

# Stable isotope composition of surface water in Namibia and the connectivity to groundwater (Oral/ Poster)

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## ABSTRACT

Knowledge about stable isotope composition of river water is useful for assessing the contribution of different water sources (e.g., precipitation, surface runoff, and groundwater) and how changes in land use or climate influence these contributions, ultimately informing water management decisions. However, records of stable isotopic composition of river water and surface water in Namibia are currently very limited and no data entry is available from, for example, the Global Network of Isotopes in Rivers (GNIR). This study has therefore compiled existing data of  $\delta^{18}\text{O}$  and  $\delta^2\text{H}$  of surface water in Namibia in a systematic database. The database has been updated with own data collected since 2014 and contains data for three perennial and several ephemeral catchments. The systematic analysis of the dataset has considered local meteoric water lines (LMWLs), groundwater data, catchment characteristics and - where possible - temporal and spatial variations in the stable isotope composition. The data plot mainly below the Namibian LMWL ( $\delta^2\text{H} = 7.1 \delta^{18}\text{O} + 1.4$ ) and are represented by  $\delta^2\text{H} = 5.5 \delta^{18}\text{O} - 13.9$  ( $R^2=0.95$ ) with mean=-3.65‰ and median=-5.08‰ for  $\delta^{18}\text{O}$ , mean=-34.0‰ and median=-36.0‰ for  $\delta^2\text{H}$ , and large ranges (range = 47‰ for  $\delta^{18}\text{O}$  and range = 284‰ for  $\delta^2\text{H}$ ). Larger data ranges are observed for ephemeral than for the perennial river catchments, mainly reflecting a more pronounced impact of evaporation over time on the ephemeral rivers. The stable isotope composition shows mostly a smaller range for the surface water than for the groundwater in the same catchment and slopes of regression lines are comparable, except for the Southern Kalahari. The intersection of the trendline for the surface with the LMWL is similar to the intersection of the groundwater with the LMWL for most of the westward draining ephemeral catchments, while for the eastward draining perennial catchments (Zambesi and Kavango) an intersection with the LMWL at more enriched values is observed for surface water than for groundwater with a bias of about 2‰ for  $\delta^{18}\text{O}$ . (-6‰ for surface water and -8‰ for groundwater). Considering an altitude effect of 0.28‰/100m (global average) this would be equivalent to an altitude difference of the source waters of about 700 m. However, bias in stable isotope composition between precipitation or surface water compared to groundwater is often observed in drylands where only major precipitation events contribute to groundwater recharge. Changes in the recurrence of extreme events are thus likely to have a stronger impact on the availability of groundwater resources, e.g., for water supply, than on surface water discharge in these catchments.

**Keywords:** stable isotope; isotopes in rivers; Namibia; river groundwater connectivity.