

Hydro-geochemical characteristics and transformation processes of the Lena River Delta branches

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Previous studies have shown that arctic river delta systems are areas of accumulation of geochemical substances at the sea-river mixing zone. In the Lena River Delta our previous work shows the tendencies of water runoff redistribution changes and heterogeneity of suspended supply distribution along the delta branches, accumulation and erosion zone in the different parts of the delta. Nevertheless, the processes of geochemical flow transformation in the subaerial deltas are so far underestimated. In order to close this gap, we sampled water, suspended and bottom sediments in the Lena River Delta in the summer seasons of 2010 and 2014. Most of the sampling points were tight to the profiles of hydrological measurements held in the delta and highlighted in Fedorova et al. [2015].

The results show that geochemical transformation of the Lena River runoff is taking place in the delta. The most active time for the transformation is the summer season due to the activity of sediment accumulation and biogeochemical processes. Hydrological conditions in the delta affect also its hydro-geochemical characteristics. Furcation of the delta branches affects the hydrodynamic conditions of different delta areas.

The factors influencing the geochemical characteristics of the delta were identified on the base of geochemical indexes approach applied to sediments and statistical factor analysis.

Based on geochemical indexes (Al/Na, Si/Al, Fe/Mn and Fe/Al ratios) similar conditions were determined for the main branch of the Lena, the upstream parts of Bykovskaya and Tumatskaya branches and in Olenekskaya branch near Chay-Tumus. Despite of high runoff the branches are characterized

by element accumulation, which can be explained by decreasing of flow turbulence and specificity redox conditions in these areas. Bottom sediments are one of the most important indicators of geochemical transformation processes.

The results of statistical factor analysis show three main factors for formation of the these geochemical conditions in the delta:

1. the general water flow of the Lena River, which is influenced by the lithogenous base of the river catchment,
2. the cryogenic condition of the Lena Delta (permafrost degradation processes and cryogenic weathering) and
3. biogeochemical transformation during redistribution of chemical water components, suspended matter and bottom sediments.

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References

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