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Mirror denudation pattern on both sides of the Central Atlantic – a trace of the Pangea break-up?

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The target area of this project is the WSW- ENE oriented intra-continental Atlas chain in Morocco located between the West Africa Craton and the Betic-Rif system. It is a key natural laboratory because it 1) is the southernmost expression of Alpine deformation in Africa, and 2) encompasses Pre-Cambrian to recent evolution of the region. The presence of high surface elevations today in the High-Atlas (>4000m) and Anti-Atlas (>2500m) to the south is subject to discussions because there is little quantitative data available at present. Phases of uplift are thus ill constrained as places where the associated erosion products were accumulated.
To better constrain the most recent orogenic growth of the Atlas chain, we selected a section located to the SW of Morocco, and investigated the time-Temperature paths from the different morpho-structural domains using low-temperature thermochronology analyses. These are Fission-Track analysis on Apatite (120-60°C), Zircon (270-210°C) and U-Th/He analysis still on Apatite (80-45°C) and Zircon (200-170°C) minerals. Results are much contrasted from one domain to the other: Pre-Cambrian bedrocks from the Anti-Atlas domain yield old thermochronological Fission-Track ages on zircon (380-300 Ma) and apatite (180-120 Ma) minerals that are associated with slightly younger (U-Th)/He ages on apatite (150-110 Ma). U-Th/He ages on apatite from the High-Atlas are much younger (̃35-5 Ma) with a clear alpine signature. Apatite Fission-Track ages from the Meseta region further north are also relatively old ranging between 200 and 140 Ma.
We here concentrate on the interpretation of old thermochronological ages from the Meseta and Anti-Atlas regions leaving the Alpine signal for another contribution. There are two direct, possibly inter fingering, interpretations for the preservation of such old thermal record in the Anti-Atlas and Meseta regions. First they remained “stable” being unaffected by ’Alpine’ deformation that took place in the High-Atlas. Second, they are being affected “now” but no level with such record is yet exposed. Thermal modelling was performed to decipher between the 2 scenarios using our new thermochronological and available geological constraints. Models suggest that the first scenario is most likely with a clear Triassic to Late Jurassic phase of heating until ̃100-90°C that was followed by a phase of cooling until the Middle Cretaceous. These results suggest that the Meseta was buried by a 2-3 kilometres thick sedimentary pile until ̃180 Ma and as a result that the concept of a topographic high limiting the Tethysian from the Atlantic has to be reconsidered. Further, denudation patterns from the mirror image of the Atlas system on the other side of the Atlantic ocean are almost identical (Grist and Zentilli, 2003) suggesting that the patterns we constrained for the Triassic until Middle Cretaceous in SW Morocco have to be related to the break-up of the Pangea and oceanization in the Central Atlantic from ̃180 Ma.