Geophysical Research Abstracts
Vol. 17, EGU2015-12839-1, 2015
EGU General Assembly 2015

Isotopic composition of Riyadh rainfall, Saudi Arabia

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Arid countries like Saudi Arabia often depend on fossil groundwater. Hence, thorough studies of the available resources are crucial. In the course of such investigations, analyses of δ18O and δD are frequently applied to constrain the provenance of the waters and to reconstruct the (paleo)climatic conditions during their recharge. Yet, to be able to evaluate the isotopic signature of the groundwater, one also has to know the isotopic composition of current precipitation. Although a few rain water analyses are available for Central Saudi Arabia in the literature – mostly in unpublished consultant reports – a Local Meteoric Water Line has never been established.
To complement the available data, 28 rain events occurring in Riyadh between 2009 and 2013 were studied for their stable isotope composition. Samples were collected as integral samples, i.e. they represent the entire precipitation event. Moreover, one event was sampled several times, aiming at an evaluation of intra-storm variability. During selected storms, a grab sample was taken for 3H analysis.
The event samples showed δ18O and δD values scattering between -6.5 and +9.5 and between -30 and +50 ‰ V-SMOW, respectively. In the course of the event that was sequentially sampled, a proceeding isotopic depletion was observed with respect to both isotopes. The relatively large ranges of δ-values for 18O and D of approximately 7 and 38 ‰ V-SMOW highlight the general need for integral sampling. The obtained grab samples are characterized by moderate 3H concentrations of a few Tritium Units.
Further results will be presented and discussed in view of associated weather data (e.g. rain amount and temperature) and the probable moisture sources derived from back-trajectories, which were calculated using HYSPLIT (Hybrid Single-Particle Lagrangian Integrated Trajectory Model; Draxler & Rolph, 2003).

References

Draxler, R.R. & Rolph, G.D. (2013): HYSPLIT (Hybrid Single-Particle Lagrangian Integrated Trajectory) Model, access via NOAA ARL READY Website (http://www.arl.noaa.gov/HYSPLIT.php). NOAA Air Resources Laboratory, College Park, MD.