



Ukrainian Scientific Club
in partnership with
National Academy of Science of Ukraine
Ministry of Education and Science of Ukraine
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British Council Ukraine

International Antarctic Conference **IAC2008**

Ukraine in Antarctica - National Priorities and Global Integration

May 23-25, 2008 - Kyiv, Ukraine

-
International Polar Year 2007/8

PROGRAM

ПРОГРАМА

Український науковий клуб
у співробітництві з
Національною академією наук України
Міністерством освіти і науки України
Міністерством сім'ї молоді та спорту України
Британською радою в Україні

Міжнародна антарктична конференція IAC2008

Україна в Антарктиці – національні пріоритети і глобальна інтеграція

23-25 травня 2008 р. - м. Київ, Україна

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Міжнародний полярний рік 2007/8

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Organizing Committee:

Ukrainian Scientific Club

IAC-2008

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IAC2008
"Ukraine in Antarctica - National Priorities and Global Integration"
International Antarctic Conference – International Polar Year 2007/8
May 23-25, 2008
Kyiv, Ukraine
Program

FRIDAY, MAY 23, 2008

8:00-18:00 **Early birds arrival, registration and placement, excursions**

18:00-20:00 **Dinner and social**

SATURDAY, MAY 24, 2008

07.30-08.30 **Breakfast**

08:00-08:45 **Participants arrival, registration and placement**

09:00-09:30 **Opening ceremony. Chair: *Dr. Nataliya Shulga***

09:30-10:50 **Plenary session. Chair: *Dr. Andrei Utevsky***

09:30-09:55 *P. Convey* (British Antarctic Survey, Natural Environment Research Council, Cambridge, UK)
Recent advances and new directions in antarctic biological research

09:55-10:20 *P. von der Gathen, M. Rex, Match team* (Alfred Wegener Institute for Polar and Marine Research, Potsdam, Germany)
Current understanding and determination of bipolar stratospheric ozone loss rates

10:20-10:50 *V. Rybachuk* (G.M. Dobrov Center for Scientific and Technological Potential and Science History, National Academy of Sciences of Ukraine, Kyiv, Ukraine)
Contribution and priorities of the national Antarctic science in the World informational space: WEB-bibliometric analysis

10:50-11:10 **Coffee-break**

11:10-13:00 **Plenary session (cont.)**

11:10-11:40 *A. Rodger* (British Antarctic Survey, Natural Environment Research Council, Cambridge, UK)

Recent results and future direction of British Antarctic Survey upper atmosphere research

11:40-12:05 *K. Gohl* (Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany)

Do tectonic structures of the Amundsen Sea embayment (West

- Antarctica) constrain ice-sheet dynamics?**
 12:05-12:30 U. Mikolajewicz (Max-Planck-Institut für Meteorologie, Hamburg, German), M. Vizcaino (Max-Planck-Institut für Meteorologie, Hamburg, Germany, now at Department of Geography, University of California, Berkeley, USA), J. Jungclaus (Max-Planck-Institut für Meteorologie, Hamburg, German), G Schurgers (Max-Planck-Institut für Meteorologie, Hamburg, German, now at Institute for Physical Geography and Ecosystem Analysis, Lund University, Sweden)
Simulating the Effect of Ice Sheet Melting on anthropogenic Climate Change
- 12:30-13:00 G. Milinevsky (National Taras Shevchenko University of Kyiv, Kyiv, Ukraine)
Ukraine Antarctic research 1996-2008: results and challenges
- 13:00-14:00 Lunch**
- 14:00-15:30 Work in Sections I**

BIOLOGY AND ECOLOGY I

- 14:00-15:30 Co-Chairs: Dr. Andrei Utevsy and Dr. Piero Luporini**
 14:00-14:15 H.-U. Peter (Polar & Bird Ecology Group, Jena University, Germany), S. Hahn (Polar & Bird Ecology Group, Jena University, Germany, Swiss Ornithological Institute, Sempach, Switzerland), M. Kopp (Polar & Bird Ecology Group, Jena University, Germany), B-U. Meyburg (WWGBP, Berlin, Germany), R. Phillips (British Antarctic Survey, Cambridge, Great Britain), M. Ritz (Polar & Bird Ecology Group, Jena University, Germany)
Migration and foraging of Antarctic skuas – the use of modern logger and transmitter technologies
- 14:15-14:30 M. Gavrilov (Arctic and Antarctic Research Institute, Saint-Petersburg, Russia)
Health of polar seabird populations: Arctic versus Antarctic. state of knowledge & further research
- 14:30-14:45 R. Bargagli (University of Siena, Italy)
Environmental contamination in antarctic ecosystems
- 14:45-15:00 M. Chesalin (Institute of Biology of the Southern Seas National Academy of Sciences of Ukraine, Sevastopol, Ukraine)
The global warming and changes in bird populations near Ukrainian Antarctic Station Akademik Vernadsky
- 15:00-15.15 E. Kravets (Institute of Cellular Biology and Genetic Engineering, National Academy of Sciences of Ukraine, Kyiv, Ukraine)
The peculiarity of adaptation features to environmental condition in reproductive system of *Colobanthus quitensis* and *Deschampsia antarctica*
- 15:15-15:30 I. Pamikoza (National Taras Shevchenko University of Kyiv, Kyiv,

Ukraine), *I. Dykyy* (Ivan Franko National University of Lviv, Lviv, Ukraine), *I. Kozeretska*, *O. Tyschenko*, *D. Inozemtseva* (National Taras Shevchenko University of Kyiv, Kyiv, Ukraine)
Current state of Antarctic herb tundra formation of Argentine Islands and adjacent archipelagos

ATMOSPHERE AND NEAR-SPACE PHYSICS I

- 14:00-15:30** Chair: **Dr. Gennadi Milinevsky**
14:00-14:20 *O. Troshichev*, *L. Egorova*, *V. Vovk*, *A. Janzhura* (Arctic and Antarctic Research Institute, St.Petersburg, Russia)
The solar wind influence on atmosphere processes in winter Antarctica
- 14:20-14:40** *A. Zalizovski* (Institute of Radio Astronomy, National Academy of Sciences, Kharkiv, Ukraine)
Weather sensitivity of sporadic structures in the ionosphere over the Antarctic Peninsula
- 14:40-15:00** *O. Evtushevsky*, *A. Grytsai* (National Taras Shevchenko University of Kyiv, Kyiv, Ukraine)
The features of tropopause position over Polar Regions
- 15:00-15:15** *V. Lozitsky* (National Taras Shevchenko University, Kyiv, Ukraine)
Quasi-stationary planetary waves in ozone distribution in Polar Regions
- 15:15-15:30** *S. Sikorsky* (National Taras Shevchenko University of Kyiv, Kyiv, Ukraine)
Zonal asymmetry of total ozone content and other lower atmosphere parameters above Antarctic region

METEOROLOGY AND CLIMATE I

- 14:00-15:30** Chair: **Dr. Svitlana Krakovska**
14:00-14:20 *V. Martazinova*, *E. Ivanova*, *V. Tymofeyev* (Ukrainian Hydrometeorological Institute, Kyiv, Ukraine)
Large-scale atmospheric circulation in southern extratropics and regional weather patterns at Antarctic Peninsula
- 14:20-14:40** *Yu. Artamonov*, *M. Babiy*, *E. Skripaleva* (Marine Hydrophysical Institute of NASU, Sebastopol, Ukraine)
The interannual variability of the sea surface temperature and oceanic fronts in the Atlantic sector of Antarctica
- 14:40-15:00** *E. Shkolny*, *E. Galich* (Odessa state ecological university, Odessa, Ukraine)
Features of large-scale circulation atmospheric processes in western sector of the Southern hemisphere
- 15:00-15:15** *N. Shven'* (Central Geophysical Observatory, Kyiv, Ukraine), *O. Kosovets-Skavronska* (Central Geophysical Observatory, Kyiv National Taras Shevchenko University, Kyiv, Ukraine)
Long standing changes of basic climatic characteristics in the area of Ukrainian Antarctic station Akademik Vernadsky

15:15-15:30 *V. Tymofeyev, Gernega A. (Ukrainian Research Hydrometeorological Institute)*
Regional features of climate change at Antarctic Peninsula

GEOLOGY, GEOPHYSICS AND GLACIOLOGY I

14:00-16:00 Chair: *Dr. Sergiy Shnyukov*

14:00-14:20 *C. Dominguez (Universidad de Salamanca, Salamanca, Spain),
A. Eraso (Universidad Politécnica de Madrid, Madrid, Spain)*

Network of glacier discharge monitoring stations for measuring the evolution of global warming

14:20-14:40 *S. Savenok, S. Shnyukov, A. Andreiev, O. Andreiev, V. Morozenko, O. Bunkevich (National Taras Shevchenko University of Kyiv, Kyiv, Ukraine)*

Single-grain geochemistry of zircon and monazite detrital populations from glacial sediments as a tool for geological study of subglacial terrains of Antarctica: new results of preliminary testing and future trends of development during IPY 2007/2008

14:40-15:00 *I. Lazareva, S. Shnyukov, E. Khlon, A. Mitrokhin, Yu. Gasanov (National Taras Shevchenko University of Kyiv, Kyiv, Ukraine)*

Integrated geochemical modeling of magmatic systems as applied to 'Circum Antarctic Zircon Census' (CAZIC) project (IPY 2007/2008)

15:00-15:15 *A. Andreiev, S. Savenok, O. Andreiev, A. Bunkevich, E. Meshcheryakova (National Taras Shevchenko University of Kyiv, Kyiv, Ukraine)*

Zircon and monazite single-grain trace element analysis and dating by XRF milliprobe: application to CAZIC project (IPY 2007/2008)

15:15-15:30 *O. Bunkevich, S. Shnyukov, A. Andreiev (National Taras Shevchenko University of Kyiv, Kyiv, Ukraine)*

Some perspective approaches in interpretation of single-grain geochemical data on detrital populations of wide-spread accessory minerals from subglacial terrains of Antarctica and other regions

15:30-16:00 Coffee-break

16:00-18:15 Work in Sections II

BIOLOGY AND ECOLOGY II

16:00-18:15 Co-Chairs: *Dr. Iryna Kozeretska and Dr. Roberto Bargagli*

16:00-16:15 *S. Mosyakin, L. Bezusko, A. Mosyakin (M.G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine)*

Origin and age of vascular plants (*Deschampsia antarctica* and

- Colobanthus quitensis**) in Antarctica: a review of current status and prospects of integral research
 16:15-16:30 *V. Bibik, B. Trotsenko, L. Pshenichnov (Southern Scientific Research Institute of Marine Fisheries and Oceanography, Kerch, Ukraine)*
Antarctic marina living resources and prospects for steady utilization
 16:30-16:45 *I. Dykyy (Ivan Franko National University of Lviv)*
Seals monitoring in the Argentine Islands archipelago area
 16:45-17:00 *P. Luporini (Dipartimento di Biologia Molecolare Cellulare Animale, University of Camerino, Italy)*
Molecular cold adaptation in Antarctic Protozoan ciliates
 17:00-17:15 *A. Utevsky, S. Utevsky (V.N. Karazin Kharkiv National University, Kharkiv, Ukraine)*
Antarctic region is the centre of origin of piscicolid leeches
 17:15-17:30 *R. Metcheva, L. Yurukova, M. Nedjalkova, Y. Yankov (Institute of Zoology, Bulgarian Academy of Sciences, Sofia, Bulgaria)*
Toxic elements in Antarctica top predators
 17:30-17:45 *G. Shandikov (V.N. Karazin Kharkiv National University, Kharkiv, Ukraine)*
On the species composition of icefishes (Perciformes: Channichthyidae) in the Kerguelen Islands area (sub-Antarctica)
 17:45-18:00 *P. Convey (British Antarctic Survey, Natural Environment Research Council, Cambridge, UK)*
Plants as indicators of environmental change in the Antarctic Peninsula region
 18:00-18:15 *O. Peklo (National Science and Nature Museum of National Academy of Sciences of Ukraine, Kyiv)*
On the expansion of the several bird species natural habitats to South in the Graham Land region
 18:15-18:30 *K. Afanasieva, S. Ryshkovsky, V. Bezrukov (National Taras Shevchenko University of Kyiv, Kyiv, Ukraine)*
Chromosome aberration in lymphocytes of the Ukrainian Antarctic winterers before and after expeditions
- ATMOSPHERE AND NEAR-SPACE PHYSICS II**
Chair: Dr. Oleg Troshichev
 16:00-16:20 *S. Chernouss (Polar Geophysical Institute, Apatity, Russia), N. Kalitenkov (Murmansk State Technical University, Murmansk, Russia)*
Auroral disturbances as an indicator of deviations in GPS data in Polar Regions
 16:20-16:40 *O. Koloskov (Institute of Radio Astronomy, National Academy of Sciences of Ukraine, Kharkiv, Ukraine)*
Using the electronic geophysical database from station Akademik Vernadsky for the analysis of Alfvén resonance observations

- 16:40-17:00 *M. Sosonkin (Main Astronomical Observatory of National Academy of Sciences, Kyiv, Ukraine)*
Ozone in troposphere: what for Antarctica?
- 17:00-17:15 *V. Vojtenko (East-Ukrainian National Volodymyr Dal' University, Lugansk, Ukraine)*
Monitoring of atmospheric parameters from of the secondary space radiation registration in the Antarctic Peninsula area
- 17:15-17:30 *V. Kravchenko, O. Evtushevsky (National Taras Shevchenko University of Kyiv, Kyiv, Ukraine)*
Comparison of the ground-based and satellite total ozone measurements over the Antarctic stations

METEOROLOGY AND CLIMATE II

- 16:00-17:30 Chair: Dr. Vladyslav Tymofeyev**
- 16:00-16:20 *V. Grischenko, V. Tymofeyev, Yu. Tavrov (Ukrainian Hydrometeorological Institute, Kyiv, Ukraine)*
On the state of the glaciation in the Akademik Vernadsky base region during the period of current climate change
- 16:20-16:40 *S. Kovalenok (Ministry Education and Science of Ukraine, Kyiv, Ukraine), V. Chizhevsky, V. Glotov (National University Lvivska Politechnica, Lviv, Ukraine), V. Vojtenko (East-Ukrainian National Volodymyr Dal' University, Lugansk, Ukraine)*
Antarctic Peninsula regional climate warming impact on small ice caps
- 16:40-17:00 *V. Vojtenko (East-Ukrainian National Volodymyr Dal' University, Lugansk, Ukraine), S. Kovalenok (Ministry Education and Science of Ukraine, Kyiv, Ukraine)*
Monitoring of the acoustic sea activity and the acoustic small ice caps crack emissions for study of the Antarctic Peninsula regional climate
- 17:00-17:20 *E. Galat, T. Danova (Odessa state ecological university, Odessa, Ukraine)*
Dynamics of ice cover of Antarctic seas in the process of modern climatic changes
- 17:20-17:25 *V. Lisovodsky, V. Dolia (Odessa state ecological university, Odessa, Ukraine)*
Regional changes of hydrometeorology conditions in the south-west sector of Atlantic
- 17:25-17:30 *V. Ukrainsky, Yu. Popov (Ukrainian Center of Sea Ecology, Odessa, Ukraine), V. Sytov, I. Neverovsky (Hydrometeorology Center of Black and Azov Seas, Odessa, Ukraine)*
Characteristic of tidal currents according to natural observations in the Argentina Islands archipelago region

GEOLOGY, GEOPHYSICS AND GLACIOLOGY II

- 16:00-17:30** Co-Chairs: **Dr. Sergiy Shnyukov, Dr. Carsten Gohl**
16:00-16:20 S. Shnyukov, S. Savenok, A. Andreiev, I. Lazareva (National Taras Shevchenko University of Kyiv, Kyiv, Ukraine)
Circum Antarctic Zircon Census (CAZIC/Plates & Gates/IPY 2007-2008): main trends of development as a global project of earth crust monitoring
- 16:20-16:40 V. Kobolev (Institute of Geophysics, National Academy of Sciences of Ukraine, Kyiv, Ukraine)
The riftogenic nature of Antarctica in context of Earth's hot belts
- 16:40-17:00 M. Orlyuk, A. Romanets (Institute of Geophysics, National Academy of Sciences of Ukraine, Kyiv, Ukraine)
Geomagnetic maps of the region of the station Akademik Vernadsky: geological and ecological aspects
- 17:00-17:15 O. Liashchuk, E. Kariagin, I. Kachalin (Main Centre of Special Monitoring National Space Agency of Ukraine, Makariv-1, Kyiv Region, Ukraine)
The complex researches of the dangerous geophysical phenomena in region of the Vernadsky Station
- 19:00-21:00** **Dinner and Social**

SUNDAY, MAY 25, 2008

- 07:30-08:30** **Breakfast**
9:00-10:30 **Work in Sections III**

BIOLOGY AND ECOLOGY III

- 9:00-11:00** Co-Chairs: **Dr. Peter Convey and Dr. Iryna Kozeretska**
9:00-9:15 I. Kozeretska, I. Pamikoza (National Taras Shevchenko University of Kyiv, Kyiv, Ukraine), S. Korsun (Institute of Agriculture of the Ukrainian Academy of Agrarian Sciences, Kyiv, Ukraine)
Human impact evaluation on Antarctic herb tundra formation of Arctowski ice-free area
- 9:15-9:30 S. Bushuyev (Odessa Center of Southern Scientific Research Institute of Marine Fisheries and Oceanography ("YugNIRO"), Odessa, Ukraine)
The Ukrainian data on feeding and food objects of southern minke whales
- 9:30-9:45 G. Shandikov (V.N. Karazin Kharkiv National University, Kharkiv, Ukraine), V. Herasymchuk (State Committee for Fisheries of Ukraine, Kyiv, Ukraine), L. Pshenichnov (Southern Scientific Research Institute of Marine Fisheries and Oceanography, Kerch, Ukraine)
Cetaceans of the Antarctica, whaling and investigations

- 9:45-10:00 K. Janko, C. Marshall, A. DeVries, G. Lecointre (Institute of Animal Physiology and Genetics, Czech Academy of Sciences, Libechov, Czech Republic)
Does the life history affect the ability of Antarctic fish to cope with climatic changes? – population genetic approach
- 10:00-10:15 O. Mustafa, C. Braun, S. Pfeiffer, H.-U. Peter (Polar & Bird Ecology Group, Institute of Ecology, University of Jena, Germany)
Spatial analysis of potential conflicts between visitors and fauna at Fildes Peninsula (King George Island, Antarctica)
- 10:15-10:30 L. Pshenichnov (Southern Scientific Research Institute of Marine Fisheries and Oceanography, Kerch, Ukraine)
Basic biological resources of the high-latitude seas of the Southern Ocean and their efficient use
- 10:30-10:45 V. Bogillo, M. Bazylevska (Institute of Geological Sciences, National Academy of Sciences of Ukraine, Kyiv)
The transport, partitioning and fate of the persistent organic pollutants in Antarctica
- 10:45-11:00 P. Zehndindjev, R. Metcheva (Institute of Zoology, Bulgarian Academy of Sciences, Sofia, Bulgaria), V. Bezrukov (National Taras Shevchenko University of Kyiv, Kyiv, Ukraine), P. Jouventin, M. de Dinechin (Equipe Ecologie Comportementale CEFE/CNRS UMR, Cedex, France)
Genetic variability in four gentoo penguin populations (*Pygoscelis papua*)

ATMOSPHERE AND NEAR-SPACE PHYSICS III

- 09:00-10:30**
Chair: Dr. Sergey Chernouss
- 09:00-9:20 G. Milinevsky, A. Evtushevsky, A. Grytsai (National Taras Shevchenko University of Kyiv, Kyiv, Ukraine), A. Klekociuk (Australian Antarctic Division, Kingston, Australia)
Planetary waves in total ozone distribution and tropopause height asymmetry in connections to Antarctic Peninsula warming
- 9:20-9:40 V. Lisachenko, Y. Zanimonskiy, A. Sopin (Institute of Radio Astronomy NAS, Kharkiv, Ukraine), P. Wielgosz (University of Warmia and Mazury in Olsztyn, Poland)
Ionosphere Total Electron Content variations by the GNSS data: Antarctic Peninsula region Investigations
- 9:40-10:00 V. Lozitsky (National Taras Shevchenko University, Kyiv, Ukraine)
Adaptation of the SCIATRAN radiative transfer model for ozone profiles retrieval from spectra of solar TII spectrometer with CCD detection system
- 10:00-10:15 O. Shlyakhovenko (National Taras Shevchenko University of Kyiv, Kyiv, Ukraine)
Whether there is asymmetry in "semi-global" ozone content in

10:15-10:30 **the Earth' stratosphere?**
ANSP Section discussion and decision

METEOROLOGY AND CLIMATE III

9:00-10:30 Chair: **Dr. Svitlana Krakovska**
9:00-9:20 O. Prokofyev, T. Danova (*Odessa state ecological university, Odessa, Ukraine*)

Description of temperature and regime of humidity of troposphere above Antarctic continent

9:20-9:40 S. Krakovska (*Ukrainian Hydrometeorological Institute, Kyiv, Ukraine*)

Ice forming processes in Antarctic mixed-phase clouds

9:40-10:00 Y. Zanimonskiy (*Institute of Radio Astronomy National Academy of Sciences of Ukraine, Kharkiv, Ukraine*), J. Krynski (*Institute of Geodesy and Cartography, Warsaw, Poland*), G. Milinevsky, V. Danylevsky (*National Taras Shevchenko University of Kyiv, Kyiv, Ukraine*)

Common features of the sea level records at Antarctic Peninsula and South America tide gauges

10:00-10:15 B. Kapochkin, V. Doliá (*Odessa State Ecological University, Odessa, Ukraine*)

Geodynamic processes in Antarctica as a cause of global changes of movable spheres of the Earth

10:15-10:30 **MC Section discussion and decision**

10:30-12:30 **POSTER SESSION AND COFFEE-BREAK**

SCHOOL-TRAINING FOR YOUNG SCIENTISTS

11:00-14:00 (**Sponsored by the Ministry of Family, Youth and Sport**)
Instructors **Dr. O. Mustafa, Dr. A.Utevsky and Dr. Ye.Dyky**

12:30-14:00 **Session and discussion «Sustainable use of Antarctic resources»**

Co-chairs: Dr. Volodymyr Herasymchuk, Dr. Gennadi Milinevsky, Dr. Leonid Pshenichnov

