Dating of seawater intrusion into the Israeli coastal aquifer, using $^{14}$C and tritium analysis

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The rate of seawater intrusion is usually estimated by a rise in salinity in wells and/or theoretical hydrological models. The purpose of the present work is to assess directly seawater intrusion rates into the aquifer using $^{14}$C and tritium analysis. The effects of major biogeochemical, transport and decay processes on the $^{14}$C ages is evaluated. Determining the rate of penetration is a very important factor for efficient utilization of groundwater in coastal systems. Moreover, it plays a significant role in the assessment of future consequences of sea level rise due to global climate change.

Groundwater from the fresh-saline water interface near the Israeli shoreline were sampled for their $^{14}$C and tritium content. The low tritium values (<2 T.U.) in many of the saline groundwater indicate that recent seawater (<40 years) did not penetrate inland. At some locations measurable tritium values were found indicating a younger water component probably originated from young seawater with some mixing with fresh groundwater. The low $^{14}$C values also imply on a non-recent seawater source although these values could have been affected by chemical interaction with the sediment along the penetration route.

A more detailed $^{14}$C profile was conducted in a specific borehole across the interface between fresh and saline groundwater. $^{14}$C values along this profile showed small variations in the range of 60 to 75 PMC. The isotopic and chemical composition of the saline end-member was characterized by sampling seawater and interstitial water in the nearby sea. The relatively low $^{14}$C values in most saline groundwater imply on apparent ages of several thousands years. These ages are still open to several possible interpretations that will be discussed.