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Present and Past Aral Sea Level Fluctuations and Its Possible Causes

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We analyzed 4.3 m long core retrieved from Chernyshov Bay in the NW of Large Aral Sea using scanning NIR-Vis spectroscopy, chemical analysis with Cu-trien method for determination of cation exchange capacity and water soluble salts, and diatom analysis. We acquired proxies of the detrital, biogenic, and chemogenic components of the sediments that reflect the past lake hydrology. The age model was constructed from ^{14}C dating of mollusk shells corrected according to the reservoir effect estimated by Kuzmin et al. (2007). The studied core probably contained a discontinuity in between the bottom segment of lake fluctuations in the period of 5-6 ky BP, and the central and upper parts covering the last 1.5 ky BP. The obtained dating of the major lake regressions in the last 1.5 ky is comparable to the previous results obtained within CLIMAN project (Mackay and Oberhänsli, 2007). The diatom analysis allowed a high-resolution (18 years on average) qualitative palaeohydrologic reconstruction based on different ecological demands of individual diatom species. The dominance of the most abundant species with a low salinity tolerance, *Cocconeis placentula* Ehrenberg, pointed to the major freshwater stages. The last 1.5 ky are characterized by a high abundance of brackish and marine species, while at $\sim$5 ky BP freshwater diatom species dominated far more frequently. The most remarkable species succession was the replacement of *Actinocyclus octonarius* Ehrenberg by marine species *Tryblionella*

compressa (Bailey) Poulin which was often followed by a gypsum layer - this succession pointed out phases of the most dramatic lake level regressions.

The "inorganic", i.e., chemical or mineral proxies confirmed the basic interpretations of the diatom record. Chemical analysis allow for tracing periods with the highest siliciclastic riverine input when content of detritic expandable clay minerals reach maximum values.

The timings of the lake level regression phases in the last 1.5 ky according to our data are 1090–1260 A.D., 1430–1550 A.D. and 1900– recent. The riverine input was highest at 400–700 A.D., 1520–1580 A.D., and in the 19^{th} century and it was lowest at 1120 –1340 A.D., and 1590 A.D. up to recent. Transgression and regression periods of Aral Sea are more or less governed by varying Amu Darya inflow as Aral Sea's major tributary (80 % of the fluvial input). Amu Darya runoff to Aral Sea has varied as a response to a combination of anthropogenic and natural environmental changes. In the period of 14^{th}–16^{th} century Amu Darya was redirected to nearby Sarykamysh depression according to historical descriptions and the corresponding regression stage was found also in the studied section. On the other hand the natural causes of Aral Sea level fluctuation are controlled by climate variation in the whole catchments area, i.e., by a global climate change. The most dramatic regression at 1090–1260 AD coincides with the Mediaeval Warm Period. For evaluating periods with either natural or anthropogenic forcing caused the Aral level fluctuations, we will compare our results with data from other local hydrologic events and global change data reported in literature.

Kuzmin, Y.V., Nevesskaya, L.A. , Krivonogov, S.K. , Burr, G. S., 2007. Apparent ^{14}C ages of the 'pre-bomb' shells and correction values (R,DR) for Caspian and Aral Seas (Central Asia). Nuclear Instruments and Methods in Physics Research B 259, 463–466.

Mackay, A.W. and Oberhänsli, H. (2007) Editors. Special Issue: Reconstructing past environments from remnants of Human occupation and sedimentary archives in western Eurasia. Quaternary Research 67, pp. 313-410.