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Hydrocarbon Molecular Markers as Indicators of the Late Cenozoic Sedimentation on the Amerasian Continental Margin (Arctic Ocean)

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Abstract— The main factors controlling the bulk sedimentation in the region of the Mendeleev Rise and the adjacent part of the Arctic Ocean during the late Cenozoic were studied using a complex of geomorphological, lithological, and organic geochemical data. Samples for the study were collected during the cruises of the R/V Akademik Fedorov in 2000, 2005, and 2007 and icebreaker Kapitan Dranitsyn in 2012. Analysis of the group and molecular compositions of the dispersed organic matter (DOM) in bottom sediments has shown that the input of terrigenous sediments enriched with abrasion products of lithified rocks from the eastern source province determines the Holocene–Pleistocene sedimentation on the continental slope of the East Siberian Sea and in the Podvodnikov Basin. The individual characteristics of DOM of the late Cenozoic deposits from the underwater mountains of the Mendeleev Rise reflect the wide diversity of sedimentary sources and depositional conditions. Subaqueous erosion and redeposition of denudation products of source rocks and pre-Holocene sediments play an important part in sedimentation together with a terrigenous flow and ice transport.

Keywords: bottom sediments, dispersed organic matter, biomarkers, Arctic Ocean, East Arctic shelf

INTRODUCTION

The deep-water part of the Arctic Ocean as a final sedimentation basin includes a stratified sequence of sediment flows that makes it possible to identify contribution from various sources (e.g. terrigenous flow, ice transport, turbidite flows, along-slope oceanic currents (contourite flows), subaqueous erosion, and source rock redeposition) to sedimentary cover formation.

According to the current concepts (Stein et al., 2009; Yamamoto and Polyak, 2009), the composition of the dispersed organic matter (DOM) in unconsolidated cover sediments of the deep-water Amerasian continental margin is determined by two main sediment sources:

– hydrospheric transport of terrigenous humic organic matter (OM) during glaciation periods;

– hydrospheric transport of terrigenous humic OM and ice/iceberg transport of rocks containing thermally mature (lithified) OM during deglaciation periods.

The influence of subaqueous transport and redeposition of source rock on bottom sediments formation is questioned, since they are overlaid by a rather thick Meso-Cenozoic sedimentary cover. However, two seismic sections obtained by icebreaker HEALY show that the acoustic basement comes close to the seabed surface (Bruvoll et al., 2012). In addition, the southeastern slopes of the Shamshura Seamount, as well as the western and eastern slopes of the Trukshin Seamount are also the basement protrusions of tectonic origin at the seabed according to the CDP seismic reflection data obtained during "Arctic-2012" expedition (Gusev et al., 2014, 2017).

In the present paper, a comparative analysis of molecular composition and sedimentary DOM distribution is performed to identify sources of unconsolidated deposits of the Amerasian continental margin and their formation conditions.

MATERIALS AND METHODS

Sedimentary cores collected during cruises of R/V Akademik Fedorov (in 2000, 2005, 2007, and 2008) and icebreaker Kapitan Dranitsyn (in 2012) along two meridional transects from the continental slope to 83°N (Fig. 1) were studied. Bottom sediments were taken from gravity corers (up to 6 m) with plastic liners, placed in sterile containers and preserved at –18°C. The analytical procedure of DOM study included identification of elemental composition – the inorganic (C_{carb}) and total organic carbon (TOC) contents, extractable part (EOM) of OM study and identification of its group composition, chromatographic extraction of saturated and aromatic hydrocarbon (HC) fractions with further GC-MS study using an Agilent Technologies 5973/6850 system equipped with a quadrupole mass detector and analytical software (Petrova et al., 2010, 2017).

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RESULTS AND DISCUSSION

Transect 1 starts at the inclined plain of the outer shelf (AF-07-29, AF-08-06), intersects the upper part of the continental slope in the north (AF-08-07), then emerges at the upper terrace at the bottom of the Podvodnikov Basin (AF-08-08) and ends near its northern boundary (AF-08-11) (Kaminsky…, 2017).

Sedimentary cores (up to 300 cm) are predominantly represented by noncarbonate silty-clays with low TOC (0.3–0.8%) (Fig. 2). Maximum TOC is observed in sediments from AF-07-29, and minimum - in abyssal sediments from AF-08-11. The last core is also characterized by nonsystematic variations of C_{carb} (0.05–1.34%) not observed in sedimentary sections of the continental slope and its foot.

DOM group composition (extractable OM, humic acids, and insoluble components) indicates a significant degree of its transformation (residual organic matter, ROM > 90%). The highest degree of transformation (ROM = 97.2%) is observed in the sediments from station AF-07-29 collected in the southern part of the transect (upper part of the continental slope). However, this paradoxical fact agrees with the middle Neopleistocene age of sediments of this section (~172 ka) (Gusev et al., 2013), and is consistent with the late diagenetic transformation degree of DOM.

The general trend in distribution and group composition of soluble DOM components (EOM and humic acids) in the shelf-pelagic direction agrees with the main geochemical pattern typical for the offshore areas of the World Ocean (Romankevich, 1977) including the Arctic region (Gramberg and Romankevich, 1980). Thus, the contents of polar components (resins and asphaltenes) decrease and HC contents increase in the EOM (Fig. 2) reflecting the general trend in diagenetic and post-diagenetic transformation of DOM.

Transect 2 starts at the interface between the continental shelf and Kucherov Terrace and passes along the Mendeleev Rise (Fig. 3). In the geomorphological sense, the Mendeleev Rise is a system of descending stairs (Naryshkin, 1995; Kaban'kov et al., 2004, 2008).

Sediments are represented by clays and silty clays with presence of sands and gravelites chaotically distributed across the sections. Sediments within the continental slope (AF-05-02, AF-05-05) are represented by noncarbonate (C_{carb} < 0.1%) fine-grained material with low TOC (< 0.5%) (Fig. 3). However, the average C_{carb} increases significantly (up to 0.6%) and its distribution varies through the section from 0.04 to 1.75% in the area of the southern slope of the Mendeleev Rise (AF-05-09). Splashes of C_{carb} content are recorded along the entire length of the core (600 cm) but correlate with the coarse-grained fraction (> 63 μm) only in its lower part (Fig. 3). Thus, the increased carbonate contents are unlikely related to the ice transport material in this case. In addition, pink interlayers, which according to the current concepts (Stein et al., 2009) mark the input of drift carbonates, were not observed in this sedimentary section. The cited paper includes a description of sedimentary cores from the eastern-west transect (77°N) intersecting the Mendeleev Rise and attests to the presence of these layers only in sediments of its eastern slope (core PS72/340-5). A similar trend is also observed in higher-latitude sediments (80°N). Comparison of C_{carb} and coarse-grained fraction distribution in sediments from the western slope foot (AF-00-23), central part (AF-00-08) and the eastern slope foot (AF-00-02) of the Mendeleev Rise testifies to the link between these parameters in the eastern and central part of the transect especially. On the other hand, C_{carb} decreases sharply and shows no correlation with the coarse-grained fraction in the sedimentary section of the Podvodnikov Basin.

