Wind surge influence on flows of heavy metals and polycyclic aromatic hydrocarbons in the Don River delta

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The Don River Delta is densely populated and subjected to the significant anthropogenic impact caused by agriculture, shipping, recreation and fishing activities. One of the major problems in the delta is wind surges, which cause catastrophic consequences due to the sharp water rise (up to 3,2 meter in 2014). Increasing technogenic pressure coupled with the unstable hydrological regime determines great interest of scientists in its study. Research of aquatic systems of the Don River delta carried out by the authors since 2012. Since that, a great data on heavy metals (HM) and polycyclic aromatic hydrocarbons (PAH) content in water, suspended matter and bottom sediments has been received. The data characterize different hydrological conditions including spring flood, summer and winter low water periods, and water surges of 2014 and 2019.

The content of HMs and PAHs in water and suspended matter of the Don delta is usually below the world average. There is a significant seasonal and spatial variability in the concentration of pollutants in suspended matter. In general, the majority of heavy metals are characterized by an increase in contents from the top of the delta to the estuary seaside. Deltaic waters were found polluted Cu with the maximum value in the mouth of the main shipping channel. Increased concentrations of HMs and PAHs are observed near or downstream of settlements and industrial facilities. According to seasonal changes the heavy metals in the Don delta can be divided into 2 groups. The first group includes Fe, Mn and Pb, which maximum concentrations are characteristic of the winter low-water period. The second group includes Cu, Ni, Zn and Mo, with the highest content during floods.

The average concentration of PAHs in the summer-autumn low-water period (300 ng/g) is almost 10 times lower than in the winter low-water period (3000 ng/g). The composition of PAHs in suspended matters is dominated by light compounds: diphenyl-phenanthrene-naphthalene association in the summer-autumn low-water period and phenanthrene-naphthalene-anthracene association during the winter low-water period. Small low-flow channels have a low content of polyarenes.

Surge events significantly affect the spatial distribution of HMs and polyarenes in suspended matter and bottom sediments, mainly due to an increase in flow turbulence. During the surge the content of HMs and PAHs in upper part of the sediments was found decreased, since in suspended matter increased.
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