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The Assessment Of Heavy Metals Biogeochemical Activity

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The paper presents the results of assessment of biogeochemical activity of some heavy metals in the shallow area of the North Caspian. The activity was estimated by means of the method developed in KaspMNIZ. The method is based on comparison of the dynamics of a pollutant substance (PS) with the dynamics of a conservative component dependent exclusively on the processes of water mixing. PS activity is revealed in deviation from conservative behavior as it passes from water to other components of the marine environment, including living organisms (biofiltration, biosorption processes, etc.). PS activity was estimated by means of two non-dimensional indices: the index of activity direction IFs and the index of activity level IFm. The first one characterizes the direction of PS transfer (depletion - enrichment) and the second one helps compare different substances in their activity level. The research showed that in 2001-2009 the average activity level of heavy metals in marine water varied insignificantly (IFm values are indicated in brackets): Cu, Pb (0.80) - Zn, Ni (0.78) - Cd (0.77). The activity of Cd and Cu mainly revealed in water enrichment with these metals, while the activity of Pb, Ni and Zn - in depletion. The analysis of seasonal variability revealed that there was a rise in activity of Pb and Zn in spring and summer, and the rise in activity of Cu in autumn. The activity of Cd и Ni didn't depend on the season. Activity direction among the most of the studied metals changed to the contrary with the change of the season. The changes of average metal concentration in water almost did not have an impact on their activity. Positive correlation was identified only for Ni in the warm period of the year. Metal activity was also studied in different water types (differing in salinity level) of the North Caspian Sea. It was revealed that in spring and summer the activity of Cd, Cu, and Ni in the water with the salinity of 7-9‰ was higher than in fresh water (S<2‰); in autumn the activity of these metals fell as water salinity increased to more than 9 ‰. Pb activity rose significantly in fresh water, especially throughout spring period. The level of Zn activity almost didn't change. The analysis of activity direction showed that while the 2‰ salinity threshold was reached the activity sign of the most of the studied metals changed to the contrary. One of characteristic features is that Cd, Cu and Zn mainly deposit from fresh water, Pb - under salinity of more than 2‰, and Ni - under the salinity of more than 7‰. The results of assessment of pollutants biogeochemical activity are accounted

for in the description of environmental situation in the North Caspian, as the process of water self-purification with living organisms can lead to either positive (PS biodegradation) or negative (PS bioaccumulation) consequences. Keywords: biogeochemical activity, heavy metals, North Caspian