The highest C_{carb} values (up to 4%) likely related to pink interlayers were observed in deposits collected from the peak area of the Shamshura Seamount (AF-00-08, KD-01-15) (Fig. 3) and the eastern flank of the Mendeleev Rise to the southeast from Pochtarev Plateau (Gusev et al., 2013) (KD-03-10). It should be noted that C_{carb} values clearly correlate with coarse-grained fraction contents only in the sediments of core AF-00-08 (Fig. 3), while for core KD-03-10 there is no such a good correlation. Moreover, in the upper part of this core, where the mineralogical composition is characterized by increased contents of dolomites, carbonate organic fragments (Rekant et al., 2013), and therefore C_{carb}, the insignificant content of the coarse-grained fraction (< 10%) is observed. Correlation of this sedimentary core with cores HLY0503-08JPC (Yamamoto and Polyak, 2008),

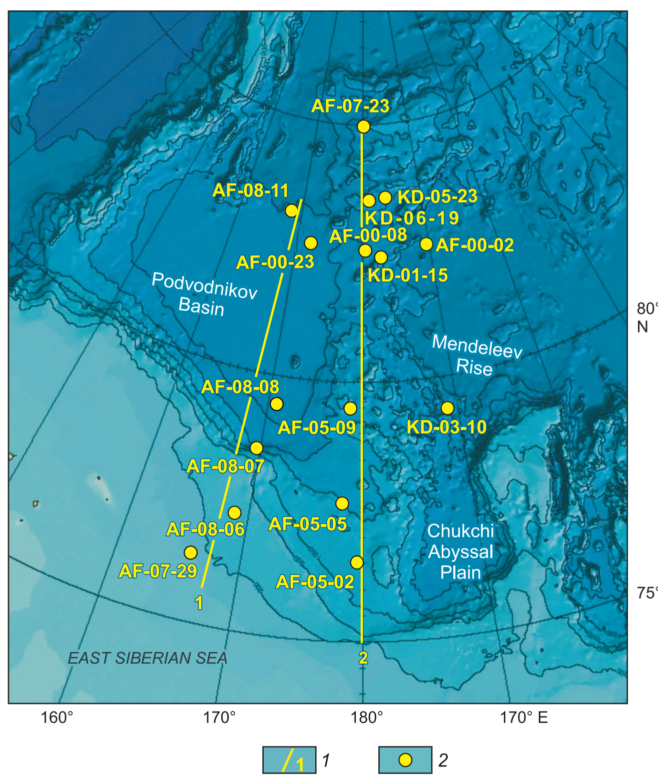

Fig. 1. Positions of studied sedimentary cores on a bathymetric map. *1*, transect; *2*, sampling station.

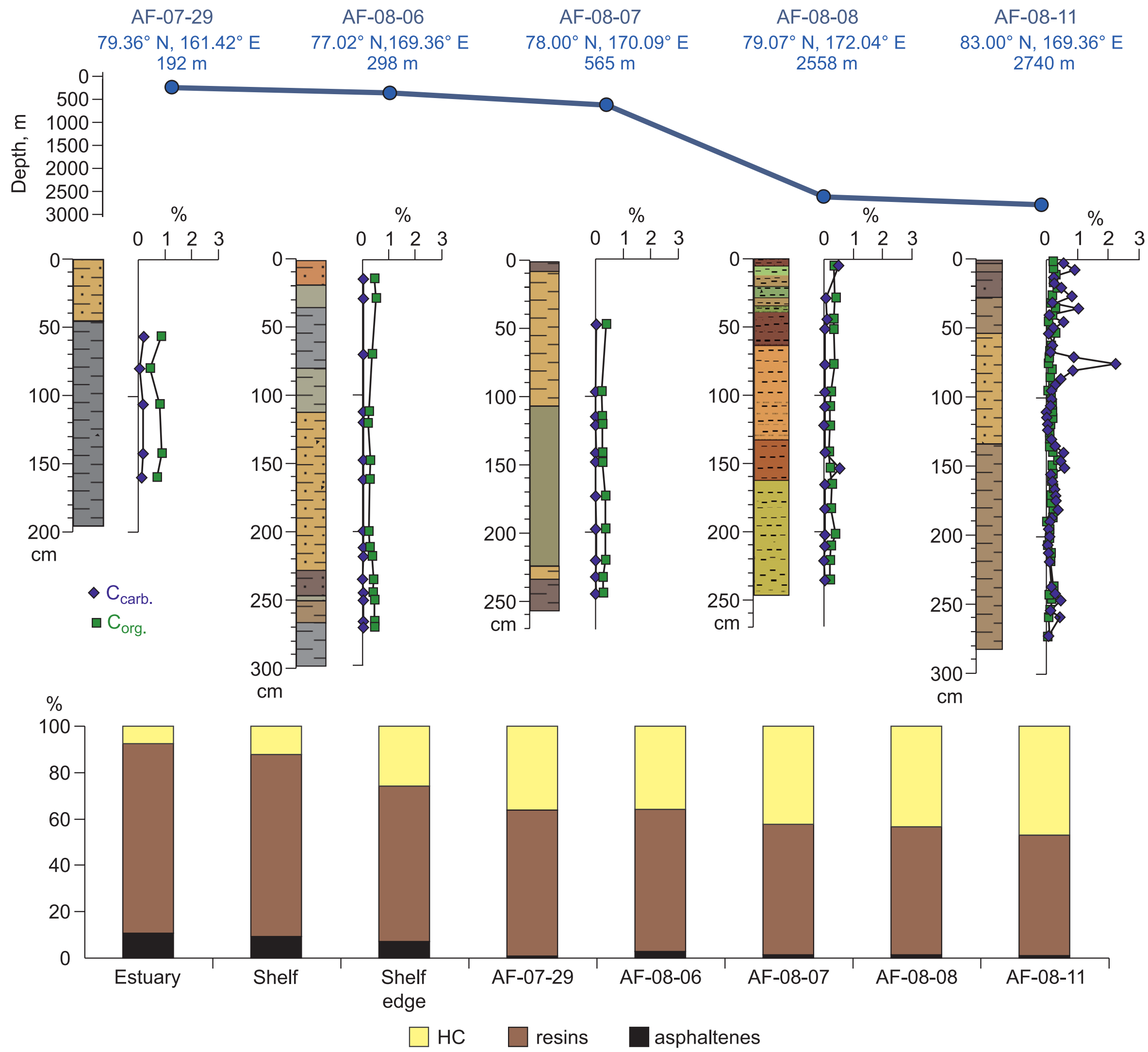

Fig. 2. Transect 1, lithological and geochemical characteristics of sediments (Rekant et al., 2016).

and PS72/404-3 (Stein et al., 2009) is not possible, even considering their proximity to each other, due to the significant differences in stratification methods. Moreover, the age range of core KD-03-10 is also controversial and is identified as Neopleistocene according to paleontological data and Pliocene according to magnetostratigraphic data (Taldenkova et al., 2016; Kaminsky…, 2017) making further paleoreconstructions rather speculative.

