

## **Preliminary Magnetostratigraphic Dating of the Ouarzazate Basin: implications for the Timing of Mountain Building in the High Atlas of Morocco**

**E. Teson<sup>1</sup>, E.L. Pueyo<sup>2</sup>, A. Barnolas<sup>2</sup>, A. Teixell<sup>1</sup>, J. Agustí<sup>3</sup>, and M. Furió<sup>4</sup>**

<sup>1</sup> Dept. de Geologia, Universitat Autònoma de Barcelona, 08193-Bellaterra, Spain

<sup>2</sup> Área de Estudios Geológicos, Instituto Geológico y Minero de España, Spain

<sup>3</sup> ICREA-Institut de Paleoeecologia Humana, Universitat Rovira i Virgili, 43005-Tarragona, Spain

<sup>4</sup> Institut de Paleontologia M.Crusafont, 08201-Sabadell, Spain

The Cenozoic Ouarzazate basin contains the best record of the building of the High Atlas mountains of Morocco. The infill of this foreland basin is characterised by terrestrial red beds, imprecisely dated so far. An ongoing magnetostratigraphic study in these formations aims to constrain their age, sedimentation rates and the timing of deformation in the adjacent High Atlas chain. Two profiles covering the entire basin infill are being studied. The first comprises the lower part, corresponding to the Hadida Formation which conformably overlies dated Middle Eocene marine carbonates. The second covers most of the unconformable Ait Ouglif and Ait Kandoula Formations, previously ascribed to the Oligocene and Neogene. The Hadida profile consists of ~ 490 m of red sandstone, shale and gypsum, deposited in coastal sabkha to aeolian and distal alluvial fan environments. 102 standard samples were collected with a portable drilling machine. The Amekchoud section (208 cores) is ~780 m thick, comprising a basal level of conglomerates (Ait Ouglif Fm.), channelised sandstones, shales and lacustrine carbonates (Ait Kandoula Fm.). On top of the measured section, the uppermost Ait Kandoula Fm. is made of ~ 300 m of conglomerates and shales that are the subject of ongoing analysis. Paleomagnetic analyses (thermal demagnetization) conducted in the "Jaume Almera" CSIC laboratory allow characterising stable and double polarity and high coercivity components unblocking between 500 and 670°C.

An initial correlation between the local polarity sequence and the GPTS has been strongly based on the magnetozone pattern. The Amekchoud base may start at chron C5ABn (Serravalian), chron C5n is undoubtedly defined, and the profile probably ends at chron C4An (Tortonian). This interpretation is consistent with the micromammal remains found at the top of the section, which include *Myocricetodon* sp., *Africanomys* sp. and *Muridae* indet. *Myocricetodon* sp. that is close to the *Myocricetodon seboui*-M. ouaichi group; therefore, a late Miocene age is supported for this upper part of the section. The Hadida section is not so unambiguously defined and could start at chron C20N (Lutetian), probably ending at C13r (Priabonian-Rupelian). In both profiles the accumulation rate curves are steady and support our preliminary calibration, although data in progress are expected to reduce uncertainties.

The Eocene Hadida Formation, regarded as the first foreland basin deposit, predates local deformation in the High Atlas frontal thrust belt, and may be attributed to early mountain building in the internal parts of the orogen. It is followed by a marked hiatus of ~ 20 m yr, which appears widespread in southern Morocco; generalized deformation in the frontal thrust belt occurred in this period. Sedimentation was resumed in mid-Miocene times (Ait Ouglif and Ait Kandoula Formations), contemporaneously with continued thrusting. Our data thus suggest that the main thrusting in the southern High Atlas frontal thrust belt took place from the late Oligocene – early Miocene to the early Pliocene.