

Estimation of the Aral Sea state predictability based on the open data sources and the unique field observations

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The Aral Sea, formerly one of the four largest lakes in the world, has lost over 90% of its volume during the dramatical dessication mainly caused by the severe alteration of water budget of the basin. Shrinkage of the Aral Sea resulted in profound changes of the lake's ecosystem, that became a subject for a number of publications based on a wide range of methods such as field observations, remote sensing data analysis and numerical modeling. However, by the early 21th century, the number of field studies decreased significantly due to almost complete cessation of navigation and displacement of the Aral's shoreline far away from roads and other infrastructure. Thus, only a small amount of field data (salinity, temperature, etc.) for different regions of the lake is available for the last two decades. On the other hand, a set of the open data sources (sea level variability, atmospheric reanalysis) were developed for the region.

The main idea of the presented study is to estimate the possibility of prediction of the Aral Sea state using coupled system of basic geoanalysis tools, numerical modeling of hydrological cycle (both for sea and land-surface interactions with atmosphere) and state-of-art machine learning techniques. Firstly, available in situ data, obtained in the Aral Sea by Shirshov Institute and other researchers, are concerned as the "base points of state" for each year within the studied period. Secondly, consistent patterns in the interannual variability of all other available parameters, taken from the open data sources and numerical modeling predictions, are founded out. As a result, such an approach allows predicting the future state of sea basing on the possible climatic scenario.