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Present geochemical state of the Aral Sea and consequences for the ecosystem

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The location of the Aral Sea in an endorheic basin makes the system highly responsive to both human activities and climatic variability that alter inflows. The lake level is tightly linked to the runoff from its main inflowing rivers, the Amu Darya and the Syr Darya. The rich archaeological record of the region gives evidence of both climate and human-induced regressions of the Aral Sea due to irrigation already BC. In the early Holocene, the Oxus river (Amu Darya) repeatedly changed its course towards the Caspian Sea, due to tectonic motions and human impact (Uzboj Channel), leading to major regressions of the Aral Sea. The most recent regression of the Aral Sea since the sixties shows impressively how human activities may accelerate natural processes. Since the seventies a massive decline of zooplankton and zoobenthos diversity was recorded. Here we present results from field campaigns in summer 2002 and spring 2004, and look at the consequences the desiccation has on the ecosystem. We use the salt composition and mass ratios, benthic cycling, nutrients, oxygen, and uranium isotopes as indicators of the geochemical changes in the ecosystem. Nowadays, the Aral Sea has split up into three almost independent ecosystems representing the different stages of its desiccation process: the Small Aral is a shallow brackish inland water body; the Large Aral consists of the almost disconnected western and the eastern basins. The deep trench of the western basin with a salinity range of 80 to 110 g kg^{-1}becomes periodically anoxic, depending on the inflow of high saline water from the eastern basin, further reducing biodiversity.

The increase in salinity from 10 g kg^{-1} to 80-90 g kg^{-1} in the Large Aral reflects the shrinkage in water volume. Clearly, the decrease in the water level causes dramatic changes in the water chemistry and the redox milieu of the lake, followed by gradual

overturn of the whole ecosystem. Since 2000, Artemia sp. constitutes 99% of the zooplankton biomass in the western basin. Since 2002, only two fish species (Atherina sp. and flounder) were recorded in the western basin. The eastern shallow lagoon-like basin has salinities as high as 150 g $kg^{-1}$and is devoid of fish.