ANNUAL REPORT ON GEOTRACES ACTIVITIES IN RUSSIA

April 1st, 2020 to April 30th, 2021

New GEOTRACES relevant scientific results

Eurasian Arctic Shelf Seas

- River plumes in estuaries and deltas have very large synoptic and seasonal variability, which cannot be reconstructed from structure of bottom sediments due to their small accumulation velocity. However, the geochemical properties of bottom sediments can be indicative of variability of river plumes on inter-annual and decadal time scales. The large Ob and Yenisei buoyant plumes formed in the central part of the Kara Sea interact and mix in the area adjacent to the closely located Ob and Yenisei gulfs. Suspended sediments carried by these river plumes have different geochemical characteristics that can be used to detect Ob or Yenisei origin of bottom sediments. Using new geochemical methods we revealed dependence between spreading patterns of these plumes and spatial distribution and vertical structure of bottom sediments in the study area (**Figure 1**). The mineral sedimentary material of the Ob origin found in the bottom sediments of the Yenisei Gulf also indicates the possibility of adding radioactive contamination from the Ob catchment area to the pollution of the Yenisei Gulf (Osadchiev et al., 2019).

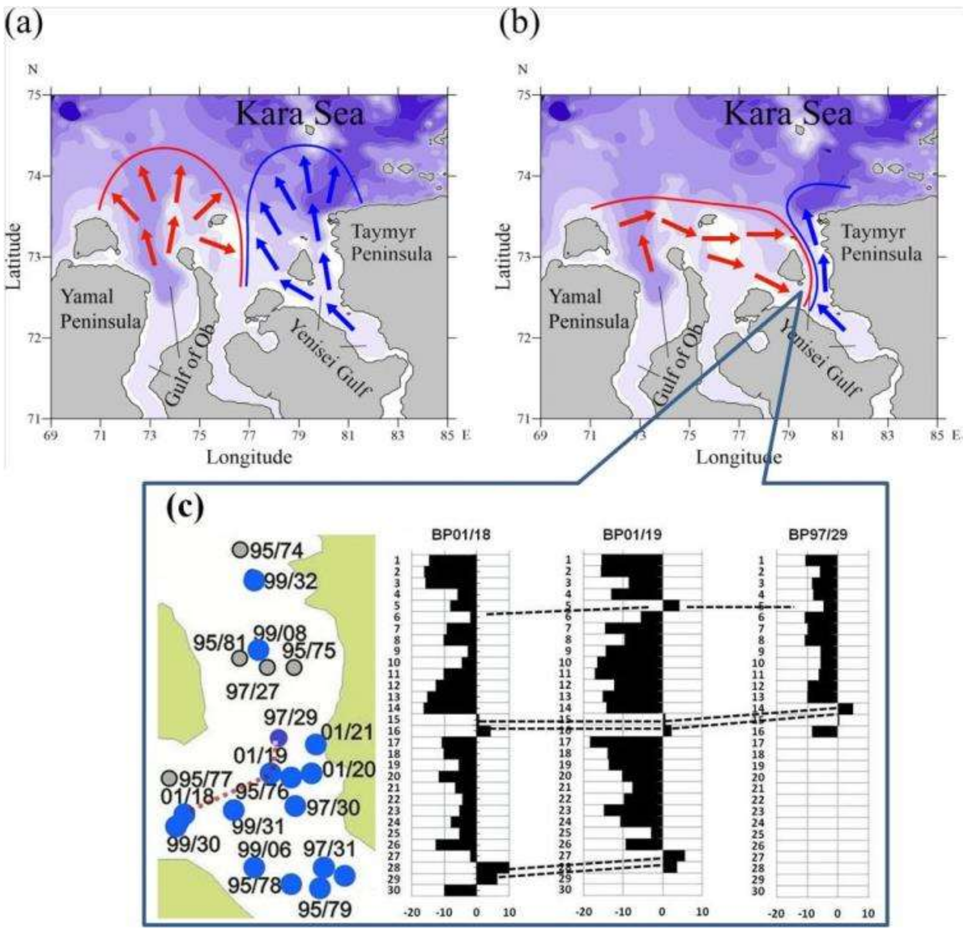

***Figure 1. (a) & (b)** – the general patterns of the interaction between the Ob (red) and Yenisei (blue) plumes: northward spreading and offshore collision of the plumes (**a**); eastward intrusion of the Ob plume into the Yenisei Gulf and isolation of the Yenisei plume (**b**). **(c)** – sediment cores collected in the Yenisei Gulf area where clastic material from the Ob River was geochemically detected and depth/time correlation was established in bottom sediments.*

- Repeated core sampling of bottom sediments at key points of areas of increased radiocaesium activity in the Kara Sea and subsequent analysis of the distribution of radionuclides made it possible to establish positive trends in the change in the radiation state of the region's ecosystem. Almost complete degradation of the Ob Estuary radiocaesium contaminated zone and a rather significant degradation of the same Yenisei Gulf zone (initially the most polluted) were revealed (Miroshnikov et al., 2020a).

- Insoluble particles in the snowpack of the Kara Sea catchment area (the Western Siberia) were studied at 36 sites on a 2800 km submeridional profile from the city of Barnaul to Salekhard along the Ob River and its tributaries in February 2020 (**Figure 2**). Snow samples were collected over the full depth of the snow core, from the surface of the snow cover to the boundary with soil, except for the lower 1–2 cm. After the filtration of melted snow through a 0.45 µm-membrane, the particle composition was studied using a scanning electron microscope with an Energy microprobe. In the background areas, the concentration of insoluble particles in the snow was below 2 mg/L. Significantly higher particle concentrations were encountered near cities and hydrocarbon production areas. Particulate matter in snow mainly consists of biogenic and lithogenic particles mixed with anthropogenic particles (ash and black carbon aggregates). The proportion of anthropogenic particles increases near cities and areas of active hydrocarbon production (Shevchenko et al., 2020).

