Records of Late Quaternary environmental changes preserved in eolian and fluvial sediment geoarchives of the SW-Kalahari, South Africa

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ABSTRACT

Precipitation in southern Africa – tropical summer rains in the north and the east and extratropical winter rains in the southwest – is strongly influenced by the seasonal shift of the Intertropical Convergence Zone (ITCZ). Little is known so far about the displacement since the Last Glacial Maximum (LGM; ~22-18 ka BP). Geomorphological and sedimentological field work and laboratory analyses were carried out on fluvial, colluvial and eolian geoarchives (valley, pan and terrestrial slope sediments, as well as dunes) in the catchment of the southern lower Molopo River within the southwest Kalahari and were paleoclimatically interpreted. This area is very suitable for terrestrial research on paleoclimatic and environmental change. Here dunes and pans coexist as major Kalahari geomorphological types in an ideal way with the Molopo River valley, including different fluvial sediment facies interbedded with slope and eolian sediments, as well as the confluence of the Molopo and Orange River systems.
The results are discussed in the context of existing literature about terrestrial and marine southern African paleoenvironmental geoarchives. Literature evaluation, earlier research, results of field trips in 2009, as well as first sediment age determinations support the hypothesis of a contemporaneous southward shift of the ITCZ during the LGM along with a northward relocation of the westerlies. As a result, the southwest Kalahari (~25°30'S) was influenced by summer and winter rains during the LGM. This leads to new ideas about the reconstruction of glacial climate circulation patterns over the southern African subcontinent and is of major importance for modelling of past and future climate scenarios.

KEYWORDS: ITCZ, paleoclimate, geoarchives, SW-Kalahari, Molopo River