Geophysical Research Abstracts
Vol. 12, EGU2010-15141, 2010
EGU General Assembly 2010


# Estimates for Masses of Different Minerals Precipitated on the Aral Sea Bottom during its Desiccation

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The salinity build-up in the Aral Sea following its desiccation was accompanied by massive precipitation of minerals from the water column. However, while the sequence of minerals to precipitate is theoretically known (calcium and magnesium carbonates, gypsum, mirabilite, halite, ...), the total masses of the compounds sedimented to date, as well as the relative proportions between different minerals, are practically unknown because of the lack of quantitative data. There are two possible approaches to obtaining these estimates. Firstly, one can compare the ionic contents of the Sea's water mass before and after the desiccation, and thereby quantify the masses of individual ions consumed by precipitation. The masses of ions can then be converted into the masses of specified minerals by solving a system of linear equations (with certain misfit). This is an indirect approach. Secondly, one can attempt directly analyze samples of the bottom sediments. The both methods require a substantial number of samples collected from different locations of the lake.

In this work, we followed the both approaches, using chemical analyses of water samples collected in field surveys of the last years on the one hand, and bottom sediment samples we collected in August 2009 at 5 stations along a section across the western basin of the Sea on the other. The bottom sediment samples were analyzed through X-ray spectroscopy in the Institute of Geochemistry, Russian Academy of Sciences.

The indirect method yielded the following results (billion tones precipitated over the entire desiccation period): Calcium carbonate – 0.07 (2%); Magnesium carbonate – 0.1 (2%); Gypsum – 2.3 (49%); Mirabilite – 1.9 (40%); Halite – 0.4 (8%). The rate of salt accumulation is estimated as 3 kg per m2 per year.

The number of bottom sediment samples analyzed through the direct approach was insufficient to allow for estimates of the total masses. However, we note that the both approaches yielded rather similar results in the terms of relative proportion between mirabilite, gypsum, and halite, namely, 40:49:8 and 38:60:8, respectively. We also discuss the dependence of the bottom sediment mineral composition on the depth at the location where the sample was collected.