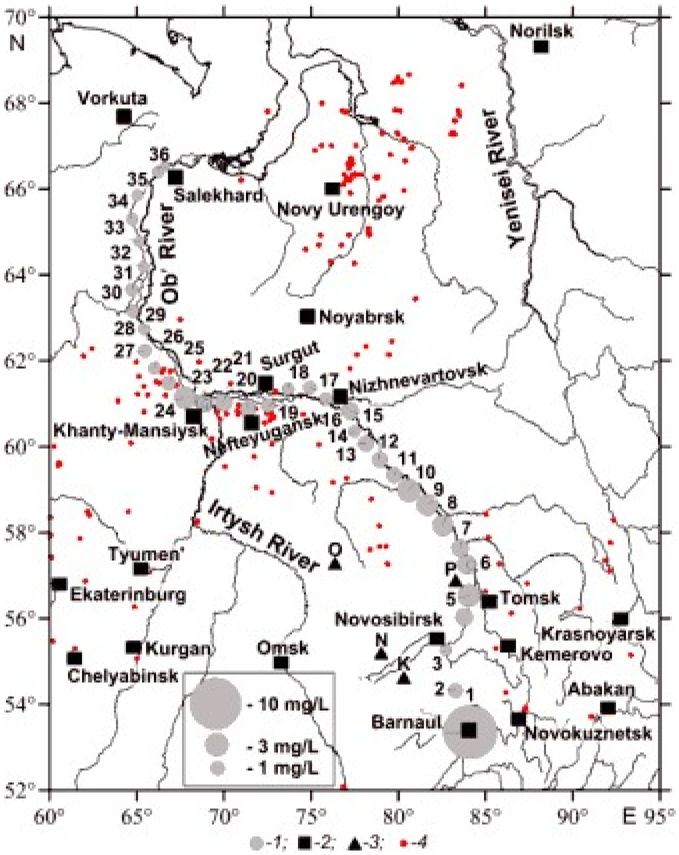

__Figure 2.__ Concentration of insoluble particles in the snowpack of the Kara Sea catchment area (the Western Siberia, Russia) along the Ob River and its tributaries in February 2020 [Shevchenko et al., 2020]: 1—positions of the sampling sites (sizes of circles reflect the concentrations of particulate matter); 2—large cities; 3—sites of snowpack studies in (Ermolov et al., 2020); 4—the positions of gas flaring taken from https://firms.modaps.eosdis.nasa.gov/download/.

- The concentrations of the artificial radinuclides and sedimentation rates were determined in the recent sediments of the Bear Island Trough, the Cambridge Strait (Franz Josef Land), and Russkaya Gavan' Bay (Novaya Zemlya Archipelago), Barents Sea (**Figure 3**). The concentration of ^{137}Cs in sediments is low and does not exceed 10 Bq/kg, that corresponds to the regional background values. The highest activity levels were found near the Franz Josef Land. Moreover, the samples contain appreciable amounts of ^{241}Am, up to 2.6 Bq/kg. The highest sedimentation rates (> 4 mm/year) were found in Russkaya Gavan' Bay (st. 5424, the

Novaya Zemlya Archipelago), slightly lower ones (2.5 mm/year), in the Cambridge Strait (st. 5454, the Franz Josef Land). In the western part of the Barents Sea (st. 5432), the Bear Island Trough, the much lower sedimentation rate was detected (1.3 mm/year) (Demina et al., 2020).

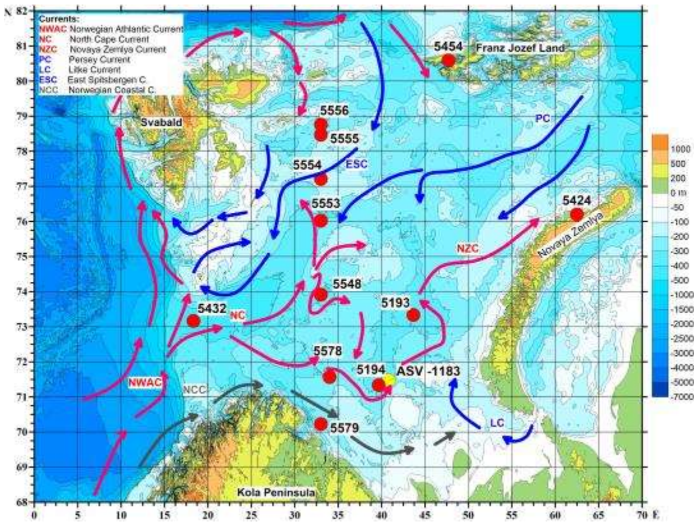

Figure 3. *Scheme of location of studied sediment cores and directions of surface currents in the Barents Sea. Red and blue arrows mean relatively warm and cold currents respectively.*

- Elemental and mineral proxies were tested for recognizing recent change in the environmental conditions in the Barents Sea. Three cores of the recent sediments (age did not exceed 140 years, length to 33 cm) were studied (Demina et al., 2020). Along with the mean sedimentation rates, these sediments differ in grain-size and mineral composition, as well as elemental contents. These characteristics are obviously related to different sediment source: the basaltic province associated with trap magmatism of the Franz Josef Land, and the sedimentary rocks of the Novaya Zemlya Archipelago, while sediments from the Bear Island Trough are deposited under unstable conditions of bottom currents bearing sedimentary material from both the Atlantic and Arctic oceans. The most intense sediment deposition in the Russkaya Gavan' Bay is reflected in the highest sedimentation rates, leading to weak particle differentiation. As a result, throughout the core of the Russkaya Gavan' Bay, mineral composition, as well as values of Si/Al, Mn/Fe, P/Al, and Ti/K ratios are lowered and almost invariable (**Figure 4**), accompanied by elevated values of the quartz-feldspar Q/Fps ratio (1.05–1.79).

