The first $\delta^{37}Cl$ and $\delta^{81}Br$ data from the Wasia-Biyadh mega-aquifer in Saudi Arabia: Implications for the origin of dissolved solutes

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The aquifers of Saudi Arabia store vast amounts of useable groundwater accumulated during fluvial periods 30-6 ka [1]. Present day arid conditions limit natural aquifer recharge to about 20% of Saudi Arabia's current groundwater use [2]. Groundwater quality degradation, due to the invasion of saline waters driven by aquifer overuse, has been of concern in eastern Saudi Arabia. This study investigates the origin of dissolved salts in the Wasia-Biyadh (W-B) mega-aquifer to evaluate the risks for aquifer salinization. The W-B aquifer contains ~30 % of Saudi Arabia's groundwater reserve hosted by a nonmarine sandstone of early to mid-Cretaceous age. The aquifer dips gently to the east underlying a land area of ~800,000 km^2. Groundwater quality ranges from about 500 mg/l near the outcrops in central Saudi Arabia to about 250,000 mg/l in the Arabian Gulf coastal area [3]. Fresh water is Ca-SO_4 type while high salinity fluids in the deep east/northestern parts of the aquifer are Na-Cl type [3]. The concentrations and stable isotope compositions of the conservative species Cl and Br have been instrumental in determining the source(s) of dissolved solutes in natural waters [4]. Those, along with the $\delta^{18}O$, $\delta^{2}H$, $\delta^{34}S$, and $^{87}Sr/^{86}Sr$ were determined on samples collected from the eastern part the W-B in an area of sharp salinity transition that separates useable groundwater from high salinity fluids. While limited isotope data have been reported from the W-B in the past [5], this is the first $\delta^{37}Cl$ and $\delta^{81}Br$ study of a major Saudi Arabian aquifer. This presentation will discuss the implications of the Cl and Br isotope and other geochemical data for the origin of dissolved solutes in the W-B aquifer.

[1] Wagner (2011) Groundwater in the Arab Middle East ed., [2] FAO (2009) Water Report **34**, [3] MAW (1984) Water Atlas of Saudi Arabia, ed., [4] Kharaka & Hanor (2003) Tr. on Geochem. **5-16**, [5] Shampine *et al.* (1978) IAEA-SM-**228/23**