



Estimation of Sabkha evaporation as an important sink of groundwater on the Arabian Peninsula

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Arid regions like the Arabian Peninsula are limited on water resources. Hence, it is important to estimate the water balance components. On the Arabian Shelf an important natural sink term are Sabkhas (salt flats) from which shallow saline groundwater evaporates. The Sabkhas are mostly located along the coast of the Arabian Gulf and in the Rub' Al Khali basin.

The first task is to map the spatial distribution of the active Sabkhas, where evaporation of groundwater is taking place. The mapping is conducted in two steps via remote sensing. In the first phase potential Sabkhas are mapped by the use of thresholds of MODIS spectral band ratios 3/2, 3/6, and 6/7. For the second step we use the thermal band information of Landsat ETM+ 7 data to distinguish the active areas inside the potential Sabkhas from inactive areas. To check for a possible seasonal trend of the spatial distribution of active Sabkhas we compare satellite images after the rain season (May) and at the end of the dry season (September). The results of the classification are verified by ground truthing points, recorded during a field trip to Saudi Arabia in November 2012.

As a second stage we estimate the evaporation rate by soil column experiments. To account for the textural variability of different Sabkhas in Saudi Arabia four undisturbed soil columns were extracted from the top layer. The soil columns have a height of approximately 50 cm and a diameter of 16 cm. With the experimental setup we determine evaporation rates according to water level and temperature.

To determine the source (ascending groundwater, precipitation, or seawater) of the evaporating water several samples were taken. These samples are analyzed for the (i) chemical composition and the chloride-bromide-ratio compared with reference samples, (ii) $^{2\text{H}}\text{-}^{18\text{O}}$ -signature in pore water through vertical soil profiles, and (iii) isotopic signature of sulphate compared with reference samples.