System".

Ecuador's position on Antarctica includes, in particular, the following guidelines:

a) As long as the Antarctic Treaty is in force, Ecuador abides by what is established in Article IV Section 2, concerning claims to territorial sovereignty in Antarctica, however Ecuador reserves the right to protect its direct and substantive interests in Antarctica;

b) The claims of territorial sovereignty formulated before the Antarctic Treaty's entrance into force cannot interfere with compliance to its provisions, nor can they constitute obstacles to future activities of economic character that are realized under the protection of the Treaty and other related international instruments that are accepted by the Parties;

c) Ecuador is a developing country. This situation must be taken into account in order to facilitate its activities in the context of the Antarctic Treaty, and its participation in those activities concerning Antarctic economic resources.

In accordance with the formulated National Ecuador's Policy in Antarctica the Ecuador's priority directions of scientific activities in Antarctica are concentrated in these research programs:

Study of the Antarctic ecosystem;

Estimates of the Antarctica resources;

Investigation of the processes in the ocean and atmosphere which combines the Antarctica with other Earth regions;

Study the processes which have an influence on the climate;

Study of the Antarctica living resources and of their recovery issues.

The scientific activity of Ukraine in Antarctica has been carrying out strictly within the frameworks of the State Program of Research in Antarctica for the period 2002-2010 adopted by the Cabinet of Ministers of Ukraine Decree of 13 September, 2001, № 422-p.

Under the same Decree the Ministry for Education and Science is entrusted as the Program Customer and the National Antarctic Scientific Center ? as the Program control body. This Program is in its meaning and content in accordance with the SCAR concept draft. For example, the Projects by geological, geophysical, oceanographic research are realized in the Program at the Geo Sciences direction.

The Projects by the biological, bio-resources, medical research are realized in the Program at the Life Sciences direction. The Projects by the physical nature of energy processes in the Earth nucleus, by the seismoacoustics monitoring for the development and improvement of the earthquakes prediction methods, by the development of the astrophysical models of the global climate, by the physics of the upper atmosphere and near-space research, by the hydrometeorological research are realized in the Program at the Physical Sciences direction.

In connection with the carrying out in 2007-2008 of the III International Polar Year (IPY) the National Coordinating Committee was formed by the Order of the Cabinet of Ministers of Ukraine of June 7, 2006, № 323-p for the preparation and holding in Ukraine of the III IPY.

In accordance with the same Order the Coordinating Committee has developed and approved by the Chairman of the Coordinating Committee – Minister of Education and Science of Ukraine the action Plan for preparation and holding in Ukraine of the III IPY.

In accordance with the approved Plan of activities the Coordinating Committee has formed and approved 16 Research Projects that were submitted in the International Program Committee for the III IPY preparation and execution and were included in the Full Projects (Clusters) of the III IPY. Among approved by the Coordinating Committee of 16 Projects are:

5 Projects in the field of Geo Sciences;
6 Projects in the field of Life Sciences;
4 Projects in the field of Physical Sciences;
1 Project in the field of the Antarctic Data Management.

During 2007-2008 15 Projects were financed by the National Antarctic Scientific Center. It should also be noted that our International Antarctic Conference is carrying out in accordance with the approved Plan for preparing and holding in Ukraine of the III IPY.

The analysis of the III IPY Program; of the SCAR conception draft "Antarctic Science in the XXI century"; of the Argentina, UK, USA, and Ecuador national policies in Antarctica points that the research program of Ukraine in Antarctic fully correlates with the above mentioned national and international research Programs in Antarctica.

This principle is laid down in the Conception draft of the new aimed State Scientific and Technical Research Program of Ukraine in Antarctica for 2011-2020 which is now being developed by the special Commission formed by the Order of the Ministry of Education and Science of Ukraine of July 31, 2008 № 104-p.

In accordance with the Order of the Cabinet of Ministers of Ukraine of 13 September, 2002 № 1371 "About the participation procedure of the Central Government Bodies in the activities of the International Organizations to which Ukraine is the Party", the Ministry for Education and Science of Ukraine has an obligation to effectively use the potential possibilities, in particular, of the Antarctic Treaty System to strengthen the national security of Ukraine, to ensure its political, socio-economic and environmental interests, to speed up the economic reforms. Accordingly, the National Antarctic Scientific Center has been providing in the new Program Conception draft the issues of the promotion and strengthening of national political, economical and scientific interests of Ukraine in Antarctica and in the Antarctic Treaty Organizations.

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