

Assessing Age Distribution and Contaminant Movement in Ground Water in the Contributing Recharge Area to a Public Supply Well in the Karstic Upper Floridan Aquifer

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Abstract

Multiple isotopic and other chemical tracers were used to assess age distribution and contaminant movement in ground water within a contributing recharge area to a public supply well (PSW) near Tampa, Florida, as part of the U.S. Geological Survey National Water Quality Assessment Program. During 2003-2006, water samples were collected from the PSW [open interval 39-53 m below land surface (bls)] and 28 monitoring wells in the karstic Upper Floridan aquifer (UFA) and the overlying surficial aquifer system (SAS). Concentrations of the transient age tracers, SF₆ and ³H/³He, in water from the oxic SAS indicated recent recharge (<7 years), but tracer concentrations in water from monitoring wells and the PSW in the anoxic UFA were consistent with binary mixtures that contained varying amounts of recent recharge and tracer-free water (>50 years). Although ground-water age generally increased with depth in the UFA, monitoring wells that tapped a 43-49 m zone (bls) had higher fractions of young water than water from wells at shallower depths (23-31 m bls). Mixtures of water in the PSW also were consistent with delta ³⁴S of sulfate, ²²²Rn, nitrate-N, and VOC concentrations that fell between end-member values for waters from the SAS and various zones in the UFA. Ratios of ⁸⁷Sr/⁸⁶Sr in the PSW water were slightly less radiogenic (0.70779) than water from other UFA monitoring wells (0.70790-0.70804) indicating that the PSW also withdraws some water from deep parts of the aquifer. Geochemical mass-balance mixing models for the PSW indicate a 40-60% contribution of water from the SAS based on various isotopic and chemical indicators. Geophysical data from the PSW borehole indicated a highly transmissive zone at 43-49 m bls, which likely is related to a large solution feature that is hydraulically connected to the surface and SAS, thus yielding the younger age water mentioned above.