

The Structure of the Ras Afrou and Tamsamane Units (Eastern External Rif, Morocco)

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The deepest units of the external Rif crustal wedge outcrop in the Tamsamane Massif in the Eastern Rif. These units underwent IP/LT metamorphism during the development of their main foliation (Sp) which is axial-planar to large SE-vergent recumbent folds. This main deformation stage was produced in a non-coaxial regime with an ENE-WSW transport direction and a sense of movement of the hanging-wall towards the WSW and it involved both Palaeozoic basement and its Mesozoic sedimentary cover. We have differentiated three main units separated by brittle-ductile thrusts with a top-to-the-south sense of movement that cut the recumbent folds and have inverted the metamorphic order. Normal faults record later thinning of the thrust pile. The older fault system is formed by low-angle normal faults that record extension parallel to the ductile lineation in the Tamsamane Massif, and to the Rif Chain orientation. This extension is similar to the WSW-ENE extension described in the Betics producing the exhumation of the Nevado-Filabride Complex during the Upper Neogene. The younger system records N-S extension controlling the formation of the Kert Basin during the Messinian-Pliocene. The Movement of the Nekor Fault during the Upper Miocene to Quaternary with a lateral motion and a normal component translated the upper Subrif units towards the WSW, producing also the final exhumation of the Tamsamane rocks and the formation of the Boudinar Basin.

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