

**DENSITY FLOW ON ISLANDS IN THE OKAVANGO DELTA: SMALL-SCALE FIELD EVIDENCE AND
IMPLICATIONS FOR THE LARGE-SCALE SALT BALANCE**

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ABSTRACT.

The Okavango Delta is a large ($\sim 30\,000\text{ km}^2$) inland delta situated in northern Botswana. The discharge into the Okavango Delta ($\sim 300\text{ m}^3\text{s}^{-1}$) is entirely consumed by evapotranspiration and consequently, some 300'000 tons of dissolved solids are deposited in the wetland every year. However, the surface waters stay fresh and most of the salt is accumulated in the shallow aquifers below islands of various sizes that are scattered throughout the swamp. Evapotranspiration is building up highly saline brines at the surface of the islands. Eventually, the vertical density distribution becomes unstable and salt is transported from the surface into the deep aquifer layers via density driven flow.

This process was studied on selected islands in the Okavango Delta using geophysical methods and tracers. Time domain electromagnetic surveys as well as multi-electrode DC resistivity soundings were conducted. In the centre of one island, nested boreholes were drilled to various depths and the vertical concentration distribution was measured. Geophysical logging and resistivity soundings from within the boreholes further elucidated the vertical concentration distribution. Groundwater below the islands and the surrounding surface waters were extensively sampled for stable isotopes as well as Tritium and Carbon-14 for dating.

The results suggest that density driven vertical flow is indeed taking place on the islands in the Okavango Delta. Satellite imagery from different sensors is used to identify the number of salt-accumulating islands per unit area. The knowledge gained from the detailed studies on selected islands can thus be used on the regional scale to assess the salt balance of the system.

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