Two sedimentary cores in the northern part of the transect were collected from the eastern (KD-05-23) and western (KD-06-19) slopes of the Trukshin Seamount and described in detail in (Gusev et al., 2014). It was shown that the bottom slope on the western side reaches 35–50°, wherein the steepest areas are limited to flanks of a big submarine canyon. An exposure of source rock with a fractured surface was observed. The bottom slope on the eastern side also reaches 30–40°.

The studied sedimentary cores are represented by noncarbonate (C_{carb} < 0.1%) silty clays with TOC < 0.2%. No correlation between C_{carb} values and granulometric fraction >63 μm is observed. Group composition of DOM (with ROM up to 98%) and its soluble components, i.e. EOM (HCs, resins, and asphaltenes; Fig. 3), indicates a significant post-diagenetic transformation degree.

It should be noted that sediments from transect 2 in contrast to the sediments from transect 1 do not show characteristic transformations of DOM composition and distribution typical for the transitional shelf – deep-water depositional environments. The high specificity of each studied sediment core indicates significant variations in sources and conditions of sedimentation in the region. These differences are especially clear, when studying molecular composition of DOM.

DESCRIPTION OF DOM MOLECULAR COMPOSITION

Distribution of aliphatic HCs in the sediments of transect 1 indicates a significant degree of transformation and

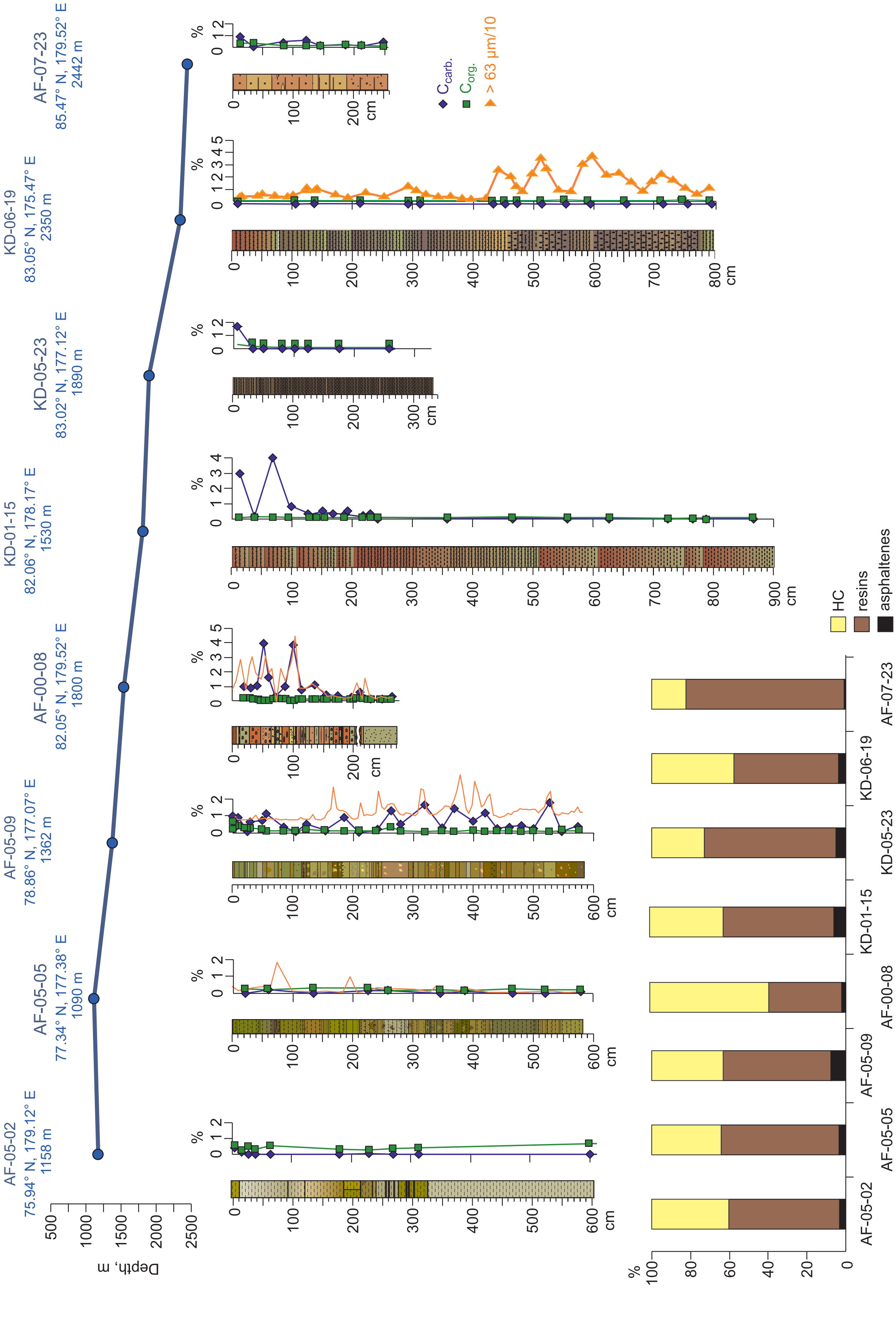

Fig. 3. Transect 2, lithological and geochemical characteristics of sediments (Rekant et al., 2016).

Table 1. Transect 1, main geochemical characteristics of *n*-alkanes and isoprenoids

Station	$CPI_{23–33}$	n-C_{17}/n-C_{27}	$OEP_{17–19}$	$OEP_{27–31}$	Pr/Phy	K_{iso}	Lithic n-alk/Σn-alk
AF-07-29	2.98	0.33	1.30	4.11	0.81	0.47	0.32
AF-08-06	2.39	0.67	0.81	4.65	0.89	0.32	0.22
AF-08-07	2.14	0.86	0.71	3.78	0.84	0.35	0.48
AF-08-08	2.38	0.58	0.74	4.70	0.95	0.37	0.39
AF-08-11	1.84	0.96	0.49	3.98	1.08	0.41	0.57

Note. Here and in Table 2, Kiso is the isoprenoid index (Pr + Phy)/(n-C_{17} + n-C_{18}), where Pr, pristane, Phy, phytane.

mixed sapropelic-humic genesis of DOM formed under near-shore and shallow-water marine conditions, which is clearly illustrated by the Connon–Cassou diagram (Connon and Cassou, 1980) (Fig. 4).

