Geophysical Research Abstracts
Vol. 19, EGU2017-8327, 2017
EGU General Assembly 2017

Quantification of surface uplift by using paleo beach deposits (Oman, Northern Indian Ocean)

Gösta Hoffmann (1,2), Bastian Schneider (2), Martin Monschau (2), and Silke Mechernich (3)

(1) German University of Technology, Applied Geosciences, Muscat, Oman (goesta.hoffmann@gutech.edu.om), (2) Bonn University, Steinmann Institut, (3) University of Cologne, Institute of Geology and Mineralogy

The study focusses on a coastal area along the Arabian Sea in Oman. Here, a staircase of marine terraces is seen as geomorphological evidence suggesting sub-recent uplift of a crustal block in the northeast of the Arabian Peninsula. The erosional terraces are cut into Paleocene to Early Eocene limestone formations. These limestone formations are underlain by allochtonous ophiolites.
We mapped the terraces over a distance of 60 km and identified at least 8 terrace levels in elevations up to 350 m above present sea level. The uppermost terraces are erosional, whereas the lower ones are depositional in style. Mollusc and coral remains as well as beach-rock are encountered on the terrace surfaces. The formations are dissected by NW-SE trending faults. Some of the terraces are very pronounced features in the landscape and easy to trace, others are partly eroded and preserved as remnants only.
The deposit along the shoreline angle act as a datum making use of the fact that the rocks formed in a defined horizontal level which is the paleo-sea level. Hence, any offset from the primary depositional level is evidence for neotectonic movements. We utilise differential GPS to map the elevation of beachrock deposits. Age constraints on terrace formation is derived by sampling the beachrock deposits and dating using cosmogenic nuclii. The results indicate ongoing uplift in the range of less than a millimetre per year. The uplift is differential as the terraces are tilted. We mapped oblique normal and strike-slip faults in the younger terraces.
We hypothesise that the mechanism responsible for the uplift is not tectonics but driven by the serpentinisation of the ophiolite that underlie the limestone formations. One process during the serpentinisation is the hydration of the mantle rocks which is responsible for a decrease in density. The resulting buoyancy and significant solid volume increase lead to the observed deformation including uplift.