ORGANIC MATTER IN BOTTOM SEDIMENTS OF THE NORTHEASTERN PART OF THE KARA SEA AS AN INDICATOR OF SEDIMENTATION

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The composition of bottom sediments of the western arctic shelf is mainly determined by the geological structure and lithologic-petrographic characteristics of rocks that form the coast, bottom and islands of the basin (Romankevich et al., 2001; Levitan et al., 2007). The presence of deep-sea troughs, shallow underwater plains and a complex hydrological regime is typical for the Kara Sea. Furthermore the maximum value of river discharge (about 41%), the inflow of cold waters from the Arctic basin and the Laptev Sea, and warm Atlantic waters from the Barents Sea create variety of sedimentation regimes.

The main idea was to investigate the composition of hydrocarbon (HC) molecular markers, as indicators of the origin of sedimentary material. The object of the study are bottom sediments collected from crossing profiles in the northeastern part of the Kara Sea near the Komsomolets Island during the research cruise of institution "VNIIOkeangeologia" in 2017 (R/V "Professor Molchanov") (Fig. 1).

The analytical procedure includes determination of elemental composition of sediments (TOC, Ccarb), and group and molecular composition of the extractable part of the dispersed organic matter (DOM). Fractionation of the saturate and aromatic HCs and molecular markers identification (*n*-alkanes, isoprenoids, cyclanes, terpanes and polycyclic aromatic HCs) are carried out using preparative liquid chromatography methods and GC-MS analysis with the Agilent 6850/5973 system respectively.

The studied bottom sediments are represented by Holocene-Quaternary deposits of predominantly silty-clay composition. The admixture of gravel, sand and sandy-silty-clayey mixed sediments in the surface layers of cores testify to the influence of processes of ice transport and erosion and redeposition of nearby land and sea bottom on their formation (Polyak et al., 2008). This is reflected in variations of geochemical parameters, which also indicate a mixed composition of DOM. The TOC content widely varies in sediments (from 0.47 to 1.70%). The observed predominance of humic acids in the extractable part of DOM is typical for the low mature humic OM. However, the content of the non-extractable part of DOM reaches 97.8%, indicating an input of redeposited sediments with a post-diagenetic level of the DOM transformation.

Molecular characteristics of aliphatic HCs also agree with the mixed composition of DOM. Distribution of *n*-alkanes in all the samples reflects the similar sapropelic-humic genesis of the initial OM ($C_{17\text{-}19}/C_{27\text{-}31}$ ca. 0.25), but the values of isoprenoid indexes (Pr/Ph; Pr/C_{17}; Ph/C_{18}) indicate significant differences in facial conditions and maturity degree of DOM (Fig. 1). Sediments sampled from the profile *1* (along the Voronin Trough) most likely are formed under the influence of the river runoff and are dominated by the sapropelic-humic DOM of early diagenetic transformation degree (Pr/Ph <1; $CPI_{23\text{-}33}$ <2; $OEP_{27\text{-}31}$ =2.7).

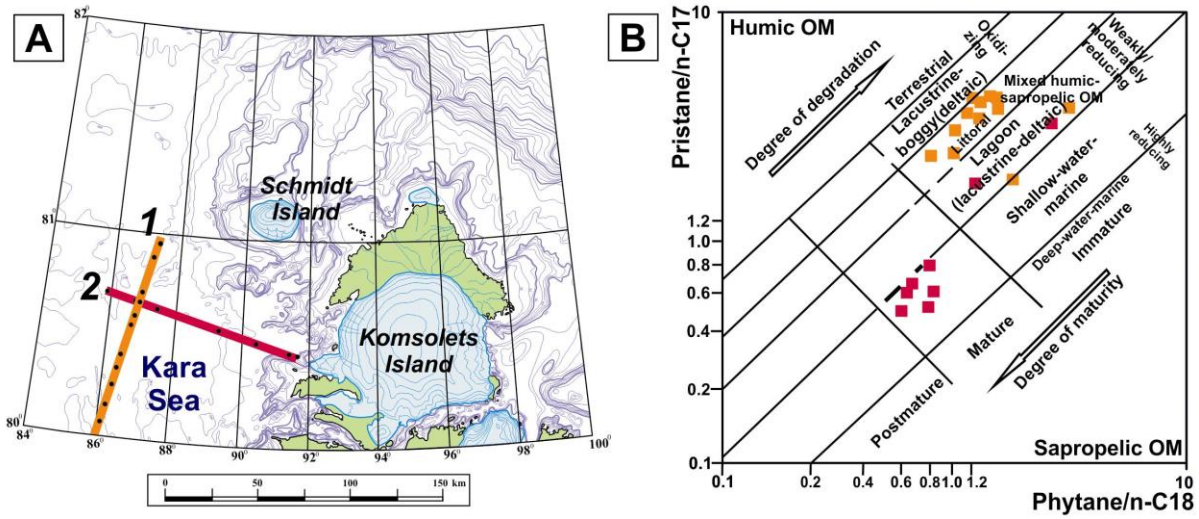

Figure 1 *Map of the study area (A) and diagram of facial genetic characteristics of DOM (B) (Connan-Cassou diagram (Connan and Cassou, 1980)).*

The low values of the thermal maturity indexes of steranes and hopanes (Ts/(Ts+Tm), $H_{31}S/(S+R)$ and $St_{29}20S/(20S+20R)$), that are all less than 0.4, indicate insignificant level of OM transformation in the bottom sediments from the profile *1*. In the sediments collected from the profile *2* these indicators are slightly higher ($H_{31}S/(S+R)$ = 0.46), but do not reach values characteristic for the thermally mature sedimentary rocks. This agrees with the values of MPI that are less than 0.4.

Result of the complex molecular characteristics study assumes that the formation of these deposits have taken place in the shallow water and/or lagoon reducing conditions (H_{35}/H_{34}>0.8; St_{27}/St_{29}=0.6) with a significant contribution of terrestrial biota (cadalen+reten+perylene = 52% sum of PAH).

Thus, the DOM composition of the Quaternary sediments of the region is determined by the high influence of the island land Paleogene deposits erosion during the transgressive-regressive processes associated with the western Arctic shelf development.

References

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