Bimodal *n*-alkane distribution with maxima in low (n-C_{17-19}) and high (n-C_{25-31}) molecular weights (HMW) areas is typical for DOM of mixed nature (Table 1) and demonstrates the contribution from aquagenic and terrigenous components, and the decrease of the HMW components in seaward direction (n-C_{17}/n-C_{27} from 0.33 to 0.96) (see Table 1). The increase of DOM thermal transformation goes in the same direction and is indicated by the low indices of CPI and OEP and the increase in relative content of lithified (thermally mature) aliphatic HCs (Lithic n-alk/Σn-alk) (Yamamoto and Polyak, 2009). The relative increase in aquagenic DOM components (n-C_{17}/n-C_{27} = 0.96) observed in the sediments of core AF-08-11 may be due to the drift or redeposition of carbonate material input. Overall, the similarities in *n*-alkane distributions in surface and submerged (up to 300 cm) sediments indicate stable conditions of the late Quaternary sedimentation.

Geochemical parameters, which characterize the composition of aliphatic HCs (*n*-alkanes and isoprenoids) in the sediments of transect 2 (along the Mendeleev Rise), are considerably unique. The variations in *n*-alkanes and isoprenoids distribution characteristic for transect 1 are not detected in the sediments of transect 2. The wide scatter of dots on the Connon–Cassou diagram (Fig. 4) characterizes the high diversity of thermal maturity, genesis, and deposition conditions of the studied sediments. Thus, the highest content of aquagenic components is detected in sediments from the continental slope and southern part of the rise (AF-05-02, AF-05-05) (Table 2).

The highest degree of DOM thermal transformation is identified in sediments from the eastern slope of the Mendeleev Rise (KD-03-10). Low values of the odd/even preference indexes (CPI = 1.07, $OEP_{17–19}$ = 0.59, $OEP_{27–31}$ = 1.47) typical of DOM with post-diagenetic maturity level together with the high content of lithified *n*-alkanes indicates a significant influence of mature lithified rocks on sediments formation.

The DOM of this sedimentary core is exceptionally specific. According to the proposed stratigraphic scheme (Taldenkova et al., 2016), the sediments of the lower part of the section (450–570 cm) are older than MIS 16 and were formed under mild conditions with seasonal ice cover. The interval of 350–450 cm corresponds to MIS 16–13 and is characterized by massive input of ice-transported material from the shelf with Transarctic drift. Finally, the upper part of the section (MIS 12–1) corresponds to the development of thick ice cover and carbonate input with Beaufort Gyre.

According to the paleomagnetic data (Kaminsky, 2017), the core formation took place at sedimentation rates ca. 1.5 mm/ka that is significantly lower than it was expected by other authors. Thus, the lower part of the section is of Pliocene age (3.58 Ma). The three intervals characterized by normal and reverse polarity of the geomagnetic field were distinguished by the authors as 531.0–394.5, 394.4–123.5, < 123.5 cm, where 394 cm is the Matuyama–Gauss Chron boundary, and 123.5 cm — the Brunhes–Matuyama Chron boundary.

Comparison of geochemical parameters of *n*-alkanes and isoprenoids in accordance with sedimentation stages gives us three distinct complexes of data (Fig. 5). Sediments of the lower part of the section (> 350 cm) contain the DOM of humic-sapropelic genesis with the same composition and

Table 2. Transect 2, main geochemical characteristics of *n*-alkanes and isoprenoids

Station	$CPI_{23–33}$	n-C_{17}/n-C_{27}	$OEP_{17–19}$	$OEP_{27–31}$	Pr/Phy	K_{iso}	Lithic n-alk/Σn-alk
AF-05-02	2.14	1.12	0.59	4.05	0.88	0.63	0.48
AF-05-05	1.94	1.49	1.03	3.36	0.82	0.64	0.42
AF-05-09	1.52	0.92	1.20	2.33	0.95	0.76	0.39
KD-03-10	1.07	0.88	0.59	1.47	0.90	0.63	0.89
KD-01-15	1.44	0.51	0.69	1.92	0.92	0.71	0.66
KD-05-23	2.22	0.27	0.64	3.40	1.00	0.56	0.44
KD-06-19	2.09	0.48	1.16	3.25	0.76	0.79	0.50

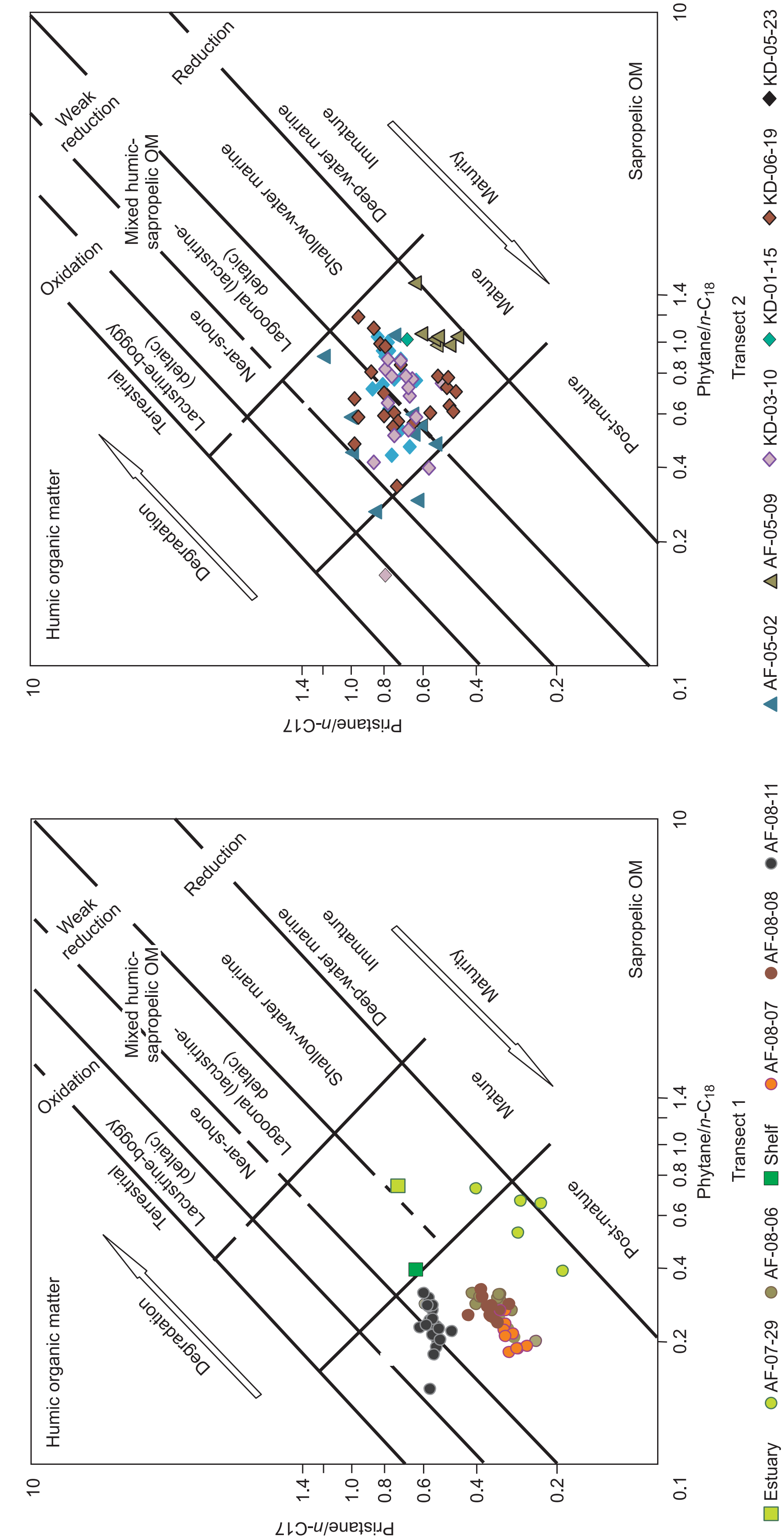

Fig. 4. Genetic characteristics and facial conditions of sedimentation.

