USING A VARIABLE-DENSITY MODEL TO DETERMINE POSSIBLE SOURCES OF ELEVATED SALINITY LEVELS AND DISSOLVED CONSTITUENTS RECORDED IN SUWANNEE RIVER BASIN SPRINGS, NORTH-CENTRAL FLORIDA

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Abstract. The objective of this work is to model the depth of the freshwater-saltwater interface in the Floridan aquifer system to determine its relationship to discharging springs near the Suwannee River during periods of heavy withdrawals. We are improving an existing USGS finite-difference model by simulating the springs as individual sink terms and modeling movement of the interface by incorporating a variable density package.

In north-central Florida, the Suwannee River interacts with the Floridan aquifer system in a dynamic flow network that is hydrologically connected through a variety of karst features including numerous artesian springs. In recent severe droughts, pumping and development of the Floridan aquifer system resulted in greater than normal draw-down of the potentiometric surface and water table. Spring water quality data recorded during these conditions display elevated levels of salinity and dissolved constituents derived from limestone.

In the existing USGS model, the saltwater/freshwater interface in this basin is defined using the Ghyben-Herzberg Principal. However, this approximates the location and does not represent the extent of the diffusive interface. The USGS is constructing a more accurate representation with resistivity logs from oil and gas wells, which allows for interpretation of salinity variations, depth of the diffusive freshwater-saltwater interface, and permeable zones that contain saline waters. Expanding the existing model to include a more accurate spring simulation along with better definition of the diffusive interface will help determine the source of increasing salinity in these springs.