Russian-German marine expedition "Polynya-2009/TRANSDRIFT-XV» to the Laptev Sea in March-April 2009

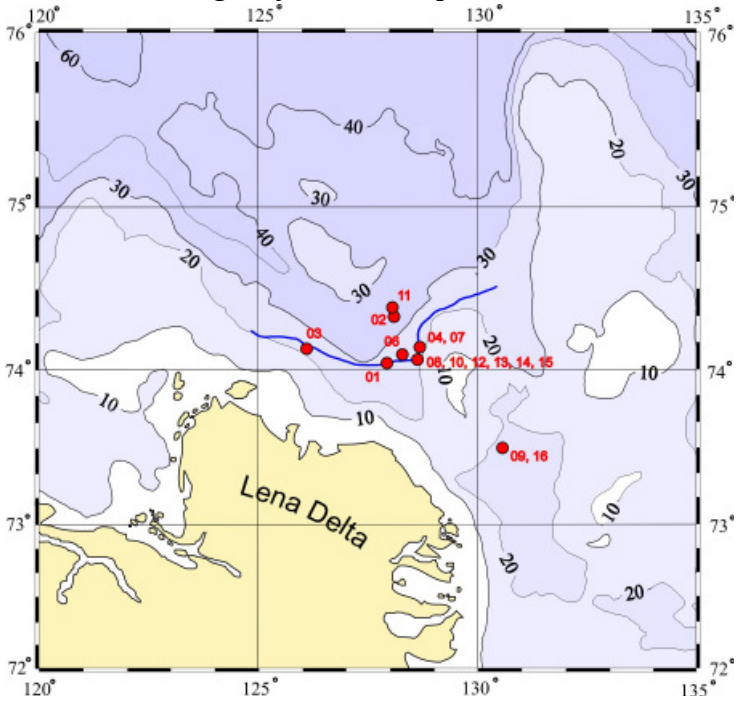
Expedition research were carried out on the Russian-German project "Global change in the seas of Eurasian Arctic shelf: frontal zones and polynyas in the Laptev Sea" in the framework of program "Laptev Sea System" on the program International Polar Year (IPY).

From the Russian side participated: Arctic and Antarctic Research Institute of Roshydromet, State Lena Delta Reserve, Moscow State University.

From the German side participated: Alfred Wegener Institute of Polar and Marine Research, IFM-GEOMAR, University of Trir.

Project "Global change in the seas of Eurasian Arctic shelf: frontal zones and polynyas in the Laptev Sea" is aimed to estimate a state of polynya systems and frontal sections as the indicators of state and climatic environment variability in the Laptev Sea region. The main tasks of winter research on fast and drifting ice are to carry out episodic oceanographic stations; sampling of water and ice cores for chemical analysis and definition of quantitative and qualitative content of suspended matter, ice flora and fauna, structure and texture of sea ice, snow cover depth and ice thickness, sampling of phyto- and zooplankton, meio- and macrobenthos at oceanographic stations; meteorological measurements by automatic meteorological stations, deployment of autonomous short-term (7-8 weeks) oceanographic stations on fast ice edge, by which temperature and sea water salinity at fixed horizons and current velocity profile are measured; to define sea ice thickness on ice measuring profiles.

Main region for research was fast ice edge in central Laptev Sea northward Lena river delta. Expedition research were carried out within period March 16 until April 27 basing in Tiksi. Flights were carried out by helicopters MI-8. First flight to ice was on March 24 to deploy automatic meteorological station (AMS) and subsurface buoy station (SBS). Then the flights to ice were carried out every 3-4 days depending on weather and ice conditions. On March 27 the second complex of SBS and AMS was deployed on fast ice edge at 70 km distance from the position of the first SBS and AMS.



Position of the executed stations

Due to destruction of fast ice edge the first AMS and SBS complex was removed from drifting ice floe on April 2 and redeployed in new point on April 8. But on April 3 in the region of deployment of the second SBS and AMS complex the hummocking was observed, and the decision to remove the stations was made. Removing the SBS the sub-ice part of station was cut off by ice shearing. AMS had been removed in this position was redeployed on April 14 at long distance from fast ice edge. On April 23 two AMS and one SBS were removed.

Totally during the expedition 30 CTD-soundings at 15 oceanographic stations were carried out. In research water area the unique information about thermohaline state of water mass in the flaw polynya region in the central Laptev Sea was obtained, samples were collected to analyze the main hydrochemical characteristics. A set of 2-week records of temperature and salinity on fixed horizons, records of current velocity profiles averaged with 5 min interval from subsurface buoy

station at 24 m depth, 4 sets of measurements of different terms in three different positions on fast ice edge at 80 km distance from edge toward the coast were obtained, water samples were collected from 14 oceanographic stations to analyze the dissolved oxygen content, biogenic elements (phosphates, silicates) and oxygen isotopes. Selectively water samples were collected and filtered to analyze content of suspended organic and anorganic matter, chlorophyll "a" content and phytoplankton, integral content of zoo- and phytoplankton in water column, samples of macrobenthos and meiobenthos, samples for analysis of chlorophyll content, phytoplankton and ice fauna in ice thickness were collected.

Landing of helicopters

Research expedition "Polynya-2009/TRANSDRIFT XV" significantly contributed to IPY goals implementation. Expedition results were included to oceanographic data base of Roshydromet and AARI. Carrying out the oceanographic stations located along fast ice border allows to perform comparable analysis of processes in winter period in the central Laptev Sea and their interannual variations. According to the results of measurements, performed in 2009, significantly freshened surface layer, salinity of which was less by some per mille than salinity in this region in winter, was observed. As there are no other sources of fresh water during this period, it may be concerned that winter river discharge of Lena river distributes under fast ice. Therewith a thickness of freshened layer of river water is 2-3 m. Within the period April 15-23 the significant development of flaw polynya was fixed instrumentally.

Performance of oceanographic station

Open water areas and new ice were formed at 8-10 km distance from fast ice edge due to winds of southern directions. Information from subsurface buoy and automatic meteorological stations will be used to obtain quantitative estimations of water column state for this period and its changes due to polynya development. Data obtained and information collected during previous work in the framework joint Russian-German program "Laptev Sea System" are very valuable for improvement of quantitative and qualitative concepts about flaw polynyas influence on all complicated complex of meteorological, oceanographic, hydrochemical and biological processes in the research region.