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Impact of microbial processes on the fate of metals in groundwater

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The transfer and chemical stability of metal contaminants in soils and sediments are dependent on a complex series of biogeochemical processes controlling variables like pH and redox conditions. The interactions between biological and chemical processes of heavy metals in groundwater and their combined effects need to be further investigated. We performed a series of batch tests to estimate the impact of micro-organisms on the fate of metals in a saturated soil system along a redox gradient, i.e., ranging from oxic aquifers up to sulfate reducing conditions. The aquifer material was first characterized in terms of organic matter content, pH, particle size distribution, total inorganic carbon, CEC and total S. Initial metal concentrations were determined after sequential extraction (adapted Tessier) and after destruction with aqua regia. Various conditions using different concentrations of the electron acceptors O2, NO3- and SO42- were studied. The effect of different redox zones on the fate of metals was evaluated in sacrificed batch experiments (50 ml vials) as described above. Vials were set-up at T0 and for 5 points in time (T1, T2, T3, T4, and T5). Metal concentrations, electron acceptor concentrations, pH, dissolved oxygen, volatile fatty acids and redox were monitored. The first results of the batch experiments will be presented.