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## Navigation in the ice conditions in Arctic basin in September-October 2021

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In September-October 2021 during NABOS-2021 expedition specialized shipborne ice observations were carried following methodological principles developed in AARI. The overall research area for the cruise included Arctic basin area toward north of Laptev and East Siberian seas within 73-82°N 125°E-170°W. Ice conditions were generalized and analyzed along the oceanographic cross-sections in accordance with the ice conditions homogeneousness. Hard ice conditions were unforeseen during the planning period, which made adjustments to the initial expedition plans and several minor northern cross-sections were canceled.

The route fragment with the hardest ice conditions was observed within 78-82°N 160°-172°E. Sea ice concentration was 10 tenths totally, concentration of residual ice varied from 5-7 to 10 tenths directly on the route of the vessel. Prevailing forms of the sea ice were big (500m-2000m) and often vast (2000-10000m) floes with strongly smoothed hummock formations covered with snow 10-15 cm high. The thickness of the residual ice on the route was mainly 50-70 cm (17%), often over 100 cm (6%), in hummocks over 2-3 meters. The water area between the ice fields was captured by young ice, grey and grey-white (3-4 up to 9 tenths).

Several areas were crossed by vessel twice in a time difference of one month. Sea ice formation process during the month long was fixed and analyzed by changes in distribution of ice with different stages of development. In general, 66% of the ship track within the ice during expedition had sea ice concentration of 10 tenths, the residual ice on the route accounted for 26%, young ice was observed for 38%, nilas and new ice 36%. The residual ice thickness varied from 30-50 cm to 160 cm and above, in some cases (hummock formations) over 300 cm. Ice thickness of 30-50 and 50-70 cm accounts for 9% each, thicknesses over 70 cm account for 8% of all thickness ranges observed throughout the entire route of the vessel in the ice.

**Key words:** *shipborne observations, ice conditions of navigation, ice thickness, ice concentration, stage of development of ice.*