Geophysical Research Abstracts
Vol. 14, EGU2012-3895-1, 2012
EGU General Assembly 2012

Differential GPS measurements as a tool to quantify Late Cenozoic crustal deformation (Oman, Arabian Peninsula)

M. Rupprechter (1,2), A. Roepert (1,3), G Hoffmann (1,4)

(1) German University of Technology, Applied Geosciences, PO-Box 1816, PC 130 Athaibah, Muscat, Oman (magda.rupprechter@gutech.edu.om), (2) Salzburg University, Department of Geography and Geology, Hellbrunnerstr. 34, 5020 Salzburg, Austria, (3) Institute of Geography and Geology, Greifswald University, Jahnstr. 17a, 17487 Greifwald, Germany, (4) Institute of Neotectonics and Natural Hazards, RWTH Aachen University, Lochnerstr. 4-20, 52056 Aachen, Germany

The Sultanate of Oman is situated in the north-eastern part of the Arabian Plate. It therefore represents the leading edge as the plate is drifting north relative to the Eurasian Plate. The movement results in continent-continent collision in the northwest (Zagros fold and thrust belt) and ocean-continent collision in the northeast (Makran subduction zone). We follow the hypothesis that this plate tectonic setting results in an internal deformation of the Arabian Plate.
The study presented here is part of a larger project that aims at quantifying the forcing factors of coastal evolution (Hoffmann et al. 2012). The sea level development, climate – and associated rates of weathering and sediment supply - and differential land movement (neotectonics) are identified as key factors during the Late Cenozoic. Recent vertical land movement is obvious and expressed in differences of the coastal morphology. Parts of the coastline are subsiding: these areas show drowned wadi mouths. Other parts are characterised by a straightened coastline and raised wave-cut terraces are evident well above present mean sea-level. Despite these erosional terraces, depositional terraces on alluvial fans are also encountered in close vicinity to the mountain chain.
Detailed topographic profile measurements are carried out using a LEICA Viva GNSS-GS15 differential GPS. The instrument yields data with an accuracy of 1-2 cm relatively to the base station. The profile measurements are orientated perpendicular to the coastline and therefore perpendicular to the raised wave-cut terraces. Up to 6 terraces are encountered in elevations up to 400 m above present sea level with the older ones being the highest. The data allow calculating the scarp height, tread length and tread angle of the terraces. The results indicate that the terraces show an increased seaward tilting with age. This observation is interpreted as reflecting ongoing uplift. A coast-parallel deformation pattern becomes obvious when comparing parallel profiles. Profiles measured along depositional fluvial terraces also indicate a direct correlation of the age of the deposits and the dip-angle of the surface. Further evidence for ongoing uplift is seen as the older fluvial terraces are situated further inland.
Additional dating evidence is needed to quantify the uplift and to resolve the differential land movement in time and space.

References:
Hoffmann, G. et al. (2012): Quaternary coastal evolution of Oman (Arabian Peninsula) – a quantitative approach. Abstract EGU 2012