



Hydrographic properties of separate residual basins of the Aral Sea: in situ observations and intercomparison

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Desiccation of the Aral Sea continued intensively throughout the last decade. As reported by NASA and widely commented in mass media, the eastern lobe of the Southern Sea (i.e. the Large Aral Sea) dried up completely in the summer of 2014. Only the western basin of the Large Sea remains there, and the separation of its northernmost portion called Chernyshev Bay is imminent. The northern part of the former Aral Sea known as the Small Aral Sea has separated decades ago and eventually stabilized thanks to a man-made dam trapping all of the Syr Daria discharges in the Small Sea. In addition, the Tschebas Bay, formerly a large bay of the Aral Sea, has evolved into a separate lake with relatively stable boundaries. In this way, the present-day Aral Sea should be considered as a system of separated water bodies with a common origin but different fates and very different physical, chemical, and biological features.

In the presented study, we focus on hydrophysical state of the newly individual parts of the former Aral Sea. The comparative investigation is based on field data collected during two surveys of Shirshov Institute of Oceanology to the Aral Sea which took place in the fall season of 2014. In situ measurements including CTD profiling and water sampling were carried in the central western basin of the Large Aral (Aktumsuk area), in the northern extremity of the western Large Aral (Chernyshev bay), in Tschebas Lake, and the western part of the Small Sea (Shevchenko Bay). The analysis of direct observations together with the satellite data allows clarifying main processes and factors determining the physical state of the residual water bodies.

According to the results of the in situ observations, three different types of hydrographic structure were documented in the lakes of the former Aral Sea. Salinity of Tschebas Lake water was around 92 g/kg, with the water column fully mixed from surface to bottom. The CTD measurements conducted in the Shevchenko bay of the Small Aral also identified homogeneous water structure from surface down to the bottom. However, salinity values here were an order of magnitude lower than in Tschebas lake, close to those observed in pre-desiccation state of the Aral Sea. In contrast, the western Large Aral Seal was highly stratified, while the upper mixed layer extended only to 6 meters depth. Salinity values from this level began to increase significantly down to the bottom. A very steep temperature inversion (nearly 9 degrees Celsius across a layer of thickness only 2 m!) was observed below upper mixed layer in Chernyshev Bay of the Large Aral. Differences in hydrological structure of the residual parts of the Aral Sea are discussed. Those are determined by forming mechanisms, such as evaporation, river inflow, groundwater discharge, whose relative roles are variable for the different parts of the sea.