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Assessment of present day geomorphological dynamics to decipher landscape evolution around the Paleolithic sites of Melka Kunture, Ethiopia

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The area of Melka Kunture (central Ethiopia) is one of the most important clusters of Paleolithic sites in Eastern Africa. The archaeological record spans from c. 1.7 Ma onwards, with a number of stratified occurrences of Oldowan, Acheulean, Middle Stone Age and Late Stone Age industries, together with faunal remains and human fossils. However, the archaeological sites are endangered by flooding and soil erosion. The main excavation area lies close to the convergence of the Awash river with the Atabella river, one of the main tributaries of the upper Awash catchment. In the semi-arid Ethiopian highlands, gully networks develop especially in the vicinity of the active and inactive river meanders. Various erosion processes are linked to specific driving factors such as the rainfall regime, the land use/cover changes and vertic soils with a specific hydrological behaviour. It was documented in the field and by previous research that the origin of most of the man made erosion channels is due to animal pathways and car tracks. However, paleolandscape features increase the general erosion risk. Former wetland areas and deposition zones are particularly affected by soil erosion processes. Hence, the spatial distribution and characteristics of present day geomorphic processes also reveal information on the paleolandscape. In order to assess landscape evolution and present day geomorphologic dynamics, we mapped the geomorphology describing in detail the present-day slope processes at a 10.000 scale. We performed a detailed terrain analysis based on high resolution DEMs such as SRTM-X with 25m resolution and ALOS/PRISM with 10m resolution to characterize the main erosion processes and surface runoff dynamics. The latter ones are simulated using a Soil Conservation Service Curve Number method. Landuse was delineated for a larger area using ASTER 25m multispectral data. Finally, using calibrated topographic indices and a simple hydrological model we were able to detect and quantify the major present day soil erosion and surface runoff processes. Based on the analysis of the processes and the respective terrain features derived from the digital elevation models we also identified the major paelolandscape features. This will be the basis for assessing conservation risks related to modern land use and climate.