V. Herasymchuk (*State Committee for Fisheries of Ukraine, Kyiv, Ukraine*)

Fishing and scientific research in Antarctica

G. Milinevsky (*Antarctic Krill Conservation Project, Kyiv, Ukraine*),
I. Mikityuk (*AKCP - Antarctic and Southern Ocean Coalition, representative in Ukraine, Kyiv, Ukraine*)

Antarctic krill conservation project (AKCP), climate change aspects

B. Trotsenko, V. Bibik, L. Pshenichnov, O. Bityuyska (*Southern*

*Scientific Research Institute of Marine Fisheries and Oceanography,
Kerch, Ukraine)*
**On the development of the Complex National Program of Ukraine
on utilization of Antarctic Seas marine living resources**
*V. Spiridonov, O. Kirillova, A. Chernetskiy (P.P. Shirshov Institute of
Oceanology of Russian Academy of Sciences, Moscow, Russia)*
**En route census of marine mammals as potential ecosystem
monitoring tool**

14:00-15:00 **Lunch**

15:00-16:30 **Round table “Future of the Ukrainian Antarctic research and
development”**. Conference recommendations and resolution
adoption
**Co-Chairs: Dr. Nataliya Shulga, Dr. Victor Svizhenko and
Dr. Yaroslav Yatskiy**

16:30-17:00 **Closing and Departure**

**Poster program
SUNDAY, MAY 25, 2008**

- BE-P1 *I. Terenetska (Institute of Physics, National Academy of Sciences of
Ukraine, Kyiv, Ukraine)*
**Direct monitoring of vitamin D synthetic capacity of sunlight and
artificial UV sources for prevention of vitamin D deficiency at
polar explorers**
- BE-P2 *V. Gorobchishin, I. Kozeretska (Taras Shevchenko National University
of Kyiv, Kyiv, Ukraine)*
**Dynamics of age and sex structure of population of *Boeckella
poppei* (Mrázek, 1901) (Copepoda: Centropagidae) of Lake
Wujka, King George Island, in 2005-2006 season**
- BE-P3 *A. Dranitsina (Scientific Research Institute of Physiology After
Academician Peter Bogach of the National Taras Shevchenko
University of Kyiv, Kyiv, Ukraine), G. Telegeev, M. Dybkov (Institute of
Molecular Biology and Genetics of National Academy of Sciences of
Ukraine, Kyiv, Ukraine), I. Chumachenko (National Taras Shevchenko
University of Kyiv, Kyiv, Ukraine), S. Maliuta (Institute of Molecular
Biology and Genetics of National Academy of Sciences of Ukraine,
Kyiv, Ukraine), V. Bezrukov (National Taras Shevchenko University of
Kyiv, Kyiv, Ukraine)*
**Analysis of gentoo penguin’s (*Pygoscelis papua*) polymorphism
by means of different DNA markers**
- BE-P4 *N. Taran, L. Batsmanova, A. Okanenko, N. Svyetlova (National Taras*

- Shevchenko University of Kyiv, Kyiv, Ukraine)
Oxidation stress action on *Deschampsia antarctica* one of higher plants species of Antarctic biota
- BE-P5 M. Gavrilo (Arctic & Antarctic Research Institute, Saint-Petersburg), K. Afanasieva, T. Vasilenko (National Taras Shevchenko University of Kyiv, Kyiv, Ukraine), A. Volkov (Foundation Sustainable Development, Moscow, Russia)
Cytogenetic parameters of chromosomal instability as an index for the population state of indicator species of high-latitude marine ecosystems with the ivory gull (*Pagophila eburnea*) as an example
- BE-P6 Yu. Hihiniak (State Scientific Production Association «Scientific-Practical Center of the National Academy of Sciences of Belarus for Biological Resources», Minsk, Belarus)
Features of biology and caloric content of invertebrates from Antarctic sublitoral
- BE-P7 M. Vergolyas (A. V. Dumansky Institute of Colloid Chemistry and Water Chemistry, Kyiv, Ukraine), V. Bezrukov (National Taras Shevchenko University of Kyiv, Kyiv, Ukraine), L. Manilo (National Museum of Nature, National Academy of Sciences of Ukraine, Kyiv, Ukraine)
The blood formula description of the three Antarctic fish species
- BE-P8 A. Utevsky (V.N. Karazin Kharkiv National University, Kharkiv, Ukraine), Ye. Dyky (National University “Kyiv – Mohyla Academy”, Kyiv, Ukraine)
Methodology and methodic of the benthos community complex monitoring at the Antarctic Peninsula shelf
- BE-P9 D. Lytvyn, A. Yemets, G. Portnichenko, Y. Blume (Institute of Cell Biology and Genetic Engineering, Kyiv, Ukraine)
UV-B overexposure induces programmed cell death in plant cells
- BE-P10 A. Camacho (Cavanilles Institute of Biodiversity and Evolutionary Biology & Department of Microbiology and Ecology. University of Valencia. E-46100 Burjassot, Spain)
Climate warming in the maritime Antarctica and sub-Antarctic islands: a chance for strongest biotic interactions?
- ANSP-P11 K. Laska, P. Prošek (Department of Geography, Faculty of Science, Masaryk University, Brno, Czech Republic), L. Budík (Czech Hydrometeorological Institute, Brno Regional Office, Brno, Czech Republic), M. Budikova (Department of Mathematics and Statistics, Faculty of Science, Masaryk University, Brno, Czech Republic), G. Milinevsky (National Taras Shevchenko University of Kyiv, Kyiv, Ukraine)
Prediction of erythemally effective uv radiation by means of nonlinear regression model
- ANSP-P12 S. Kovalenok (Ministry Education and Science of Ukraine, Kyiv, Ukraine), O. Evtushevsky, A. Grytsai (National Taras Shevchenko

University of Kyiv, Kyiv, Ukraine)

Antarctic total ozone distribution climatology and asymmetry in connection with possible impact on ecosystem

- ANSP-P13 *O. Burgaz (Odessa state environmental university, Odessa, Ukraine)*
Structure of the fields of total content of ozone and its connection with circulation processes of South Hemisphere
- ANSP-P14 *Ye. Serdyuk (National Antarctic Scientific Center of Ukraine of Ministry Education and Science of Ukraine, Kyiv, Ukraine)*
Search of the troposphere disturbance influence on E_s layer in the Antarctic Peninsula region
- ANSP-P15 *J. Biszczuk (Centre of Aerology, Institute of Meteorology and Water Management)*
Antarctic ozone hole – signature in UV measurements on the Henrik Arctowski Polish Antarctic Station during the period 2003-2007
- MC-P16 *V. Ukrainsky, Yu. Popov (Ukrainian Center of Sea Ecology, Odessa, Ukraine), V. Sytov, I. Neverovsky (Hydrometeorology Center of Black and Azov Seas, Odessa, Ukraine)*
Characteristic of tidal currents according to natural observations in the argentina islands archipelago region.
- MC-P17 *V. Lisovodsky, V. Dolia (Odessa State Ecological University, Odessa, Ukraine)*
Regional changes of hydrometeorological conditions in the South-West sector of Atlantic in 2005
- GGG-P18 *O. Liashchuk (Main Centre of Special Monitoring National Space Agency of Ukraine, Makariv-1, Kyiv Region, Ukraine), V. Vashchenko (National Antarctic Scientific Center, Kyiv, Ukraine), V. Gukov, I. Kachalin (Main Centre of Special Monitoring National Space Agency of Ukraine, Makariv-1, Kyiv Region, Ukraine)*
Seismic observation in the Argentina Islands region
- GGG-P19 *J. Cisak (Institute of Geodesy and Cartography, Warsaw, Poland), Y. Zanimonskiy (Institute of Radio Astronomy, Kharkiv, Ukraine)*
Investigations of the GNSS antennae to detect near-field effects under antenna calibration procedure
- G-P20 *N. Videnina, V. Rybachuk (G.M. Dobrov Center for Scientific and Technological Potential and Science History, National Academy of Sciences of Ukraine, Kyiv, Ukraine)*
Ukraine research in Antarctica: presentation and scientometric analysis of the Ukrainian scientist publications bibliography (1997 – 2007)



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International Antarctic Conference
IAC2008

Ukraine in Antarctica - National Priorities and Global Integration
May 23-25, 2008 - Kyiv, Ukraine

-
International Polar Year 2007/8

Abstracts

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Український науковий клуб
у співробітництві з:
Національною академією наук України
Міністерством освіти і науки України
Міністерством сім'ї молоді та спорту України
Британською радою в Україні

Міжнародна антарктична конференція
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Тези

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Preface

For over decade independent Ukraine has been part of the world effort to conduct scientific research and monitoring in the extreme region of the planet – Antarctica, utilizing its only polar station named after Academician Volodymyr Vernadsky (former Faraday station of BAS, UK). This Conference aimed to summarize the research outcomes and challenges experienced by Ukrainian scientists and the Station administrators. We welcome participants to discuss prospects for the research programs that will continue during and after the International Polar Year 2007-2008. We expect to formulate Ukraine's national priorities in Antarctica and define the Ukraine's niche in the international research programs. Antarctica is the important region for research on climate change, atmosphere-ionosphere coupling, geological and tectonic processes. So, conference discussions and materials contribute to brainstorming of the challenges, which could be generalized as *"Antarctica: key region for the study of environment change"*.

Вступ

Понад десятиріччя незалежна Україна бере участь у світових зусиллях з проведення наукових досліджень і моніторингових спостережень у екстремальному регіоні планети – Антарктиці, використовуючи антарктичну станцію *Академік Вернадський* (колишня станція Британської антарктичної служби *Фарадей*, Велика Британія). Конференція має на меті підсумувати результати досліджень в Антарктиці і розглянути існуючі проблеми. Учасники конференції обговорять перспективи дослідницьких програм, які виконуються під час (і будуть виконуватись після) Міжнародного полярного року 2007-2008. Під час конференції будуть запропоновані національні наукові пріоритети України в Антарктиці і місце України у міжнародних дослідницьких програмах. Антарктика - це важливий регіон для досліджень змін клімату, взаємодії атмосфера-іоносфера, геологічних і тектонічних процесів. Тому дискусії та матеріали конференції є внеском у мозкову атаку сучасних викликів регіону, які можна узагальнити як *"Антарктика: ключовий регіон для вивчення змін у навколишньому природному середовищі"*.

Plenary

Review

R1

RECENT ADVANCES AND NEW DIRECTIONS IN ANTARCTIC BIOLOGICAL RESEARCH

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The SCAR science research programme 'Evolution and Biodiversity in Antarctica' (EBA; www.eba.aq) sets out to integrate biological research in Antarctica in order to "Describe the past, understand the present, predict the future". At a time when the planet is facing unprecedented environmental changes as a consequence of human activities, the poles have never been more important in providing key vantage points against which to assess global change processes.

The concept of biodiversity is central to biological research in Antarctica. 'Biodiversity' has a much more complex definition than that of simple species number, including at its widest *all aspects of biological variability, from the gene to entire communities and ecosystems*. Polar ecosystems provide the opportunity to identify key elements important in the maintenance of ecosystem function, in systems that are tractable and testable in comparison with the inherently far more complex, human impacted and poorly understood ecosystems of temperate and tropical regions.

With the advent and incorporation of molecular biological techniques into Antarctic research, along with increasingly effective international collaboration, and increasing access to the continent and its surrounding ocean, rapid and important advances are being made in several areas of biology. The importance of increasing knowledge of biological unknowns (e.g. the deep seas, continental interior, sub-glacial environments) has been recognised.

The application of molecular technologies promises rapid advances in understanding of adaptation and change response at the genomic and proteomic level. Integration of understanding across levels of organisation from the genomic to the entire ecosystem is becoming a realistic goal, encouraged in part by the application of complex modelling techniques. Understanding of responses to change at all levels within the ecosystem, and their implications for the maintenance of ecosystem function and services, is fundamental to understanding biodiversity, identified as one of the main issues for the world's future by the Millennium Ecosystem Assessment.

R2

CURRENT UNDERSTANDING AND DETERMINATION OF BIPOLAR STRATOSPHERIC OZONE LOSS RATES

P. von der Gathen, M. Rex, Match team

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After the discovery of the Antarctic ozone hole by Farman et al. (1985) the need for a complete understanding of stratospheric ozone chemistry and related dynamics became apparent. Since the early 1990ties we concentrated our research on following questions: 1. Do similar ozone losses appear in the Arctic stratosphere? 2. How much ozone becomes depleted? 3. Is our understanding of the underlying chemical and dynamical processes correct? Only with a complete understanding the future of the ozone layer can be predicted.

To answer the first two questions we developed a Lagrangian method, the so called Match method, to detect and to quantify ozone losses. By means of hundreds ozonesondes launched in near-real time coordination at several stations in the polar and sub-polar region during a winter season we were able to show that processes similar to those leading to the Antarctic ozone hole occur in the Arctic, too, and that the amount considerably varies from winter to winter. However, we found that the amount of ozone losses in winter with great losses increased.

It turned out that the Match data set was very well suited for comparisons with model results. First comparisons showed a significant underestimation of the ozone losses by state-of-the-art models. After more than ten Arctic Match campaigns we therefore performed two Antarctic campaigns to enlarge our experimental data base qualitatively. One took place in 2003 and the other one more recently in 2007 within the frame of the IPY project ORACLE-O3. In the mean time the models have been improved and explain experimental data quite well. However, recent new laboratory measurements of a fundamental constant in the ozone loss chemistry cast doubt on our general understanding of the corresponding processes. We will report about our results with respect to the current state of the ozone research.

R3

CONTRIBUTION AND PRIORITIES OF NATIONAL ANTARCTIC SCIENCE IN WORLD INFORMATIONAL SPACE: WEB-BIBLIOMETRIC ANALYSIS

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The results of web-bibliometric analysis of information volume of publication of Ukrainian scientists about Antarctica in one of the biggest in the world full thematic bibliographies in the field of Arctic and Antarctic studies – abstract database *Cold Regions Bibliography (CRB)*, as well as in Ukrainian abstract database “Dzherelo” (“Source”) (URZh) and in indexes of scientific web-search engines *Scirus* and *Scopus* are presented.

The total number of abstracts of publications by Ukrainian scientists is comparatively low (35-38th place among 47 countries, working in Antarctica). But the number of publications tends to increase after 1996, which is undoubtedly connected with start of systematic research by Ukrainian scientists on Antarctic station “Academician Vernadsky” and in marine expeditions.

The article mentions that scientific works of Ukrainian scientists are presented insignificantly in meta-informational space and do not reflect a real contribution of the national science in world research of Antarctica. It is worth of mentioning spontaneous and irregular character of entering of national scientific publications to database *CRB*. Only the articles, published in main Ukrainian journals, republished abroad in English and in international *peer review* publications are to some extent represented there. The same situation is observed with the results, received during bibliometric analysis of relevant informational volume of publications, concentrated in the URZh and other studied electronic databases of abstract data.

R4

RECENT RESULTS AND FUTURE DIRECTION OF BRITISH ANTARCTIC SURVEY BAS UPPER ATMOSPHERE RESEARCH

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British Antarctic Survey carries out a wide range of upper atmospheric research that aims to describe and quantify the key mechanisms by which variations in the solar wind and solar high-energy radiation affect the Earth's atmosphere to determine whether or not these have a significant effect on the Earth's climate system.

In addition tides, and planetary and gravity waves play a critical role in driving mesosphere circulation and the day-to-day variability of the thermosphere and ionosphere. Ideas and methods from complexity science are being used to offer new insights into how the upper atmosphere operates, and indeed how predictions of its behaviour can be improved. Examples from each of these science areas will be presented together with some ideas for future upper atmosphere research.

R5

**DO TECTONIC STRUCTURES OF THE AMUNDSEN SEA EMBAYMENT
(WEST ANTARCTICA) CONSTRAIN ICE-SHEET DYNAMICS?**

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An understanding of the glacial history of the Amundsen Sea Embayment and Pine Island Bay (PIB) is essential for proposing models on the future development of the West Antarctic Ice Sheet (WAIS). It requires both an understanding of the tectonic history, because basement morphology and inherited erosional features may control the flow direction of ice-sheets and the influx of Circum-Polar Deep Water at later times. We attempt to reconstruct the tectonic history with the aim to search for basement features and crustal boundaries which may be correlated to the flow and dynamics of ice-sheet advances.

The Amundsen Sea Embayment played a central role in rifting and break-up of greater New Zealand from West Antarctica. New seismic, magnetic and gravity data from the Amundsen Sea Embayment and Pine Island Bay reveal the crustal thickness and tectonic lineations. The Moho is 24-22 km deep on the shelf. NE-SW trending magnetic and gravity anomalies and the thin crust indicate a former rift zone that was active during or in the run-up to breakup between Chatham Rise and West Antarctica before or at 90 Ma. NW-SE trending gravity and magnetic anomalies, following a prolongation of Peacock Sound between Thurston Island and Ellsworth Land, indicate the extensional southern boundary to the Bellingshausen Plate which was active between 79 and 61 Ma. However, both lineation trends, NE-SW and NW-SE, seem to be observed over broad regions. This infers stepwise and multiple rift and extension phases over a wide period of time before, during and after the break-up between New Zealand and West Antarctica. We propose that these tectonically inherited erosional trends on the continental shelf of the Amundsen Sea Embayment have controlled the main directions of ice streams during times of an advancing West Antarctic ice-sheet.

R6

SIMULATING THE EFFECT OF ICE SHEET MELTING ON ANTHROPOGENIC CLIMATE CHANGE

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Almost all simulations with complex coupled atmosphere ocean general circulation models (AOGCMs) investigating the long-term consequences of anthropogenic greenhouse gas emissions have been made without considering the effect of the ice sheets. This is also true for the simulations made for the latest IPCC report.

Here results are presented from a new earth system model (ESM) containing an dynamic ice sheet model. The entire ESM has been used without artificial flux correction. The ESM consists of the AGCM ECHAM5 (T31L19), the OGCM MPIOM (40 levels), the ice sheet model SICOPOLIS (80 km) and the dynamical vegetation model LPJ. The mass balance at the surface of the ice sheet is calculated using an energy balance scheme.

With this model CO₂ stabilization experiments of 2x and 4x preindustrial level have been performed. The total length of each integration was 600 years. The effect of the ice sheets was determined using one set of experiments with and another without interactive ice sheet model.

The model simulations show a rise of the global mean near-surface air temperature of more than 4K (2x) and 8k (4x). Towards the end of the 2x experiments, most of the Arctic becomes ice-free in summer, whereas the winter sea ice is only slightly reduced. In the 4x experiment the Arctic becomes essentially ice-free even in winter. Around Antarctica maximal sea ice extent is reduced to 20% of its present value. In the interior of Antarctica ice thickness increases, the melting due to anthropogenic warming is restricted to coastal regions.

R7

UKRAINE ANTARCTIC RESEARCH 1996-2008, RESULTS AND CHALLENGES

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The main researches conducted on Ukrainian Antarctic station “Akademik Vernadsky” (UAS) in 1996-2006 were in the fields of atmosphere and upper atmosphere physics, physics of ozone layer, meteorology and climate, geomagnetic field studies, seismic observation, glaciology, biology and ecology. The new complex of the global thunderstorm activity radiation was developed. The satellite geomagnetic data transfer equipment has been installed to send information to INTERMAGNET system. The experimental measurements of the global Schumann resonance activity were collected at Vernadsky. The methods of the ionosphere parameters remote investigation using the HF broadcasting radio station signals were introduced that allows better organizing of atmosphere-ionosphere conditions monitoring. The importance of the ozone layer study, regional climate change, Sun and low atmosphere processes influences on geospace condition ("space weather") are obvious.

Unfortunately, after 2006 the development of many key researches at the UAS Vernadsky was terminated. Some national and international research projects and agreements including the IPY projects suffered too. For example, (1) study of glaciers discharge with Spanish scientists, (2) gentoo penguins study, (3) Ukrainian part of ClicOPEN project, (4) Ukraine participation in ICESTAR program (project TIMIS) and many others collaborative project with Poland, Luxembourg, USA (NSF). This situation dramatically effected participation of Ukraine in international Antarctic research during IPY 2007/8. As a result, very few publications appeared in peer-reviewed journals and research at Vernadsky station was diminished.

The key solutions for successful Ukraine participation in joint international research are proposed. For example, the scientific equipment renovation (digisonde, automatic weather station, ozone spectrophotometer), Ukrainian Antarctic research vessel commissioning, establishing of modern communication system and National Antarctic Data Center are crucial. The analysis of the state of the existent research and the ways how to improve it are also discussed.

Biology and Ecology

BE1

MIGRATION AND FORAGING OF ANTARCTIC SKUAS – THE USE OF MODERN LOGGER AND TRANSMITTER TECHNOLOGIES

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Three skua species are breeding on the Southern hemisphere and overwinter on the oceans. Since it is difficult to distinguish these, reliable data on the temporal and spatial migration patterns are absent.

Since 1984, we banded more than 2000 skuas on King George Island, Antarctica, i.e. South polar skuas (*Catharacta maccormicki*), Brown skuas (*C.antarctica lonnbergi*) and hybrids (*C.a.lonnbergi x C.maccormicki* and *C.maccormicki x C.chilensis*) not only with metal rings, but also with plastic bands . Only a few banded birds were seen outside of the Antarctic. One hybrid (*C.maccormicki x C.chilensis*) and one South polar skua were found in the Northern Atlantic.

Additionally, we equipped South polar skuas with satellite transmitters. Only two birds transmitted data from outside of the breeding area: one bird was found to be migrating northwards in the Atlantic; the second bird had overwintered between Japan and Aleutian Islands.

In the season 2006/07, we attached skuas with light GLS-loggers. In January 2008 these loggers were removed and the data processed. They provide a much more detailed picture of Brown skuas in the overwintering area of the South Atlantic and the migration route of South polar skuas to the North Atlantic and North Pacific.

The development of miniaturized GPS-systems allowed in recent years to track animals at a very fine temporal and spatial scale. We employed GPS-logger at the two skua species during the 2007/08 season and tracked the feeding flights. The Brown Skua *Catharacta a. lonnbergi* feeds mainly on penguins partly in rookeries at inaccessible islands, while the South Polar Skua *C. maccormicki* feeds offshore and uses the shallow waters near the islands.

