

# Salinization of groundwater in the North German Basin: Results from conjoint investigation of major, trace element and multi-isotope distribution

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**Abstract:** Conjoint consideration of distribution of major, rare earth elements (REE) and Y (combined to REY) and of H, O, C, S, Sr isotopes reveals that four types of groundwater are distinguishable by their chemical composition presented by spider patterns. REY patterns indicate thermo-saline deep water and two types of shallow saline groundwaters. Presence of connate waters is not detectable. Sr isotope ratios distinguish three sources of Sr: fast and slow weathering of biotite and K-feldspar in Pleistocene sediments, respectively, and dissolution of limestones.  $\delta^{13}\text{C}(\text{DIC})$  indicate dissolution of limestone under closed and open system conditions. Numerous samples show  $\delta^{13}\text{C}(\text{DIC}) > 13\text{‰}$  which is probably caused by incongruent dissolution of calcite and dolomite. The brines from below 1,000 m represent mixtures of pre-Pleistocene seawater or its evaporation brines and infiltrated post-Pleistocene precipitation. The shallow waters represent mixtures of Pleistocene and Recent precipitation salinized by dissolution of evaporites or by mixing with ascending brines. The distribution of water types is independent on geologic units and lithologies. Even the Tertiary Rupelian aquiclude does not prevent salinization of the upper aquifer. © Springer-Verlag 2007.

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