HYDROGEOLOGY OF LOCAL WATER BALANCES IMPACTED BY A DYNAMIC SALTWATER INTERFACE

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Understanding the relationship between freshwater and saltwater in coastal aquifers is important for management of water resources and protection of water quality and infrastructure. The Ghyben-Herzberg approximation tells us for every 1 m increase in freshwater head there is a 40 m decrease in the elevation of the interface between fresh and salt water. Based on this principle, long-term cyclical dynamics of freshwater head would lead to concomitant cycling of large volumes of freshwater and saltwater in coastal aquifers. The timescales of lags between freshwater-saltwater interface responses and changes in freshwater head depend on the hydrogeological setting. A recent study found evidence for multidecadal recharge-discharge time lags in 9 watersheds overlying combinations of confined, unconfined, and semi-confined conditions in the deep and highly conductive Floridan Aquifer System (FAS). In this study, simulations were run using the numerical model SUTRA (Saturated-Unsaturated TRAnsport) to build a more robust definition of the hydrogeologic conditions leading to freshwater-saltwater aquifer dynamics that may produce lagged groundwater discharge on multidecadal scales. The approximate hydrogeologic conditions of these 9 watersheds were simulated using a 2D profile model of a coastal aquifer with inland lengths of 3 km, 15 km, and 50 km. Sensitivity analyses revealed inverse relationships between time lag and both recharge flux and permeability. Pending further results, the large time lags modeled in different hydrogeologic settings could suggest a direct impact of the freshwater-saltwater interface on both freshwater availability and solute delivery from aquifer to stream in the FAS.

PRESENTER BIO: Brady Evans is a PhD candidate under the supervision of Dr. Annable. He specializes in quantitative research in groundwater hydrology with experience in numerical modelling and the managing and processing of large datasets.