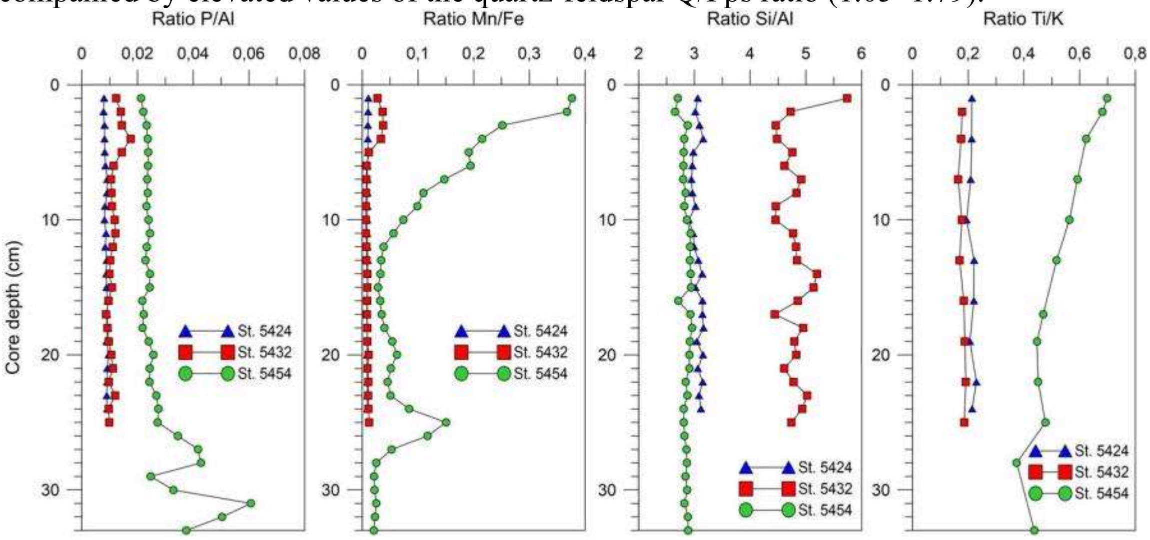

Figure 4. *Comparison of selected elemental ratios in sediment cores collected in the Barents Sea: st. 5424, the Russkaya Gavan' Bay, Novaya Zemlya Archipelago; st. 5432, the Bear Island Trough, and st. 5454, the Cambridge Strait, Franz Josef Land Archipelago.*

The sediments of the Bear Island Trough with the low sedimentation rate and strongly elevated coarse-grained fraction, in contrast, are characteristic by the much higher Si/Al indices, showing rhythmic variation, along with the weak change in Mn/Fe, P/Al, and Ti/K ratios down the core. Unlike these, in the Cambridge Strait, the low value of Q/Fps (0.4–1.2), along with the lowered Si/Al and strongly elevated Mn/Fe, P/Al, and Ti/K ratios, indicate an insignificant supply of the clastic material and enlarged contribution of the weathered basaltic rocks. Besides, the downcore distribution pattern of Mn/Fe, P/Al, and Ti/K ratios differs from that in the Bear Island Trough and Russkaya Gavan' Bay. For this reason, these three ratios have been proposed as good proxies for detecting the differences in the short-term change in sedimentation environment (Demina et al., 2020).

- In the East Siberian Sea the γ-spectrometric analysis found that the existed specific activity of artificial cesium-137 in sediments is two orders of magnitude below the acceptable level and reflects the influence of global fallout from the atmosphere only. Sediments are not contaminated with heavy metals either. The data obtained can be considered as initial background values for subsequent monitoring of the ecological state of the East Siberian Sea (Miroshnikov et al., 2020b).

- Sources of surface bottom sediments in the eastern part of the East Siberian Sea were reconstructed based on geochemical data. Studies were carried out along the profile stretching 550 km from Billings Point towards the underwater Mendeleev Ridge (**Figure 5**). It was found that the studied set of samples for the values of Cr/Th, Th/Co, La/Sc, as well as Eu/Eu* and $(Eu/Sm)_N$, consists of two groups. On the diagrams $(La/Yb)_N$–Eu/Eu* and $(La/Yb)_N$–(Eu/Sm)N, the obtained data points are located in the overlap zone.

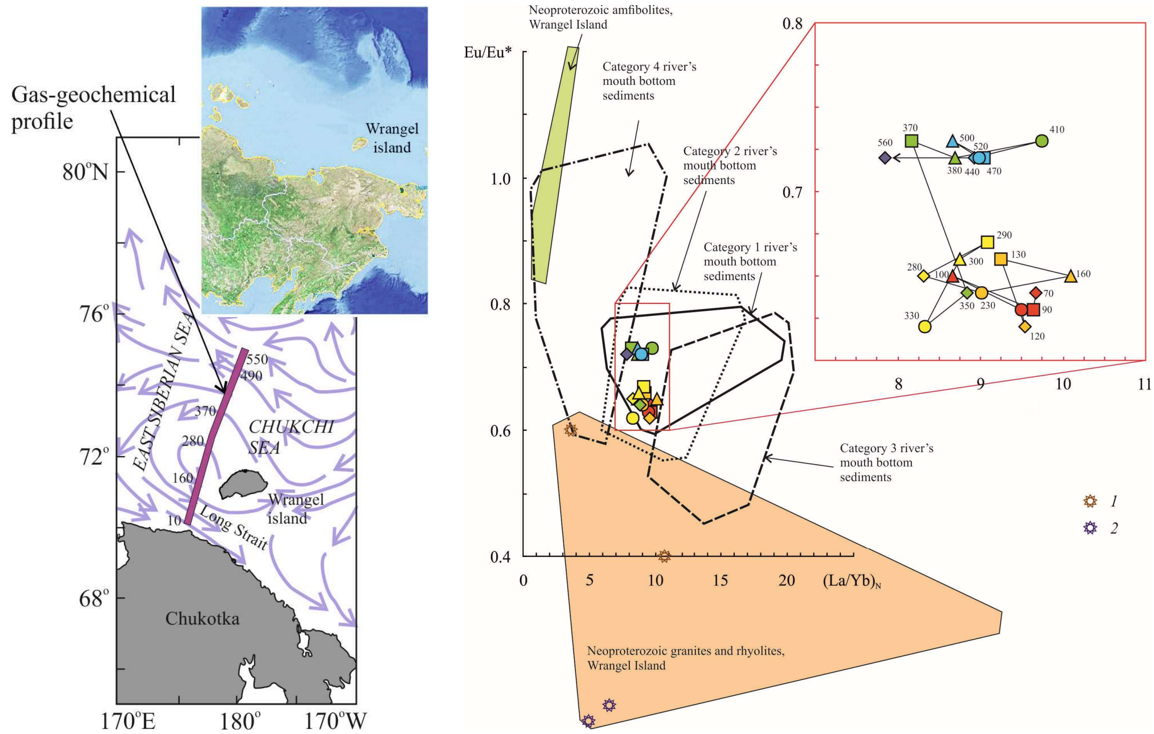

__Figure 5__. The studied transect location (left). The arrows show the surface water circulation. Distribution of data points of sediment samples collected along the transect on the $(La/Yb)_N$–Eu/Eu diagram (right): 1 – muscovite granites; 2 – rhyolites.*