BE2

HEALTH OF POLAR SEABIRD POPULATIONS: ARCTIC VS ANTARCTIC. STATE OF KNOWLEDGE & FURTHER RESEARCH

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Population size and distribution is structured by various environmental factors including natural (pathogens, parasites, climate) and anthropogenic (pollution, disturbance etc.) stressors. Polar seabirds are thought to live in relatively healthy environment in comparison to birds of lower latitude, terrestrial or aquatic habitats. Then they are suggested of being capable to invest more energy for survival in harsh climate and under unpredictable ecological conditions. Strong dependence of polar seabirds on ice habitats increases risk of combined effect of spreading pathogens and parasites in warming climate. Along with general similarity in seabird ecology in both polar oceans, there are differences in risk to their health under modern conditions of changing world, and in conservational and social-economic issues. Antarctic seabirds being evolved in Southern Ocean are more isolated from wildlife of other geographical zones, and hence more immunologically naive; in turn they are more at risk towards alien diseases under conditions of increasing Antarctic exploration. Risk assessment of disease spread among/by Arctic and Antarctic birds has rather different implications for wildlife conservation and human health. Possibility of disease transmission by migratory birds to man is of major concern in the Arctic. Health of seabirds themselves is of primary concern in the Antarctic as reflected in the Antarctic Treaty documents. Our pilot test of existing hypothesis in euarctic seabird – the *Pagophila eburnea*, revealed high levels of some POPs and relatively high prevalence of some parasites; presence of influenza A viruses is also traced. Pilot screening of genetic and hematological parameters was done in cooperation with Ukrainian scientists are reported separately.

First results along with little expected recent findings of pathogens and parasites in Antarctic seabirds should trigger further researche in this field. Comparative studies of Arctic and Antarctic seabird as well as of East Antarctica versus Antarctic Peninsula will help in better understanding of the problem.

BE3

ENVIRONMENTAL CONTAMINATION IN ANTARCTIC ECOSYSTEMS

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Although Antarctica is often perceived as the symbol of the last great wilderness, its environment is no longer pristine. Human presence in the Southern Ocean and the continent began in the early 1900s for hunting, fishing and exploration, and many invasive plant and animal species have been deliberately introduced in several sub-Antarctic islands. Over the last 50 years, the development of research and tourism have locally affected terrestrial and marine coastal ecosystems through fuel combustion (for transportation and energy production), accidental oil spills, waste incineration and sewage. Available data on concentrations of metals, pesticides and other persistent pollutants in air, snow, mosses, lichens and marine organisms show that most persistent contaminants in the Antarctic environment are transported from other continents in the Southern Hemisphere. At present, levels of most contaminants in Antarctic organisms are lower than those in related species from other remote regions, except the natural accumulation of Cd and Hg in several marine organisms and especially in albatrosses and petrels. The concentrations of some organic pollutants in the eggs of an opportunistic top predator such as the south polar skua are close to those that may cause adverse health effects.

Population growth and industrial development in several countries of the Southern Hemisphere are changing the global pattern of persistent anthropogenic contaminants and new classes of chemicals have already been detected in the Antarctic environment. Although the Protocol on Environmental Protection to the Antarctic Treaty provides strict guidelines for the protection of the Antarctic environment and establishes obligations for human activity in the continent, the global warming, population growth and industrial development in countries of the Southern Hemisphere will likely increase the impact of anthropogenic contaminants on Antarctic ecosystems.

BE4

THE GLOBAL WARMING AND CHANGES IN BIRD POPULATIONS NEAR UKRAINIAN ANTARCTIC STATION “AKADEMIK VERNADSKY”

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The considerable changes in the abundance and the distribution of the *Pygoscelis adeliae* and *Pygoscelis papua* were found in the colonies around Vernadsky station. The number of *P. papua* nests on Petermann Island increased about 30 times since beginning of XX century, 3-4 times from 1970-80th, and approximately 2 times from 1990th. Same trends were marked on other nearest *P. papua* colonies (Pléneau Is., Booth Is.). Besides, new southernmost rookeries were formed on the Moot Point and Yalour Is. during last several years. While the number of *P. adeliae* decreased. The *P. papua* occupies the nesting sites of the *P. adeliae*, replace it from the traditional places of the reproduction.

The *P. papua* is more competitive in the comparison with *P. adeliae*. Due to rise of temperature during spring period, *P. papua* start to early arrive to nesting sites in the places where previously rookeries of *P. adeliae* were located. They are larger in sizes, take more care about eggs and chicks, quieter and less sensible to the presence of man, have more wide food spectrum and can eat bottom invertebrates (amphipods, limpets) and less dependent on krill. During last ten years the number of blue-eyed shag nests on the Peterman and Uruguay islands visibly decreased, approximately two times. There are some changes in the abundance and behavior of other bird species in the studied region. In particular, the *Catharacta maccormicki*, which appearance connected to the start of the Antarctic spring, begun to arrive earlier to UAS region (in October). On the contrary, the *Chionis alba*, that usually fly away after this, began to remain near the station in a summer period.

Thus, owing to the global warming the Antarctic ecosystem undergoes essential changes of structure and functioning. Birds are one of the best indicators of ongoing changes. Due to high mobility they quickly spread and occupy the areas released from snow, forming new colonies, carrying the new invasion species and forming the new trophic relations. At the same time, the more narrowly specialized Antarctic species lose in the competition and compelled to retreat farther southward as a result of offense by sub-Antarctic ones.

BE5

THE PECULIARITY OF ADAPTATION FEATURES TO ENVIRONMENTAL CONDITION IN REPRODUCTIVE SYSTEM OF COLOBANTHUS QUITENSIS AND DESCHAMPSIA ANTARCTICA

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The vital forms of the both species reflect an adaptation to the frigid environmental condition: succulent (*Colobanthus quitensis*) or xeromorphic (*Deschampsia antarctica*) type of structure, development of aerenchyma in the structure of vegetative and generative organs, ephemeralism and polymorphism of morphogenesis.

The basic targets which the ultraviolet and low temperatures influence are reproductive organs and processes. In strategy of their defence a large role belongs to the special physiological and anatomic adaptations: cleistogamy, aerenchyma and aerenchymatic cavities in the ovary and stamens (*C. quitensis*), that creates a niche for the processes of reproduction. An important role in the mechanisms of defence of male gametophyte is executed by well-developed wall of stamens, powerful sporoderma and carotinoid granules, which cover the internal surface of pollen chamber (*C. quitensis*). Cleistogamy and rapid germination of 3-rd cell pollen grains may promote defence of sensitive processes at the critical stage of reproduction. The polymorphism and sterility of pollen grains of the both species (up to 30 %) can be related to disturbances in microsporogenesis and formation of the unbalanced microspores. The multicellular (8-cell) pollen grains under effecting low temperatures were observed in senescent stamen of *D. antarctica*. Types of reproduction of observed species are vegetative and sexual. The seed within the fruit and panicle is differentiated in process of maturing. Limiting factors of seed development are probably nutritions and photoperiod. The seeds are viable. The embryos of both species are well differentiated.

BE6

CURRENT STATE OF ANTARTIC HERB TUNDRA FORMATION OF ARGENTINE ISLANDS AND NEAREST ARCHILPELAGO

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Argentine Islands region is known to include several ice-free territories with Antarctic herb tundra formation (majority of them is not included in ASPA). The archipelago endures progressive warming and varying human activity (relatively high at Galindez Island near Ukrainian station to much lower at adjacent islands and archipelagoes). Fowbert & Lewis Smith (AAAR, 1994, v. 26, 290-296) reported expansion of tundra and increase of *Deschampsia antarctica* (25-fold) and *Colobanthus quitensis* (5-fold) populations due to warming at the Western side of Antarctic Peninsula. Our investigation of 2006 hasn't revealed overall increase or further expansion in *Deschampsia* population of Galindez Island. Its population has decreased since 1990. The success of primary expansion must have been short-lived. Meanwhile, there was some increase in population near the north-western side of the glacier, probably due to its notable retreat since 1990. As to *C. quitensis*, its localities haven't expanded either, and it is still quite rare in the region. As the plant is only scarcely found at Galindez and Skua, it probably was transferred there accidentally by birds.

At the Argentine Islands and adjacent archipelagoes (in comparison to more northern Arctowski ice-free area of South Shetland Islands) the vegetation was mostly found in coastal habitats. There was no significant expansion to deglaciated slopes, except for *Deschampsia* locus by the lakes near the top of Woozle Hill, where the plant might well have been introduced artificially. However, at coastal localities of Galindez and Uruguay (Argentine Islands), at the old penguin colony of Petermann, Cape Perez and in some other places there were found rather large tufts of *D. antarctica*, and the local total cover of vegetation there reached 80%. It may be a result of more favorable local conditions. To monitor the dynamics of the tundra we established in 2006 study plots where populations of both native vascular plants are planned to be studied regularly.

BE7

ORIGIN AND AGE OF VASCULAR PLANTS (*DESCHAMPSIA ANTARCTICA* AND *COLOBANTHUS QUITENSIS*) IN ANTARCTICA: A REVIEW OF CURRENT STATUS AND PROSPECTS OF INTEGRAL RESEARCH

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Origin and age estimates of the two native vascular plants species (*Deschampsia antarctica* and *Colobanthus quitensis*) occurring in Antarctica remain a controversial issue, with some authors favoring their late and recent arrival to the Antarctic continent (Holocene migrants or, at best, Late Pleistocene relicts of the last interglacial), and some researchers providing evidence in favor of a relict status of these species, dating their immigration back to the Tertiary. Here we provide a review of the current status of the issue, and outline some prospects of and approaches to integral research aimed at finding the final solution of this long-standing enigma. Some of our arguments substantiating the concept of the Holocene (or Late Pleistocene) age of the two native taxa of vascular plants were already outlined in our publication in 2007.

We provide further direct and indirect evidence based on available data of phytogeography, plant taxonomy, paleobotany, paleogeography, and related fields. The colonizing propagules of *D. antarctica* and *C. quitensis* most probably arrived to Antarctica through bird-aided long-distance dispersal, but the number and dating of these dispersal events remain unknown. We conclude that it is highly improbable that these approaches might confirm the idea of the pre-Pleistocene age and relict status of *Colobanthus* and *Deschampsia* in Antarctica. Reasonable age estimates and historical biogeographical reconstruction can be obtained only by combining methods of molecular phylogeography (with sampling plants from Antarctica and South America) and molecular phylogenetics, paleobotanical (paleopalynological) studies, and approaches of comparative historical biogeography. The main causes for the depauperate species composition of the Antarctic vascular flora are not some specifically harsh environmental conditions of Maritime Antarctica, but the Pleistocene decimation of the flora, geographical and climatic migration barriers (Drake Passage, Antarctic Polar Front, and Antarctic Circumpolar Current), and difficulties in initial colonization by a few successfully delivered diaspores.

BE8

ANTARCTIC MARINA LIVING RESOURCES AND PERSPECTIVES OF THEIR SUSTAINABLE USE. 1. ANTARCTIC KRILL

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Antarctic krill is harvested near South Shetland Islands, South Orkney Islands and South Georgia Island (ANTCOM Subareas 48.1, 48.2 and 48.3). According to CCAMLR-2000, krill resources in the western part of Area 48 in 2000 consisted of 44.000.000 t. Maximum sustainable yield (MSY) was established as 4.100.000 t (XXVI session, Hobart, 2007). MSY-2008 was lowered to 3.700.000 t, but real krill yield in Antarctic part of Antarctic (APA) may not exceed 0.62 million t, as set by ANTCOM to minimize negative outcome for krill-dependent mammals, birds, etc. If the world yield reaches the threshold, the trade must be cancelled, though technically allowed by MSY. World annual krill catch is about 100-130 thousand t (Ukrainian share 15%), and there's a real opportunity to raise it to 600.000 t, Ukrainian share – to 80-100 thousand t. The second region in terms of krill abundance is Division 58.4.2. XXVI ANTCOM session set MSY-2008 here as 2.600.000 t (against previous 450.000 t). Yield threshold is 450.000 t. Krill resources here may be regarded as promising.

World krill catch approaches the threshold and ANTCOM is compelled to speed up developing fishery management. The key moment would be dividing current regions and limiting yield in lesser subunits. Countries are recommended to exploit resources in the open sea where it's unprofitable instead of reducing trade near islands. We consider the distribution of harvest limits through subunits to be unjustified.

Fishery profitability is strongly influenced by vessel fuel consumption, since supply bases are extremely distant. Ukrainian krill-fish supertrawlers (KFST) "Antarctica" are nowadays significantly less efficient than other models. Increase in fuel price inevitably caused decrease in KFST profitability. Therefore, full-scale trade organization should include a number of arrangements (trawlers provision, cooperation with foreign companies specializing in delivering krill-based forage, medical and dietary products, etc.).

BE9

ANTARCTIC MARINE LIVING RESOURCES AND THEIR SUSTAINABLE USE. 2. FISHES OF THE SOUTHERN OCEAN

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Chaenodraco wilsoni. Subarea 48.1 – appr. 100.000 tonnes; Division 58.4.2 – 50-70 thousand tonnes. Sustainable resources revealed in Cosmonaut Sea allow harvesting at 8-10 searched elevations since the end of December till the beginning of April if the ice conditions are favourable. Maximal sustainable yield (MSY) might reach 15-20 thousand tons. Harvesting in Cooperation Sea appears potentially promising.

Trematomus eulepidotus. Division 58.4.2 – appr. 15.000 tonnes; Subarea 48.1 – appr. 6.500 tonnes. There were found (1989-90) sustainable flocks in the Cooperation Sea (oceanic shelf edge between 62 and 65 longitude East), MSY here is 3-6 thousand tonnes. The species was confirmed at Storegg Bank. New flocks are expected to be found in Davis Sea.

Notothenia gibberifrons. Subarea 48.1 – 40.000 tonnes; 48.2 – 20.000 tonnes. Resources are probably prosperous. In the subareas it may be harvested industrially. It is recommended to yield 15.000 tonnes at the shelf of Mordvinov Island (S/a 48.1) and appr. 8.000 tonnes at the shelf of South Orkneys (S/a 48.2).

Lepidonotothen kempfi. Subarea 48.2 – 20-30 thousand tonnes. The species may contribute to 50% of overall catches. MSY in the S/a is 8.000 tonnes.

Chapsocephalus gunnari. Subarea 48.1 – 5-15 thousand tonnes; S/a 48.2 – 10-50 thousand tonnes. The number is likely underestimated.

Pleuragramma antarcticum. Division 58.4.2 – 160-200 thousand tonnes.
Dissostichus mawsoni. MSY set annually by ANTCOM. MSY-2008 for Southern Ocean is 5507 tonnes. Resources are satisfactory. There is no overcatch in any subarea.

Electrona carlsbergi. MSY in Subareas 48.3, 48.4 and 48.6 can be set after trawling regions of fish aggregations. It is assumed that overall yield may exceed 200.000 tonnes annually. In the subareas the catch is estimated as 200.000 – 400.000 tonnes annually.

Notothenia rossii. The biomass of the exploitable part of population in the S/a 48.1 was proved to recover almost to the initial state (in 1980, the yield was 20.000 tonnes).

BE10

SEALS MONITORING IN THE ARGENTINE ISLANDS ARCHIPELAGO AREA

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For the first time since the foundation of Ukrainian Academician Vernadsky Antarctic Station, a theriological study of maritime mammals was conducted at the Argentine archipelago and adjacent waters. Additionally, all relevant fragmentary data gathered by earlier biologists in the region in winter, were analyzed. Besides route surveys and counting from boats, we studied craniology and coprology of seal remnants, development of newborn pups (they were marked with 12% cremoxyd to determine their biotopical distribution at the Argentine archipelago and migrations). There were found in the region 5 of 6 Antarctic seal species, one of them (*Arctocephalus gazella*) belongs to family Otariidae, four – to family Phocidae (*Lobodon carcinophagus*, *Leptonychotes weddelli*, *Hydrurga leptonyx* of subfamily Monachinae and *Mirounga leonine* of subfamily Cystophorinae). Two most numerous species *L. carcinophagus* and *A. gazella*, may be used as quantitative krill indicators in the region when estimating its resource potential. Coprological analysis of all species showed that *A. gazella* at the Argentine islands feeds mainly on krill species *Euphausia superba* (97,2% of faeces contents), while trophic studies of *L. weddelli* revealed a new large (up to 44 cm) commercial squid species *Psychroteuthis glacialis*. *L. weddelli* newborn pups appeared to be relatively large and heavy in comparison with data in the literature. Therefore, food supply of pregnant *L. weddelli* females in the region, mainly krill (70%), appears sufficient and nutritious enough. The results are of importance not only for estimation of the actual state of Antarctic ecosystem and biodiversity conservation on Earth, but also may be used as grounds for future state management plans on rational use of krill and squid resources in the region of Antarctic.

BE11

MOLECULAR COLD ADAPTATION IN ANTARCTIC PROTOZOAN CILIATES

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The freezing coastal waters of Antarctica host a huge variety of protozoan ciliates, among which *Euplotes* species are quite common and easy to isolate and expand into laboratory cultures that represent optimal experimental material to study cold-adaptation in eukaryotic organisms. In this context, more attention will be focused on two species, *E. focardii* and *E. nobilii*, that are studied at molecular level for distinct cold-adaptive aspects. *E. focardii* has been found to represent a (quite exceptional) heat-shock unresponsive organism, consistently with its tight psychrophilic behaviour.

Recent experimental evidence suggests that the primary cause of this unresponsiveness resides, rather than in some specific modifications (mutations) of the heat-shock gene structure, in the incapacity of specific transcriptional trans-activating factors to bind effectively regulatory elements of the gene promoter region. *E. nobilii*, like two other *Euplotes* species (*E. raikovi* and *E. octocarinatus*) of temperate waters, has been found capable to secrete constitutively a family of signal proteins (pheromones) into the extracellular environment. Some members of this cold-adapted protein family have been isolated and their three-dimensional conformations were determined by NMR spectroscopy (in collaboration with the laboratory of Prof. Kurt Wuthrich). They show to have retained a common core of three helices that ensures a long-range and long-lasting pheromone activity, and to have adaptively evolved unique, extended non-structured regions. Together with increased concentrations of negatively charged side-chains on the molecular surface, these regions improve, locally and globally, the flexibility and breathing of the molecular structure, and thus help pheromone docking and binding to target cell-surface receptor proteins.

BE12

ANTARCTIC REGION IS THE CENTRE OF ORIGIN OF PISCICOLID LEECHES

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The first information on Antarctic fish leeches came from W.A. Harding who published in 1922 a short paper based on an examination of leeches collected by the *Terra Nova* Expedition of the same year. The author assigned this species to a new genus and named it *Cryobdella levigata*. After this a number of new species were described by J.P. Moore, K. Brinkmann, M.C. Meyer, R.T. Sawyer, E.M. Bureson, V.M. Epshtein, A.Yu. Utevsky and others.

Today, 21 species of fish leeches from the Antarctic Region (Hirudinea: Piscicolidae) assigned to 13 genera have been recorded. All the genera except for *Pontobdella* and *Austrobdella*, are endemic and do not overrun the Circum-Antarctic Current. *Pontobdella tasmanica* and *Austrobdella translucens* were originally found in the Australian waters and later in Antarctica.

The leeches are parasites of benthic fishes and invertebrates. Antarctic leeches occur from the littoral to more than 4000 m depth and may be classified into both stenobathic and eurybathic species. Phylogenetic relationships of 26 species (including 7 Antarctic) from 3 subfamilies of the piscicolids were investigated using 4 mitochondrial and 1 nuclear DNA sequences. Analyses recovered one of three subfamilies (Pontobdellinae) as non-monophyletic. Two of the genera of the subfamily (the Arctic *Oxytonostoma* and the Antarctic *Moorebdellina*), being very similar in the external characters and the organization of the coelom, did not form a monophyletic group and showed weak affinities to other piscicolid taxa. *Trachellobdellina glabra* and *Nototheniobdella sawyeri*, in spite of the presence of pulsatile vesicles, a distinguishing feature of the subfamily Piscicolinae, do not group at all with members of this subfamily. Based on the basal position of the giant Antarctic *Megaliobdella szidati*, it is hypothesized that the putative ancestor of piscicolids was a free-ranging, large bodied, muscular leech. Antarctica emerges as a possible centre of origin of fish leeches. Alternatively, the Antarctic Seas can be considered as a refuge for "primitive" species.

BE13

TOXIC ELEMENTS IN ANTARCTICA TOP PREDATORS

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Concentrations and distribution of trace and toxic elements in organs, tissues, embryo and guano of Gentoo (*Pygoscelis papua*), organs and tissues of brown skua, crabeater seal and Nototheniidae fish collected on Livingston Island, South Shetlands, Antarctica are presented. The elements As, Co and Mn were evenly distributed in the bodies of top predators. Sr and Ni are maximally accumulated in bones, teeth and feathers. Pb, Cd and Zn tend to accumulate in higher levels, in kidneys and spleen. Generally, higher concentrations of the toxic elements were found in the liver and kidneys than in other tissues.

Nototheniidae fish are a part of the diet of top predators. They accumulate in higher concentrations in their bodies Cd and Pb. The measured concentrations of Cd were relatively high due to the Cd-enrichment of the Antarctic marine food net.

The obtained data could serve as a starting point for broader investigation of the possible changes in the ecosystem of Antarctic Peninsula under climate and environmental changes. Further results will help in increasing the base-line data on potential pollutant in Antarctic.

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BE14

ON THE SPECIES COMPOSITION OF ICEFISHES (PERCIFORMES: CHANNICHTHYIDAE) IN THE KERGUELEN ISLANDS AREA (SUB-ANTARCTICA)

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The Antarctic icefishes *Channichthyidae* includes 11 genera and, according to my data, about 25 species; of these, 7 genera and 11 species have been recorded from the high-latitude area of the Indian Ocean sector of the Southern Ocean. In the Sub Antarctic region of the Kerguelen Plateau and the Kerguelen-Heard Submarine Ridge Area the *Channichthyidae* is represented by two genera — *Champscephalus*, with a single species *C. gunnari*, and the endemic genus *Channichthys*, which, according to my data, comprises of 9 species, of which 2 species still not described.

The first three species: *C. rhinoceratus*, *C. rugosus* and *C. velifer* were discovered by Richardson (1844), Regan (1913), and Meissner (1974) respectively. Subsequently, the two latter (probably by the mixing material including unrecognized different species) were synonymized with *C. rhinoceratus* by Hureau (1964) and Iwami and Kock (1990) accordingly. In his revisions, Shandikov (1995a; 1995b and 1996) described 4 new species (*C. panticapaei*, *C. irinae*, *C. bospori*, and *C. aelitae*), confirmed the specific validity of *C. velifer* with a redescription of the holotype, and described *C. aff. rugosus* — a form presumably conspecific with *C. rugosus*. Redescriptions of the type specimens of *C. rhinoceratus* and *C. rugosus* lately published by Balushkin (1996) confirm the specific validity of *C. rugosus*, as well as the fact that *C. aff. rugosus* and *C. rugosus* are conspecific. The taxonomic status of *C. normani*, described by Balushkin (1996), considered at present paper as a junior synonym of *C. panticapaei*.

