Joint International Conference

MINERALS OF THE OCEAN-9

ABSTRACTS

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PREVAILING CHARACTER OF DRIFT SEA ICE IN THE ARCTIC BASIN IN CIRCULATION EPOCHS OF THE NORTHERN HEMISPHERE (XX – THE BEGINNING OF THE XXI CENTURY)

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Sea ice is one of the most powerful agents for preparing, transporting and depositing sedimentary material. The range of action of this transportation agent in ocean conditions: large icebergs pass distances from the places of their formation to 4-6 thousand km and in the course of thawing they deposit the sedimentary material contained in them. Icebergs and sea ice can carry sedimentary material from boulders with a diameter of more than 10 m to a thin pelitic material. The lifting force of ice is great: 1 cubic meter of ice, depending on the density, can carry 100 to 300 kg of sediment (Lisitzin A.P., 1994).

The large-scale circulation of surface waters and ice in the Arctic Ocean is represented by: Transarctic transport in the eastern hemisphere and anticyclonic circulation in the western. Transarctic drift begins in the north of the Chukchi Sea. Then through the area of the pole goes to the Fram Strait between Greenland and Spitsbergen. Further it continues the East Greenland Current to the southern tip of Greenland. From the source of the Transfrctic drift to the south of Greenland (about 6,000 km long) it takes about 4-5 years (Lisitzin A.P., 1994). Such a time would be required for the transportation of aerosol material and other kinds of sediments transported by icebergs and ice islands.

Earlier, according to the hydroclimatic indicators of 2004, 2007 and 2011, new data were obtained on the relationship between the dynamics of the atmosphere circulation in the Northern Hemisphere and the ice drift fields in the Arctic basin (Zakharov V.G., Kononova N.K., 2013). The role of the elementary circulation mechanism 13l (ECM 13l) was established in the formation of ice fields and their progress to the Spitsbergen fjords (summer 2004 and 2011). The consistency of the periods of ECM 13l and cyclonic circulation of ice drift in the Arctic basin in different years is shown. It was also found that when the ECM 12a was acting in the Arctic basin anticyclonic circulation of ice drift was observed (summer 2007).

Simultaneously, maps of the atmospheric circulation of the Northern Hemisphere and the character of the ice drift in the Arctic basin were obtained for the periods of action of the various elementary circulation mechanisms in 2011. These are the dynamic schemes: winter - ECM 13w (with cyclonic circulation of ice drift in the Arctic basin), spring - ECM 8 gz on 07.03.2011, summer - ECM 4c on 14.08. 2011

(with anticyclonic circulation of ice drift in the Arctic basin in the area of the pole) (Zakharov V.G., Kononova N.K., 2013).

It was also found that the change in atmospheric pressure in the Arctic, and, accordingly, the character of the circulation of the atmosphere in the Northern Hemisphere (cyclonic to anticyclonic and vice versa) can significantly affect migration and the Transarctic drift regime (displacement, deceleration, acceleration), as well as intensity, direction of transport and sedimentation by sea ice in the Arctic basin.

The found interrelationships allowed us to approach the identification of the prevailing character of the sea ice drift in the Arctic basin in different circulating epochs of the Northern Hemisphere of the XX - XXI centuries. The study was based on Classification of the circulation mechanisms of the Northern Hemisphere B.L. Dzerdzeevsky) (Kononova N.K., 2008) and Classification of Ice Drift Fields in the Arctic Basin (Gorbunov Yu.V., Losev S.M., Dyment L. N., 2008).

In the first — the meridional northern circulation epoch of the XXth century (1899-1915), the longest were winter ECM 11a and 12bw (Kononova N.K., 2008), characterized by high pressure in the Arctic and the anticyclonic character of ice drift in the region of the pole.

In the second — the zonal circulation epoch of the XX century (1916-1956), winter meridional northern circulation mechanisms ECM 11a and 12bw were also the longest ones. High pressure in the Arctic and anticyclonic character of ice drift fields were noted. High duration was shown by summer ECM 4b and ECM 3 with disturbance of zonal in one of the sectors of the Northern Hemisphere. The ice drift in the area of the pole with these and other ECM of zonal group was of anticyclonic character.

In the third — the meridional southern circulation epoch of the XX-XXI centuries (1957-2000-e) was dominated by ECM 13l and ECM 13w (Kononova N.K., 2008). The atmospheric pressure in the Arctic was low, the ice drift around the pole was cyclonic. Rapid growth of the meridional southern circulation was observed in 1981-1997. The decrease in the duration of the meridional southern circulation and the growth of the northern meridional circulation (due to ECM 12a with anticyclonic circulation of ice drift in the area of the pole) appeared in 1998-2013.

Inside the meridional southern epoch of the XX-XXI centuries, according to (Kononova N.K., 2008), periods are marked:1957-1969 (increase in the duration of the meridional northern circulation and anticyclonic drift of ice in the region of the pole) and 1970-1980 (increase in the duration of zonal circulation with high pressure in the region of the pole and with anticyclonic character of ice drift).