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Variscan to Neogene thermal and exhumation history at the Moroccan passive continental margin assessed by low temperature thermochronology

M. Sehrt (1), U. A. Glasmacher (1), D. F. Stockli (2), O. Kluth (3), and H. Jabour (4)

(1) Institute of Earth Sciences, University of Heidelberg, Germany (manuel.sehrt@geow.uni-heidelberg.de), (2) Department of Geology, University of Kansas, USA, (3) RWE Dea AG, Hamburg, Germany, (4) ONHYM, Rabat, Morocco

In North Africa, a large amount of Mesozoic terrigenous sedimentary rocks are deposited in most of the basins along the continental margin indicating a major episode of erosion occurred during the rift and early post-rift period in the Central Atlantic. In the Tarfaya-Dakhla Basin, Morocco the sedimentary cover reaches thicknesses of up to 9000 m.

The presence of high surface elevations in the Anti-Atlas mountain belt (2500 m) indicates a potential source area for the surrounding basins. The NE-SW oriented Anti-Atlas of Morocco is located at the northwestern fringe of the West African Craton and south of the High Atlas and represents the Phanerozoic foreland of the Late Paleozoic North African Variscides and the Cenozoic Atlas Belt.

Variscan deformation affected most of Morocco. Paleozoic basins were folded and thrusted, with the major collision dated as late Devonian to Late Carboniferous. Zircon fission-track ages of 287 ($\pm$23) to 331 ($\pm$24) Ma confirmed the main exhumation referred to the Variscan folding, followed by rapid exhumation and the post-folding erosion. Currently, phases of uplift and exhumation in the Anti-Atlas during the Central Atlantic rifting and places where the associated erosion products are deposited are poorly constrained and there is little quantitative data available at present.

The objective of the study is to determine the thermal and exhumation history of the Anti-Atlas and the connected Tarfaya-Dakhla Basin at the Moroccan passive continental margin. Besides zircon fission-track dating, apatite and zircon (U-Th-Sm)/He and apatite fission-track analyses and furthermore 2-D modelling with 'HeFTy' software has been carried out at Precambrian rocks of the Western Anti-Atlas and Cretaceous to Neogene sedimentary rocks from the Northern Tarfaya-Dakhla Basin.

The apatite fission-track ages of 120 ($\pm$13) to 189 ($\pm$14) Ma in the Anti-Atlas and 176 ($\pm$20) to 216 ($\pm$18) Ma in the Tarfaya Basin indicate very obvious a Central Atlantic opening signal and confirm the Anti-Atlas as a potential source area of the Mesozoic basins along the passive continental margin. Young apatite (U-Th-Sm)/He ages of 49 ($\pm$3) Ma to 89 ($\pm$5) Ma in the Anti-Atlas and 64 ($\pm$4) to 73 ($\pm$4) Ma in the Tarfaya Basin are related to the interplay between the African and Eurasian plates. The time-temperature models of samples from the AA indicate that the main exhumation in the Anti-Atlas occurred during the Variscan folding, the post-folding erosion and besides the Central Atlantic rifting phase until the Upper Triassic. After this event large parts of the Western Anti-Atlas hold a stable position without significant movements during the Jurassic and Cretaceous, followed by an exhumation phase during the Atlasian orogeny.