Meanwhile, up to the present time some biologists do not accept the taxonomical changes in the genus *Channichthys* being firmly convinced in extraordinary “phenotypic plasticity” of a single — *C. rhinoceratus* (Kock 2005) or two species only — *C. rhinoceratus* and *C. velifer* (Duhamel et al., 2005). Besides its morphological differences species of the genus *Channichthys* differ by features of its reproduction cycles and feeding. All nine *Channichthys* species can be considered in evolutionary trends as a good example of wide intraspecific adaptive radiation to the narrow trophic niches — from typical benthopiscivorous species to semipelagic piscivorous and pelagic zooplankton consumers.

BE15

PLANTS AS INDICATORS OF ENVIRONMENTAL CHANGE IN THE ANTARCTIC PENINSULA REGION

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Rapid regional warming is occurring within the maritime Antarctic, along with changes in other biologically important variables. The record from Vernadsky (formerly Faraday, Argentine Islands) has been central in the description of these trends, with analogous evidence available from as far south as southern Alexander Island, and as far north as the South Orkney Islands. The trends at various locations have differences with important biological implications. That at Vernadsky indicates warming predominantly in winter, advancing the onset of biological activity in spring, and delaying it in autumn. Signy Island is dominated by summer warming, allowing increased activity (growth, reproduction), but possibly increasing stress through desiccation. There is an urgent need for better description and understanding of the linkage between macro- and micro-climatic variation, and of its impacts on biological function.

The most frequently reported biological consequence of these changes has been the 'rapid expansion' of the two flowering plants native to the region, again based initially on detailed studies carried out in the Argentine Islands. Factors underlying this expansion include increased establishment and growth, and increased seed production. However, there is a wide misconception that the species' biogeographical range in the Antarctic Peninsula region has expanded. This is not the case, while our ability to assess this is currently limited by the level of survey data available from locations near to the currently described range limits. This will be illustrated by reference to recent survey data extending the range of both plant species by approximately 100 km southwards and 500 km westwards. The urgent need for research programmes monitoring both the large-scale distribution and smaller-scale biological responses of these two key indicator species is clear, as is the need to expand such studies to include elements of the dominant cryptogamic vegetation of this region.

BE16

ON THE EXPANSION OF THE SEVERAL BIRD SPECIES NATURAL HABITATS TO SOUTH IN THE GRAHAM LAND REGION

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Analysis of original observations and data in the literature showed that settlements of three bird species of the Western coast of Graham Land tend to expand southward at islands of Penola Strait and adjacent ones.

Pygoscelis papua. In the end of XX century the most southern nesting site of the species in the region was situated at the Petermann Island (65°11'S; 64°10'W). In 1909 there nested 75 pairs (Gain, 1914), in 1971 – 480 (Muller-Schwarze C., Muller-Schwarze D., 1975), in 1982 – 375 (Airey, 1982), and during the season of 1998-99 we noted about 850-1000 pairs. It seems therefore that the nesting numbers of Gentoo Penguin at this most southern (before our research) site increased since the beginning of the XX century. In the first years of XXI century we registered a first, unsuccessful, nesting of 3 pairs at the Galindez Island near Ukrainian Antarctic Station “Academician Vernadsky” (65°13'S; 64°21'W) and during 2002-2003 Austral summer the nesting colony here consisted of 15 pairs. Three of them have successfully raised one chick each.

Pygoscelis antarctica. The most southern valid nesting site of the species in the region was Anvers Island and those adjacent. During 1997-98 Austral summer there were found 2 nests of Chinstrap Penguin at Yalour Islands (Penola Strait, between Argentine Islands and the Western coast of Antarctic Peninsula. Each contained a nestling in its second downy coat.

Chionis alba. The most southern valid nesting site of the species is situated at the Petermann Island, where nesting was initially registered by S.A. Loparev (January 2001) and confirmed by author in March, 2004. The species probably nests sporadically at the adjacent Argentine Archipelago: at the northern part of Uruguay Island and admittedly at the Galindez Island.

BE17

CHROMOSOME ABERRATION IN LYMPHOCYTES OF UKRAINIAN ANTARCTIC WINTERERS BEFORE AND AFTER EXPEDITIONS

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The Antarctic conditions cause alterations of many physiological functions of human organism (cardiovascular, immune, endocrine systems). However, genetic after-effects of the long-term sojourn in Antarctica are still nearly obscure.

We studied the levels of chromosomal instability in lymphocytes of participants of VI-X (2000-2006) Ukrainian Antarctic expeditions (UAE) before and after sojourn at Vernadsky station. Blood samples for chromosome assays were obtained from the group of candidates (54 healthy men) for VI – X UAE during medical examinations before expeditions and immediately after their return to Ukraine. To evaluate remote after-effects of the long-term residence in Antarctic stations the re-examination was carried out for 12 winterers one year after return.

The average level of chromosomal aberrations (CA) before expeditions was 1.88 ± 0.1 per hundred metaphases (PHM). After return the average level of CA in lymphocytes of polar staff increased and was 3.53 ± 0.26 PHM. The growth of CA level was statistically significant ($p < 0.05$). The significant increase of the CA level after the expeditions indicates the presence of factors in Antarctica, which influence the human genome. Found stable tendencies of chromosomal aberration rise for each expedition suggest uniformity of these factors. An analysis of the spectrum of the aberrations after expeditions showed no alterations of the ratio of chromatid to chromosomal types of aberration. This indicates that neither chemical nor physical mutagens can be considered as essentially more important damaging factors in Antarctica. One year after the winterers return to Ukraine, the increased level of CA remained constant. This finding suggests that Antarctic genetic after-effects may have prolonged manifestations and a monitoring of the CA level should be managed for all winterers to evaluate real genetic impact of the long-term sojourn in Antarctica.

BE18

**HUMAN IMPACT EVALUATION ON ANTARCTIC HERB TUNDRA
FORMATION OF ARCTOWSKI ICE-FREE AREA**

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Arctowski ice-free territory (King George Island) is the region where native ecosystems (mainly Antarctic herb tundra formation) that are partially included in ASPA 128 are subjected to tangible human impact. Also, the territory is successfully invaded by an alien vascular plant – *Poa annua*. In order to determine impact of various human activities on the native ecosystems, we studied soil and phytocoenological features of local Antarctic herb tundra formation at study plots where there was known human activity, and at those where no such activity was reported. Human impact at the station includes building, housekeeping, transport, research and tourism. It was shown that these activities gradually ruin Antarctic herb tundra formation: both total cover of the coenosis and individual cover of both native vascular plants decreased, as well as the biodiversity of mosses and lichens; the tundra becomes susceptible to invasion (of *P. annua* in particular). Also, there was found some recolonization of area that is mostly influenced by housekeeping; *Colobanthus quitensis* has spread considerably along the road to Point Thomas. The species has overall higher germination abilities than *Deschampsia antarctica* (up to 25% pregenerative plants in a population). Anthropogenic influence can shelter the native plants from winds and subtly change the morphology of *D. antarctica* and *C. quitensis*. Recolonization combined with invasion result in various coenoses including *P. annua* that should be monitored annually since climate variations may well dampen or boost the species success. Research activity (namely, sampling and trampling) doesn't seem to be above the ecosystems' compensatory abilities.

Comparison of “native” and “anthropogenic” soils that are close in origin and proximity showed wide variation in pH, biogens, microelements and heavy metals, probably due to transport activity. Restricting human activity, *P. annua* invasion regulation and distinguishing between annual variations and overall tendencies require regular annual monitoring of the area.

BE19

THE UKRAINIAN DATA CONCERNING A FEED AND OBJECTS OF FOOD OF SOUTHERN MINKE WHALES AS THE BASIS OF THE MONITORING OF CHANGE OF TROPHIC STRUCTURE AT SOUTHERN OCEAN

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The minke whale (*Balaenoptera acutorostrata*) is currently the most numerous baleen whale of the Southern Hemisphere. Minke whale's part in the total whale's withdrawal of krill is currently more than 90%. Knowledge about the diet of this species can be of great interest in studying trophic relations in the Antarctic ecosystem. Researches of changes which have occurred in Antarctic pelagial trophic structure in consequence of climatic changes and krill superfluous withdrawal, which in a feed of many species is now replaced with other kinds of crustaceans, are especially important.

This paper presents research on feeding and the dietary structure by species of minke whales, conducted on board the whaling fleet *Sovietskaya Ukraina* during the 1982/83 - 1985/86 seasons. These results are among the fullest sets of data and can serve as a starting point for comparison with a present condition.

The dominant species in the diet of Antarctic minke whales is Antarctic krill (*Euphausia superba*). Minke whales have no feeding selectivity on size indication of *E. superba*. The whales can be fed on various size groups *E. superba* presented in accessible for them water horizon. So, more important factor is not the size of krill but denseness of krill congestions.

In total, 10 species besides *E. superba* (4 *Crustacea* species and 6 fish species) have been registered as dietary components of minke whales in high latitudes of Antarctica.

With the exception of *E. superba*, the role of all others organisms in the diet of minke whales in the Antarctic was very insignificant, and less than would be expected based on the results of hydrobiological research and krill trawls. It is obvious that in comparison with trawls, minke whales display a much higher degree of selectivity.

It is expedient to obtain modern similar set of data about a feed of whales that will allow to reveal displacements in a trophic network of Antarctic pelagial, caused by excessive krill withdrawal, and to find possible compensatory mechanisms on highest levels of a pyramid.

BE20

CETACEANS OF THE ANTARCTICA, WHALING AND INVESTIGATIONS

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Seven whales species were conducted whaling from 1904 till 1987: *Physeter catodon*, *Eubalaena australis*, *Balaenoptera musculus*, *B. physalus*, *B. borealis*, *B. bonaerensis* and *Megaptera novaeangliae*. Before II World War in the World Ocean were 34 flotillas with mother-ship in each. In the second half of XX century two Soviet huge mother-ship based on Odessa. Only *B. bonaerensis* resides in South Ocean waters all-the-year-round.

Commercial whaling in the Antarctica finished in 1987 when International Whaling Commission (IWC) introduces Moratorium for the whaling after depleting of stocks some Antarctic whale species. Illustrating for that is two thousands blue whale individuals what living now in the Southern Hemisphere.

Before Moratorium Ukrainian scientists led research aboard whaling mother-ships and whaler-ships. Attendant observation for the whales in Antarctic waters conducted by our scientists from boards of the fishing and research vessels. After 1991 Ukrainian scientists lacks possibility to investigate whales.

Whaling, protection and supporting of scientific research are accomplished by IWC that was founded in 1946. At present time 77 countries are members of IWC. It's about half of United Nations members. Some of IWC members are not connected with Oceans and Seas: Austria, Switzerland, San Marino, Mongolia etc. Independence of Ukraine in 1991 automatically was entail to leave the member of IWC. Ukrainian scientists each season to conduct scientific observations aboard fishing vessels in the Southern Ocean including observations of the whales in the frame of CCAMLR scientific observation scheme and observations in the frame of Ukrainian Antarctic Expeditions. It is possible to start a new phase of Ukrainian scientific research in the Antarctica and to get the IWC membership for Ukraine.

BE21

DOES THE LIFE HISTORY AFFECT THE ABILITY OF ANTARCTIC FISH TO COPE WITH CLIMATIC CHANGES? – POPULATION GENETIC APPROACH

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Ongoing climatic change poses challenges to many organisms and is expected to dramatically affect polar ecosystems. Modelling of organism distribution in dependence on environmental parameters is a useful way to predict the impact of climatic changes on polar biota. In this study, we adopted a different, retrospective, approach based on comparative phylogeography and sequencing of mitochondrial and nuclear genes. By comparison of Quaternary demographic histories of four Trematomid species (Perciformes: Notothenioidei), differing in life histories, we addressed a question how did benthic and pelagic species react on repeated glacial advances-retreats during the Pleistocene.

Demographic analyses suggested a recent population expansion in benthic species (*Trematomus bernacchi*, *T. pennelli*) likely related to the Holocene retreat of the glacier from the shelf. Their populations were also significantly structured. Contrastingly, the populations of pelagic feeders (*T. newnesi*, *Pagothenia borchgrevinki*) were in apparent panmixia and either did not deviate from constant-size model or suggested that the onset of major population expansion by far predated those of the benthic species and that pelagic organisms flourish during glacial maxima. Similar pattern was apparent even when comparing previously published data on other Southern Ocean organisms, suggesting important role of life history in the response of organisms to climatic changes. Our results also suggest higher susceptibility of benthic organisms to population fragmentation and putatively to allopatric cladogenesis, which might have been promoted during the glacial maxima.

BE22

SPATIAL ANALYSIS OF POTENTIAL CONFLICTS BETWEEN VISITORS AND FAUNA AT FILDES PENINSULA (KING GEORGE ISLAND, ANTARCTICA)

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Due to its vicinity to South America, the existence of a number of permanent stations, an airstrip as well as save anchoring sites for ships, the 30 km² Fildes Peninsula is the logistic hot spot for the South Shetland Islands. Its wildlife on land is affected by three main categories of visitors: tourists, station members and governmental delegations. Thus four types of visitor access to the area can be differentiated in the region:

Ship (& land): Visitors enter the area by sea through Maxwell Bay and ships, sometimes land visitors.

Air & land: Visitors are flown in and spend time on land, not at sea.

Air & ship & land: Visitors are flown in and out and spend time on land and sea (fly-cruise tourism).

Land: Visitors who live in the area for several months and use land, sea and air for recreation.

Exemplarily, this study shows how potential conflict zones between on-foot visitors and fauna can be derived by GIS-based spatial analysis.

We defined a visitor pressure index to express both the number of visitors and the frequency of visits. This we set in relation to the local fauna using a wildlife index. The wildlife index contains information on the spatial distribution of the 13 species of breeding birds and the four species of resting seals in the area over the time span of three seasons.

Because of the different geometry of the data we used a vector-raster-conversion for data preparation and analyzed the results on a cell-by-cell basis with a resolution of 500 m. Finally the indices for visitors and wildlife were combined to obtain a parameter expressing the conflict potential between visitors and wildlife. With this kind of analysis a spatial differentiation can be done, to develop detailed management strategies for such multiple used areas.

BE23

BASIC BIOLOGICAL RESOURCES OF THE HIGH-LATITUDE SEAS OF THE SOUTHERN OCEAN AND THEIR EFFICIENT USE

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High-latitude Seas of the Antarctic characterized by peculiar high biological productivity and short open from the ice covering season. Huge phytoplankton biomass in the vegetative (solar) period of the Southern Hemisphere permits to develop for marine animals in the enormous quantities. Next trophic level – zooplankton provides for food consumers of highest levels: squids, fishes, birds, baleen whales and seals.

The active exploitation of the biological resources of high-latitude seas of the Southern Ocean begun more than 40 years ago: whales and the next krill and fish. At the same time, the researches of commercial species resources had begun that eventually discovered great supply of new commercial species and some new potential fishing grounds.

At present time, quite small part of biological resources utilized. Catch of krill per year is less than 100000 tons, fishes – less than 5000 tons, baleen whales – less than 800 heads. Fishing and whaling in the Southern Ocean regulated and controlled by international organizations: Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) and International Whaling Commission (IWC).

CCAMLR permits to fish some millions tons of krill (*Euphausia superba*) per year. Estimated fish stock for the high-latitude Antarctic seas are some hundreds thousands tons. Huge biomass of cephalopods (including giant Antarctic squid *Mesonychoteuthis hamiltoni*) practically not investigated and not used by the human.

BE24

THE TRANSPORT, PARTITIONING AND FATE OF THE PERSISTENT ORGANIC POLLUTANTS IN ANTARCTICA

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By virtue of its geographical isolation and unique meteorological conditions, Antarctica provides unparalleled opportunities for monitoring the long-range transport of air pollutants. Since 1960s, persistent semi- or low-volatile organic pollutants (POPs), such as chlorinated pesticides, polychlorinated biphenyls, dibenzo-p-dioxins and dibenzofurans were found in the abiotic compartments of Antarctica and its biota. The introduction of the compounds to Antarctica and the Southern Ocean comes entirely from extra-regional sources.

The POPs emitted in warmer, mid-latitude climates make their way to the Antarctica via atmospheric streams. Being much colder at the pole, they condense out of the atmosphere and settle there in large quantities, in the water, snow, ice, soils, sediments and biota.

The patterns for transport of the POPs to Antarctica, the latitudinal, seasonal and spatial variations of their content in air, the temporal variations in air, seawater, snowpack and sea ice have been studied. The temporal declines of the POPs level in the mobile compartments of Antarctic environment reflect the global declines in use and emission of the contaminants in Southern Hemisphere.

The partition coefficients for POPs at typical temperatures in Antarctica and Southern Ocean are calculated and they are used to estimate the partitioning of the POPs between atmospheric particulates and gas phase, scavenging the POPs from gas phase by snow flakes, atmospheric persistence of the POPs, the direction and strength of air/seawater, air/snow, air/soil and seawater/sea sediment fluxes for the POPs in Antarctica. The air/soil and seawater/sea sediment fluxes of POPs are agreed with the "cold condensation" hypothesis. The deep water in Weddell and Ross Seas, the shelf sediments and the Antarctic snowpack would be important sinks for the POPs. The glaciers melting in Western Antarctic Peninsula under current global warming would be essential source of the POPs secondary emission into the aquatic ecosystems in the present and in the future.

BE25

GENETIC VARIABILITY IN FOUR GENTOO PENGUIN POPULATIONS (*PYGOSCELIS PAPUA*)

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A portion of the mitochondrial D-loop region (475 bp) was sequenced for 108 Gentoo penguins sampled in 4 breeding colonies from the Livingston (n=26), Petermann (n=24) Islands (Antarctica) and sub-Antarctic islands: Kerguelen (n=37) and the Falklands (n=18). The sequenced region contained 89 variable sites which defined 64 haplotypes (haplotype diversity Hd: 0,987). None of the individuals appeared to be heteroplasmic. The most common haplotype was detected in only 6 of the samples from Kerguelen. In the Livingston population, the Hd was 0,98 and contained 21 haplotypes. In the Petermann population we observed a Hd of 0,95 and 25 different haplotypes. The Hd registered in Kerguelen was 0,94 resulting in 18 haplotypes. In Falklands we defined 15 haplotypes (Hd: 0,91). The calculated Tajima's D for all sampled populations were negative (between -0,4 and - 1,35 , $P > 0.10$, not significant). In contrast to the two Antarctic populations, the haplotypes of the sub-Antarctic Gentoo have diverged stronger. There was little evidence of divergence between populations at the Antarctic (Livingstone and Petermann) and Populations at Falklands (Fst: 0,67) whereas the samples from Antarctic populations differed significantly from the population in Kerguelen (Fst: 0,85). The maximum likelihood phylogeny showed a separation in two major clades (Kerguelen on one hand, the Antarctic Peninsula + the Falklands on the other hand) supported by high bootstrap values (97% and 70% respectively). The Antarctic populations and the Falklands formed two consistent subclades, although supported by lower bootstrap values (31% and 68%). This highlights the existence of three distinct biogeographic zones in the Southern Ocean, with clear separations between the populations from the Atlantic and from the Indian Oceans, and from the Antarctic and the sub-Antarctic zones of the Atlantic. These results also confirm the subspecific status of *Pygoscelis papua ellsworthii*, but reveals that *Pygoscelis p. papua* is polyphyletic. A revision of the taxonomy of the species will be necessary.

The research is supported by Grant B 16-15/2006 from the Bulgarian National Science Fund.

***Atmosphere
and
Near-Space Physics***

ANSP1

THE SOLAR WIND INFLUENCE ON ATMOSPHERE PROCESSES IN WINTER ANTARCTICA

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Galactic cosmic rays altered by the solar wind are traditionally regarded as the most plausible agent of the solar activity influence on the Earth's atmosphere. Meanwhile, it is well known that severe reductions in the galactic cosmic rays flux, known as Forbush decrease (FD), are caused by the solar wind of high speed and density, which sweeps the galactic cosmic rays on its way. Since the FD beginnings are registered at the Earth's orbit simultaneously with dramatic disturbances in the solar wind, the atmospheric effects, assigned to Forbush decreases, can be, in reality, result of the solar wind influence on the atmospheric processes. The paper presents the summary of the experimental results demonstrating the strong influence of the interplanetary electric field on atmospheric processes in the central Antarctica, where the large-scale system of vertical circulation is formed during the winter seasons. The influence is realized through acceleration of the air masses, descending into the lower atmosphere from troposphere, and formation of cloudiness above the Antarctic Ridge, where the descending air masses income into the surface layer. The acceleration is followed by sharp increase of the atmospheric pressure in the near-pole region, which gives rise to the katabatic wind strengthening above the entire Antarctica. The cloudiness formation is resulted in the sudden warmings in the surface atmosphere, since the cloud layer efficiently backscatters the long wavelength radiation going from the ice sheet, but does not affect the adiabatic warming process of the descending tropospheric air masses. When drainage flow strong strengthening the circumpolar vortex about the periphery of the Antarctic continent decays, the surface easterlies typical of the coast stations during the winter season are replaced by southerlies and the cold Antarctic air masses rush in the Southern ocean.

ANSP2

WEATHER SENSITIVITY OF SPORADIC STRUCTURES IN THE IONOSPHERE OVER THE ANTARCTIC PENINSULA

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The tropospheric weather impact on the excitation of sporadic ionospheric structures, namely, sporadic E layers and spread-F, over the Antarctic Peninsula is considered, based on the experimental data obtained at the station *Akademik Vernadsky* in 1993 through 2005. The study has been carried out through analyzing the conditional probabilities of appearance of the ionospheric phenomena for various weather conditions.

It has been found that the probability of detecting both the spread F and sporadic E layers is higher in the presence of cyclonic and frontal activity during the winter time. On the contrary, in the summer the weather has no influence on the sporadic structures. In the winter, these spread-F phenomena as well as sporadic E layers were observed more often during the periods of low surface pressure. Hence, it suggests that the level of ionospheric disturbances increases both in E- and F-regions over the low pressure areas. The observation probability of the spread-F effect and semi-transparent sporadic E layers was also increased in presence of North-East wind (associated with frontal activity). However, the probability of appearance of the dense sporadic E layers was decreased at the frontal activity.

