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Early Cenozoic denudation of the Namibian passive margin: new thermochronological constraints from the Brandberg Inselberg

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A steep escarpment and the very slow erosion of a granitic landscape characterize the Northern Namibian passive margin. In this region, between the coast and the escarpment, numerous inselbergs dominate the landscape. However, both the persistence of high topographic relief along the Namibia margin some 130 Myr after rifting and the formation of inselbergs remain poorly understood. Quantifying the denudation rates and landscape evolution is essential to understand the processes that shaped the Namibian margin since rifting. Based on apatite fission track data, previous studies proposed that a late uplift phase affect the Namibian margin 90-80 Ma ago. Nevertheless, the more recent denudation and uplift history are not well constrained. We provide new apatite (U-Th-Sm)/He dates along a vertical profile in the Brandberg Inselberg. We use QTQt code (Gallagher, 2012) to combine our AHe dataset with previously published AFT data (Raab et al., 2005) and constrain the thermal history of the Brandberg. The AHe dates obtained from the Brandberg Inselberg range from 140.3±11.2 to 30.0±2.4 Ma. The time-Temperature paths obtained suggest an early denudation/cooling phase at ∼130-100 Ma and a more recent denudation phase at 65-40 Ma. We suggest that the initial cooling phase is due to a combined effect of the magmatic cooling of the Brandberg intrusion and the uplift and erosion of the passive margin after the continental break up at ∼130 Ma. We interpret the second cooling phase as an erosion phase in agreement with an increase of the sedimentation rates starting at ∼68 Ma offshore in front of the Brandberg (Baby, 2017). However, we do not exclude that intensive weathering which has been recorded in West Africa from 60 to 40 Ma (Beauvais and Chardon 2013; Chardon et al., 2018) also played an important role in this denudation event. At 35 Ma the samples were at surface temperature and our modelling indicate that since 35 Ma erosion rates were extremely low in the Brandberg massif. These low erosion rates are consistent with Late Eocene aridification of the area (Scott et al., 2006; Pickford et al., 2014) and 10Be erosion rates obtained in the Brandberg (Matmon et al., 2018).