The distribution of the data points of bottom sediments on these diagrams, as well as on the $(La/Yb)_N$–Th diagram, differs from the distribution of data points of the Neoproterozoic amphibolites, granitoids, and rhyolites of Wrangel Island. Therefore, the latter, most likely, could not be sources of thin aluminosiliciclastics. The samples of the first group are quite close to the surface sediments of the East Siberian Sea in terms of Eu/Eu* and $(Eu/Sm)_N$ values and a number of other parameters. On the contrary, the samples of the second group are closer to the bottom sediments of the Chukchi Sea. Apparently, the bottom sediments northwest of Wrangel Island were formed under the influence of currents carrying clastic material from the Chukchi Sea. To the west of Wrangel Island, the composition of the sediments is controlled mainly by material coming from the western and central regions of the East Siberian Sea (Maslov, 2021).

- The intensive annual blooms of *Emiliania huxleyi* found every summer in the southern Barents Sea (data of 2014–2018). The blooms were recorded in the upper mixed layer in July and August every year, during which they spread to cover large areas and were associated with Atlantic water. The transformation of Atlantic water in the Barents Sea in the *E. huxleyi* bloom areas is associated with a decrease in dissolved inorganic nitrogen (DIN) concentrations in surface waters. In contrast, the Si and P concentrations remain unchanged. These blooms typically occur in the presence of water column stratification, low Si and DIN concentrations, and relatively high P concentrations, and DIN:P ratio significantly below the Redfield ratio. The results of our study most greatly support hypothesis that *E. huxleyi* is a good competitor at low DIN concentrations since these conditions limit diatom growth. The seasonal thermoclines are essential for decreasing DIN flux to the upper mixed layer. The absence of diatoms and the presence of large cell mixotroph dinoflagellates create a simple community with a high rate of nutrients turnover (Silkin et al., 2020).

Far Eastern seas

- The radium quartet ^{224}Ra, ^{223}Ra, ^{228}Ra ^{226}Ra with half-lives of 3.6 and 11.5 days, 5.7 and 1600 years, respectively, was used to identify the sources of water discharge at the biogeochemical test site “Estuary of the Razdolnaya River”, Amur Bay, Sea of Japan (Semkin et al., 2021). Dissolved radium isotopes determined using a delayed coincidence system (RaDeCC, USA). In the winter season (**Figure 6**), a high activity of the radium quartet was discovered at a distance of more than 15 km from the mouth bar upstream. This is caused by groundwater discharge (GWD). The activity of radionuclides in the GWD area was as follows: ^{224}Ra − 66.32 ± 0.60 dpm 100L^{-1}, ^{223}Ra − 2.85 ± 0.17 dpm 100L^{-1}, ^{226}Ra − 61.12 ± 2.69 dpm 100L^{-1}, ^{228}Ra − 159.15 ± 0.13 dpm 100L^{-1}. Also GWD accompanied by the temperature anomaly and thawing of ice in the river/sea mixing zone area. The composition

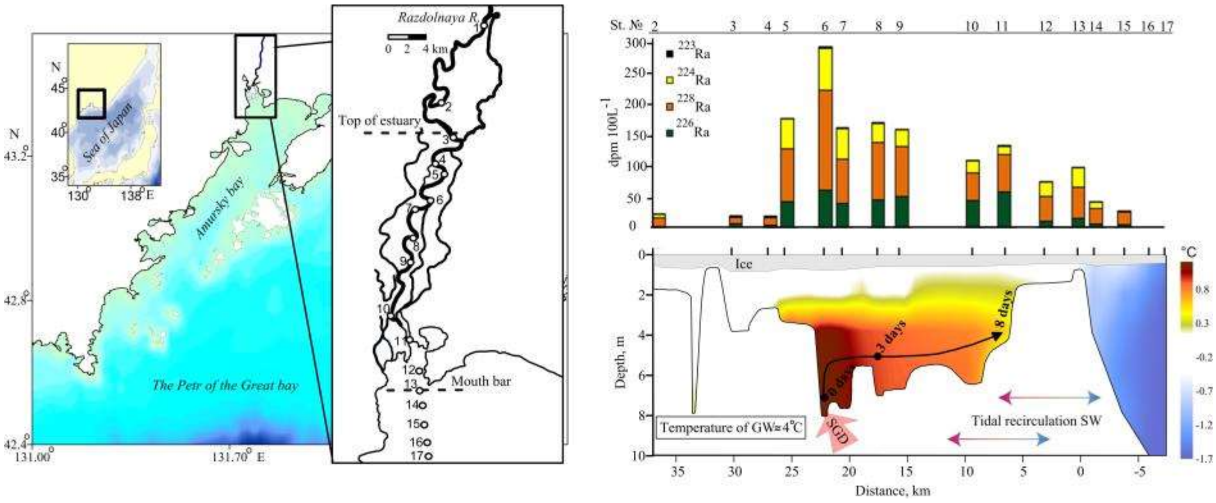

Figure 6. *Layout and numbers of stations in the winter season. Activity of radium isotopes, water temperature and age (days) calculated for radium in the longitudinal profile of the Razdolnaya River Estuary, Amur Bay, the northwestern part of the Sea of Japan.*

of stable isotopes $\delta^{18}O$ and δD in the discharge zone is subject to the sea water/river water ratio. It is considered that the main reason for GWD is that recirculated sea water has penetrated into the upper aquifer during the winter runoff low period and further discharged into the deepest section line of the estuary.