These experimental facts can be interpreted as a result of propagation of atmospheric gravity and planetary (Rossby) waves from the troposphere up to ionospheric heights. Tropospheric cyclones and their frontal zones can be considered as the generators of atmospheric waves transporting the energy upward to the upper atmosphere. The diurnal and seasonal variations in the amount of tropospheric weather impact on the ionosphere are associated with changes in the conditions of internal atmospheric wave propagation through the real nonisothermal atmosphere.

ANSP3

THE FEATURES OF TROPOPAUSE POSITION OVER POLAR REGIONS

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The tropopause height is very important for the troposphere-stratosphere interaction and for other processes in lower atmosphere. Due to this influence, study of the tropopause height space-time variations is necessary. In this work total ozone TOMS data and NCEP-NCAR reanalysis data are used to compare troposphere and stratosphere temperature, geopotential height and total ozone content with tropopause height over polar regions. Meridional tropopause profiles, ozone and air temperature differences in the Southern and Northern Polar Regions show distinctions between troposphere and stratosphere influence on tropopause height. Stratosphere temperature differences between Southern and Northern Hemispheres have been determined. In particular, spring Antarctic stratosphere is colder than Arctic one. Ozone Hole existence results in the cooling of the lower stratosphere over Antarctica in average by about 10K. This causes significant elevation of the spring tropopause in the Southern Hemisphere relative to the Northern Hemisphere's one. The values of anomalous tropopause height increasing are calculated. The spatial location of the highest tropopause at the polar latitudes is determined. Possible effects of Antarctic tropopause seasonal changes concerned with the dominance of the stratospheric influence are discussed.

ANSP4

**QUASI-STATIONARY PLANETARY WAVES IN OZONE DISTRIBUTION
IN POLAR REGIONS**

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The quasi-stationary planetary waves in ozone distribution in the high latitudes of Northern and Southern hemispheres are investigated. Version 8 of TOMS total ozone satellite data is used for a visualization of variations of the longitudinal ozone distribution. Time vs. longitude plots (Hovmoller diagrams) for the 1979–2004 years were created for 60N and 60S latitudes. Longitudinal profiles, averaged over three month period, were analyzed to determine the main characteristics of the quasi-stationary wave in total ozone content. Seasonal variations of the amplitude and phase values are compared for Arctic and Antarctic regions. The quasi-stationary planetary wave 1 is prevailing in the Ozone Hole region during Southern hemisphere spring. Wave 1 is also predominates In Northern hemisphere, although wave 2 dominates in separate years. The maximal disturbances in total ozone caused by planetary waves in Arctic region are observed in a winter-spring period (January-March). These differences in ozone distribution can impact on tropopause height variations by changing the lower stratosphere temperature regime. Long-term changes of quasi-stationary wave characteristics are discussed.

The research was partly supported by National Taras Shevchenko University of Kyiv, project 06BF051-12.

ANSP5

ZONAL ASYMMETRY OF TOTAL OZONE CONTENT AND OTHER LOWER ATMOSPHERE PARAMETERS ABOVE ANTARCTIC REGION

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There is a hypothesis on the stratosphere processes influence on troposphere parameters and climate (Ozone Hole, decreasing temperature of stratosphere). The existence of the longitude asymmetry in ozone distribution was found in early works. In addition, there is a tendency that a circumpolar vortex disappears in summer later in the last years. Using the position and circumpolar vortex «strength» data as well as TOMS ozone measurements we investigated connection of total ozone content distribution with vortex asymmetry. Possible mechanism – strong zonal wind above the region of ozone minimum produces the removal of ozone, which arrived in meridional Brewer-Dobson circulation from lower latitudes, weak wind in area of maximum – promotes better settling and accumulation of ozone.

Difference between the peak values of wind on 10 hPa level in August-October is 50-70 m/sec. For this study the database was created of fields of wind, temperature and total ozone distribution. The vertical distribution of these parameters was studied and the heights with the maximal influence were found. For wind, temperature, total ozone on heights 10, 50, 100, 600 hPa the zonal distribution was built, and the correlation dependences were found. The results of analysis of wind, temperature, and total ozone zonal-height distribution are discussed.

ANSP6

AURORAL DISTURBANCES AS AN INDICATOR OF DEVIATIONS IN GPS DATA IN POLAR REGIONS

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This review is designed to determine the temporal development of GPS signal deviations in Arctic and Antarctic regions during magnetic storms. The data sets consisted of Antarctic network of GPS receivers data, published before and own measurements by GPS receiver in Murmansk in 2006-2007. Satellite images of auroral oval and low light ground-based camera data also widely used in the report to show significance of auroral activity for GPS signal deviations. Diurnal variations of polar patches activity associated with TEC fluctuations observed in Antarctic stations (Mawson, Davis, Mac-Murdo and Casey) compared with positions of the auroral oval. This comparison, as well as data obtained in the North Hemisphere permits us to make conclusion that level of fluctuations of GPS signal strongly depends on auroral oval position and appearance of auroral forms.

Temporal and spatial variations of the GPS data including data on position of receiver in geographic coordinates and its altitude in Murmansk compared with auroral and geomagnetic variations in the Barents region by ground-based optical and magnetic measurements and satellite optical data. Hard ware (GPS Garmin 128, GPS Garmin 172) and soft ware, used during experiments, allow us to get positioning information and to make all needed calculations to estimate relationship between position and intensity of aurora and deviations in GPS positioning data. It shows dependence of deviations of received GPS parameters on auroral activity with the high temporal and spatial resolution. Deviation values can reach ~100 and more meters in cases under discussion. Possible advances of above discussed experimental work in Arctic and Antarctic are presented.

ANSP7

USING THE ELECTRONIC GEOPHYSICAL DATABASE FROM STATION AKADEMIK VERNADSKY FOR THE ANALYSIS OF ALFVÉN RESONANCE OBSERVATIONS

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Ukrainian Antarctic Station *Akademik Vernadsky* has a unique set of facilities for diagnosing the upper atmosphere, ionosphere and magnetosphere of the Earth. The data arrays collected can be effectively used for studying physical processes in the near-Earth plasma in the framework of Space Weather related programs. Advantages of Station Vernadsky, as the geophysical observatory, are following: a highly suitable geographic location; year-round, twenty four hours a day operations, and a nearly total absence of local interference. To improve the effectiveness of the research, an integrated electronic geophysical database was started at the station in 2005.

The present paper describes the structure and general operational principles of the database. It includes the data sets collected by a weather station, an ionospheric sounder system, a geomagnetic observatory, and coil magnetometers Lemi112 and Lemi112A operating in the ELF waveband. Both raw records and some pre-processed results are stored. The software environment used to develop the database was mainly the *Matlab* programming language. The *Matlab* is a powerful tool highly suitable for data processing because of the great variety of in-built scientific libraries and algorithms. To illustrate the benefits offered by the database for complex data processing, an analysis of ionospheric Alfvén resonances observed in Antarctica is discussed. The data sets from the ELF waveband coil magnetometers, the geomagnetic observatory and a digital ionosonde have been used. The basic diurnal and seasonal regularities shown by the resonance parameters have been determined, as well as their dependences upon the level of geomagnetic activity and ionospheric conditions.

ANSP8

OZONE IN TROPOSPHERE: WHAT FOR ANTARCTICA?

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The review of latest results of the troposphere ozone observations was undertaken. It was determined that the troposphere ozone abundance has increased by 60% on average within the last 30 years. About 90% of impact on vegetation which caused by air pollution is explained by presence of ozone in the ground layer. As to the human being, the respiratory ways are mainly subjected to the harmful effect of ozone. There are also some experimental data that the liver, central nervous system, blood and endocrine system could be subjected to ozone influence not only as a strong poison but also as the mutagen and carcinogen.

The troposphere ozone increasingly contributes to the greenhouse effect. According to current theory of the troposphere ozone budget, photochemical production and stratospheric flux are principal sources of ozone, which are balanced by photochemical destruction and surface deposition. The photochemical production of ozone is mainly limited by availability of nitrogen oxides, NO_x. In areas where the concentration of NO_x is relatively high, there is net photochemical ozone production. In areas where the concentration of NO is low, such as Antarctica photochemical destruction dominates. To better understand how technical activities of mankind causes not only total ozone in the atmosphere but also its redistribution over the height – it is important to enlarge the network of the ozone-monitoring stations.

The peculiarities of troposphere ozone variations and stratosphere-troposphere ozone interrelations are discussed.

ANSP9

MONITORING OF ATMOSPHERIC PARAMETERS OF THE SECONDARY SPACE RADIATION REGISTRATION IN THE ANTARCTIC PENINSULA AREA

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The establishing of the atmospheric parameters study of the secondary cosmic rays registration in the Antarctic Peninsula area is proposed. The cosmic rays and wide atmospheric showers are partly responsible for the cloud and precipitation formation and could be used to study the regional climate changes, if long-term monitoring will be established. The correlation of the secondary particles vertical flow - muon and neutron - with cloud cover and precipitations will allow studying the cosmic rays impact on weather and climate in the region. The proposed research will be conducted using the scintillation and gas-discharge counter methods of the particle registration and the statistical data processing methods.

The vertical flow of neutrons which has been created in lower layers of atmosphere is corresponded to intensity of the galactic cosmic rays mainly, but the vertical muon flow which appears on 15 – 20 km height, is more sensible to the parameters of absorbing atmosphere layer, such as a mean temperature and pressure. The long-term changes and linear trend of mean atmosphere temperature can be obtained on the basis of the atmospheric pressure and variations of vertical muon flow monitoring, taking into account variations of the primary cosmic rays on the basis of neutron flow variations. These parameters could serve as indicators of regional climate changes. The muon and neutron monitors have been already created and now undergo test observations. The first results of the proposed methods are discussed.

ANSP10

COMPARISON OF THE GROUND-BASED AND SATELLITE TOTAL OZONE MEASUREMENTS OVER THE ANTARCTIC STATIONS

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Comparison of the ground-based and satellite total ozone content (TOC) measurements in the atmosphere over the Antarctic stations Akademik Vernadsky, Rothera, Halley and Amundsen-Scott has been carried out. Similar discrepancy analysis is made using global network of the ground-based ozonometric stations from the beginning of the regular satellite observations (1978). Slowing of the long-term global ozone losses has observed during last decade and recovering of the ozone layer is forecasted for the next decades. Therefore, the accuracy requirements to the ozone change registration are increased, which, in turn, demands the corresponding analysis of mistakes of measurement.

In this work, the EP-TOMS satellite data of 1996-2005 are used. Satellite daily TOC values are taken by the last 8th Version of the algorithm introduced in 2004 and empirically corrected in 2007. Influence of seasonal TOC changes over Antarctic region on distinctions between ground-based and satellite measurements is analyzed. The most persistent features are: 1) significant increase of the dispersion of the relative “satellite – station” difference in the period of the spring TOC decrease and Ozone Hole formation and 2) difference dependence on the TOC level.

ANSP11

PLANETARY WAVES IN TOTAL OZONE DISTRIBUTION AND TROPOPAUSE HEIGHT ASYMMETRY IN CONNECTIONS TO ANTARCTIC PENINSULA WARMING

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The review of recent research of authors on planetary waves in the total ozone distribution in Antarctic region is presented. Climatology of the quasi-stationary wave (QSW) features are analyzed using the TOMS data. The main parameters of the zonal wave numbers 1–5 in the total ozone at the latitudes of 50S - 80S are calculated. The asymmetry of total ozone distribution over Antarctic region during Austral spring is discussed. The planetary wave TOC minimum shift in eastward direction, at about 40 degrees in longitude, was found above Antarctic Peninsula - Weddell Sea area during 1979-2005, whereas the zonal maximum position is relatively stable. This displacement is discussed in connections to latest findings of the strengthening circumpolar westerlies and regional climate warming in Antarctic Peninsula. Long-term shift in the position of the total ozone minimum is confirmed by similar tendency in tropopause pressure zonal structure. However, quasi-stationary zonal anomalies in the troposphere temperature do not have a significant influence on the tropopause structure during spring months, when ozone loss in the lower stratosphere is dominant factor of the thermal regime formation above tropopause. The higher tropopause in West Antarctica coupled with its increasing decadal trend could be involved in climate change in this region. The peculiarities of total ozone distribution and tropopause height are discussed in the connection to troposphere-stratosphere coupling mechanisms (Yang et al. *J. Climate*, 2007, 20(14), 3395-3410). Long-term ozone loss and lower stratosphere cooling produce the strengthening of meridional temperature gradient and intensification of polar stratosphere vortex. The latter caused decreasing of planetary waves penetration to lower stratosphere, which changed meridional circulation and could change the surface wind in the studied region. This probably is in connection to extreme Antarctic Peninsula climate warming which is observed last decades.

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ANSP12

IONOSPHERE TOTAL ELECTRON CONTENT VARIATIONS BY THE GNSS DATA: ANTARCTIC PENINSULA REGION INVESTIGATIONS

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The results of the investigations on the base of GPS observations performed at Vernadsky Station in the region of Antarctic Peninsula are presented. The effect of atmospheric impact on GNSS observations was an object of research in several aspects, in particular, for the study of the troposphere-ionosphere coupling. The wave-like quasiperiodic variations of the total electron content (TEC) in the ionosphere are shown in this presentation. We suppose those TEC variations appeared as the ionosphere response caused by the propagation of troposphere weather front. The variations of TEC with the scale of several hundreds kilometers correspond to mesoscale spatio-temporal ionosphere structures well known as traveling ionospheric disturbances (TIDs) of the electron density. The sources of the TIDs could be ionosphere storms and strong tropospheric disturbances, i.e. weather fronts, typhoons coupled with orography structures. The solar terminator has been surmised as the source of more or less regular ionospheric structures. It is suggested that the weather fronts or/and geomagnetic storms produce disturbances, which break up the regular TEC structure of the ionosphere and create TID. The meteorological data (pressure variations, temperature and wind speed) from the Vernadsky station as well as TID time series for nearest permanent stations were used to identify the front's passage. Maps of autocorrelation function of TEC variations are plotted for individual days both for moderate and severe tropospheric situation. It has been shown that TEC variations are connected with the presence of tropospheric disturbances under comparatively quiet geomagnetic conditions. TEC variations in the diurnal cycle have been found presumably connected with the solar terminator. For verification of the hypothesis about detection of a wave-like ionospheric disturbances the analysis of simultaneous measurements of the critical frequency of F-layer, registered by the vertical sounding of ionosphere at Vernadsky station has been applied. Some examples of the troposphere-ionosphere coupling are shown. The conclusions about opportunity of the stimulation of a wave structures in ionosphere by passage of powerful weather fronts were made.

ANSP13

ADAPTATION OF THE SCIATRAN RADIATIVE TRANSFER MODEL FOR OZONE PROFILES RETRIEVAL FROM SPECTRA OF SOLAR TII SPECTROMETER WITH CCD DETECTION SYSTEM

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A small, compact two-channel spectrometer for a routine zenith sky spectra captions has been installed at Davis Australian Antarctic station during 61-th ANARE summer season, 2007/2008. Range of spectral bounds for these captions (440-560 nm) perfectly fits with short-wave half of the Chappius band of ozone absorption. Photometer is operated via USB interface and automatically performs measurements each 4 hours. Any adjustments to its work can be made through the network access remotely. Due to generally unknown spectral response characteristics of entire spectrometer system (Perspex dome – optical system – CCD detection system) the Differential Optical Absorption Spectroscopy (DOAS) method is used. Therefore all slow changing with a wavelength instrumental influence on the actual spectra detected alongside with Rayleigh and M_i scattering can be easily eliminated by simple subtracting of a polynomial from both measured and modeled spectra.

For future ozone profiles retrieval from these spectral data adaptation of the SCIATRAN radiative transfer model is currently in progress. SCIATRAN is a software package for radiative transfer modeling and retrieval of trace gases, written by Institute of Remote Sensing, University of Bremen, Germany. Due to its initial orientation for UNIX/LINUX workstations a generally extensive process of its installation and compilation must be passed to create native Win32 executable and libraries.

The research was partly supported by National Taras Shevchenko University of Kyiv, project 06BF051-12.

ANSP14

WHETHER THERE IS AN ASYMMETRY IN "SEMI-GLOBAL" OZONE CONTENT IN THE EARTH' STRATOSPHERE?

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As an analog of the global electron content in GPS observations a new parameter – the “global ozone content” (GOC) is proposed to describe the amount of ozone molecules in the Earth atmosphere. However the TOMS or OMI satellite spectrometers do not cover all surface of ozone layer in winter (summer) time in the Polar Regions. Therefore we propose the "semi-global" ozone content parameter (SGOC) to describe the peculiarities of ozone content distribution in the atmosphere. The SGOC is calculated from the total ozone content observations which have been provided continuously since 1979. This parameter is useful to determine existence of the global asymmetry in ozone distribution between north and south hemispheres due to ozone hole appearance since 1980th. The SGOC trends and features of 2002, 1988, and connections to Antarctic ozone distribution asymmetry are discussed in the report.

Meteorology and Climate

MC1

LARGE-SCALE ATMOSPHERIC CIRCULATION IN SOUTHERN EXTRATROPICS AND REGIONAL WEATHER PATTERNS AT ANTARCTIC PENINSULA

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Intensification of cyclonic activity in the Western Antarctic sector (WAS) is detected by means of analysis of mean sea level pressure fields as well as 'etalon' weather patterns ranged on their probability. The most probable weather type comprises low pressure at Bellingshausen Sea as well as subtropic ridge east of the Antarctic Peninsula. Deepening of cyclones in the Bellingshausen Sea determines regional weather settings creating prevailing west-northwest advection of warm and wet air towards Graham Land, along with cutting the inflow of cold continental air. Predominant cyclonic circulation determine unstable weather with air temperatures above the climatic normals in both summer and winter, with moderate or strong winds (stronger in winter), mixed or rainy precipitation in summer and snow in winter. Great probability of predominant weather types (65-76% in winter and 83-92% in summer) can serve as a basis of mastering of the weather forecasts. Several sub-types of circulation were distinguished within the predominant class of synoptic processes, mainly because of different positions of weather patterns, firstly of high pressure. Typically wedges are positioned in sectors 100-140, 40-60W. The greatest number of circulation subtypes is identified for the winter season, and the smallest – for summer.

Weather patterns of rare probability are characterized by predominance of meridional type of atmospheric circulation, mostly within WAS, accounting for both sharp ridges and deep depressions. Meridional processes are responsible for winter cold spells at the Antarctic Peninsula; in comparison to coldest decade of 1960s their frequency and intensity have significantly reduced. Analysis of etalon weather patterns allow us to better understand circulation mechanism responsible for the recent warming at the Antarctic Peninsula and can be used to working out weather forecast methods.

MC2

THE INTERANNUAL VARIABILITY OF THE SEA SURFACE TEMPERATURE AND OCEAN FRONTS IN THE ATLANTIC SECTOR OF ANTARCTICA

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In this report the results of the investigation of the interannual variability of the sea surface temperature (SST) and temperature fronts in the Atlantic sector of Antarctica are discussed. Investigations of low-frequency variability of SST field and oceanic fronts in Antarctica are important for understanding large-scale processes of the ocean-atmosphere interaction. They also promote solution of a number of applied problems. This work is based on SST dataset (British Atmospheric Data Center HADLSST, 1870–2002) and SST satellite measurements (AVHRR Ocean Pathfinder Data JPL NOAA/NASA, 1986–2002). The temperature trends and correlation coefficients R_{SOI} and R_{NAO} between the ocean surface temperature anomalies and South oscillation (SOI) and North-Atlantic oscillation (NAO) indexes are analyzed. Year-averaged SST trends are negative ($-0.6 \dots -1.0^{\circ}\text{C}$) in the Antarctic Circumpolar current (ACC) zone. The estimations of SST trends for different months show, that in Northern branch of ACC zone two maximum of positive trends in March (0.3°C) and November (0.6°C) are observed, and since July till August trends are negative. In the Central branch of ACC the extreme of negative trends (-0.5°C) is observed in May and positive (0.4°C) in February. In the El-Nino events periods (index SOI positive) in the ACC zone the negative values of R_{SOI} prevail, and they are positive when the index SOI is opposite in sign. The values of R_{NAO} are half less then those of R_{SOI} . In the periods of the El-Nino relaxation (for example, 1984–1986) the positive values of R_{NAO} are observed in the areas of negative values of R_{SOI} . The anomalous changes of fronts characteristics to be observed during El-Nino events. Interannual variations of temperature gradients are equal to $0.7^{\circ}\text{C}/54 \text{ km}$, fronts spatial displacement 200–300 km, fronts temperature 2–3 $^{\circ}\text{C}$.

The work is carried out within the framework of National Scientific and Technical Program of Ukraine Researches in Antarctic Region and also the Program of International Polar Year 2007–2008.

MC3

FEATURES OF LARGE-SCALE CIRCULATION ATMOSPHERIC PROCESSES IN WESTERN SECTOR OF THE SOUTHERN HEMISPHERE

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Circulation processes above the equator of the Southern Ocean, and especially in the high latitudes of Southern Hemisphere are insufficiently studied. However they play an important role in formation and development of large-scale components of General Atmospheric Circulation (GAC) and, consequently, the climatic system as a whole. Statistical features in the flow patterns for isobaric surfaces of AT-925, AT-850, AT-500 and AT-200 of hPa, are discussed. ERA-40 re-analysis data were used as initial information, presented in the regular grid $2.5 \times 2.5^\circ$ in a sector from the South Pole to 20°S and from 120°W to 30°E for each month of the period 1958-2002. The Antarctic Peninsula with the Ukrainian Antarctic station *Akademik Vernadsky* is included in the sector. On the basis of covariation matrices a component analysis was made, which revealed the important features of structure and dynamics of large-scale atmospheric processes. As dispersions in the first three orthogonal components are responsible for most of the total dispersion in the fields (more than 70%), the corresponding orthogonal components are characteristic of the basic features of the most large-scale circulation processes. The first orthogonal component belongs to the main large-scale component of GAC – west-east transfer. The second principal component as the corresponding fields of other proper vectors has the form of bipolar oscillation in all months of a year which describes the correlation between GAC processes above the southern equator of the Pacific and the Atlantic. It was termed the South-Pacific-Atlantic Zonal Oscillation (SPAZO). It was further explored an interrelationship between the global oscillations, El-Niño South Oscillation, North Pacific-American Oscillation and North-Atlantic Oscillation, which act as the indices of intensity of circulation processes in the atmosphere, describes the features of weather processes and, consequently, provides climatic descriptions of separate regions and global climate as a whole, as well as whether there will be an interrelationship between these oscillations and SPAZO. Statistical correlations between the factors that characterize circulation processes in the Northern and Southern hemispheres revealed that GAC is determined by the large-scale atmospheric processes which are formed in both hemispheres and influence each other.

