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Evaluating groundwater inflow to Texas coastal embayments

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Abstract

In South Texas embayments, sources of nutrients fueling both red and brown tide growth remains enigmatic, though these blooms tend to occur during times of year when surface inflows are minimal. Extremely low precipitation and high evaporation rates limit the surface freshwater inflows to coastal emayments. It is therefore conceivable that groundwater represents a significant source of freshwater, nutrients, and organic matter and plays a major role in surface water quality degradation and ecosystem health. However, knowledge of groundwater contribution to this area is extremely limited. This study aims to analyze the groundwater contribution and interaction with surface water to Oso Bay and Nueces River Tidal segment by applying a combination of methods such as resistivity imaging and forensic geochemistry. Preliminary geochemistry data collected from groundwater, water column, and stream bed pore water indicate an increase of groundwater inflow during dry periods and reduced surface inflows. Resistivity data and field parameters collected from Nueces River at Hazel Bazemore Park indicate that total dissolved solids concentrations gradually decrease at the river bank. Furthermore, land and marine resistivity vertical profiling of water column and subsurface sediment, collected along a shore-normal transect, reveal the presence of upwelling groundwater at three locations in Oso Bay. Furthermore, pore-water and surface water samples collected along the resistivity transect are enriched in Radon indicating that groundwater may be discharging into the bay at this location. Further data collection and analysis will be conducted to better characterize the extent and seasonal variation of groundwater discharge to coastal embayments in South Texas.

Biography

Dorina Murgulet is an Assistant Professor of Hydrogeology at Texas A&M University-Corpus Christi (TAMUCC). She began her career with the TAMUCC in 2011. Prior to that, Dr. Murgulet worked as a research hydrogeologist for the Geological Survey of Alabama (GSA) while completing her Ph.D at the University of Alabama in Tuscaloosa. She also graduated with a M.S. degree in Hydrogeology from University of Alabama and a M.Sc. in Geochemistry and a B.S. in Technical Geology from Alexandru Ioan Cuza-Iasi University, Romania. Her dissertation project involved a comprehensive evaluation of groundwater flow dynamics and contaminant transport to coastal waters under low recharge conditions. As part of this project, she worked to develop a conceptual and mathematical model describing the groundwater flow dynamics, seawater intrusion, and nutrient transport to the Gulf of Mexico in response to density driven flow caused by the presence of saltwater intrusion. While at GSA, Dr. Murgulet worked on several projects related to water resources such as groundwater sustainability for large-scale irrigation, source-water and resource evaluations, among others.

Currently, Dr. Murgulet is continuing her research efforts by working with undergraduate and graduate students in the Department of Physical and Environmental Sciences at Texas A&M University-Corpus Christi. Her research group is currently working on investigations related to groundwater-surface water interaction in a semi-arid coastal area using radioactive, anthropogenic, and stable isotopes and other geochemistry methods, GIS, remote sensing techniques, and groundwater modeling. Specifically, the research includes understanding: a) groundwater contributions to water quality and habitat degradation in coastal embayments; b) groundwater discharge zones and surface water salinity variations in response to seasonal fluctuation of hydraulic gradients; c) the role of groundwater nutrients in system-wide nutrient budgets; and d) evaluate hypoxia and phytoplankton (red & brown tide) trends in relation to groundwater flow and nutrient discharge.