In the summer (**Figure 7**), the high activity of radionuclides was in the area of the mouth bar. The activity of ^{224}Ra, ^{223}Ra, ^{228}Ra increased by 4, 17, and 139 times, respectively, in the area compared with their activity in river water. The ^{228}Ra maximum is associated with desorption from particulate matter carried by the river. The maximum ^{224}Ra (65.41±0.68 dpm 100 L^{-1}), and high activity of ^{223}Ra observed in near-bottom waters with a low concentration of particulate matter. The enrichment of the bottom water layer with ^{224}Ra isotopes, in the area of the estuarine seashore, is associated with bioirregation and bioturbation. Thus, in summer, desorption from river particulate matter in the area of the mouth bar was the source of the dissolved isotopes ^{228}Ra. The exchange of pore waters with near-bottom waters caused an extremum of ^{224}Ra and an increase activity of ^{223}Ra (Semkin et al., 2021).

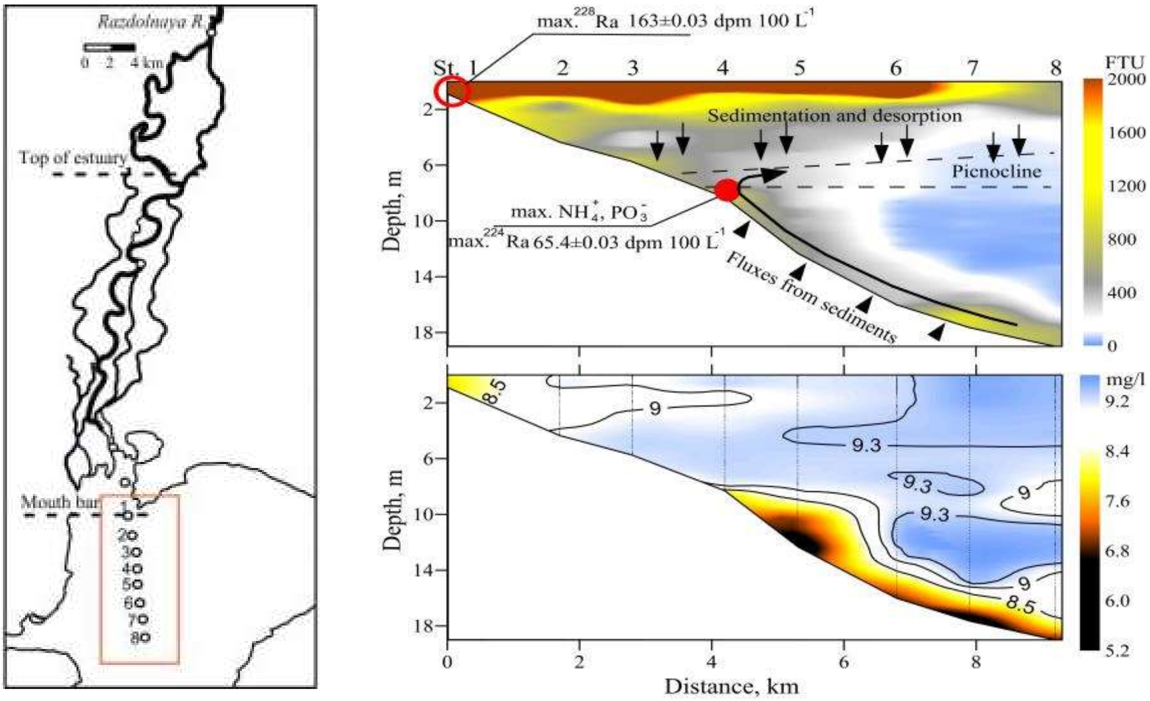

***Figure** 7. Layout and numbers of stations in the flood regime of the Razdolnaya River Estuary, Amur Bay, the northwestern part of the Sea of Japan. Distribution of turbidity, oxygen concentration, and location of extremums of radium isotopes at the estuarine seashore.*

Atlantic Ocean

- Paleoceanographic and geochemical record for the last ~250 kyr of the sediment core from the southwestern Lofoten Basin (Norwegian Sea) is carried out using X-ray fluorescence spectrometer Geotek core logging system (**Figure 8**). We revealed four global cooling stages (MIS 2, 4, 6, 8) and four warming stages (MIS 1, 3, 5, 7). The IRD grains marked the iceberg influence during the stages MIS 2–4 and MIS 6 that corresponded to the magnetic susceptibility data. Si/Al ratio used as a proxy for biogenic production and changes in the composition of aluminosilicate. The Si/Al ratio marks changes in the grain size composition with maxima corresponding to the increasing of sandy fraction content. In the Vedde ash interlayer (12.6 kyr), the increase of Si/Al and Sr/Ti ratios does not depend on the coarse-grained fraction of sediment. Ca/Ti ratio record shows higher values matching each interglacial stage in the Loften Basin sediments. The highest values of Ca/Ti ratio belong to the end of cooling stage MIS 4 and warming stages MIS 5–5e and correspond to the maximum of the total plankton and benthic foraminifer's concentrations. Therefore, the elemental ratios along with grain size and micropaleontological data show at least tree hiatus during the last 250 kyr sedimentation in the Lofoten Basin. The iceberg sedimentation in this area continued until the 10.4 kyr with a reduction during the MIS 5–5e stage while the biogenic carbonate production has peaked (Novichkova et al., *in preparation*).

