

Thermal and inversion history of the Tarfaya Basin and uplift and exhumation history of a potential source area, the Western Anti-Atlas, assessed by low temperature thermochronology

Sehrt, M.¹, Glasmacher, U.A.¹, Stockli, D.², Kluth, O.³, Schober, J.³, Jabour, H.⁴, Lahsini, S.⁴, Boutib, L.⁴

¹Institute of Earth Sciences, University of Heidelberg, Germany; corresponding author: manuel.sehrt@geow.uni-heidelberg.de

²Department of Geology, University of Kansas, Lawrence, USA

³RWE Dea AG, Hamburg, Germany

⁴ONHYM, Rabat, Morocco

The Tarfaya-Dakhla Basin located at the western margin of the Sahara is the southernmost Atlantic basin of Morocco and stretches over 1000 km. The Precambrian basement of the basin is unconformably overlain by a Mesozoic to Neogene sedimentary cover with thicknesses up to 9000 m. The project is focused on the time-temperature development of the Mesozoic to Neogene sedimentary succession for a better understanding of the hydrocarbon generation in time and space.

In the northeast the Tarfaya Basin is bounded by the NE-SW oriented Anti-Atlas. The AA located at the northwestern fringe of the West African Craton and south of the High Atlas represents the Phanerozoic foreland of the Late Paleozoic North African Variscides and the Cenozoic Atlas Belt. The presence of high surface elevations in the Anti-Atlas mountain belt (2500 m) indicates a potential source area for the Tarfaya Basin. Therefore the thermal, uplift and exhumation history of the Western Anti-Atlas were investigated.

In order to determine the thermal history, Triassic to Neogene well and outcrop samples from the Tarfaya Basin and Precambrian rocks from the Anti-Atlas were analysed by apatite and zircon (U-Th-Sm)/He and fission-track dating and time-temperature modelling with HeFTy software has been carried out.

The thermochronological data as well as the t-T models from Lower Cretaceous rocks of the Tarfaya Basin suggest a burial until the Paleogene in the onshore part of the basin. At the C/P boundary the basin inverted and similar to the Anti-Atlas the Tarfaya Basin underwent an exhumation phase during the Atlasian orogeny.

The thermochronological data and time-temperature models 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.