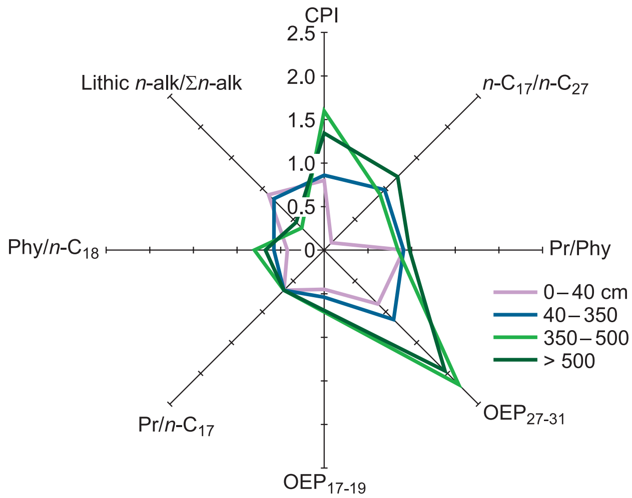

Fig. 5. Geochemical characteristics of *n*-alkanes and isoprenoids in sediments from station KD-03-10.

transformation degree (n-C_{17}/n-C_{27} = 0.9–1.2; CPI = 1.3–1.6; Lithic n-alk/Σ n-alk = 0.3–0.5). Massive input of weakly transformed OM with significant contribution of aquagenic biota to the sedimentary basin agrees with the concept of climatic optimum. Content of thermally mature DOM (CPI = 0.8–0.9; Lithic n-alk/Σ n-alk = 0.8–0.9) increases up the sedimentary section (< 350 cm) possibly due to terrigenous flow of source rock abrasion products and ice transport. The most specific distribution of *n*-alkanes is detected in sediments from the upper part of the section (up to 40 cm) and is characterized by sharp degradation of low molecular weight compounds (n-C_{17}/n-C_{27} = 0.13) and anomaly distribution of the even homologues ($OEP_{17–19}$ = 0.44).

This specificity of *n*-alkane composition in the interval of 0–40 cm may indicate intense microbial degradation of DOM (Peters et al., 2004). This assumption agrees with the geomorphological position of station KD-03-10 located on the eastern slope of the Mendeleev Rise within the elongated NW-trending structural depression (Kaminsky, 2017). This likely attest to the association of the studied sedimentary section with the fault zone and possible hydrothermal activity. Dredging operations at the same slope revealed multiple ferromanganese crusts (FMC) and nodules quite atypical for deep-water Arctic. Detailed study of FMC samples by Konstantinova et al. (2016) revealed the hydrothermal genesis of the lower and possibly middle layer of the crusts and hydrogenic genesis of the upper layer. Discovery of specific, apparently authigenic carbonate crusts (Pakhalko et al., 2017) is another sign of hydrothermal activity in the region. A high-amplitude normal fault clearly identified in the HLY 0521 seismic section in (Gusev et al., 2014) may act as a hydrothermal fluid source within the research site. Thus, the discussed phenomenon determines the uniqueness of DOM composition in the upper part of the sedimentary section.

The sediments from the northern part of the Mendeleev Rise collected at the Shamshura Seamount show increased contents of terrigenous components (n-C_{17}/n-C_{27} = 0.3–0.5). Despite the slight decrease of their transformation degree it nevertheless exceeds the values observed in the sediments from the Podvodnikov Basin (transect 1).

Analysis of the molecular composition of cyclane series biomarkers, i.e. terpanes and steranes give additional opportunities to assess DOM thermal maturity and determine its genesis. The hopane indices of DOM thermal maturity in the sediments of transect 1 indicate a significant contribution of transformed geological material (Fig. 6). Increase of tricyclane content (ΣTricyclanes/Σαβ, βα hopanes) in northern direction may attest to the predominance of eukaryotes in the composition of initial OM (Kontorovich et al., 2009), but it does not agree with the general trend of humic OM decrease in seaward direction. It is well known that tricyclanes are more thermodynamically stable than hopanes (Peters et al., 2004) and better preserve during DOM transformation. The significant degree of DOM transformation is also confirmed by the tricyclane – trisnorhopane indices cor-

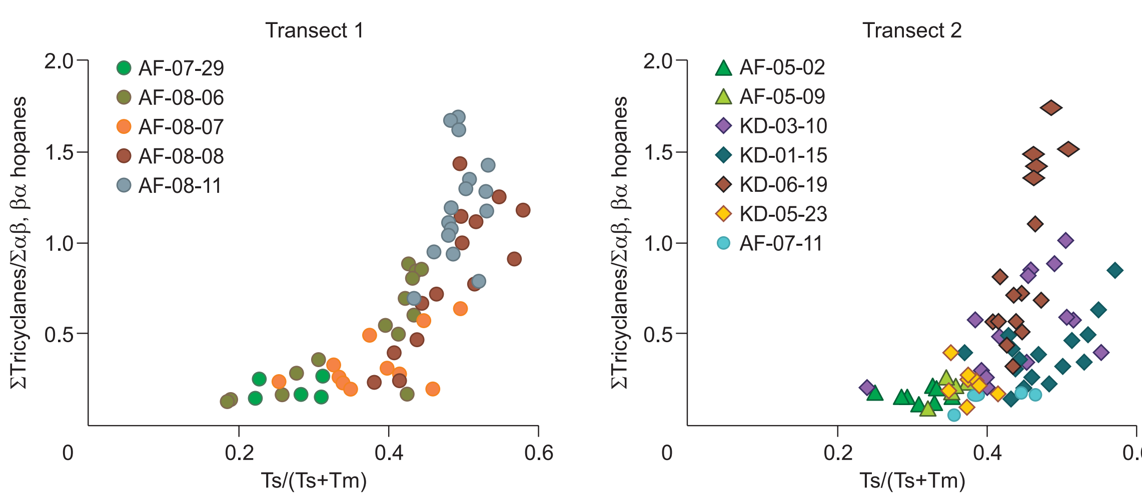

Fig. 6. Geochemical characteristics of sedimentary DOM: hopanes maturity indices.

