Fossil Seawater in Floridan Aquifer

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The Floridan Aquifer System is one of the most productive aquifers on Earth, underlaying the entire state of Florida and beyond. It consists of a sequence of hydraulically connected carbonate rocks with minor amounts of evaporites of Paleocene to Miocene age [1]. Based on noble gas recharge temperature and $\delta^{18}O$ data [2,3], it was suggested that the Upper Florida Aquifer was recharged during the last glacial period, and that the seawater intrusion in Lower Floridan Aquifer was triggered by the holocene sea-level rise [3]. The ^{14}C activities are compromised by water-rock interactions, hence we analyzed radiokrypton isotopes of 8 groundwater samples by Atom Trap Trace Analysis [4] in order to set constraints on the timing of recharge, mixing and flow regime. Sample collection and preparation methods are described elsewhere [5].

In all samples, ^{85}Kr was below 1% of modern air activity, indicating that there was no significant atmospheric contamination during sampling and Kr purification. The isotopic abundances of ^{81}Kr were between 0.89 R/Ra and modern. All but one sample had low (<2 pMC) ^{14}C activity. The apparent ^{81}Kr ages range from modern to 38.5 kyr, confirming the recharge during LGP for most locations. The younger ages near the recharge zone suggest an active hydrological cycle rather than 'trapped' LGP groundwater [3]. A sample from the first permeable zone of the Lower Floridan Aquifer had the chemical composition comparable with seawater, and showed discordant ^{14}C age of 13.7 kyr and ^{81}Kr age of 35 kyr. The discordance suggests mixing of multiple water bodies with different ages. A simple deconvolution suggests mixing of >44 kyr seawater with intruding Holocene seawater.

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