Paper Number: 769

Origin and formation specificity of the Late Cenozoic sediments of the Central Arctic rises: the experience of molecular stratigraphy

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The deep-sea part of the Arctic Ocean is the ultimate sedimentation basin for sinking particles, which accumulate in strictly stratified sequences comprising the data on various sources (terrigenous runoff, ice rafting, turbidite flow, ocean along-slope currents, subaqueous erosion and redeposition of bedrocks) and their input into the sedimentary cover.

According to the published data [1], [2], the composition and genesis of dispersed organic matter (DOM) of the Amerasian continental margin bulk sediments is controlled by two main processes: hydrosphere transport of terrigenous humic compounds during the glaciation periods and ice-transfer of rock mature (lithified) organic matter (OM) during deglaciation.
The role of subaqueous erosion of bedrock in the formation of bottom sediments remains debatable due to the continuous overlay of Quaternary sediments. However, recent seismic data [3], [4] indicates the number of faulted outcrops on the slopes of Shamshura, Rogotskogo and Trukshina where the bedrocks might be exposed.
Sediment cores (up to 9 m length) and dolomite samples (DM) for this study were collected along the meridional transect from the continental slope to the 83°N during the cruises of R/V "Akademik Federov" in 2005, 2007 and icebreaker "Captain Dranitsin" in 2012. Samples of sediments (91 pcs) were stored frozen in sterile conditions until the laboratory analysis. The determination of elementary (TOC, Ccarb), group and molecular composition of DOM soluble part, including saturate and aromatic fractions of hydrocarbons (n-alkanes, cyclanes and polyaromatic hydrocarbons) were carried out using preparative liquid chromatography method and GC-MS analysis with the Agilent Technologies 6850/5973 GC System.
The studied transect starts on the edge of continental slope and passes through the main elevation of Mendeleev Rise, particularly from the shelf break in the south to the Trukshina mountain in the north. Sediments consist mainly of clay and silty clay with minor concentrations of sand and gravel in the north part. The recent sediments are widespread mostly within the southern part of Mendeleev Rise.
The specificity of DOM geochemical characteristics suggests variety of sediment sources and sedimentation conditions which occur during the late Cenozoic deposits formation in this region of the Arctic Ocean. The distribution and ratio of molecular markers indicates both similarities and unsuspected diversities of OM composition. The most specific sedimentary sections are confined to the canyon on north-east slope of Trukshina mountain (2350 m depth). The station was sampled just in a few hundred meters down the slope from the seismic identified unconformity between Quaternary and Cretatious deposits. The probable analogs are the Cretaceous deposits of Indigiro-Zyryanka basin (northeastern Yakutia), where the similar molecular composition of OM was observed.
Thus, the full complex of organic-geochemical data on the studied samples evidences the few sediment-forming sources for Pleistocene-Holocene deposits of the Mendeleev Rise seamounts.
The most important fact is that the observed contribution of subaqueous erosion and denudation products redeposition in zones of bedrock outcrops are not less significant than the terrigenous and ice transport supply.

References:

[1] Stein at al. 2009 Polarforschung 79: 97 – 121

[2] Yamamoto and Polyak 2009 Global and Planetary Change 68: 30–37

[3] Bruvoll et al. *Marine Geophysic Res*ults *31: 149–171*

[4] Gusev et al. 2014. RAS reports 455: 184-188