

ANNUAL REPORT ON GEOTRACES ACTIVITIES IN RUSSIA
MAY 2014 – JUNE 2015

New results

- The isotope composition of hydrogen and oxygen in the water of the central part of the Black Sea and at the continental slope was studied in detail. The vertical distribution of the δD and $\delta^{18}O$ values allows one to distinguish four water masses. The surface layer is homogenous in the center of the sea despite the formation of cyclonic and anticyclonic eddies. The main variations in the δD and $\delta^{18}O$ values take place within the pycnocline beneath the CIL core to the depth of 500 m. The salinity increases by 3‰ with the growth of the delta values by 0.8 and 5‰ for the $\delta^{18}O$ and δD , respectively. Deeper than the layer of 500 m down to the bottom, including the BCL, the δD and $\delta^{18}O$ values practically do not vary. The isotope composition of the oxygen and hydrogen in water is linearly dependent on the variations in salinity. This fact allows one to describe the formation of the Black Sea waters using a simple model of mixing of the waters of the lower Bosphorus current and a hypothetical freshwater component of isotope composition formed by the riverine runoff, atmospheric precipitation, and evaporation (Dubinin, Dubinina, 2014).
- Genesis and concentration of suspended particulate matter (SPM) in the Kara Sea during the greatest Arctic sea-ice sheet decreasing (2007) were studied. The isotope composition of POC is correlative with the SPM concentration. The anomalous desalination of the sea surface layer in 2007 results in significant lightening of the organic carbon isotopic composition in the western part of the Kara Sea. Our data on 2007 confirmed an early observations that the share of marine (phytoplankton) organic matter in the composition of POC increased from the coast toward the outer shelf, the $\delta^{13}C_{POC}$ values became heavier in the same direction (Kravchishina et al., 2015).
- Study of trace metal speciation in the early diagenetic processes has allowed to estimate geochemical mechanisms of trace metal accumulation in the bottom sediments in the semi-enclosed White Sea. From our data the lithogenic form contains a great deal of Al, Fe, Cr, Co, Ni and U (>80% bulk content). Percentage of As, Pb, Mo and Cu in lithogenic form varies from 50 to 80% in average, whereas for Mn and Cd this amounts less than 50% bulk content. Manganese and Cd proved to exist in exchangeable complex and carbonate particles (30-40% bulk content). Iron and manganese in form of Fe-Mn-amorphous hydroxides contain only partially (in average 15-20% bulk content). Approximately the same amount (10–25%) of the Pb, Cd, As and Mo bulk content was adsorbed on the Fe-Mn-amorphous hydroxides. Among the metals copper was found to be associated with organic compounds in higher amounts (25%) comparing to the other metals. The predominance of the geochemically inert occurrence form of most trace metals, with the exception of Mn and Cd, reflects a major role of terrigenous processes in the trace metal accumulation in the bottom sediments in this subarctic sea (Demina et al., 2015).
- Bromine content in shelf sediments may serve as a geochemical indicator of paleo-typhoons of the Amur Bay, Sea of Japan. A negative correlation on the timescale was found between of bromine content peaks in bottom sediments with extreme floods caused by typhoons or deep cyclones (Astakhov et al., 2015).

New publications

- Akulich V.A., Obzhairov A.I., Shakirov R.B., Maltseva E.V., Gresov A.I., Telegin Yu.A. 2014. Conditions of gas hydrate formation in the Sea of Okhotsk. Doklady Earth Sciences. Vol. 454, No. 1, pp. 94-96.

