

Dynamics and Geochemical Evolution of Seawater Intruding into a Coastal Aquifer

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We present an attempt to estimate the time scale for seawater intrusion into a coastal aquifer and the operating geochemical processes by using the natural distribution cosmogenic isotopes and changes in the major ions composition of the waters.

Saline and brackish groundwaters were sampled from the Israeli coastal aquifer. All samples were analyzed for their chemical composition, stable carbon and oxygen isotopes, ¹⁴C_{DIC} (¹⁴C in the dissolved inorganic carbon) and tritium activity.

The substantial tritium content in the saline groundwaters suggests that Mediterranean seawater penetrated inland and traveled toward the shore to a distance of at least 100-200 meter only very recently (< 40 years). The wide range of ¹⁴C_{DIC} activities in the saline area (40-90 pmc) was achieved from diagenetic and transport processes in this zone and not from aging.

The high concentrations of alkalinity, DIC, Ca²⁺ and Sr²⁺ indicate that the main diagenetic processes in this zone were oxidation of organic carbon and cations exchange. Most of the groundwaters at the fresh-saline water interface represent conservative mixing between the saline groundwater and the fresh groundwater of the aquifer. In some cases there is an additional ion exchange in the mixing zone.