MC4

LONG STANDING CHANGES OF BASIC CLIMATIC CHARACTERISTICS IN THE AREA OF UKRAINIAN ANTARTIC STATION AKADEMIK VERNADSKY

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A lot of data have been accumulated since the beginning of meteorological investigations in Antarctica. These data have been properly studied in many scientific researches. Although the rows of data are not long enough for researching century changes of climate, they allow finding of the global climate changes which have taken place during last decades. In this research long-term changes of basic climatic characteristics (direction and speed of wind, temperature, and atmospheric pressure) have been analyzed in the area of Ukrainian Antarctic station (UAS) within period of 1950-2006.

It is known that the average temperature in Southern hemisphere in the twentieth century was more stable than in Northern hemisphere. Two periods of warming can be defined on UAS. The second one began in the 70-s of the twentieth century. At the beginning of the 70-s the trend of wind speed has changed from reducing to increasing. After comparing periods of 1951-1970 and 1971-2006 it was established that the greatest changes had taken place in the winter period (April-May and July-August). During the spring storms season the speed of wind has not practically changed.

The distribution of different wind speed gradations in dependence on the time of the observation was considered. It has been established that during 1971-2006 the reiterate of strong wind (speed more than 10 meters per second) increased practically twice, and the reiterate of light wind (speed less than 5 meters per second) was reduced. Influence of atmospheric pressure on these changes is minimal during 1951-2006. If we are talking about direction of wind, during 1951-1970 the northern wind was the main (except March, May and June when the north-eastern wind was the main) practically in all months. During 1971-2006 the northern wind was still prevailing only in the spring and in the summer (October- January). In the autumn (February-March) and in the beginning of the winter (April) the north-eastern wind was the main. The eastern wind was prevailing in May and the southern wind was the main during the rest of winter (June-September).

MC5

REGIONAL FEATURES OF CLIMATE CHANGE AT ANTARCTIC PENINSULA

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Near-surface air temperature growth has become a characteristic feature for the last 2 decades or so in most extratropics and both polar regions. Many common features of climate change over the last centennial were found in both Arctic and Siberian region and West Antarctic sector, including two periods of warming at the beginning of XX century and close to its end. Data of 6 stations with longest uninterrupted records at Antarctic Peninsula are used to describe regional climate change; base stations are Orcadas and Vernadsky, with more than 100- and 60-years' uninterrupted meteorological records. West side's Antarctic Peninsula stations and Orcadas show good agreement to global trends, with the most intensive warming from 1970s, following the shift of the Pacific Decadal oscillation to positive phase. It was found also that recent warming on Antarctic Peninsula region is observed on the background of warm El Nino episodes dominating over the last two decades.

Seasonal warming occurred almost uniformly between decades on stations west off the Peninsula, and in more irregular way – on east stations where topography is complicated. Annual warming is mainly caused by the growth of winter months' air temperatures along with decrease of year-to-the-next amplitudes as well as daily temperature range, constantly expanding periods of air temperatures exceeding freezing. Spatial correlations of monthly air temperatures at regional stations are found to be greatest in winter and smallest in summer, most probably because of more homogenous winter circulation. The radius of best correlations is directed north from Vernadsky towards King George Island; liaison has increased during the recent period of warming. During the last years no further warming has been observed and annual mean temperatures are ranged in narrow interval $-1.7, -4.5^{\circ}\text{C}$.

Important changes in other meteorological parameters are detected during the recent warming episode: turn of dominant winds to north-westerlies along with strengthening of dominant wind speeds and less frequent calms, growth of precipitation (not statistically significant).

MC6

ON THE STATE OF GLACIATION OF THE AKADEMIK VERNADSKY BASE REGION DURING THE PERIOD OF CURRENT CLIMATE CHANGE

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Dynamics of glaciation in the periglacial area of Akademik Vernadsky base region and sea-ice around Graham Land are studied on the background of current climate variability. Small ice caps as well as land glaciation and ice-shelves are undergone to significant recession. By the data of polygon measurements of surface snow balance on ice cap near Galindez Isl., near Vernadsky base during 1996-2005 the most intensive ablation was registered at the end of 1990s (up to 200 mm² water equivalent). But from the beginning of the new millennium years with snow ablation are followed by years with accumulation. Although ablation is predominant it has become less accelerated in conditions of no further warming.

Atmospheric circulation is important agent to form the mass balance of the glacier. Cyclones can lead to both ablation and accumulation in dependence on their tracks. Northwest cyclones responsible for positive air temperatures and liquid rainfalls are responsible for ablation; series of cyclones south of 65S with temperatures below freezing point form the background for accumulation. Persistence of anticyclones leads to the conservation of mass balance in transitive seasons but weak ablation became dominant under clear sunny weather in the summer.

Extent and concentration of sea-ice in marginal coastal zone of the Antarctic Peninsula show significant year-to-the-next oscillations and sea-ice extent has been grown during the last decade. The most recent years showed some negative tendencies in sea-ice extent.

MC7

ANTARCTIC PENINSULA REGIONAL CLIMATE WARMING IMPACT ON SMALL ICE CAPS

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The small glacier and island ice cap dynamics can serve as an indicator of rapid recent Antarctic Peninsula warming. The processes similar to the Antarctic Peninsula ice shelves disintegration are observed on the small ice caps and glaciers in this region. The research is based on recent ice cap survey and comparison of this data with historical observations. The Galindez Island and other islands on Argentina Island archipelago ice cap geomorphology monitoring is carried out using the historical data analysis, GPS-photogrammetry survey data, aerial photography, satellite image and the analysis of the bedrock position. The objectives of research are following: (1) to detect the shape, edge position and ice velocity dynamics in order to forecast the ice cap future development on the base of precision GPS-photogrammetry measurements; (2) to carry out glacial-geomorphology monitoring of the ice cap dynamic and to create the model.

The GPS-photogrammetry measurements have been developed to study the size and form changes which has being used for the observation of the ice cap of the Argentine Islands archipelago since 2002. The process of the ice caps breakdown accumulation is accompanied by acoustic emission, which spreads in the layer of ice. The parameters of acoustic emission can simply serve as sign of the ice cap formation and breakdown intensity. Acoustic monitoring of glaciers allows modelling the dynamic picture of those destructions. The observations will be based on registration of acoustic emission by the acoustic sensors net. Result of recent observations of the small ice cap of Galindez Island showed significant changes since 1950. Even since 2000 Galindez ice cap has lost more then 2-3 % of its volume. The recent data of ice cap dynamics is discussed.

MC8

MONITORING OF THE ACOUSTIC SEA ACTIVITY AND THE ACOUSTIC SMALL ICE CAPS CRACK EMISSIONS FOR STUDY OF THE ANTARCTIC PENINSULA REGIONAL CLIMATE

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The monitoring of the climate changes in the West Antarctic Peninsula on the base of the long-term registration of the acoustic sea activity and the acoustic emission of the small ice caps cracks formation in the body of glaciers is the purpose of the work. The long-term changes of atmosphere and sea water temperature observed at Antarctic Peninsula as well as modulation of total solar and especially UV radiation due to Ozone Hole can produce inhomogeneous warming of the glacier ice and floating icebergs destruction. This warming could impact on glaciers deformation and initiate the cracks in ice bulk and icebergs.

The breaking of glacier is accompanied by powerful acoustic emission with a characteristic spectrum which will be registered by acoustic sensors distributed in the body of glaciers and in sea water in the case of iceberg destruction study. Then the acoustic emission will inform about the dynamics and values of the internal glacier destruction, which is result of disintegration and/or melting acceleration. These parameters could serve as indicators of regional climate changes. The acoustic sensors for sea noise registration (hydrophones) and four acoustic sensors for space distributed ice crack analysis have been already created and are under test measurements. The prospects and peculiarities of the proposed methods are discussed.

MC9

DYNAMICS OF ICE COVER OF ANTARCTIC SEAS IN THE PROCESS OF MODERN CLIMATIC CHANGES

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Methodology of satellite data analysis for sea ice conditions obtaining is proposed. It allows to estimate current sea ice field and to compare it with mean fields. Cumulated sea ice covers, as sums of sea ice fields for middles of months in the seasons, are used for 5-grades typification of ice covers of the Antarctic seas. Cumulated sea ice covers for every year is obtained by seasonal sums and analyzed with multy-year mean fields of 100 as bounds of sea ice, 500 as pack ice and 300 as a middle for determination of horizontal gradients. Thus, obtained cumulated sea ice covers in combination with mean sea ice fields allow to estimate sea ice conditions for every year in spatial matrix instead of in one point of the matrix.

The most variations in sea ice cover are found in the Ross, Weddell, Lazarev and Riser-Larsen seas that effect climate of the regions definitely. Obtained results reveal gradual accumulation of sea ice cover at the multy-year variations that could have cycles, but with a bigger period. Seasonal variations of cumulated sea ice covers reveal that estimation of increasing or decreasing of cumulated sea ice covers should be made for every sea water area. Thus tendency of sea ice cover compared with mean values has been obtained for every Antarctic sea and all seasons.

Decreasing of sea ice cover of the Commonwealth and Ross seas and increasing of sea ice cover of the other Antarctic seas are observed for the analyzed period. For the whole period of observation, 61% of the all Antarctic sea area covered by ice relates to the seas with increasing sea ice cover and 39% relates to the seas with decreasing sea ice cover.

MC10

DESCRIPTION OF TEMPERATURE AND REGIME OF HUMIDITY OF TROPOSPHERE ABOVE ANTARCTIC CONTINENT

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Data of the atmosphere radiosounding obtained at stations inside and on the coastline of the Antarctic continent at 12 GMT are analyzed. Since water vapor is one of important components of the high-latitude climate, analysis of vertically integrated moisture content distribution is proposed. The vertically integrated mixing ratio is obtained by summation of these characteristics at the standard isobaric surfaces. These data obtained by monthly means can be used for moisture content monitoring in the troposphere. Analysis of the obtained data has shown that approximately 80% of all water vapor measured from the ground to 100 hPa is under the 500 hPa isobaric surface. Relationships between integral mixing ratios and monthly mean temperatures at the 850, 700, 500 and 300 hPa surfaces are found and trends of multi-year air temperature changes with integral mixing ratios are received at those surfaces. Anomalies of yearly mean air temperatures at the above surfaces are calculated, plotted and statistically analyzed. Analysis of multi-year variations of yearly mean temperatures has shown that the variations are cyclic. The performed analysis of spatial distribution of this characteristic has allowed to allocate zones of stable increasing and decreasing. Periods of increasing (decreasing) of moisture content at the Antarctic coastline are cyclic too and depend on temperature.

MC11

ICE FORMING PROCESSES IN ANTARCTIC MIXED-PHASE CLOUDS

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The presented study is focused mostly on the investigation of ice forming processes in precipitating clouds over the Antarctic Peninsula for the different seasons with aid of numerical models. So-called the Combined Model of the Cloudy Troposphere (CMCT) which is a combination of 3D mesoscale diagnostic and 1D microphysical prognostic numerical models developed at the UHMI was applied. 3D mesoscale diagnostic model on the domain 1500x1000x10 km with resolutions of 25 km horizontally and 100 m vertically was constructed based on upper-air sounding data of Bellingshausen radiosonde station. 1D model included spectral microphysics with 100 bins for each of three types of cloud particles (droplets, raindrops, ice crystals approximated by spheres or plates) formed on activated ice (IN) and cloud condensation nuclei (CCN) and interacted with one another by collision, condensation, evaporation, sublimation, freezing, etc. This 1D model was constructed based on the outputs of the above 3D model as the most close to the observed thermodynamical fields. The model allowed obtaining both spectra of cloud particles and the following integral microphysical characteristics developing in time over a fixed point on the 3D domain: rain and snow (or sleet) precipitation intensities and sums, ice (IC) and liquid water contents (LWC), and particles concentrations.

The first recent numerical simulations of Antarctic cloudiness microstructure with the above models revealed that the number of ice crystals present in the cloud was much larger than would be expected at the same temperature at mid-latitudes. At the same time, very few observations made high on top of the Antarctic Peninsula from the ground suggested the same: ice particle concentrations were typically one or two orders of magnitude greater than those in mid-latitude clouds at similar temperatures. This fact forces to pay an extremely high attention to the ice forming processes in Antarctic mixed-phase clouds, since, their correct parameterization in GCM or other atmospheric models would eliminate errors, e.g., in a highly sensitive radiative transfer, etc.

MC12

COMMON FEATURES OF THE SEA LEVEL RECORDS FROM ANTARCTIC PENINSULA AND SOUTH AMERICA TIDE GAUGES

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Tide gauge data provide information on sea level variations as well as on the vertical land movements at tide gauges area. Sea level records from a number of tide gauges in the region of Antarctic Peninsula and South America were analyzed.

Data from each tide gauge has been expressed as a sum of four components: a tide gauge constant, a linear trend, a regional component and a local component. The regional component represents the variations of sea level that are common for all tide gauges. The local component consists of local systematic effects, signal and a noise that are, however not clearly separated in the present analysis.

Tide gauge data with monthly resolution was first detrended and then averaged over a chosen sample of sites resulting in the determination of regional component. Correlations between regional component and individual site data were investigated. High level of correlations obtained indicates common features in tide gauge records. The regional component was used for recursive determination of trend and the local component at each site. Estimated trend indicates vertical land movement at a site. Common features in local components of two groups of sites were observed.

MC13

GEODYNAMIC PROCESSES IN ANTARCTICA AS A CAUSE OF GLOBAL CHANGES OF MOVABLE SPHERES OF THE EARTH

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The Antarctic region represents one of the key parts in a system of global dynamic processes of the planet, as in the geodynamic and atmospheric-circulating relation. At spherical fluctuations the Earth variably swell on equator and near poles. Last type of movement is typical for annual scale of geodeformations. Geodynamic methods reveal so-called «New global annual mode of geodeformation» which shows, that Northern hemisphere in February - March is compressed, and Southern - is stretched, and in August - September on the contrary. The given mode in February - March forms the effect of lowering of a surface geoid, in Southern hemisphere on 3 mm, and equatorial displacement in northern direction on 1,5 mm that corresponds to the exchange of weights between hemispheres of $1 \pm 0,2 \cdot 10^{16} \text{kg}$ and causes additional deformation of the Earth. The tension of the Southern hemisphere in February - March causes activation of the basic planetary breaks around of Antarctica and on meridional direction from continent up to the Californian peninsula, Red sea, Azores. We assume that the change of weights allocation between hemispheres results in change of gravitational potential between them, and it in turn results in change of atmospheric weights allocation. In an atmospheric and circulating mode of the Earth, in February - March and August - September there is an opposite change of dynamic processes. The maximal displacement of subtropical zones of a high pressure of both hemispheres and ITCZ had been observed in a southern direction (in February – March), and in northern direction (in August – September). In these periods extremer center of atmospheric action are changed also. In the Antarctic region near a surface of the ground in January are observed the greatest low baric gradients, in July - August, it is displayed in an annual course of speed of the wind. In middle troposphere circulation cyclone has the minimal diameter in February and starts growing in March, in July - August it is maximal and in September starts to decrease, that specifies a direction of dynamics and intensity of atmospheric processes in region. At activation of planetary fracture in meridional direction on their northern terminations there are non-standard circuits of atmospheric circulation, for example: exit and stationary cyclones on subtropical latitudes, in northern Atlantic and northern Pacific Ocean.

***Geology, Geophysics
and
Glaciology***

GGG1

NETWORK OF GLACIER DISCHARGE MONITORING STATIONS FOR MEASURING THE EVOLUTION OF GLOBAL WARMING

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Response in glacier discharge is so immediate and sensitive to any variation in environment temperature that we consider that glaciers work as natural sensors of Global Warming and may offer registers of great utility as indicators to estimate its evolution.

For using the glaciers as a continuous register to estimate the temporal evolution of global warming and its distribution according to latitude in both hemispheres, we have at our disposal a glacier observation network according to different latitudes in both hemispheres, which allow a comparative control of glacier discharge according its evolution.

As part of the GLACKMA Project we set in motion in 2001, we have already implemented five monitoring stations. These stations register temporal series with hourly intervals of, among other parameters, glacier discharge. In the Northern Hemisphere: Svalbard (79°N), Sweden Arctic (68°N) and Iceland (64°N). In the Southern Hemisphere: Chilean Patagonia (51°S), Insular Antarctic (62°S).

In this last one station, located in the Collins icecap in the King George Island (Antarctic), the time series of glacier discharge obtained during these last years shows that differential changes in the habit of its annual hydrograme are beginning to become evident. It has been possible to register how the glacier discharge wave begins earlier every year and ending later, increasing therefore the number of days that the discharge wave lasts every year (76 days during austral summer 2002/03 and 142 days during austral summer 2005/06). Annual discharged of water volume also increases in a significant way in specific values ($1,8 \text{ hm}^3/\text{km}^2$ for 2002/03 and $3,1 \text{ hm}^3/\text{km}^2$ for 2005/06).

We consider very interesting to increment the number of actual monitoring stations of glacier discharge in the Southern Hemisphere, at higher latitudes. Between them, in the area of Vernadsky Base in the Penninsula Antarctica.

GGG2

SINGLE-GRAIN GEOCHEMISTRY OF ZIRCON AND MONAZITE DETRITAL POPULATIONS FROM GLACIAL SEDIMENTS AS A TOOL FOR GEOLOGICAL STUDY OF SUBGLACIAL TERRAINS OF ANTARCTICA: NEW RESULTS OF PRELIMINARY TESTING AND FUTURE TRENDS OF DEVELOPMENT DURING IPY 2007/2008

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Standard procedures are inapplicable to geological study of subglacial terranes of Antarctica. Region-scale results may be obtained by means of single-grain trace element geochemical study of zircon and monazite large detrital populations from glacial sediments that reflect provenance. Pilot study was concentrated on zircon and monazite large detrital populations that represent two test source regions: (1) Phanerozoic Antarctic Peninsula in Western Antarctica (AP) and (2) Precambrian Ukrainian Shield with neighbouring part of East-European Platform (EEP). Last one typifies Archaean and Proterozoic terranes of Eastern Antarctica. Trace element content in both minerals and mass of each grain were determined by means of special ("single-grain") version of milliprobe XRF (XRF-MP/SG). "Total lead" method was used for their age dating. Zircon's parent rocks identification was based on earlier suggested Hf-Y discriminant diagram.

Obtained zircon's data set may be regarded as a representative contribution to present-day information about the crustal evolution within the both AP and EEP regions. These data were resulted in regional-scale models of progressive growth of the Earth's crust. A new unknown earlier stage of significant formation of monazite (~0.5-0.7 Ga) was discovered for EEP region. In whole preliminary application and testing of the proposed method to crustal history reconstruction confirms its effectiveness.

This approach is proposed as a basis for IPY 2007/2008 project "Circum Antarctic Zircon Census" (CAZIC). Realization of this project requires a great number of single-grain trace element analyses. It is XRF-MP/SG technique that permits to do it much faster and cheaper than other ones. But in order to obtain accurate age determinations XRF-MP/SG should be combined with LAM-ICPMS or (and) SHRIMP.

GGG3

INTEGRATED GEOCHEMICAL MODELING OF MAGMATIC SYSTEMS AS APPLIED TO 'CIRCUM ANTARCTIC ZIRCON CENSUS' (CAZIC) PROJECT (IPY 2007/2008)

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Specially developed approach to geochemical modeling of magmatic and corresponding magmatic-hydrothermal systems was considered. Included in the designed models are: (1) a set of equations of Rayleigh type for trace elements behaviour during the melt crystallization based on empirical data set obtained for comagmatic rock series; (2) zircon (Zrn), apatite (Ap) and monazite (Mnz) solubility equations (Watson — Harrison — Montel) used to evaluate model temperature (T_{model}) and fluid (H_2O) regime of magmatic system during its evolution; (3) calibrated $\ln K_Y^{\text{Ap/Zrn}}$ vs. $1/T(\text{K})$ dependence ($K_Y^{\text{Ap/Zrn}} = C_Y^{\text{Ap}} / C_Y^{\text{Zrn}}$, C_Y^{Ap} and C_Y^{Zrn} are the Y content in coexistent Ap and Zrn respectively) allowing to confirm the obtained values of T_{model} ; (4) equations for calculation of model fluid/melt trace element distribution coefficients as well as model trace element composition of hydrothermally altered rocks and their accessory minerals; (5) equations for determination of the initial magma source and corresponding degree of partial melting as well as procedures for total (final) validity test.

In a restricted case of points (1)-(4) a good agreement between the model (calculated) trace element compositions and modal (natural) ones serves as effective validity test. Modeling procedure was demonstrated on an example of Korosten pluton (Ukrainian Shield) with spatially associated hydrothermally altered rocks. Similar pilot study in Antarctica was concentrated on Deception Island volcano (Western Antarctica) with hydrothermally altered marine sediments of its caldera (Port Foster). Preliminary results of modeling confirm the obtained geochemical data validity. But their further realization requires the technique to derive the hydrothermal contribution from whole-rock trace element composition of Port Foster sediments. Final validity test of point (5) requires the results of modeling of geochemical evolution of crust — mantle system within the region. Such results derived from detrital Zrn and Mnz geochemical study are the main goal of the CAZIC project.

GGG4

ZIRCON AND MONAZITE SINGLE-GRAIN TRACE ELEMENT ANALYSIS AND DATING BY XRF MILLIPROBE: APPLICATION TO CAZIC PROJECT (IPY 2007/2008)

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Zircon and monazite are stable in sedimentary environments and its detrital populations could reflect provenance. Such techniques as LA-ICP-MS, EMP and SIMS commonly are applied to study a zircon and monazite composition. They have good analytical characteristics but require expensive hardware and time consuming sample preparation. Single-grain milliprobe XRF analysis (XRF-MP/SG) is a new promising technique for trace elements (Sr, Y, Hf, Pb, Th, U) determination and chemical U-Th-Pb dating of zircon and monazite.

This technique was designed on a base of original XRF installation with two thin X-ray beams (collimated to 0.5 mm) from two independent X-ray tubes with Mo and Ag anodes and energy-dispersive spectrometer with Si (Li) detector. Detection limits for grains with masses 1- 10 µg are: Sr, Y – 5-10 ppm, Pb, Th, U – 10-20 ppm, Hf – 100 ppm. The fluorescence intensity of elements vs. shape and mass of grains as well as their matrix effect were calculated to calibrate the quantitative element analysis. The statistical uncertainty is defined by counting statistics in spectrum peaks. It depends on grain mass, element concentrations and measurement time.

