Formation, deformation and vertical movements of a metacratonic domain: the north-western margin of the West African Craton; structural and thermochronological data

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Based on literature and new data, we describe the transformation of the West African Craton (WAC) lithosphere into a metacratonic marginal domain prone to deform during further orogenic episodes, the structural effects of these episodes and the vertical movements that affected the metacratonic domain in southern Morocco. The formation of a metacratonic rim around the WAC occurred during the Neoproterozoic and culminated with the Pan-African orogeny. The western segment of the metacratonic rim was converted into a Variscan collisional orogen (Mauritanides), subsequently fragmented by the Central Atlantic opening. Conversely, the northern segment (Anti-Atlas and some parts of the High Atlas) was involved successively in the Variscan and Alpine cycles. By the end of Carboniferous, the rifted metacratonic border constituted the thick-skinned external fold belt of the Variscan Orogen. Then the area was affected by the Triassic rifting process, which culminated with the CAMP magmatism. Most of the north metacratonic border will later escape to the Cenozoic inversion, which only affected restricted salient of the border (e.g. Marrakech High Atlas), whereas most of it (Anti-Atlas) was only affected by large wavelength, lithospheric folds. Zircon and apatite fission track (ZFT, AFT) thermochronology on Anti-Atlas crustal samples allows us to document the vertical movements that affected the northern WAC margin from the Variscan orogeny onward. ZFT ages cluster around 330 Ma, whereas AFT ages range between 121-173 Ma, except close to the Atlas or within the Marrakech Atlas where younger ages have been measured. The interpretation of the Middle Jurassic-Early Cretaceous apatite ages through modelling methods suggest the occurrence of hot mantle anomalies beneath the metacratonic border and adjacent areas, firstly during the Late Jurassic, then during the Neogene. The younger anomaly is confirmed by the available geophysical data.