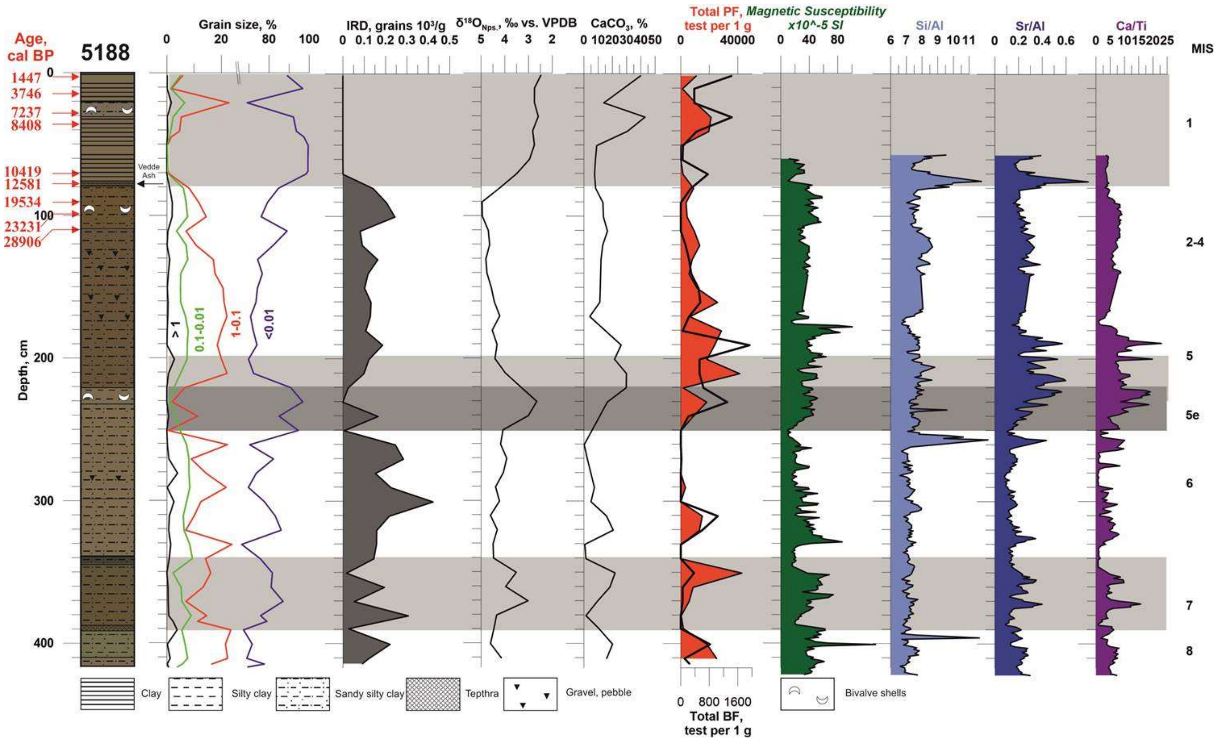

Figure 8*. The downcore distribution of grain size, IRD content, oxygen isotope values, calcium carbonate, and organic carbon content, as well as, total abundances of the planktic and benthic foraminifera, magnetic susceptibility, and Si/Al, Sr/Al, Ca/Ti ratios, Lofoten Basin, Norwegian Sea.*

GEOTRACES relevant cruises

- From July 31 to August 26, 2020, multidisciplinary studies of the European Arctic were carried out during cruise 80 of the RV *Akademik Mstislav Keldysh* (PhD Alexey Klyuvitkin is a cruise leader) (**Figure 9**). The cruise was funded by State Tasks of the Shirshov Institute of Oceanology, Russian Academy of Sciences (IO RAS). The studies were performed in the Norwegian and Barents seas, and Nansen Basin (Klyuvitkin et al., 2021). Some of the preliminary results: (i) in the sea-ice edge zone of the deep-water region of the high Arctic (Nansen basin, 83 °N), in the summer of 2020, a bloom of the large-cell centric diatom *Porosira glacialis* was found with an abnormally high biomass (Pautova et al., *submitted*). The bloom was close to the surface (5–10 m) at the halocline separating the nutrient-rich Atlantic waters from the nutrient-poor Arctic waters. The presence of this Atlantic diatom, in a complex hydrographic structure formed by the interaction of warm Atlantic and cold Arctic water masses, provides clear evidence of atlantification of high Arctic ecology. (ii) New areas of possible methane seepage with a pronounced atmospheric response have been investigated in the Russian part of the Barents Sea. *(iii)* Expansion of *coccolithophore bloom* in the southern Barents Sea was investigated and their role in biological carbon pump was studied.

Figure 9. *Expedition route and works performed during cruise, July–August 2020. Image of the ice cover is composited over August 16–18, 2020, provided by State Research Center "Arctic and Antarctic Research Institute":* http://www.aari.ru/odata/_d0015.ph. *1 – stations; 2 – grab sampling of bottom sediments; 3 – multicorer sampling of bottom sediments; 4 – gravity corer sampling of bottom sediments; 5 – recovering/ /deployment of sediment traps; 6 – route of vessel; 7 – ice concentration, 1–6 points; 8 – ice concentration, 7–10 points; 9 – fast ice.*

New projects and/or funding

- "Response of the estuarine ecosystem of the transboundary Razdolnaya River (Primorsky Region of the Russian Federation) to the discharge of groundwater of the upper aquifer", *Grant of the President of the Russian Federation* (no. MK-153.2020.5). Pavel Yu. Semkin is project leader, early career researcher, Department Ocean Geochemistry and Ecology, V.I. Il'ichev Pacific Oceanological Institute, Far Eastern Branch, Russian Academy of Sciences, Vladivostok, Russia. URL: https://www.minobrnauki.gov.ru/grants/?ELEMENT_ID=9468

New GEOTRACES-relevant publications (published or in press)

- Agafonova, E., Polyakova, Y., & Novichkova, Y. (2020). The diatom response to Postglacial environments in the White Sea, the European Arctic. Marine Micropaleontology, 161. https://doi.org/10.1016/j.marmicro.2020.101927 1 ECR involved in the publication
- Budko, D. F., Demina, L. L., & Lisitzin, A. P. (2021). The heavy metal partitioning in the particle flux of the subarctic White Sea (Northwestern Russia). Estuarine, Coastal and Shelf Science, 249. https://doi.org/10.1016/j.ecss.2020.107063 1 ECR involved in the publication
- Demina, L. L., Dara, O., Aliev, R., Alekseeva, T., Budko, D., Novichkova, E., … Bulokhov, A. (2020). Elemental and mineral composition of the barents sea recent and late pleistocene–holocene sediments: A correlation with environmental conditions. Minerals, 10(7). https://doi.org/10.3390/min10070593 2 ECRs involved in the publication