GGG5

SOME PERSPECTIVE APPROACHES IN INTERPRETATION OF SINGLE-GRAIN GEOCHEMICAL DATA ON DETRITAL POPULATIONS OF WIDE-SPREAD ACCESSORY MINERALS FROM SUBGLACIAL TERRAINS OF ANTARCTICA AND OTHER REGIONS

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Realization of Circum Antarctic Zircon Census (CAZIC) project under the PLATES & GATES umbrella during IPY 2007/2008 requires careful single-grain geochemical study of zircon and monazite large detrital populations from glacial sediments of Antarctica to obtain reliable estimation of corresponding provenance (age and composition of widely distributed rock types) within each drained area. Therefore full-scale realization of CAZIC project resulted in representative whole-Antarctica geological picture requires a great number (preliminary estimated as more than 40.000) of expensive single-grain zircon and monazite trace element analysis.

As it was suggested earlier the combination of cheap XRF-MP/SG analytical technique with expensive LA-ICP-MS or (and) SHRIMP ones is the main way to reduce the complete cost of CAZIC project. Tools for minimization of the number of single-grain analysis required as well as the new software for geochemical data interpretation represent the second powerful way to reduce the CAZIC cost.

In this work considered the mathematical approach, allowing to calculate the smallest number of grains which must be analyzed in each sample of glacial sediments at a required level of statistical adequacy. The special software for processing of detrital zircon and monazite geochemical data sets in a form of 3D spectra (histogram) was developed. As an example for zircons such spectra were built on a basis of two parameters: (1) the Hf/Y ratio in zircons grains correlated with composition of source rocks and (2) single-grain age determinations. The designed software includes possibilities for smoothing, derivation, and peak analysis. The source rocks approximate composition and corresponding rock forming age are the results of 3D spectra analysis. This software was tested on samples from various regions.

GGG6

CIRCUM ANTARCTIC ZIRCON CENSUS (CAZIC/PLATES & GATES/IPY 2007-2008): MAIN TRENDS OF DEVELOPMENT AS A GLOBAL PROJECT OF EARTH CRUST MONITORING

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Taking into account that subglacial terranes of Antarctica are inaccessible for direct geological study, region-scale results may be obtained by means of single-grain trace element geochemical study of zircon and monazite large detrital populations from glacial sediments that reflect provenance (age and composition of rock types widely distributed within the drained area). Complete application of this approach requires the realization of geochemical models of two different types for each investigated subglacial terrane.

First type includes the generalized geochemical models of the magmatic systems which were demonstrated on examples of Korosten pluton (Ukrainian Shield) and Deception Island volcano (Western Antarctica).

Second type is represented by the models designed for the geochemical evolution of the system continental crust — depleted mantle. These models are based on estimation of the rate of growth of the continental crust at the expense of the extraction from the depleted mantle. This estimation is a key input parameter to account the evolving trace element compositions of the crust and depleted mantle assuming the partial melting process as a main mechanism for the mantle-to-crust element transfer.

Both types of models are closely connected. Determination of the initial magma source and estimation of the corresponding degree of partial melting in the models of the first type create a need for information about evolving element content in crust and mantle (input parameter). These data may be derived from the models of the second type. Designed final validity test procedure allows to verify final results of both models.

This approach is proposed as a basis for CAZIC project during IPY 2007/2008. But it may be realized not only for Antarctic regions but for other source ones too as an effective tool for global Earth's crust monitoring.

GGG7

THE RIFTOGENIC NATURE OF ANTARCTICA IN CONTEXT OF EARTH'S HOT BELTS

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The notion of Earth's hot belts in context of rotational and magmatogenic mechanism of rifting is of paramount importance for solving general problems of such large and geologically inaccessible old continent as Antarctica. Available information, in the first place, geological and geochronological data allows us to argumentatively trace the signs of riftogenic processes back early stages of the geological history. Practically, from the moment of arctic continental crust originating, a tendency of its destruction is observed, which manifests itself in developing rift-like and riftogenic zones at all stages of the geological evolution.

According to our data, one Archean, six Proterozoic and eleven Paleozoic palaeomagnetic equators intersected Antarctica in different directions. The formation of this largest planetary tentional stress region could not be caused by the collective and spatially concentrated eighteen intersections of riftogenic palaeomagnetic equators of the Archean-Middle Paleozoic age and within the old crust. Thus, we assume that a riftogenic character of the crust was caused by rotational rifting.

The superplume was mainly intruded below the eastern Antarctica having produced its present-day horst structure. The adjacent region of Western Antarctica and the basement of the Ross and Weddell Seas underwent a simultaneous compensating subsidence.

The further Mesozoic-Cenozoic history of Antarctica is associated with the autonomous evolution of the superplume that led to the active (as on the East European platform) end plate aulacogen stage of developing its old craton. The cessation of the rotational rifting in Antarctica in the Late Paleozoic is evidenced by the absence of paleomagnetic poles in this territory since that time. As early as in the Mesozoic they collectively grouped themselves in a sublatitudinal direction close to the present one, remaining the position of Antarctica in the same place.

GGG8

**GEOMAGNETIC MAPS OF THE REGION OF THE STATION AKADEMIK
VERNADSKY: GEOLOGICAL AND ECOLOGICAL ASPECTS**

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The Institute of Geophysics NAS of the Ukraine performed ground- and water- surface magnetic survey of the total intensity scalar of the magnetic field T (2004-2007, about 40 000 points) of the region of the station *Akademik Vernadsky* (65°00' – 65°30' S, 64°00'-64°30' W). The special method of measuring of the geomagnetic field T was developed taking into account the specifics of the region of works. In every point the T - value was measured and its spatial-temporal co-ordinates were registered in parallel.

To variation of the magnetic field the “Argentine Islands” were taken into account on synchronous records on a magnetic observatory. All data are taken in a single digital massive (array). Digital magnetic maps of the total intensity scalar T , total intensity scalar geomagnetic anomaly ΔT and distortion of the geomagnetic field ΔD (ecological factor) are developed for this territory. Preliminary geological interpretation of the magnetic anomalies is executed. The schema of the faults of the Earth's crust of the region of the station *Akademik Vernadsky* is compiled. The comparative analysis of values of ΔD for region of the station *Akademik Vernadsky* and territory of Ukraine is executed.

GGG9

THE COMPLEX RESEARCHES OF THE DANGEROUS GEOPHYSICAL PHENOMENA IN REGION OF THE VERNADSKY STATION

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The Ukrainian Antarctic Station “Academic Vernadsky” possesses the large set of modern geophysical equipment, which can be used as a complex for the comprehensive study of geophysical processes in the region of the Antarctic Peninsula. Presently seismoacoustic, meteomagnetic, and radon sensors are included in a complex as well. The cyclonic activity observation, cryomonitoring and monitoring of the avalanche tails are fields of study to indicate the climate changes.

The research purpose is a study of the regional seismic mode and search of the possible earthquake precursors. The set of algorithms for the analysis of heterogeneous data has been developed for data processing. This set allows to investigate the cases of the hidden prediction effects.

Session and discussion

«Sustainable use of Antarctic resources»

SUAR1

FISHING AND SCIENTIFIC RESEARCH IN ANTARCTICA

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Fishing in the Antarctic region was accompanied by researches from early times beginning from 19th century. The observations were used to provide the successful fishing first and then to make forecast of the stock to maintain the sustainable fishing. Later, in the case of South Sea and establishing the Commission for the Conservation of Antarctic Marine Living Resources in 1982, the ecosystem based management was adopted to most fish species in South Ocean. The intensive scientific tracking was accomplished in former Soviet Union. The research results of the Soviet and, in particular, of Ukrainian scientists, allowed creation of the South Ocean ecosystem functioning model, although with some uncertainties. These researches were the most complete in coverage of regions and species. After finishing of intensive fishing, the Ukrainian and other countries' researches in South Ocean were strongly reduced as well. Only few countries can conduct the research of marine living resources in South Ocean due to the high costs. Practically, the reducing of active fishing caused the decline of scientific ecosystem survey. However, there is a number of convergent factors which can transform in the closest future the Antarctic fishery (including krill fishery): increasing demand for fish, krill and its by-products, more efficient ways to harvest it, ecosystem changes due to global warming - all rise strong requirements of precautionary approach application during fishing. The renewal of fishing is linked exceptionally with implementation of preliminary research to obtain information on stock and abundance of species. The possible solving of the problem could be reached via institute of scientific observers on board of the fish and krill vessels in accordance with CCAMLR's Scheme of International Scientific Observation with full observer coverage in order to gather information that is indispensable for fish/krill management. The issues of improving the reporting requirements and the improvement of scientific research programmes coordination are discussed. The scientific advice on fish/krill management and its relationship with other elements of the ecosystem should be based on research through the Ecosystem Monitoring Program.

SUAR2

ANTARCTIC KRILL CONSERVATION PROJECT: CLIMATE CHANGE ASPECTS

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In last decades the climate change impact on Antarctic ecosystems, species and habitats becomes obvious, especially in the region of the Antarctic Peninsula which has experienced a major warming over the last 50 years. Sea ice has decreased in concentration and duration around the Antarctic Peninsula which impact on krill abundance and distribution. The troposphere over the Antarctic continent also has warmed significantly over the past 30 years, accompanied by the stratosphere cooling due to the ozone depletion. In addition the Southern Ocean has become less salty and has warmed to a greater depth. All this factors strongly influence on krill population and krill dependent ecosystem. A study found that, coincident with a decline in sea ice, krill populations in some areas of the South West Atlantic have declined up to 80% (*Atkinson A., et al. 2004. Nature, 432, 100*). In addition, the ozone depletion results in an increase in the amount of biologically harmful UV-b radiation that reaches the South Ocean surface and that penetrates into the surface waters. Some results indicate that the biological damage to marine organisms is correlated to the level of ozone depletion. To increase attention to the krill-based ecosystem the Antarctic Krill Conservation Project was established as international initiative of non-governmental organizations. We need to recognize and monitor all likely effects and consequences that climate change may have on the Antarctic marine environment. Ozone hole and changes of climate are the real factors of violation of marine food chains. One of the consequences connected to recently found by authors the asymmetry in geography distribution and shift of total ozone zonal extremes which could impact on krill population features. That caused the UV-b increase and redistribution, which destroys phytoplankton in Antarctic region stimulating reduce of nutrition in an ocean in polar and sub polar regions. The needs to take into account the effects of climate change on the Antarctic environment and its inhabitants to improve the Antarctic ecosystem management regime and proposed ecosystem-based package is discussed. We have to recognize that climate change is a major factor currently affecting the Southern Ocean and to avoid the further irreversible ecosystem change need to establish a coordinated Antarctic observing system network.

SUAR3

UKRAINE: DEVELOPMENT OF THE NATIONAL PROGRAM OF ANTARCTIC MARINE LIVING RESOURCES

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Nowadays, in Antarctic regions of Antarctic and Indian Ocean living water resources (LWR) of various trophic levels are underutilized (krill is the mostly underused one). Previous experience indicates the great unused potential in the field of scientifically provided LWR industry and relevant technologies that would allow reduction of inefficient costs and implement measures to preserve biodiversity and ecosystem sustainability as a whole. Krill is the most promising resource in regard of its role in Antarctic ecosystems. Ukraine has real prospects in development of new resource processing technologies. Urgency of this issue and perspective of the output implementation requires the state program on study, development and processing of Antarctic LWR. The program should provide state security in the food industry, national health, development of infrastructure and work places. It also would improve image of Ukraine as a maritime state acting in accordance with international legislation for Antarctic that provides preservation and LWR rational utilization. Program should cover: legal aspect (national and international laws), state-funded scientific framework (ecosystem monitoring and forecasting, evaluation of resources, enterprise statistics, operative recommendations, trade management, LWR processing technology improvement), trade (efficiency assessment, recommendations on fleet improvement and logistics, raw materials production and processing, diverse raw materials supply), technical provision (modernization of fleet and fishing gear). The industry should be state-funded, and preferences should be provided to companies producing, processing and transporting materials from the Antarctic to Ukraine for technology experiments, pilot and commodity production and domestic market saturation. A necessary part of the program is marketing research: identification of the most popular production in domestic and world markets, implementation and development of traditional and original technologies of materials processing to obtain and produce specific (most salable) commodities, technologies and products promotion worldwide (advertising, pricing policy substantiation).

SUAR4

EN ROUTE CENSUS OF MARINE MAMMALS AS POTENTIAL ECOSYSTEM MONITORING TOOL

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The en route census of marine mammals was implemented in the framework of annual chartered tourist passages (tourism company “Peregrine”) to the Antarctic of R/V “Akademik Ioffe ” and R/V “Akademik Sergei Vavilov” (owned by P.P. Shirshov Institute of Oceanology of the Russian Academy of Sciences). The present data were collected in 2006-2007 during three expeditions between 22 December 2005 and 30 December 2007. The research area included the Drake Passage, coastal waters of the Antarctic Peninsula, Scotia Sea and north-western Weddell Sea.

Among the cetaceans in the observation area humpback whales and minke whales were regularly observed. Besides of this, Southern right whales, fin whales, sei whales and occasionally sperm whales were recorded in the offshore water. Fur seals were commonly observed in the South Georgia and South Shetland areas, while crabeater and leopard seals were regularly recorded near the Antarctic Peninsula. The migration pattern of humpback whales is described on the basis of three years of observations conducted at different seasons. Variation of distribution and feeding behavior of humpback whales in their feeding grounds near Antarctic Peninsula may reflect both global changes of climate conditions and (or) regional availability of prey organisms, first of all Antarctic krill.

Our results indicate that data on top predators distribution and behavior collected on board touristic vessels and other ships of opportunity may serve as a useful ecosystem monitoring tool. A proposal for developing a regular monitoring program for offshore krill predators monitoring is presented based on tourist and logistics vessels in the Antarctic is presented. This program may be conducted in particular in collaboration with relevant programs run at the Bellingshausen and the Vernadsky Stations regularly visited by tourist vessels.

Posters

BE-P1

DIRECT MONITORING OF VITAMIN D SYNTHETIC CAPACITY OF SUNLIGHT AND ARTIFICIAL UV SOURCES FOR PREVENTION OF VITAMIN D DEFICIENCY AT POLAR EXPLORERS

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Vitamin D deficiency became an unrecognized epidemic in most adults who are not exposed to adequate sunlight. The low levels of vitamin D are now known to be associated with a wide spectrum of serious diseases much of which leads on to premature death. Recent epidemiologic studies demonstrate that cancer mortality rates are correlated inversely with local solar UV-B (280-315 nm) doses for 13 types of cancer, and the most likely mechanism whereby solar UV-B radiation provides protection against cancer is natural production of vitamin D. The diseases associated with D deficiency involve more than a dozen types of cancer, autoimmune diseases, as well as the classic bone diseases: rickets, osteoporosis and osteomalacia.

Being a major provider of vitamin D for humans, the UV-B portion of sunlight initiates vitamin D synthesis from its precursor 7-dehydrocholesterol (7-DHC, provitamin D₃) in human skin. However, the steep drop in 7-DHC absorption spectrum from 280 toward 310 nm is responsible for high sensitivity of the process to the seasonal and latitudinal changes in solar UV-B radiation that dramatically affect endogenous synthesis of vitamin D.

Irradiation with artificial UV sources can prevent the vitamin D deficiency, but their ability to initiate vitamin D synthesis is varied depending on a UV lamp radiation spectrum.

The reliable method based on an *in vitro* model of vitamin D synthesis has been developed for direct measurement *in situ* of the vitamin D synthetic capacity of sunlight and artificial UV sources.

BE-P2

DYNAMICS OF AGE AND SEX STRUCTURE OF POPULATION OF BOECKELLA POPPEI (MRÁZEK, 1901) (COPEPODA: CENTROPAGIDAE) OF LAKE WUJKA, KING GEORGE ISLAND, IN 2005- 2006 SEASON

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Today, *Boeckella (Pseudoboeckella) poppei* (Mrázek, 1901) (Copepoda: Centropagidae) has been indicated in Argentina, Chili and Antarctic islands including King George.

Specimens were collected in fresh water Lake Wujka with total approximate area of 200 sq. meters in the vicinity of Polish Antarctic station Henrik Arctowski, King George Island (S 62°09.496' W0 58°28.990'). Samples have been collected using conical plankton net at the depth of 0.15 m on 23.12.2005, 3.01.2006, and 10.01.2006 from 10 a.m. till 12 a.m., local time. Here we have confirmed the finding of *B. poppei* at King George Island, Lake Wujka in the surroundings of Polish Antarctic station (Janiec, 1996; Menu-Marque at all, 2000, Potecha, 2007). In addition, this specie found in two fresh water drinking lakes in the vicinity of Brazilian Antarctic station Comandante Ferraz (S 62°05.159', W0 58°23.647').

Population density changing was accompanied with significant fluctuations in ratios of different juvenile and generative copepoda groups. In the first sample, copepoda stage (CI – CV) dominated – 800 ind./m³, when pubescent individuals composed only 250 ind./m³. Therefore, density of juvenile stage more than 3-times exceeded that of pubescent individuals. However, this ratio changed drastically in 10 days period. Adult individuals have been dominating quantitatively by that time, density of which composed 6550 ind./m³, while the density of juvenile individuals decreased dramatically with respect to pubescent individuals – 2800 ind./m³. At this time-point, density of pubescent individuals exceeded that of larvae by 2.5 times. In the third sample we noted the tendency towards increase of juvenile stage fraction: pubescent individuals – 9400 ind./m³, juveniles – 6100 ind./m³.

BE-P3

ANALYSIS OF GENTOO PENGUIN'S (*PYGOSCELIS PAPUA*) POLYMORPHISM BY MEANS OF DIFFERENT DNA MARKERS

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Gentoo - is one of the species-indicator for the evaluation of the impact of global environmental changes in the Antarctic ecosystem.

RAPD-analysis revealed the levels of polymorphism in Gentoo at Petermann Island (from 23,5 to 42,9%) and from Livingston Island (from 52,9 to 57,1%). The high level of relationship between two Gentoo populations with lack of significant genetic differentiation between them ($F_{st}=0,069$) was demonstrated, despite substantial levels of genetic variation. We could confirm that these populations belong to the same subspecies (*Pygoscelis papua ellsworthi*).

Sex identification of Gentoo penguins by PCR with specific primers was carried out. Female/male indexes (proportion of female) were 0,336 for population of Petermann Island and 0,398 for Livingston. Fisher's hypothesis was not satisfied and perhaps the determined sex ratio was under Trivers and Willard's and Charnov's models.

AM12 and RM6 microsatellite loci in Gentoo populations were absolutely monomorphic with only one allele in both populations. RM3 locus demonstrated two alleles – 221 b.p. and the new one - 217 b.p., which has not been described for RM3 to date. We also confirmed that these populations belong to the same subspecies (*Pygoscelis papua ellsworthi*), $F_{st}<0,04$.

The determined maximum telomere length of Gentoo was approximately 9000 b.p. and the average length were 5950 ± 1537 b.p. for adult specimens and $8100\pm949,1$ b.p. for chicks.

Thus, telomere length ("population age") and sex could be used as appropriate bioindicators in research of Gentoo populations in relation to Antarctica environmental state in monitoring programs of Antarctic ecosystem.

BE-P4

OXIDATION STRESS ACTION ON *DESCHAMPSIA ANTARCTICA* - ONE OF HIGHER PLANTS SPECIES OF ANTARCTIC BIOTA

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Antarctic biota represented only two species of higher plants. *Deschampsia antarctica* Desv. is one of them that colonizes oceanfront of the Antarctica. This lack of diversity of species in comparison with the Arctic may be due to the continent isolation, action of a constant low temperature and episodes of high light during the growing season.

These factors enhance the formation of active oxygen species and may cause photoinhibition. Therefore, an efficient mechanism of energy dissipation and / or scavenging of reactive oxygen species would contribute to survival in this harsh environment. Besides, it was found, that net photosynthesis is optimal at 12°C. Therefore we consider it to be expedient to study antioxidant indexes and glycolipid composition of *Deschampsia* plants. With this purpose we introduced *D. antarctica* plants delivered from various islands of Antarctic in conditions of temperate climate of Europe and investigated plants reaction against oxidation stress induced by spraying leaves with 0,5 mM H₂O₂ solution for 4 hours. In order to compare reactions we use also *Deschampsia caespitosa* plants. Data obtained showed that H₂O₂ treatment did not caused any reliable changes in SOD activity of both species. Pigment composition was characterised by increase chlorophyll *a* content in both species and carotenoids in *D. antarctica* plants. Concerning glycolipid composition expressed as lipid/chlorophyll ratio one could see all glycolipid content increase in *D. caespitosa* whereas only SQDG enlargement was noted in *D. antarctica* leaves. Studying the samples delivered from various islands of Antarctic showed indexes significant variability dependent upon the island environment peculiarities.

BE-P5

CYTOGENETIC PARAMETERS OF CHROMOSOMAL INSTABILITY AS AN INDEX FOR THE POPULATION STATE OF INDICATOR SPECIES OF HIGH-LATITUDE MARINE ECOSYSTEMS WITH THE *PAGOPHILA EBURNEA* AS AN EXAMPLE

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Among key sentinel species, seabirds are agreed to be good indicators of the health of marine environment both in Arctic and Antarctic. There are two major long-term and persistent impacts affecting Arctic seabirds currently: global change and persistent organochlorine pollutants (POPs). However, baseline health parameters are still limited for the polar seabirds, restricting our capacity to predict environmental changes reflected in these biological indicators. The Ivory Gull *Pagophila eburnea* is a rare (IUCN Near Threatened category) characteristic High Arctic species. Being top predator strictly associated with ice habitats, the Ivory Gull is at risk of climate changes and environmental pollution, hence, it is believed to be a good indicator of the ecological status of the Arctic Ocean. This study is the first attempt to evaluate integrated impact upon Ivory Gull populations using chromosomes instability as indicators of population health. Standard biometry and erythrocyte nuclear anomalies from 30 individuals of Ivory Gulls collected in NE Kara Sea, Russia in 2006 were studied. Blood smears analysis revealed presence of micronuclei (MN) and nuclear anomalies (NA) as described for other bird species. Observed rates of MN and NA in Ivory Gulls were low (0.0233 ± 0.0025 & 0.1766 ± 0.0066 respectively, $N=30$), as it was found in studied Antarctic seabirds comparing to urban birds from temporal zone. The rates of “budding nuclei” (indicator of chemical exposure) and “tailed nuclei” (indicator of radiation exposure) were comparable to normal levels described for birds. Levels of MN and NA are analyzed in relation to individual parameters (body mass and size, age, reproductive status) as well as some general population parameters (population size and productivity, reproductive phenology, POPs levels) observed in 2006. Results of this study can set the basis for future evaluations required to understand processes in Ivory Gull populations in circumpolar range and to monitor Arctic marine ecosystem health.

