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Keynote Address: The Late-Pleistocene bulk sediment geochemistry of the Rusinga and Mfangano Islands beaches, Lake Victoria, Kenya

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Assessing the historical water quality of the Lake Victoria Basin during the Late Pleistocene-Holocene epochs holds paramount importance in deciphering forthcoming climate changes and is crucial for accurately interpreting basin dynamics. The prehistoric lacustrine deposits in the Lake Victoria basin are invaluable as they serve as a unique repository of sedimentary records spanning across time. Particularly, the lacustrine deposits on the north-eastern shores of Lake Victoria, situated on the Rusinga-Mfangano islands, offer an optimal setting for reconstructing palaeoenvironments. These sites, concentrated in Kenya and spanning from 42,000 ka to the present, provide an optimal vantage point for studying lacustrine sediments that capture the dynamics of the last lake level fluctuations. A multi-proxy analysis was undertaken to examine the bulk sediment geochemistry of 350 lacustrine samples collected from various beach levels 3-4m, 12-14m, and 18-20m above the current lake level, on the Rusinga-Mfangano Islands of Lake Victoria, Kenya. The elemental ion analyses unveiled distinct concentrations, revealing higher levels of calcium, strontium, and potassium, and lower levels of magnesium and sodium within the 3-4m beach levels of the Rusinga-Mfangano islands. Notably, specific beaches on the Rusinga-Mfangano islands, such as Mauta, Lwanda Rombo, Nyawalongo, Kitenyi, Kamayoge, Kakrigu, Ulugi, Wayando, Nyagina, and Kolunga, exhibited elevated levels of potassium, calcium, and strontium. Conversely, Uuria, Chiro, Wakondo, Mrongo, Kitawi, Sienga, Kiwari, Wanyama, and Wakondo beaches, generally recognized as highly populated fishing sites in the area, and displayed higher levels of sodium and magnesium ions. Over the course of time, lake ion input values for sodium, potassium, calcium, magnesium, and strontium showed an upward trend from 42,228 cal. yr BP to AD 1970. A peak in sediment influx occurred between AD 1447 and AD 1551, aligning with the onset of the Little Ice Age. Analysis of mineralogy, organic content, and elemental geochemical proxies suggested a regenerating lake with heightened nutrient and sediment delivery from the gulf over the preceding millennium.

Calibrated radiocarbon dating of beach materials, conducted at the iThemba Laboratory, revealed ages spanning from the Late-Pleistocene-Holocene period (cal yr BP 42,228 to AD 1970). This ground-breaking study provides the first chronologically sequenced data of deep and high lake level stands on the Rusinga and Mfangano Islands, derived from Late-Pleistocene biostratigraphic data and fluctuations in former low-stand and high-stand beaches. The findings shed new light on the application of bulk sediment geochemistry as proxies for palaeowater quality from ancient lake shorelines and beaches. The reactions of these proxies to intense palaeoclimatic events, poorly understood over the last 50,000 years, are now more comprehensively explored. The bulk sediment geochemistry suggests that the palaeo-Lake Victoria featured extended shorelines shaped by rivers and streams from the Rusinga and Mfangano channels, accompanied by associated flood plains. Consequently, this study asserts that palaeowater quality, geochemical influences, and productivity patterns collectively exert a significant impact on the beaches of the Rusinga-Mfangano Islands in Lake Victoria, Kenya, rendering them valuable indicator sites for further research.
Key words: Late Pleistocene, Rusinga-Mfangano Islands, bulk sediment geochemistry, Lake Victoria -Kenya

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