- Drits, A.V., Klyuvitkin, A.A., Kravchishina, M.D., Karmanov, V.A., Novigatsky, A.N. (2020). Fluxes of sedimentary matter in the Lofoten Basin of the Norwegian Sea: seasonal dynamics and the role of zooplankton. Oceanology, 60(4), 501–517, https://link.springer.com/article/10.1134/S0001437020040074 1 ECR involved in the publication
- Golobokova, L. P., Khodzher, T. V., Izosimova, O. N., Zenkova, P. N., Pochyufarov, A. O., Khuriganowa, O. I., … Shevchenko, V. P. (2020). Chemical Composition of Atmospheric Aerosol in the Arctic Region and Adjoining Seas along the Routes of Marine Expeditions in 2018–2019. Atmospheric and Oceanic Optics, 33(5), 480–489. https://doi.org/10.1134/S1024856020050085 1 ECR involved in the publication
- Klyuvitkin, A. A., Kravchishina, M. D., & Boev, A. G. (2021). Particle Fluxes in Hydrothermal Vent Fields of the Southern Part of the Mohns Ridge. Doklady Earth Sciences, 497(1), 200–205. https://doi.org/10.1134/S1028334X21030053
- Klyuvitkin, A. A., Politova, N. V., Novigatsky, A. N., & Kravchishina, M. D. (2021). Studies of the European Arctic on Cruise 80 of the R/V Akademik Mstislav Keldysh. Oceanology, 61(1), 139–141. https://doi.org/10.1134/S0001437021010094
- Klyuvitkin, A.A., Kravchishina, M.D., Nemirovskaya, I.A., Baranov, B.V., Kochenkova, A.I., Lisitzin, A.P. (2020). Studies of sediment systems of the European Arctic during the 75th cruise of the Research Vessel Akademik Mstislav Keldysh. Oceanology, 60(3), 421–423. https://link.springer.com/article/10.1134/S0001437020030030 1 ECR involved in the publication
- Kopeikin, V. M., Shevchenko, V. P., Malafeev, G. V., Novigatsky, A. N., Pankratova, N. V., Ya Ponomareva, T., … Yu Churakova, E. (2020). The black carbon content variations in the Arctic region during 2011 - 2018. In IOP Conference Series: Earth and Environmental Science (Vol. 606). IOP Publishing Ltd. https://doi.org/10.1088/1755-1315/606/1/012024
- Lokhov, A. S., Kravchishina, M. D., Klyuvitkin, A. A., & Kochenkova, A. I. (2020). In situ Measurements of the Characteristics of Suspended Particles in the Barents Sea by the LISST-Deep Laser Diffractometer. Oceanology, 60(5), 650–663. https://doi.org/10.1134/S0001437020050148 2 ECRs involved in the publication
- Maslov A.V. (2021). Sources of Bottom Sediments in the East part of Eastern Siberian Sea (Reconstruction on Geochemical Data). Oceanology, in press.
- Miroshnikov, A. Y., Flint, M. V., Asadulin, E. E., & Komarov, V. B. (2020a). Radiation-Geochemical Stability of Bottom Sediments in the Ob and Yenisei Estuaries and Adjacent Shoal Area of the Kara Sea. Oceanology, 60(6), 817–830. https://doi.org/10.1134/S0001437020060065 2 ECRs involved in the publication
- Miroshnikov, A. Y., Flint, M. V., Asadulin, E. E., Kravchishina, M. D., Luksha, V. L., Usacheva, A. A., … Komarov, V. B. (2020b). Ecological State and Mineral-Geochemical Characteristics of the Bottom Sediments of the East Siberian Sea. Oceanology, 60(4), 518–531. https://doi.org/10.1134/S0001437020040141 2 ECRs involved in the publication
- Nemirovskaya, I. A. (2020). Natural and Anthropogenic Hydrocarbons in Seawater and Bottom Sediments of the Black Sea. https://doi.org/10.1007/698_2020_476
- Nemirovskaya, I. A., & Shevchenko, V. P. (2020). Organic compounds and suspended particulate matter in snow of high latitude areas (arctic and antarctic). Atmosphere, 11(9). https://doi.org/10.3390/atmos11090928

- Novigatsky, A. N., Lisitzin, A. P., & Klyuvitkin, A. A. (2020). Dispersed Sedimentary Matter in the Marine Cryosystem: Snow–Drifting Ice–Icewater of the Arctic and Antarctic. Oceanology, 60(5), 643–649. https://doi.org/10.1134/S0001437020050185
- Novigatsky, A. N., Lisitzin, A. P., & Klyuvitkin, A. A. (2020). Dispersed Sedimentary Matter in the Marine Cryosystem: Snow–Drifting Ice–Icewater of the Arctic and Antarctic. Oceanology, 60(5), 643–649. https://doi.org/10.1134/S0001437020050185
- Novigatsky, A. N., Lisitzin, A. P., Shevchenko, V. P., Klyuvitkin, A. A., Kravchishina, M. D., & Politova, N. V. (2020). Sedimentogenesis in the White Sea: Vertical Fluxes of Suspended Particulate Matter and Absolute Masses of Bottom Sediments. Oceanology, 60(3), 372–383. https://doi.org/10.1134/S0001437020030078
- Osadchiev, A. A., Asadulin, E. E., Miroshnikov, A. Y., Zavialov, I. B., Dubinina, E. O., & Belyakova, P. A. (2019). Bottom Sediments Reveal Inter-Annual Variability of Interaction between the Ob and Yenisei Plumes in the Kara Sea. Scientific Reports, 9(1). https://doi.org/10.1038/s41598-019-55242-3 1 ECR involved in the publication
- Sakerin, S. M., Zenkova, P. N., Kabanov, D. M., Kalashnikova, D. A., Lisitzin, A. P., Makarov, V. I., … Shevchenko, V. P. (2020). Results of Studying Physicochemical Characteristics of Atmospheric Aerosol in the 71st Cruise of RV Akademik Mstislav Keldysh. Atmospheric and Oceanic Optics, 33(5), 470–479. https://doi.org/10.1134/S1024856020050164
- Semkin, P.Yu., Tishchenko, P.Ya., Charkin, A.N. et al. (2021). Discharge of salt groundwater in the Estuary of the Razdol'naya River (Amur Bay) in February 2020. Water Resources, 48(3), 345–350. https://link.springer.com/article/10.1134/S009780782103012X 1 ECR involved in the publication
- Semkin, P.Yu., Tishchenko, P.Ya., Charkin, A.N. et al. (2021). Isotopic, hydrological and hydrochemical indicators of submarine groundwater discharge in the Estuary of Razdolnaya river (Amursky Bay, Sea of Japan) in the ice covered period. Geoecology, 3, 29–43. 1 ECR involved in the publication
- Shevchenko, V. P., Vorobyev, S. N., Krickov, I. V., Boev, A. G., Lim, A. G., Novigatsky, A. N., … Pokrovsky, O. S. (2020). Insoluble particles in the snowpack of the ob river basin (Western Siberia) a 2800 km submeridional profile. Atmosphere, 11(11). https://doi.org/10.3390/atmos11111184 1 ECR involved in the publication
- Silkin, V., Pautova, L., Giordano, M., Kravchishina, M., & Artemiev, V. (2020). Interannual variability of Emiliania huxleyi blooms in the Barents Sea: In situ data 2014–2018. Marine Pollution Bulletin, 158. https://doi.org/10.1016/j.marpolbul.2020.111392
- Silkin, V., Pautova, L., Kravchishina, M., Artemiev, V., & Chultsova, A. (2020). Dataset of theEmiliania huxleyi abundance and phytoplankton composition in the Barents Sea in summer 2014–2018. Data in Brief, 32. https://doi.org/10.1016/j.dib.2020.106251