BE-P6

FEATURES OF BIOLOGY AND CALORIC CONTENT OF INVERTEBRATES FROM ANTARCTIC SUBLITORAL

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By the data of 16-17 SAE– 1970-1972, Davis sea (depth 60 meters) have the general gain of oxygen in a water column for 12 hours of an exposition of light time is of 122,4 g O₂/l that is equivalent 36,7 g/carbon, or formation 73g of organic substance under square meter (for 12 hours). As a whole, for 40 days of an active photosynthetic season of biological spring in latitude of station Mirny (66°30 Southern latitude) net production composed 1400 g C/m² or 2,8 kg organic matter for the same period. Or in organic metrics, 1400g C/m² x 9,361 = 13105 kilocalories /m² for 40 days.

It is shown that a relationship between the oxygen consumption and body mass in Antarctic Anthozoa, Polychaeta, Amphipoda, Isopoda, Pisces (young fish, fry) of the Davis Sea living at negative water temperatures (–1,9 °C) can be presented as an equation $R = 0,335W^{0,78}$ e. individuals of different species of the same body mass consume approximately the same quantity of oxygen and have metabolic rates comparable with other hydrobionts living in high latitude Antarctic areas and in lower latitudes.

The maximal values of fertility - Hyperiidea, weight 1382 mg, 606 specimens. The fertility of Amphipoda - from 9 up to 606 eggs, Pantopoda - 360 eggs, Holothuroidea - 130 eggs. The duration of embryogenesis was about 90-120 day.

Caloric content is determined for 60 species of hydrobionts from 12 classes of invertebrates in seasonal aspect. Energetic value of animals varies from 0,8 up to 8,0 cal/mg of dry substance, the organic fraction is 13-95% in dry substance. The maximal caloric content at zooplankton in the Antarctic winter is 7,3 cal/mg of dry substance at 70% lipids. The minimal - phytoplankton is 1,0 cal/mg. Energetic value of two fish species (Trematomus) - 4,3 cal/mg of dry substance.

BE-P7

THE BLOOD FORMULA DESCRIPTION OF THE THREE ANTARCTIC FISH SPECIES

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The Antarctic fish is the object of intensive fishing, and the monitoring problems of Antarctic fish abundance are very important. The hematological research is the effective method of the population state estimation. The blood is one of the most labile tissue, which responds quickly to different external factors impact. A habitat condition affects morphological composition and quantitative indexes of red and white blood of fishes. The blood peculiarities depend on temperature and water contamination, hydrochemical regime and other parameters of environment. It allows receiving the objective estimation of physical condition of every individual fish and population as whole.

The immune parameters analysis and different cytogenetic indices analysis are impossible without preliminary estimation of the blood formula features and different blood elements ratio. For Antarctic fish species these data is not available. This work deals with comparative description of the different blood elements, their correlation and changeability for three Antarctic fish species: *Notothenia coriiceps* (135 samples), *Trematomus bernacchii* (20 samples) and *Chaenocephalus aseratus* (10 samples), which have been caught during 9th Ukrainian Antarctic expedition in winter 2003-2004 near Vernadsky station (Antarctic Peninsula region, Galindez Island, Argentine Islands, the 65°15'S, 64°15'W). The blood formula data of these Antarctic species can be a starting point for the fish population dynamics comparison in the region and for estimation of the environment changes impact on Antarctic ecosystem biota.

BE-P8

METHODOLOGY OF COMPLEX BENTHOS MONITORING AT THE ANTARCTIC PENINSULA SHELF

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Shelf benthos communities are important part of Southern Ocean ecosystem. It is necessary to develop constant benthos monitoring at the Antarctic Peninsula shelf.

First of all, different research groups should begin gathering comparable data under uniform procedure including regular benthos sampling, and organize the data in a single Antarctic benthos database to compare different sites as well as changes occurring over the years. Requirements for field data:

- Samples are gathered uniformly from a settled area;
- Precise coordinates are stated;
- Complete specific diversity of benthic organisms is identified in every sample;
- Quantitative parameters (number of specimens or (preferably) biomass) are determined for every identified species.

Common dredging of distant shelf regions deeper then 100 m appears to be most useful. Unfortunately, it seems that at these depths dredging will be the only method of collecting comparable data for a long time. Shallower regions (0-100 m) can be searched using light diving equipment. Divers also could describe spatial structure of the biocenoses (horizontal mosaicism and vertical layers). Sampling experimental transects at certain depths may easily be standardized so that different research groups obtain comparable data. Geographic coordinates determined using GPS allow resampling the same transects after one or several years ensuring continuous monitoring of ecosystem transformation. At first, it is proposed to establish transects perpendicularly to shoreline and to sample study plots at standardized depths. Primary results are then used to roughly classify benthic communities and to establish plots in the center of depths range typical for every community. This approach allows detecting innate transformations of every biocenosis at the Antarctic Peninsula shelf.

It is proposed to test the method in the waters near Ukrainian Antarctic Station Akademik Vernadsky in 2009 to introduce it as a constant monitoring procedure in the Ukrainian National Antarctic Research Program for the upcoming years.

BE-P9

UV-B OVEREXPOSURE INDUCES PROGRAMMED CELL DEATH IN PLANT CELLS

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Recently, the concentration of atmospheric ozone has decreased by about 5%. Consequently, a greater portion of the ultraviolet B (UVB) irradiation reaches the Earth's surface with serious implication for living organisms. UV irradiation has heightened interest in plant responses to UV because solar UV wavelengths can reduce plant genome stability, growth and productivity. It was established that short wave ultraviolet spectra (UVC) can induce apoptosis in plant cell, but the question - can UVB stimulate apoptosis still have no clear answer. The aim of our work is to address this problem.

UVB influence on viability of BY-2 cells (*Nicotiana tabacum*) in dose dependent manner after different time interval was studied. UV treatment was performed with covering filter to eliminate UVC irradiation and attenuate irradiation of short wave UVB spectra (25, 59, 99 and 208 kJ at 305 nm). Estimation of programmed cell death was realized with determination of apoptotic morphology using fluorescent microscopy (fluorescein diacetate/propidium iodine/DAPI staining and acridine orange/DAPI staining), nucleosomal DNA fragmentation and TUNEL assay.

At morphological level typical apoptotic features in cells treated in dose dependent manner were observed. Cells with high level of vacuolization and cytoplasm shrinkage occurred in considerable amount in all irradiated samples beginning at earlier stages of treatment. Compared to the control, cells treated with UVB characterized by presence of condensed chromatin at the nuclear periphery (pre-apoptotic nuclei), forming of micronuclei (apoptotic-like nuclei), stretched and lace nuclei. Also nucleosomal DNA fragmentation after the UVB irradiation was detected using agarose gel electrophoresis. Additionally, UVB induced apoptosis was verified using TUNEL assay. Positive staining was detected in all irradiated samples compared to non treated cells. Increasing of amount of apoptotic cells correlated with elevation of irradiation dose. Obtained results demonstrate that UVB can induce apoptosis in plant cells.

BE-P10

CLIMATE WARMING IN THE MARITIME ANTARCTICA AND SUBANTARCTIC ISLANDS: A CHANCE FOR STRONGEST BIOTIC INTERACTIONS?

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The harsh climate conditions in Antarctica strongly restrict the biological activity in Antarctic terrestrial ecosystems, such as lakes, whose communities are essentially dominated by microorganisms, with microcrustaceans as top consumers where they appear. However, the less restrictive climatic conditions of maritime Antarctica and Subantarctic Islands allows ice-melting in many lakes of this region to occur during the austral summer, when abiotic limitations are less restrictive. In this region climate warming is currently occurring at one of the fastest rates on the Earth, which supposes that conditions every time less restrictive are likely to occur during the following decades, if this trend is maintained. Under such scenario, the relevance of biotic processes in on the overall lake functioning could increase, since the input of energy and nutrients in the lake will increase as a consequence of warming, especially in those aspects related to biogeochemical cycles. With warming, the length of the period in which liquid water is present may be longer, as well as the period in which both the lakes and part of the catchment are mostly free of ice and snow. This would favour productive processes, both in the catchment, where zones occupied by microbial mats would increase overall carbon and nitrogen fixation, as well as within the lake, which would receive more nutrients as a consequence of the increase of catchment's production and also receive more energy as result of the longer free-ice period.

In addition to the increase in available nutrients and energy, other biological interactions, such as predation, can increase their importance as structuring factors in these communities. In this communication I review some results from several experimental studies showing that, at least in summer, these biotic interactions, and especially predation, have a potential as structuring factors of the planktonic microbial community of these lakes, whose relevance might increase with regional warming.

ANSP-P11

PREDICTION OF ERYTHEMALLY EFFECTIVE UV RADIATION BY MEANS OF NONLINEAR REGRESSION MODEL

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Measurement of different radiation fluxes (i.e. global solar radiation and global UV radiation intensity) has been one of the Czech-Ukrainian scientific cooperation project carried out at the Vernadsky Station (formerly British Faraday Station) in the Antarctica since 2002. A special attention was devoted to erythemally effective UVB radiation. This contribution includes the results of modelling of the erythemally effective UVB radiation (daily sums of energy) in relation to (1) total ozone content, (2) extraterrestrial and (3) incidental global solar radiation, and (4) extraterrestrial intensity of the UVB radiation.

The total ozone content (TOC) values from both ground and satellite measurements were applied to eliminate the uncertainties in measured ozone concentration. The first TOC series was taken from the Dobson spectrophotometer measurements; the second was acquired for geographical coordinates of the Vernadsky Station from the daily gridded ozone data (EP-TOMS Version 8). Two types of empirical models (linearizable and nonlinearizable) for prediction of the UVB radiation are compared. To estimate parameters of nonlinearizable (hyperbolic) model, the input data transformation was used. Thus, the distribution of residuals is much closer to the normal distribution. Moreover, the correlation field of dependencies between measured and predicted values is homoskedastic. Both regression models are verified separately for different total ozone values and seasons. Comparison of these models is aimed at their behaviour under extremely low and high ozone concentrations in polar atmosphere. Therefore it is easier to examine limitations and qualities of both models.

ANSP-P12

ANTARCTIC TOTAL OZONE DISTRIBUTION CLIMATOLOGY AND ASYMMETRY IN CONNECTION WITH POSSIBLE IMPACT ON ECOSYSTEM

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Planetary waves in the total ozone distribution in Antarctic region are studied in connection to extreme Antarctic Peninsula climate warming. Analysis of the satellite measurements by TOMS spectrometer in a period of 1979-2005 shows the existence of considerable zonal asymmetry in total ozone distribution over Antarctica. This asymmetry is caused by existence of quasi-stationary (QSW) planetary waves in a polar stratosphere. Total ozone content distribution is convenient indicator for the QSW study in the Antarctic region. It was obtained in the latitudinal interval of 55-75°S in Antarctic spring: (1) the greatest amplitude of zonal wave (to 60 DU) and the wave amplitude growth rate (65°S latitude); (2) the region of zonal minimum experienced the systematic trend - displaced to the east from ~50°W longitude to Greenwich meridian; (3) zonal asymmetry - a minimum and maximum of quasi-stationary Rossby wave are situated almost symmetric relatively to the South Pole - minimum over the Weddell Sea and Antarctic Peninsula region, and maximum in the Australian sector of Antarctic region.

Zonal asymmetry in total ozone distribution in the Antarctic region and of long-term (climatologic) changes of zonal asymmetry must substantially affect ecosystem of the South Ocean, in particular in development of plankton community and krill population. Quasi-stationary minimum ozone position over Weddell Sea and its systematic eastern shift during 25 years caused the increased UV radiation of sea surface in comparison to Australian sector, where ecosystem have to experience the lack of UVR. The spring ozone distribution asymmetry and its longitude trend have to become apparent in the features of dynamics and characteristics of populations as whole and individual organisms on different level. These peculiarities in connections with asymmetry of climate change in Antarctic region are discussed.

ANSP-P13

STRUCTURE OF THE FIELDS OF TOTAL CONTENT OF OZONE AND ITS CONNECTION WITH CIRCULATION PROCESSES OF SOUTH HEMISPHERE

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As initial data the total ozone content (TOC) is obtained in the points of the regular net in 55-75°S and 0-90°W sector for September – November period from 1979 till 2004. Height of 200 hPa surface is considered. The geopotential fields are examined in September for a period from 1959 till 2004. The fields of geopotential and ozone were examined in 30 points of regular net. It allowed to build the matrices of basic data – for ozone about 30*23, for geopotential of 200 hPa – 30*44. The fields of mean values are calculated both for ozone, and for geopotential values. It is known, that there are dispersions of the explored values on the main diagonal of covariation matrix. Their values are used for construction of the fields of mean square value (MSV) which are the measure of changeability of physical magnitudes. The component analysis of the fields of TOC and 200 hPa geopotential is also conducted. The field of the mean square value rejections of 200 hPa layer is characterized by two well expressed centers of the increased changeability, which are conditioned by frequent violation of zonal stream in a circumpolar vortex and development of meridional transfer. Though the isolines of the ozone mean value fields in September are practically parallel to the latitude circles and large meridional gradients are observed. In November the fields already are strongly smoothed out with the comparatively small difference of the TOC values. The fields of ozone MSV in September and November are characterized by the presence of the zone of high changeability between 60°- 70°S. In November the contours are practically parallel to the latitude circles. In September and October there is the redistribution of ozone between a tropical reservoir and the South Pole due to meridional transfer. The field of the first eigenvector 200 hPa is a distinctness of which actually coincides with position of center of most geopotential changeability. It represents the beginning of process of circulation alteration from the winter conditions to the summer ones. The ozone correlation field in November testifies to implementation of condition of isotropy and of distributing of ozone in a region, while in October there is sharp anisotropy. Approximation of function of correlation was also conducted by a quadratic function. The approximation coincides well with the actual function of correlation.

ANSP-P14

SEARCH OF THE TROPOSPHERE DISTURBANCE INFLUENCE ON E_s LAYER IN THE ANTARCTIC PENINSULA REGION

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It is known that mid-latitude sporadic E layer is corresponded to neutral wind shears induced by three possible main reasons: planetary waves, gravity waves and tides in atmosphere. Continuous ionosphere research at Vernadsky/Faraday station (65°15'S, 64°15'W) by ionosonde ISP-42 allowed investigating the origin of sporadic E appearance. The station is situated in the region of Antarctic Peninsula with suitable conditions for gravity waves appearance due to topography. The data of 15-min ionosphere sounding in 1999-2005 were received. Than the data on Es observation times, height ($h'Es$) and duration were used for establishing of the importance of gravity waves in the production or destroying of sporadic E. The height sporadic E ($h'Es$ -values) variations in different periods (day; month; season; year) and magnetic activity were analyzed.

From preliminary results conclusion can be made that sporadic E has been observed more frequently during the daytimes than at nighttimes, which means that the Es appearance are more under solar control than under gravity wave forcing. The solar tidal activity and local gravity wave effects in controlling the Es occurrence are discussed.

ANSP-P15

ANTARCTIC OZONE HOLE – SIGNATURE IN UV MEASUREMENTS ON THE H. ARCTOWSKI POLISH ANTARCTIC STATION DURING THE PERIOD 2003-2007

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Large ozone depletion, the ozone hole, is observed over Antarctica from the beginning of the 1980'. The ozone abundance in the atmosphere is low, nevertheless its role is very important, because it is main absorbent of UV-B radiation.

In the cooperation between Centre of Aerology IMWM and Department of Antarctic Biology PAS, the UV measurements have been performed at the Henryk Arctowski Polish Antarctic Station (62°10' S, 58°28' W) during the period 2003-2007. During that time two seasons with the biggest ozone holes were observed over Antarctica. At the turn of the September and October, in the years 2003 and 2006 the range of ozone hole reached size 28 Mkm². The ozone loss was approximately 40 megaton.

The UV data, the average and maximum daily doses from four measuring periods, have been analysed and compared. The values of UV-B radiation on the Arctowski Station are correlated with satellite data of total ozone over Antarctica. The highest UV-B radiation values were recorded during the Southern Hemisphere (SH) summers 2003/2004 and 2006/2007.

The average UV-B radiation in SH summer 2003/2004 was 32.4% larger than in SH summer 2004/2005 and 7.4% larger than in 2005/2006. Difference between SH summers 2006/2007 and 2003/2004 is 0.3%.

MC16

CHARACTERISTIC OF TIDAL CURRENTS ACCORDING TO NATURAL OBSERVATIONS IN THE ARGENTINA ISLANDS ARCHIPELAGO REGION

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The sea current observations in six points of the interisland channels of the Argentine Islands (Antarctic Peninsula) archipelago were conducted during the Second Marine Ukrainian Antarctic expedition in March 1998. The current measurements were carried out by the autonomous devices "ATSIT" on four bottom grounded facilities and on two diurnal stations from anchored vessel. The obtained sets of the discrete 15-min current data covered the periods from four hours up to six days. The sea current data with the period of observation not less than 24 hours and the sea level measurements at the station *Akademik Vernadsky* were analyzed as well.

According to sea level data the tide features correspond to the mixed type of tides with periodic amplitude predominance of diurnal and semi-diurnal variations. High current velocity is observed after 1-3 hours of high tide level. At the low tide period the velocity maximum corresponds to the 2-5 hours lag. The current ellipse orientation is mainly meridional with the different rotation direction of semi-diurnal and diurnal current vectors. The variations of diurnal and semi-diurnal current constituents at near-bottom layer are almost reversible.

The velocity vector of the semi-diurnal tide wave at a near-bottom layer is equal 6.4 cm/s, and the diurnal wave constituent - 3.7 cm/s. In surface layer the velocity of semi-diurnal and diurnal currents are 1.3 and 3.5 cm/s correspondingly. The calculated and measured regional mean velocity value is 2 cm/s. However, their variations considerably exceed mean values. The sum vector values of semi-diurnal and diurnal tide current according to the measurements are 9-10 cm/s.

MC17

REGIONAL CHANGES OF HYDROMETEOROLOGICAL CONDITIONS IN THE SOUTH-WEST SECTOR OF ATLANTIC

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The work is devoted to study hydrometeorological conditions and their changes in the region of Southwest Atlantic (SWA). Data of operative monitoring of the South-American region for the period 2000 – 2005 are used.

The goal of our work was to confirm a systematic character of changes of cloudiness field above the South America and to establish their connection to changes of a temperature field at the surface of the ocean in SWA.

The analysis of changes of topography of a surface of the World Ocean in SWA allows noting tendencies of changes of the geoid form in this region. It testifies about changes of a gravitational field in this region which in turn causes the change of a field of atmospheric pressure and, subsequently, changes of a characteristic direction of vertical movements of air – updrafts and downdrafts. It, in turn, causes decreasing of cloudiness (and precipitation) amount and as a consequence increasing coming solar radiation at the ground. This increasing in total solar heat flux at the surface causes increasing of land and ocean surface temperatures that could be found in climatic data NCEP.

GGG-P18

SEISMIC OBSERVATION IN THE ARGENTINA ISLANDS REGION

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Except for the control of global seismicity, SEISMIC supervision at Antarctic station Akademik Vernadsky have been directed recently on the control of regional and local signals which are absent in the international bulletins. A seismic network in a region is poorly developed, therefore our observations can be of significant value.

For increase in sensitivity seismic gauges have been established on some distance, and at data processing in addition considered the information from Palmer station (PMSA), that allows to process the information as from of miniarray.

Another interesting direction of development is passive sounding of the Antarctic Peninsula by seismic signals from the Scotia Sea. Considering grouping and sites of sources of sounds on local and regional distances it is interesting to watch changes of a condition of an ice cover that might be possible to use for climatology also.

GGG-P19

INVESTIGATIONS OF THE GNSS ANTENNAE TO DETECT NEAR-FIELD EFFECTS UNDER ANTENNA CALIBRATION PROCEDURE

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The presentation describes some results of the investigations of the near-field effects in GNSS antenna-mount configuration. This is particularly important in Polar Regions where the antennae are located to the nearest rocky outcrop. An influence of changes of local conditions on the phase center position of the antenna placed at fixed elevations above the ground is discussed.

The measurements executed with antenna located on elevation from several centimetres up to half of meter above a ground, have yielded the more unstable results in comparison with standard geodetic installation on a tripod. Variations of the measured height at a level up to 1-2 centimetres for iono-free combination were observed.

On the basis of the results from the experiments it is possible to draw the conclusion that investigation of antennae in real conditions of installation, that is, "in situ", should be carried out. This would allow for testing the stability of scattering of satellite signals and multipath, and, in case of stable conditions, there could be a calibration conducted "in situ".

Experiments with different kinds of antennae were made to describe the set of parameters of antenna, which are invariant to the local conditions of the placement. The main aim of this work was to put the recommendations for the selection of the optimal antenna type for the GNSS field measurements in Antarctica.

G-P20

UKRAINIAN RESEARCH IN ANTARCTICA: PRESENTATION AND SCIENTOMETRIC ANALYSIS OF THE UKRAINIAN SCIENTISTS PUBLICATIONS BIBLIOGRAPHY (1997 – 2007)

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Within 12 years which have passed from the beginning of a modern stage of scientific activities of Ukraine in Antarctica, the large volume of scientific research conducted by national scientists and experts has been published in Ukraine and abroad. Results of bibliometric analysis of publication activity of research institutes, higher education institutions, other institutions, organizations and enterprises of Ukraine, implementing scientific and technical projects and programs dealing with Antarctic issues presented. To study this, bibliographic search was conducted and bibliography of scientific works of Ukrainian scientists, published in national and international journals during 1997 till 2007 was elaborated. The total volume of information comprises of more than 500 bibliographic records of publications. There is a steady tendency of its growing.

We demonstrate that limited number of scientific and higher education institutions involved in research activities in Antarctica. These institutions form directions of research and define contributions and priorities of a national Antarctic science to world efforts. Scientific institutions of National Academy of Science in Ukraine play a leading role in this. Rank distribution of institutions by number of publications does not comply with bibliometric model by Zipf law. One of factors of deformation of empirical curve is large part of joint publications by research organizations and higher education institutions. Significant correlation between series of priorities of scientific directions, typical for Ukraine and for such countries as United Kingdom, Russia and Poland and world as a whole have been obtained. The results demonstrate comparatively high dependency of publication distribution by scientific directions on levels of funding and character of Antarctic expeditions.

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