Major research interests of Igor Melnikov

It is well known that the ***sea ice*** is a key component of Polar marine systems. Although only several meters thick, the perennial and seasonal sea ice has a dramatic impact on all aspects of environmental variations in Arctic and Antarctic of the most sensitive regions of the Earth. The existing ecological problems caused by pollution of the Polar regions and by developing here of oil and gas in the nearest future put forward the need of urgent integrated study of the Arctic and Antarctic sea ice cover to understand how it may respond to global change.

Since middle of 70th in P.P.Shirshov Institute of Oceanology, Russian Academy of Sciences, it was worked out and undertaken the multi-disciplinary, long-term research to study the Arctic and Antarctic sea ice cover. *The main goal is to determine the role of the sea ice zone in polar marine systems and in the control of environmental exchanges.* The field programs were realized during 6 Arctic expeditions at Russian "North Pole Stations-22, 23 and 24", 1975-1981, 2 Antarctic expeditions at H. Arctovsky Station (King-George Isl.), 1986-1988, and at USA-Russian Ice Station Weddell-1, 1992. During the last 10 years the main interests are focused on the Arctic sea ice biologically-oriented research during the SHEBA experiment, 1997-1998, the “Arctic-2000” expedition, at the drifting stations NP-32, 33 and 34, 2002-2006. Observations were undertaken during polar summer and winter conditions and included areas of the ice-open and ice-covered waters. On the base of these investigations it was discovered and described unknown sea ice biological communities, which play a key role in the food web of polar marine ecosystems. It was shown that both sea ice environment and sea ice biota are very fragile and needed on special delicate attention and protection.

Recent Projects

Recently, I am involved as PI into several Projects related with the Polar Marine Sciences. The first is “The sea ice ecosystem during the recent climate changes in the Arctic” under umbrella of the Russian Foundation for Basic Research (#99-05-

64767). Project is based on the sea ice materials obtained at drifting stations "North Pole-22" (1975-1981), SHEBA Ice Camp (1997-1998) and “Arctic-2000” Expedition at the icebreaker “Ak. Fedorov”, which there were conducted in the same region (Beaufort Sea Gyre, Canadian Arctic) but with the time-scale differences up to 20 years. In addition to these materials it will be used plankton samples and hydrochemical data of the Upper Ocean, as well as observations on flux study and biogeochemical dynamic on the boundary "water-ice". Preliminary data shown that during the last 20 years due to global warming of atmosphere, in the Arctic Ocean, the sea-ice cover surface and sea-ice thickness were remarkable decreased, as well as the surface water freshening and warming were indicated due to active sea ice cover melting. As a results of these processes, characteristic of the biological communities, trophically associated with the upper ocean (their biomass, number and species composition), were remarkably changed for the last 20 years within the same region under study. Duration of this Project is 1999-2007.

Taking into account a noticeable gap of knowledge about physical, chemical, and biological processes in the central Arctic Ocean it proposes to conduct during the IPY 2007-2008 *the Pan Arctic Ice Camp Expedition (PAICEX,www.paicex.ru)*. A major goal of PAICEX is to develop several manned sea-ice platforms to support basin-wide, continuous round-year, multi-disciplinary observations in the Arctic Ocean with focus on study of low atmosphere-sea ice-upper ocean system. Observations should resolve variability on scale of 400-500 km, which is typical of meteorological length scales, or different ecosystems as well as located in key regions of large decadal variability and long-term trends; priority should be given to locations with long historical records like Beaufort Gyre (Canada Basin) and Transarctic Ice Drift (Eurasian Basin). PAICEX scientific and logistic conceptions were approved by a resolution of the IPY National Committee of Russia, September 30, 2005. The field program will be started on April 2007 in the vicinity of the geographical North Pole.

The second is “Ecology of the Antarctic sea ice zone” under umbrella of the Ministry of Science and Technology of the RF. This project is of a part of the Russian Federal Antarctic Science Program. The main goal is to assess ecological parameters of the sea ice cover in areas of the Russian Antarctic continental stations. We suggest using both historical and recent field data for a comparison of ecological situation of the sea ice environment under the anthropogenic pressing. Duration of this Project is 1999-2007. During the IPY, I plan to start the long-term sea ice ecological study at the RF continental station “Progress” as a part of the ICED-IPY project - “Study of the Antarctic Sea Ice Ecosystems” (SASIE, web site is now underway). Field research program will be launched in December 2006.

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