Completed GEOTRACES-relevant Master theses

- Irina Migdisova (Geochemistry Department of the Geological Faculty, Lomonosov Moscow State University), Master degree thesis "Variability of Elemental Composition of Sedimentary Matter in the Sedimentation System of the Lofoten Basin, Norwegian Sea". PhD Dina Starodymova (participant of the International Summer School GEOTRACES–Spain, Shirshov Institute of Oceanology, Russian Academy of Sciences, Moscow) is a supervisor.

The elemental composition of settling particles collected by sediment traps and surface bottom sediments sampled using multicorer is studied in the Master thesis. Sediment traps were deployed at the depth of 3050 m in the Lofoten Basin from August 2018 to May 2019. Major and trace element composition is studied by AAS and ICP-MS (Agilent 7500 instrument). The aim of the work was to study the vertical fluxes and seasonal (monthly) variability of major and trace elements content in sedimentary matter, as well as to assess changes in the composition of sediments in the water/bottom interface. Studied sedimentary matter appears to be enriched in Ni, Ba, Pb, Mo, Zn, Cu, Cd, Mn, Sr. The enrichment of matter decreases with increasing depth as it is diluted with lithogenic matter (**Figure 10**).

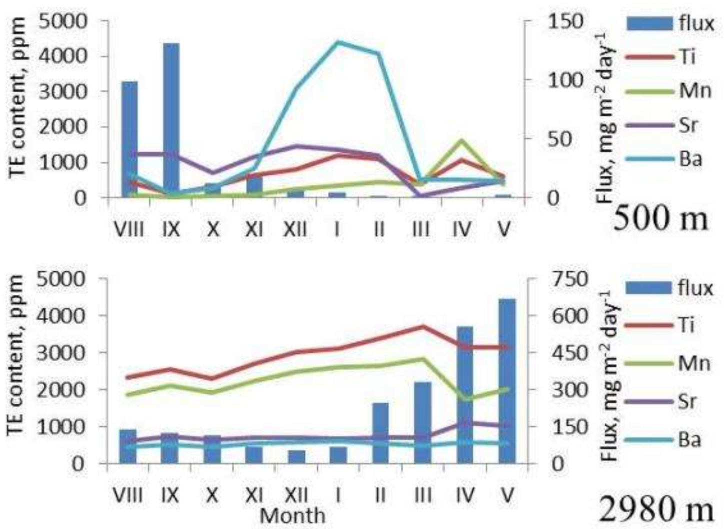

Figure 10*. Variations of trace metal concentrations in sedimentary matter collected in the upper (500 m) and near bottom (2980 m) water layers.*

The material of the near-bottom layer is more homogeneous, while the particle composition of the upper water layer depends on biological cycles. Cu, Zn, Ag, Cd, Pb enrich the near bottom sedimentary matter in comparison with bottom sediments. The REE content in sedimentary matter increases with depth what reflects an increase in the lithogenic material content, and the negative cerium anomaly becomes less pronounced (Migdisova, 2021).

GEOTRACES-relevant presentations in international conferences

- The 2nd International Electronic Conference on Mineral Science, 16–30 November, 2020. **Session D**: Mineral Geochemistry and Geochronology. Presentation by Demina L.L., Gablina I.F., Dara O.M., Budko D.F., Solomatina A.S., Gorkova N.V., Smirnova T.V. "Geochemical fractions of heavy metals in bottom sediments of the Pobeda hydrothermal field, Mid-Atlantic Ridge (17º07′–17º08′ N)". Abstract sciforum-037518. https://sciforum.net/dashboard/author/submissions/ea970e4e03030b70d774d849f95eadf2.
- Joint Workshop "Multi-disciplinary Approaches for Studying the Water and Sediments in the Oceans", Shirshov Institute of Oceanology, RAS–Institute of Ocean Research, PKU, 8 June, 2020. ZOOM at 10:30 (Moscow) = 15:30 (Beijing): presentation by Kravchishina M.D. "Particulate matter as a main source and proxy of sedimentation processes"; presentation by Klyuvitkin A.A. "Vertical and lateral fluxes of sedimentary matter".

- EGU General Assembly 2020, 4–8 May, Online: presentation by Elena Kudryavtseva "Variability in planktonic community caused by sub-mesoscale eddies and spatial features of the Baltic Sea coast" (D670 EGU2020-21523).
  https://meetingorganizer.copernicus.org/EGU2020/EGU2020-21523.html

Submitted by Marina Kravchishina (kravchishina@ocean.ru).