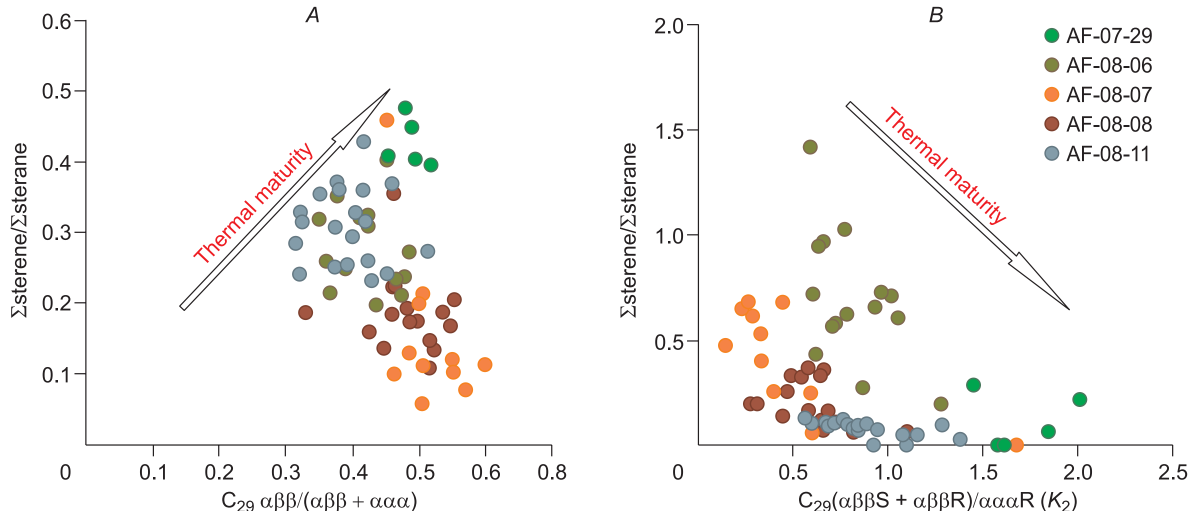

Fig. 7. Geochemical characteristics of sedimentary DOM: steranes maturity indices. *A*, *B* – see the text.

relation that is characteristic of DOM of the mesocatagenetic stage (Ts/(Ts + Tm) > 0.3) (Fomin, 2011). The similar level of DOM thermal maturity is shown for the sediments of transect 2, but the absence of its regular increase to the north may attest to the significant difference in origin and composition of sedimentary material for these two transects. As an example, we can give a triterpane maturity index that is known to be lower for sapropelic OM compared to terrigenous OM (Fomin, 2011).

Steranes maturity indices indicate catagenetic changes in DOM and are based on ratios of biologic epimers (αααR) and more thermodynamically stable geologic epimers (αββR and αββS) (Peters et al., 2004). The application boundaries of sterane indices are determined by the thermodynamic limits of isomerization which can be achieved at the MK_2 catagenetic stage.

Correlation plots for sterane indices of DOM thermal maturity in the sediments of transect 1 are shown in Fig. 7, *A*. The highest degree of transformation is observed in the sediments from the southern (AF-07-29) and northern (AF-08-11) parts of the transect and agrees with other characteristics of molecular markers. Another indicator to assess the degree of DOM transformation is the ratio of geosteranes to their biogenic precursors sterenes (oleanene and friedooleanene) that are typical markers of higher terrestrial plants. This parameter marks the direction of present humic OM input with terrigenous flow and reflects the intensity of its transformation. The relative sterene content decreases seawards in sediments of transect 1 (Fig. 7, *B*) indicating both the decrease of humic components input to the DOM composition and increase of its transformation degree that agrees with the sterane maturity index K_2.

While the trace contents of sterane biologic epimers do not allow one to characterize the thermal maturity of transect 2 sediments, the genetic analysis of DOM is still possible.

The ratio of sapropelic and humic steranes C_{27}–C_{29} characterizes facies of the depositional environments of the studied sediments. According to the diagram (Fig. 8), sediment DOM from transect 1 was formed predominantly in the near-shore and shallow-water marine conditions, and only in the northern part of the transect conditions are close to the off-shore. Sediment DOM from the continental slope and the southern part of the Mendeleev Rise of the transect 2 could be formed in near-shore facies as well.

Composition of steranes in the sediments from the eastern slope of the rise (KD-03-10) indicates the aquagenic nature of DOM. This observation completely agrees with distribution of other groups of HC molecular markers (*n*-alkanes, isoprenoids, and terpanes) and confirms the uniqueness of DOM of the studied sedimentary section.

Ratios of various groups of biomarkers that characterize the contribution from pro- and eukaryotes clearly illustrate the predominance of terrigenous humic component with the increased sterane and C_{23} tricyclane (Tt_{23}) contents in DOM of transect 1 (Fig. 9). Values of these parameters for DOM of the sediments of transect 2 confirm significant variations in their genesis. Thus, sediments from station KD-03-10 show extremely high content of prokaryotic molecular markers (Hopane/Sterane up to 27), attesting to the significant contribution of microbial OM. This totally agrees with the assumed paleohydrothermal activity in the region (Pakhalko et al., 2017).

The level of DOM thermal maturity may be assessed using the ratio of aromatic molecules with various thermodynamic stability (Radke et al., 1988; Peters et al., 2004). Methylphenanthrene index (MPI) is one of such parameters that reflects the ratio of phenanthrene and various isomeric forms of its monomethyl homologues. Distribution of these components is controlled by the DOM catagenetic maturity within the wide temperature range and directly correlates with vitrinite reflectance (R°_{Vt}) (Fomin, 2011).

Variations of this parameter from 0.2 to 0.6 for the sediments of transect 1 reflect the scatter of catagenetic transformation degree of DOM from PK to MK_2 (Fig. 10). The low-

