Variation in Submarine Groundwater Discharge (SGD) among Semi-Arid Depositional Environments

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EXTENDED ABSTRACT

Geology and hydrology undoubtedly have an effect on submarine groundwater discharge (SGD) (Russoniello et al., 2013; Sawyer et al., 2014). Permeability, bioturbation, hydraulic gradient, exposure to currents, waves, and shear all effect SGD (Santos et al., 2012), and the proportion of these parameters vary based on depositional environment.

To determine differences in SGD at a variety of settings in the South Texas Coastal Bend, temporal changes in resistivity, stable and radiogenic isotopes, and elemental geochemistry were examined in surface and pore waters during daylight hours. Continuous radon (^{222}Rn) in water and air measurements were conducted using a Durridge RAD–7 continuous radon gas monitor simultaneously with an 8 channel resistivity instrument equipped with a 112 meter electrode cable in a dipole-dipole configuration. Locations for the study were determined by delineating a variety of geomorphic areas including a paleovalley, paleovalley margin, oyster reef, shoreline bluff, and interfluve.

Continuous ^{222}Rn monitoring had higher concentrations in the reef, shoreline, and paleovalley margin (65.2 ± 4.5, 63.9 ± 5.3, and 39.2 ± 4.1, respectively) than the interfluve and paleovalley (34.4 ± 3.4 and 32.2 ± 3.3, respectively) (Fig. 1). Additionally, apparent resistivity changes, which are linked to changes in pore water salinity (Dimova et al., 2012), were larger at the paleovalley margin, oyster reef, and shoreline bluff (Table 1). This comparative study reveals information regarding meteoric SGD (Fig. 2A), the depth of pore water-surface water recirculation (Fig. 2B), and the geochemical constituents (i.e., chlorophyll-α; Fig. 3) of various geomorphic areas.

Preliminary results support pre-identified linkages between geology and SGD (Russoniello et al., 2013; Sawyer et al., 2014) and furthers understanding of subsurface hydrology at oyster reefs. Unlike a literature review that would inherently have error due to differences in data collection and analysis methods, the same techniques were employed at each study site, and therefore provide a superior understanding of SGD-related differences in semi-arid coastal settings. This information may provide insight when attempting to quantify SGD at the basin-wide scale.

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