Interpreting Recent Groundwater Chemistry Results from St. Catherine's Island, Georgia

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Abstract. Hydraulic head and chemical data have been collected regularly on St. Catherine's Island since 2011 to characterize the hydrogeology. An E-W transect of six wells was installed to monitor the surficial aquifer, and a N-S transect of six water-supply wells was used for the Upper Floridan aquifer (UFA). LiDAR data show that the core of the island is subdivided topographically along a N-S trending axis, with the eastern side being 2-3 meters higher. Results show that total dissolved solids (TDS) within the surficial aquifer average 50 mg/L on the crest of the island and 95 mg/L in topographically low areas. Piper diagrams reveal that surficial groundwater in low areas is a strong Na-Cl type water that plots close to modern seawater, but is a more mixed type water on the topographic high. When integrated with lithologic, ground-penetrating radar and radiocarbon data, it's hypothesized that the island core consists of Pleistocene marine units overlain by Holocene eolian and washover sands. Head data confirm that the UFA transect follows a S-N flowpath into the Savannah drawdown cone. UFA chloride concentrations average 14.5 mg/L at the upgradient end of the transect, decreasing to 9.0 mg/L at the downgradient end. Piper diagram analysis eliminates the surficial aquifer and modern sea water as possible mixing end members, whereas samples from the Lower Floridan plot upgradient of the mixing line. Saltwater intrusion into the UFA on St. Catherine's appears to be taking place by the upward movement of more saline water along vertical fractures or faults.