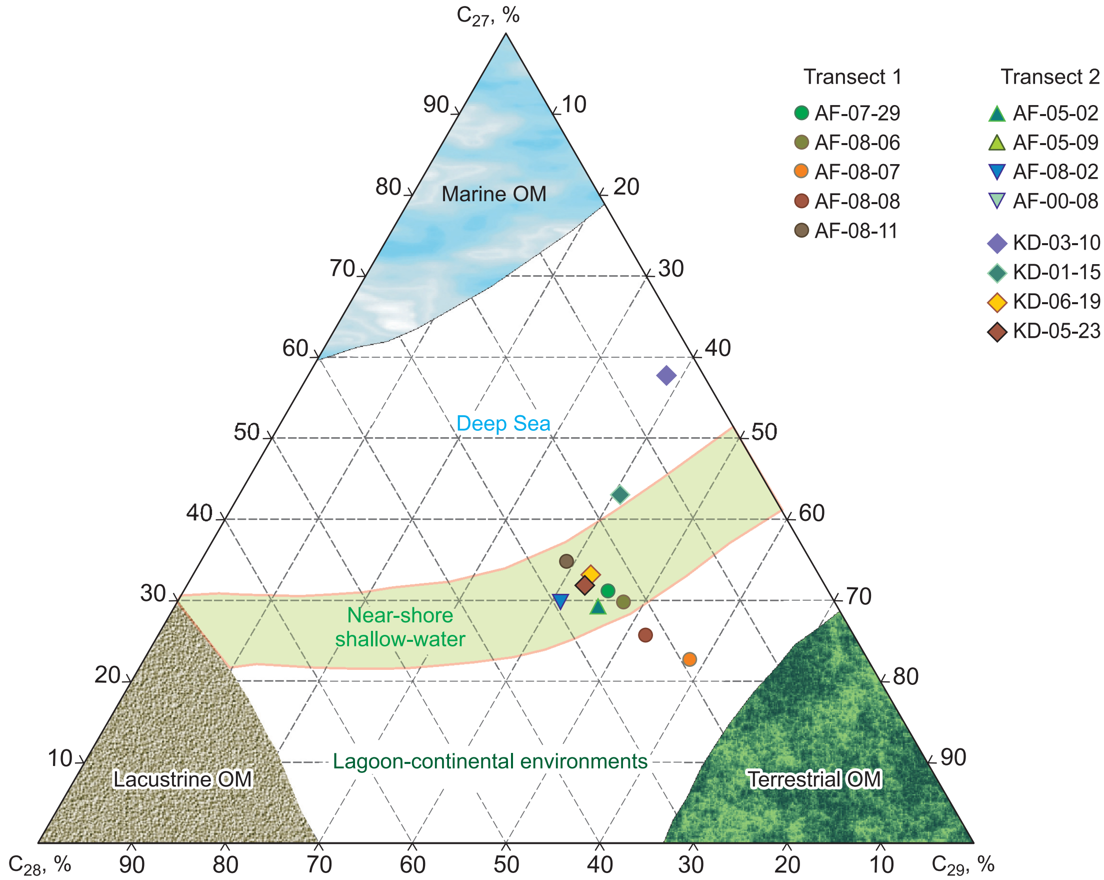

Fig. 8. Facies and genetic characteristics of sedimentary DOM based on steranes composition.

est MPI values correspond to the sediments from the northernmost station AF-08-11. This can be due to the enrichment of these sediments with carbonates that drastically reduces the values of MPI (Peters et al., 2004). DOM of the sediments from the upper part of the continental slope (station AF-08-06) shows the maximum values of thermal maturity that agrees with the described age characteristics of this sedimentary section.

The ratio between phenanthrene and its tetra-alkylated homologue–retene (Ret/(Ret + Ph)) reflects the processes of

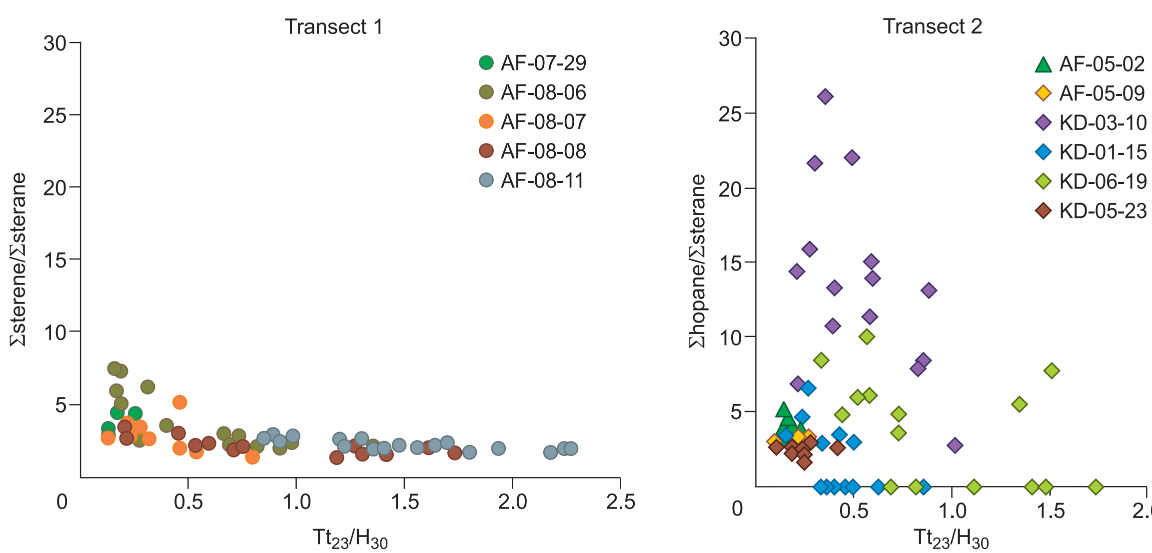

Fig. 9. Genesis of DOM according to the cyclane indices distribution (Tt_{23}–C_{23} tricyclic terpane, H_{30}–C_{30} αβhopane).

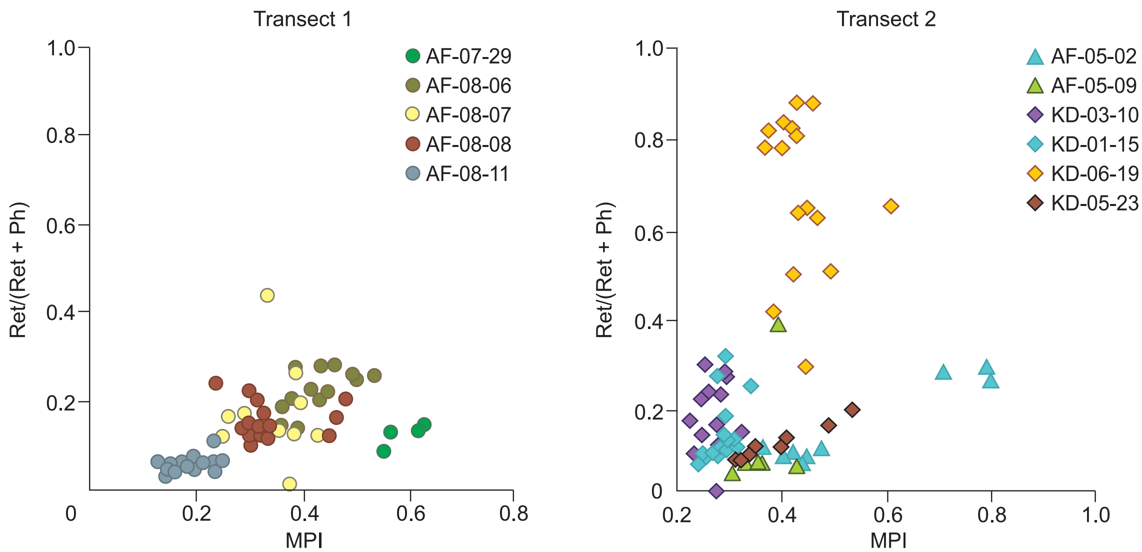

Fig. 10. Main geochemical characteristics of polycyclic aromatic HCs (Ret, retene; Ph, phenanthrene).

aromatization and dealkylation of the biogenic precursor of phenanthrene – the abietic acid during dia- and protocatagenesis and provides an information about the degree of transformation of DOM (Bastow et al., 2001). Besides this, retene is a marker for terrestrial gymnosperms useful for terrigenous component input assessment. The value of this parameter decreases seawards in sediments of transect 1 (Fig. 10).

