Geophysical Research Abstracts
Vol. 12, EGU2010-3944, 2010
EGU General Assembly 2010

Reconstruction of Late Quaternary climate and landscape changes in Southern Africa based on integrative analyses of geoarchives

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Many studies deal with geoarchives such as dunes, fluvial and slope sediments, pans, speleothems and paleosoils, but often investigations are spatially limited or carried out on isolated landforms. Large-scaled, geochronologic and geomorphologic stratigraphies as well as generally accepted reconstructions of the paleoclimate are still missing for the southern African subcontinent. Only combining records of all geoarchives, and particularly the analysis of sediment interstratifications, would promise good results.

For several relief generations of southern Africa, lots of sediment dating already exists, even if methodological and environmental problems delimit the radiocarbon (14C), optic stimulated or thermic luminescence (OSL/TL) chronologies. They illustrate fluctuating climates with a general trend to increasing aridity throughout the Quaternary. Periods of less precipitation led to the development of eolian sediments, while moister periods led to the development of lacustrine-fluvial sediments. Other investigations indicate both processes coexisted, as they did in the SW-Kalahari during the last glacial maximum (LGM).

The study areas will be selected according to results of the authors' former field trips and using remote sensing methods. The Molopo River catchment in the south Kalahari is already selected as one major study site. It is highly applicable for paleoclimate research because of its location within the semi-arid to semi-humid Kalahari, which is a region with enormous climatic fluctuations due to recent and former shifts of tropical and subtropical circulation patterns and changing climatic factors. During the Last Glacial Maximum at approximately 24°S, a transition zone existed that was characterized by the overlap of alternating dry and cool climates in the north (summer rains), and cold and moist winters in the south. In the Late Glacial and Holocene period this boundary was shifted southwards. 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.

Regarding the methods, a combination of sedimentologic, pedologic and geomorphologic field and laboratory work, as well as geophysical prospection of the shallow subsurface and remote sensing will be carried out. Chronological records of erosion and accumulation processes will be obtained by 14C- and OSL sediment datings. The combination of remote sensing methods by the means of aerial photographs (hyperspectral data of HyMAP and CHRIS-Proba) and geomorphological/sedimentological field and laboratory work (ground truth) provides diagnostic parameters of the sediments which will help to differentiate the geoarchives to improve the paleoenvironmental interpretation.

The results of two first field campaigns in 2009 are presented including sediment descriptions, laboratory analyses and 14C-ages. The results of OSL dating are not yet available.