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Reading seven-century Aral record by spectral and chemical means

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430 cm core of Aral Sea sediments was obtained in 2004 from Chernyshev Bay (N part of W basin). The age model was obtained by correlation with previous coring and radiocarbon dating of the sediments from similar locations performed within EU-funded project CLIMAN. Our core covers a period of 7 centuries during which the lake passed from a low-level state at the end of Mediaeval Warm Period through a high-level state in Little Ice Age to the final low-level state after 1960's. The aim of the work was to obtain a proxy record of the Lake productivity from the chlorophyll absorption band at about 670 nm and mineral input from the absorption of Fe(3+) species at about 400 nm using near IR-Vis optical-fibre spectrometer in a setup with spatial resolution (linear step) 1.5 mm. Simple colour characteristics of the sediments can hardly be evaluated because the sediments are extremely sensitive to air oxidation: it causes a change from the original dark to greyish blue or white colours to khaki or grey within about half hour after core opening under ambient conditions. That problem was solved by acquiring spectra with 3 nm resolution and then using only narrow and carefully selected spectral regions for data processing. The spectral analysis was complemented by magnetic susceptibility scanning, and finally by chemical analysis of salt contents and expandable clay minerals with spatial resolution 1 cm. The combination of these characteristics will yield an about annually resolved record of periods of an increased mineral input (increased cation exchange capacity, increased Fe(3+) content), a decreased mineral input (chlorophyll), and an increased net evaporation from the lake (gypsum).