Geochemical parameters of polycyclic aromatic HCs vary significantly in the sediments of the Mendeleev Rise (MPI = 0.2–0.8; Ret/(Ret + Ph) = 0.01–1.0) attesting to the high diversity of sediment sources and genesis of DOM. The most specific composition of PAHs is observed in DOM of sediments from the station KD-06-19. This includes the increased content of eukaryotic transformation products (Tt_{23}/H_{30} up to 1.7), and high predominance of retene in PAH composition (Ret/ΣPAH > 0.5; Ret/(Ret+Ph) up to 0.9) that is anomalous for deep-water sediments. Correlation of retene with the lithified C_{23}–C_{33} *n*-alkanes that are characteristic for thermally mature DOM of humic genesis has also been demonstrated (Fig. 11).

A significant content of retene – molecular marker of humic OM – was recorded earlier in the deep-water part of the Arctic Ocean (Yamamoto et al., 2008; Petrova et al., 2013). Its presence in the weakly-transformed DOM of grey-colored clays was detected together with the other characteristic markers of terrestrial biota (oleanenes, tetrahydrochrysenes, and perylene). The absence of these characteristic compounds in the studied sedimentary section makes it difficult to carry out any comparison of these objects. Much more similarities in DOM composition can be found between the studied sedimentary section KD-06-19 and the Cretaceous deposits of the Indigirka-Zyryanka Basin from the northeastern Yakutia (Kashirtsev et al., 2012) (Fig. 11). It is important to note that this sedimentary core is sampled from the flank of a major submarine canyon below the point, where a regional boundary of Cretaceous unconformity was detected (Rekant et al., 2015). Thus, the probability of the input of Cretaceous age products to this sediment core due to the source rock redeposition and submarine weathering seems to be very high.

CONCLUSIONS

The study of bottom sediments from 17 sedimentary cores (273 samples) collected along two meridional transects was performed. The key organic geochemical parameters, including the composition and distribution of HC molecular markers (alkanes, isoprenoids, terpanes, steranes, and PAHs) were determined. All these parameters reflect the genesis and thermal maturity level of DOM that has allowed us to describe the sources, routes and conditions of sedimentation in the region.

The study has shown that the Holocene-Pleistocene sedimentation on the continental slope and in the Podvodnikov Basin (transect 1) is determined predominantly by the input of the terrigenous sediments enriched in the abrasion products of metamorphosed rocks from the eastern source province. The identified similarities in key geochemical parameters distribution and a high thermal maturity level of DOM of the bottom sediments confirm this assumption.

The individual characteristics of DOM of the late Cenozoic deposits from the Mendeleev Rise seamounts (transect 2) attest to the wide diversity of sedimentary sources and depositional conditions. Processes of subaqueous erosion and redeposition of denudation products of the source rocks and pre-Holocene sediments play here an important part in sedimentation together with a terrigenous flow and ice transport.

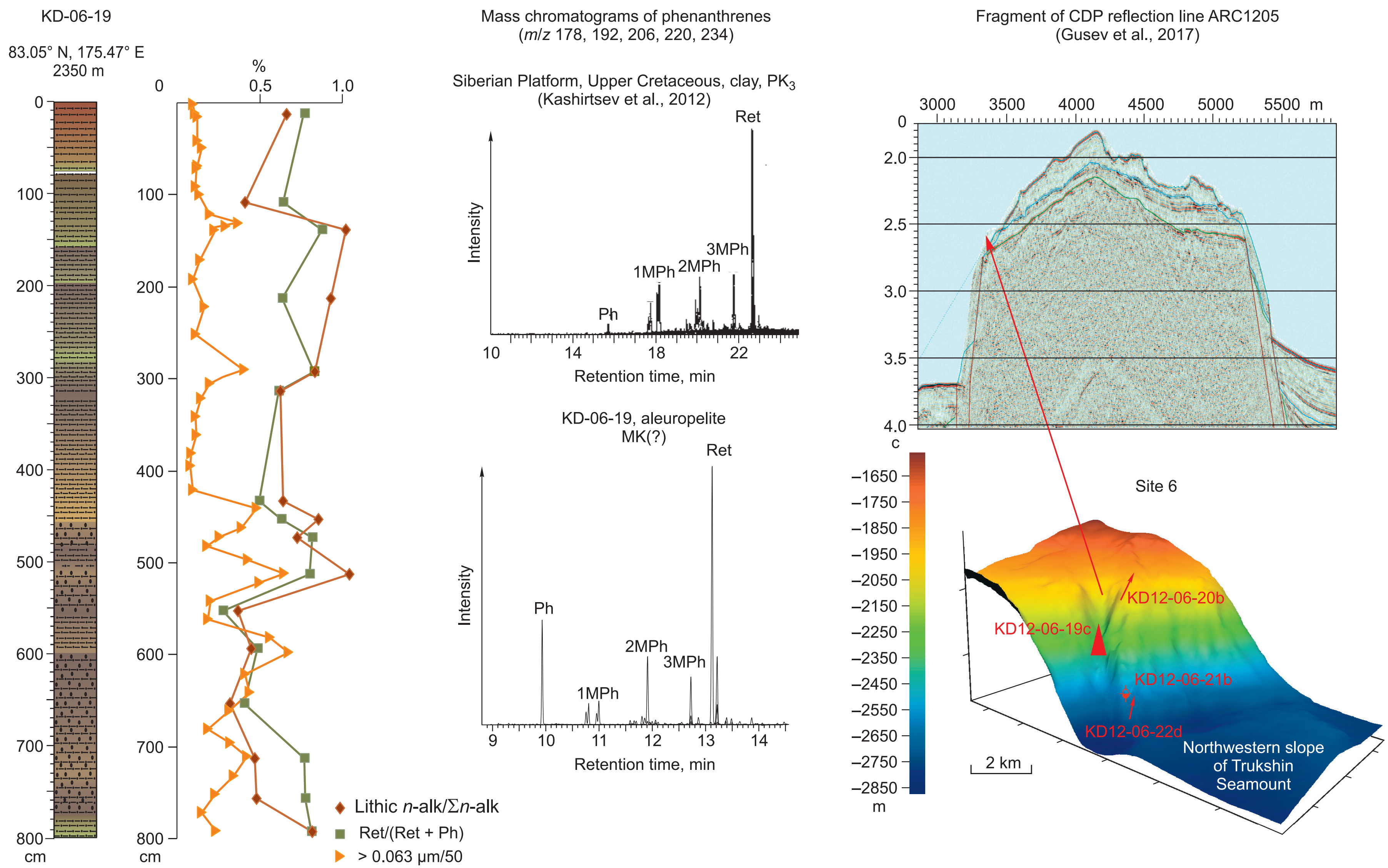

Fig. 11. Geomorphological and lithological–geochemical characteristics of the core KD-06-19, MPh, methylphenanthrene (Rekant et al., 2016).

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