
Unexpected chemical composition of waters and salts in the Okavango Delta (Botswana)

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Résumé

The Okavango Delta wetlands are world-famous for their landscapes and biodiversity richness. But, below the surface of this wildlife paradise is hiding something much less life friendly. Indeed, the Okavango Delta is also known for the presence of alkaline groundwaters with pH values up to 10, total organic carbon values up to 1200 ppm and elevated concentrations of dissolved metals and metalloids, some of which are toxic (arsenic up to 6 ppm, uranium up to 12 ppm, vanadium up to 4 ppm, etc.). A first model explained the formation of the saline groundwater through evapotranspiration of the flood fresh water infiltrating through the tree line ringing the islands. However, our recent trace-elements geochemical studies of groundwater and sediment in Nxaraga Island in the central part of the Delta, showed that groundwater composition could not result through a simple evapotranspiration of surface water. Following this initial result, the present study addresses the nature, composition and origin of salt deposits that have been described on several of the numerous islands of the Delta, especially in its eastern part along the Maunachira and Mboroga rivers. For the first time, we provide a complete major and trace elements geochemical description of these salts and compare them to evaporites from the Makgadikgadi pans. We demonstrate that the composition of the Delta salts (essentially natron) is very different from that of the Makgadikgadi evaporites (mostly halite) but, similar to that of the alkaline groundwater previously described. This result suggests a direct communication between the toxic groundwater and the surface environment, although this remains to be further described.

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The concentrations of trace elements in the Delta salts (As: up to 110 ppm, U: up to 12 ppm, V: up to 14 ppm) are again highly toxic for the environment and local populations. The project will investigate further the way plants directly in contact with the salt deposits are concentrating the toxic elements initiating their uptake in the trophic chain. A specific effort will also be made to evaluate the potential threat represented by the groundwater and salt composition to the health of the local communities.

Mots-Clés: Okavango, Rare Earth Elements, Arsenic