- Akulichev V. A., Astakhov A. S., Karnaukh V. N., et al. 2015. Geoacoustic Evidence of Methane Migration from Submarine Coaliferous Formations to Holocene Sediments (Amur Gulf, Sea of Japan) *Doklady Earth Sciences*, Vol. 460, Part 2, pp. 163–167.
- Asadulin En. E., Miroshnikov A. Yu., Usacheva , A. A., Velichkin V.A. Geochemical Recognition of Terrigenous Material from the Ob and Yenisei Rivers in Bottom Sediments of the Eastern Part of the Kara Sea, ISSN 1028_334X, *Doklady Earth Sciences*, 2015, Vol. 461, Part 1, pp. 270–272 <http://www.springer.com/6/d5683965a0d246568ed4dbb0b6c983eb>
- Astakhov A.S., Kalugin I. A., Aksentov K. I., and A. V. Darin. 2015. Geochemical Indicators of Paleo-Typhoons in Shelf Sediments. *Geochemistry International*, Vol. 53, No. 4, pp. 383–388.
- Demina L.L., Budko D.F., Novigatsky A.N., Filippov A.S. Occurrence Forms of Trace Metals in Bottom Sediments of the White Sea // 26-th IUGG-2015 General Assembly, Prague, 22June-2 July 2015. Abstracts. IAPSO: PO-2 Symposium. Physics and biogeochemistry of semi-enclosed and shelf seas.
- Demina L.L. Quantification of role of the organisms in the geochemical migration of trace metal in the ocean// *Geochemistry International*. 2015. Vol. 53. No 3. P. 224–240.
- Gorbarenko S., Chebykin E., Goldberg E., Stepanova O., Lu H. Chronicle of regional volcanic eruptions recorded in Okhotsk Sea sediments over the last 350 ka // *Quaternary Geochronology*. 2014. T. 20. C. 29-38.
- Gorbarenko S.A., Nam S-I., Rybiakova Y.V., Shi X., Liu Y., Bosin A.A. High resolution climate and environmental changes of the northern Japan (East) Sea for the last 40 kyr inferred from sedimentary geochemical and pollen data // *Palaeogeography, Palaeoclimatology, Palaeoecology*. 2014. T. 414. C. 260-272.
- Kalinchuk V.V., Astakhov A.S. 2014. Atmochemical mercury dispersion aureoles over active geologic structures of the northern Sea of Japan. *Russian Geology and Geophysics*. 55. 1361–1368.
- Kolesnik O.N., Kolesnik A.N., Pokrovskii B.G. 2014. A Find of an Authigenic Methane-Derived Carbonate in the Chukchi Sea. *Doklady Earth Sciences*. V. 458. Part 1. P. 1168–1170.
- Kravchishina M., Lein A., Burenkov V., Artem'ev V., Novogatsky A. Distribution and sources of suspended particulate matter in the Kara Sea // *Complex Interfaces Under Change: Sea - River - Groundwater – Lake*. IAHS Publ. 365. Proceedings of IAHS-IAPSO-IASPEI Assembly. Land-ocean interaction: Hydrodynamics and biogeochemistry. Gothenburg, Sweden, July 2014. IAHS Press, 2014. P. 42–48.
- Kravchishina M., Klyuvitkin A., Filippov A., Novigatsky A., Politova N., Shevchenko V., Lisitzin A. Suspended particulate matter in the White Sea: the results of long-term interdisciplinary research // *Complex interfaces under change: Sea – River – Groundwater – Lake*. IAHS Publ. 365. Proceedings of IAHS-IAPSO-IASPEI Assembly “Land-ocean interaction: Hydrodynamics and biogeochemistry”, Gothenburg, Sweden, July 2014. IAHS Press, 2014. P. 35–41.
- Kravchishina M.D., Lein A.Yu., Sukhanova I.N., Artem'ev V.A., Novigatsky A.N. Genesis and spatial distribution of suspended particulate matter concentrations in the Kara Sea during maximum reduction of the Arctic ice sheet // *Oceanology*. 2015. V. 55. No. 3. In press.
- Lein A.Yu., Savvichev A.S., Kravchishina M.D., Kozina N.V., Peresypkin V.I., Zakharova E.E., Veslopolova E.F., Mitskevich I.N., Shul'ga N.A., Lobus N.V., Politova N.V., Ivanov M. V. Microbiological and biogeochemical properties of the Caspian Sea sediments and water column // *Microbiology*. 2014. V. 83. No. 5. PP. 648–660.

