Submarine Groundwater Discharge and Nutrient Input to a Semiarid and Hypersaline Estuary: Baffin Bay, Texas

DORINA MURGULET AND CODY LOPEZ[1]

[1]Texas A&M University-Corpus Christi, Center for Water Supply Studies

This study evaluates the role of submarine groundwater discharge (SGD)-derived nutrients to Baffin Bay, a semi-arid, hypersaline bay in south Texas. SGD measurements were conducted using the radium (radium-226 [^{226}Ra], radium 224 [^{224}Ra]) and radon [^{222}Rn] geochemical tracers and electrical resistivity imaging. There was slight spatial variation in SGD, with higher rates near the shoreline around areas characterized by course-grained sediments and relic serpulid reefs. The^{222}Rn and ^{226}Ra-based SGD estimates produced agreeable results, within each other's range of uncertainties, and no significant changes in SGD from July to November were observed. July and November ^{222}Rn-derived SGD rates were 31.4±32.7 and 30.0±30.9 cm·d^{-1}, respectively while those derived from ^{226}Ra were 16.6±1.7 and 13.2±1.3 cm·d^{-1}, respectively. However, surface and pore water ^{226}Ra and ^{224}Ra activities decreased from July to November and are associated with large decreases in porewater dissolved inorganic nitrogen (DIN). Changes in radium activities may be explained by organic matter (OM) decay and the consequent reducing conditions that enhance radium solubility from sediments. In addition, a shift from a seawater to a terrestrial groundwater source within the subterranean estuary could also lead to the larger porewater radium activities and nutrient concentrations in July. Regardless of the magnitude of SGD and its nature (i.e. fresh or saline; groundwater or recirculated saline), the associated nutrient input is likely significant in this shallow bay system in warmer months.