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MOBILIZATION AND TRANSPORT OF CONTAMINANTS TO A WATER TABLE AQUIFER IN RESPONSE TO EXTREME WET WEATHER EVENTS

DORINA MURGULET[1], CHRISTOPHER VICKERS[2], MUSTAFA EISSA[2,3], VALERIU MURGULET[2], ARASH JAFARZADEH[4] AND VIKRAM KAPOOR[4]

[1]Texas A&M University-Corpus Christi
[2]Texas A&M Universty-Corpus Christi
[3]Desert Research Center
[4]University of Texas San Antonio

Presenting Author: dorina.murgulet@tamucc.edu

Understanding how shallow aquifers respond to extreme climate events, including the possibility of groundwater contamination via floodwaters that carry pathogens and mobilize contaminants, directly affecting human and ecosystem health, is crucial. With that goal, this study sampled an unconfined sandy aquifer at nine locations within a 375km2 area in the Rio Grande Valley (RGV), near the U.S.- Mexico border. Sampling began immediately after the landfall of Hurricane Hannah (HH-early August 2020) in south Texas and until the end of a summer monsoon (SM-August 2021), also capturing a few dry weather months (DW-winter 2020-spring 2021). The downpours brought by the hurricane caused over 1 m flooding in low-laying areas and near the Rio Grande River, where agriculture, landfills and the lack infrastructure including sewage, and drainage are sources of contamination limiting access to portable water. Using geochemical measurements, this project showed a large variability in nitrate, phosphate, silicate, lead (Pb^{2+}), and zinc (Zn^{2+}) concentrations, both temporally and spatially. The highest nitrate and phosphate occurred during SM, which coincides with the planting season and the application of fertilizer. Both Pb^{2+} and zinc Zn^{2+} were in low concentrations during the dry season. Pb^{2+} was significantly higher at the end of the SM while Zn^{2+} was spiked after flooding. Preliminary linear regression models indicate that precipitation amount rather than intensity may explain mobilization of Pb^{2+} and incidence of max streamflow occurrences. This is also supported by the inverse correlation between Pb^{2+} and salinity which is expected to decrease as soils are flushed for a long time and aquifers start recharging with fresh water. A decrease in pH is also responsible for Pb^{2+} mobilization, but to a lesser extent. While precipitation explains a significant portion of the Zn^{2+} occurrence in groundwater, the input of more oxic waters of higher Br concentrations, is an indication of floodwater's rapid infiltration, as also suggested by a sharp increase in the groundwater elevation immediately post-HH. Further analyses are conducted to determine the degree of mixing with surface water during each event and further constrain the relationship between the type of recharge event and occurrence of contaminants in groundwater.