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Organization: Western Michigan University

Category: Ocean and Atmospheres

Paper ID: 57-OOA-A328

Title: Chemical and Isotopic Investigation of coastal and off-coastal groundwater in Eastern UAE

Abstract: (OA4) UAE is located at the southeast of Arabian Peninsula. Two main aquifers occupy the study area: The Eastern Gravel Plain aquifer that occurs near the coastal area, and the inland Ophiolite aquifer. Increasing salinity of groundwater and depletion of aquifers are a major concern in the UAE. Previous studies suggest that groundwater, particularly in the Eastern Gravel Plain aquifer, is affected by seawater intrusion and evaporation. Isotopes, namely oxygen, hydrogen, carbon and chlorine, and chemical analyses were used to investigate this problem in detail. Samples of groundwater from the Eastern Gravel Plain aquifer (Cl >1000 mg/l) have R36Cl values in the range of 13.3 to 17.4 ´10-15 while those from the Ophiolite aquifer (Cl <517 mg/l) have R36Cl values in the range of 20 to 118 ´10-15. These values indicate the presence of bomb-produced 36Cl and are consistent with recent (post 1950) recharge of most of the samples. δD - δ18O relationship plots on a typical evaporation line, which suggests potential evaporation of the recharging waters prior to infiltration. Decreased deuterium excess may be attributed to the secondary evaporation such as return flow. The slope of 4.3 and the deuterium excess of about 4.2 also suggest that the evaporation of return flow is significant in the study area. This argument is also supported by a positive correlation between potassium and nitrate in Eastern Gravel Plain aquifer which suggests that the salinity of this aquifer could be from irrigation water. The R36Cl values of the coastally- bound Eastern Gravel Plain aquifer are lower than the Ophiolite aquifer. Seawater intrusion is absent or negligible based on oxygen-hydrogen isotopes, R36Cl and Cl/Br ratio. Measurements of bromide concentrations support the contention that organically bound Cl is being released into this environment. Agricultural practices, which are extensive in this region, are a possible source. Samples of groundwater from Eastern Gravel Plain aquifer have δ13C and DIC values in the range of −10 to -17‰ and 12 to 100 mg C/l respectively. While samples from Ophiolite aquifer have δ13C and DIC values in the range of −11 to −16.4‰ and 16 to 114 mg C/l respectively. The calculated δ13C of CO2 source ranges from −17.5 to −23.3‰ and −13 to −23.2‰ with an average of -20.4 and −18.1‰ for Eastern Gravel Plain and Ophiolite aquifers respectively. This suggests that the control on DIC is via soil cover vegetated by C-3 and C-4 plants.

Presentation Mode: Oral

Keywords: United Arab Emirates, Ophiolite aquifer, Eastern Gravel Plain aquifer, evaporation, return flow, salinity, Chlorine-36, oxygen and hydrogen isotopes, bromide, DIC.

Status: Pending.

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