

# **Modeling Variable-density Groundwater Flow in the Coastal Aquifer of Apalachee Bay, Gulf of Mexico: Submarine Groundwater Discharge (SGD), Tides Influence and Nearshore Circulation.**

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## **Abstract**

Submarine Groundwater Discharge (SGD) as an unseen phenomenon is now recognized as an important pathway between land and sea. These discharges typically display significant spatial and temporal variability making quantification difficult. Groundwater seepage is patchy, diffuse, and temporally variable, and thus makes the estimation of its magnitude a challenging enterprise. A two-dimensional hydro geological model is developed to the near-shore environment of an unconfined aquifer at a Florida coastal area in the northeastern Gulf of Mexico. Due to insufficient information of coastal aquifer, several trial models were set first to investigate the influence of heterogeneity. By applying SEAWAT2000, this variable-density-flow model incorporates the tidal-influenced seawater recirculation and the freshwater-saltwater mixing zone under the dynamics of tidal pattern, tidal amplitude and sea-level seasonal change. These are thought as the contributing factors of tidal pumping and hydraulic gradient as the driven forces of SGD. An intertidal reaction zone in the nearshore aquifer shows the importance of tidal mechanism to flow and salt transport.

*Keywords: Submarine Groundwater Discharge; Variable-density flow; tidal mechanism; seawater recirculation; intertidal reaction zone.*