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IDENTIFICATION OF PALEOLAKE STAGES BY MULTISENSORAL REMOTE SENSING

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ABSTRACT:

Lake Manyara in northern Tanzania is a shallow lake which periodically dries out completely. The lowest outlet of the endorheic basin is about 80 m above today's lake level. In this part of the Gregory Rift Valley a lot of vertebrate fossils, handaxes and also hominin-bearing sites from different periods were found. This makes the area to an important region for paleo-climatic and paleo-anthropological research. The quaternary paleolake extension is a crucial parameter for such studies. Within the basin lacustrine relicts like stromatolites, paleo-shore terraces and sediment deposits can be found far above today's lake level. We applied different satellite sensors and techniques to identify remains of the former lake.
TerraSAR-X Stripmap scenes were terrain corrected and backscatter intensity was processed. Hardly visible in optical remote sensing images, the paleo-terraces were highlighted by an intense backscatter signal. For extracting the linear paleo-shorelines and terraces a canny filter was implemented in a Python-script. The corresponding heights were extracted from a SRTM-X DEM so that it was possible to distinguish between different elevation levels. The highest detected paleolake level reaches the elevation of the outlet. Casanova & Hillaire-Marcel (1992) measured different ages of associated stromatolites up to 90,000 yr before present. The outcrops of even older lake sediments (Lower Manyara Beds) could be traced at tributaries of the Makuyuni River using multispectral ASTER data. Mineral indices of the VNIR and SWIR bands and topographical indices were utilized to delineate the spatial occurrence of the sedimentary deposits using Support Vector Machines. Besides already known vertebrate paleo-fauna locations, several new outcrops could be identified.