Comparative analysis of conductivity and triple isotopic ratios in contaminant water: a laboratory simulation of brine presence in shallow groundwater systems

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Comparative analysis of conductivity and triple isotopic ratios in H₂O in contaminant water in lab. experiments have been carried out. Quartz sand was washed, dried and placed into a vertically oriented pipe (10 cm diameter, 1 m long). Distilled water (δ^2 H=-60,13‰, δ^{17} O=-4,34‰ and $\delta^{18}O = -8,27\%$) levels were stepwise raised from 0 to 30, 60 and 90 cm (till surface of the sand) 10 times to each level, and the drained water was collected for conductivity measurements and isotopic analyses. Then, the sand was dried, mixed with a powdered halite (NaCl) 10:1, and placed back to the pipe. Rising distilled water level and draining have been caried out in 6 series (10x3 levels, i.e. 30 samples of water in one seria). The experiment was to mimic conditions where brines are rising up from the depth to the shallow groundwater level, then dry leaving the salt in the soil (e.g. mining areas, seasides). After those 6 series, a "peculiar" water (δ^2 H= -126,45‰, δ^{17} O=+14,05‰ and δ^{18} O=+27,31‰) obtained due to the method described by Jedrysek (this volume), and the distilled water again, have been in the experiment. After analogous flushing (3 levels, 10 flushes each) the drained water from each level was still contaminated with NaCl (although conductivity decreased), but after 3 flushes with the trace water, the drained water has shown the primary isotopic values (no contamination with the "peculiar" water). Then, it was confirmed by flushing with distilled water. This is clear for isotope geochemist, but not always for groundwater environmentalists, who often consider conductivity as the reliable parameter showing severe new contaminations of soil. by brines filtrating up from deeper groundwaters, when only rainwater infiltrates to the contaminated soil. This means that we used isotopically distinguishable waters to evidence that the leaching of salt takes much longer as compared to leaching of water particles – chlorides are conservative but isotopic analyses are better toll.