- Pautova L.A., Kravchishina M.D., Vostokov S.V., Zernova V.V., Silkin V.A. Features of the vertical phytoplankton structure in the deep-sea parts of the Caspian Sea in summer // Doklady Earth Sciences. 2015. Vol. 462. Part 2. PP. 604–608.
- Polyakov D.M., Zarubina N.V. 2014. Accumulation of alkaline and alkaline-earth elements in subcolloidal fraction of bottom sediments at the river-sea geochemical barrier. Water Resources. V. 41, No 6. P. 666-670.
- Sattarova V.V., Artemova A.V. 2014. Geochemical and micropaleontological character of Deep-Sea sediments from the Northwestern Pacific near the Kuril-Kamchatka Trench// Deep Sea Research Part II: Topical Studies in Oceanography. V 111. P. 10-18.
- Semenov I.N., Miroshnikov A. Yu., Asadulin E.E., Usacheva A. A., Velichkin V.I., Laverov N.P. The Ob River Basin as a Source of Kara Sea Contamination with Global Fallout of Cs-137, ISSN 1028_334X, Doklady Earth Sciences, 2015, Vol. 463, Part 1, P. 704–706.
- Shakirov R.B. 2014. Chemical and Isotopic Characteristics of Hydrocarbon Gases from Mendeleev and Golovnin Volcanoes, Kunashir Island. Geochemistry International. Vol. 52, No. 3, pp. 267-279.
- Shulkin V.M., Zhabin I.A., Abrosimova A.A. 2014. The influence of the Amur river runoff on the biogeochemical cycle of iron in the Sea of Okhotsk. Oceanology. Volume 54, Issue 1, pp. 38-45
- Wenshen Xiao, Rujian Wang, Leonid Polyak, Anatolii Astakhov, Xinrong Cheng. 2014. Stable oxygen and carbon isotopes in planktonic foraminifera *Neogloboquadrina pachyderma* in the Arctic Ocean: An overview of published and new surface-sediment data // Marine Geology. V. 352. 397–408 DOI: 10.1016/j.margeo.2014.03.02

Meetings

- Over late 2014 up to date (July 2015) Russian scientists participated in 3 conference, where they have presented around 30 presentations. Among the conferences there was only one relevant to GEOTRACES: 26-th IUGG General Assembly, Prague, 22 June- 02 July 2015. About 15 presentations were made there, among them one titled “GEOTRACES highlights in the Indian Ocean and plans for the future, by E. Masferrer Dodas¹, E. Boyle², C. Jeandel¹, R. Schlitzer³, was presented by L. Demina⁴ (¹GEOTRACES International Project Office, Toulouse, France; ²Massachusetts Institute of Technology, Cambridge, USA; ³Alfred Wegener Institute, Bremerhaven, Germany; ⁴Shirshov Institute of Oceanology, Moscow, Russia).

Cruises

- In November 2014 Shirshov Institute of Oceanology held a cruise in the Caspian Sea (hydrochemistry, currents, sedimentation). In February-April 2015 there were 2 expeditions for collection of snow and ice at the White Sea (winter fluxes of aerosols), besides at the Biological Marine Station of Moscow State University in the coastal zone of the White Sea a continuous collection of aerosols (analysis of black carbon) is carried out by the High volume sampler (UK). In June –July on board the *RV “Academik Ioffe”* a transect along 60oN in the Northern Atlantic was made to estimate evolution of water masses by hydrochemical and hydrophysical parameters. Just in a few days a cruise of the *RV “Academik Mstislav Keldysh”* will start in the Northern Atlantic and the Barents Sea to perform a geological and geochemical investigation.
- In plans for 2016 there is an international multidisciplinary expedition in the Arctic Ocean which holds Pacific Oceanology Institute (*RV “Academik Lavrent'yev”*) where participants from other nations are welcome.

New funding

- We have got a financial support of the 15 initiative projects, related to the GEOTRACES objectives, from the Russian Foundation on Basic Research (rfbr.ru), aimed to investigate Russian Seas.
- In addition we have got 2 initiative projects from the recently organized Russian Scientific Foundation (rscf.ru).
- Among the aims of some projects, multidisplinary expeditions in the Arctic seas (including the Barents, Kara and East Siberian and Chukchi Seas) are laid out on 2016.

Other activities

- New equipment was bought (Laminar box, Teflon subboiling system for acids' cleaning, new Multicorer sampler for bottom sediment sampling with possibility of high resolution of layers and so on).

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