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Present physical state and plausible future of the Aral Sea

P. Zavialov

Shirshov Institute of Oceanology, Moscow, Russia (peter@sio.rssi.ru Phone: (7-095)-1245994)

In this review, we summarize recent findings from several field campaigns of 2002-2004, numerical modeling, laboratory experiments, and remote sensing observations to get insight into the physical state of the Aral Sea under its present conditions of severe anthropogenic desiccation. As known, the desiccation has already led to the loss of about 90% of the lake volume, and dramatic salinity build-up from about 10 ppt in 1960 to around 100 ppt in 2004. Therefore, while the Aral Sea remains a notable inland body of water whose maximum depth exceeds 43 m, the present lake is physically quite different from the Sea in its "normal", pre-desiccation state, and still poorly explored in its new capacity. We use the data from recent CTD profiling and water sampling to describe the 3D thermohaline structure and stratification of the lake, as well as their temporal variability at the scales from seasonal to interannual. Laboratory measurements on the collected water samples have yielded updated empirical relations for the density, electric conductivity, and freezing temperature of the present Sea water as functions of salinity. The well-known Princeton Ocean Model adapted for the Aral Sea was used to investigate the basin scale and mesoscale circulations in the present lake as well as quantify the water and salt exchanges between different parts of the lake. Furthermore, we used the water and salt budget equations (with updated specific hypsometric relations) to investigate the likely future dynamics of the lake level for different scenarios of the anthropogenic diversions of water from the tributary rivers.