

Anisotropy of Magnetic Susceptibility (AMS) unlocks syndimentary deformation kinematics at Pico del Aguila, Pyrenees, Spain

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Abstract: The Pico del Aguila is a transverse décollement fold located along the Pyrenean thrust front. An age-model derived from combined magnetostratigraphy and rock magnetic cyclostratigraphy in deltaic sediments shows folding to have occurred from 41.6 to 36.0 Ma. Both anisotropy of magnetic susceptibility (AMS at 77° K and 295° K) and of anhysteretic remanent magnetization (AARM) show that the principal susceptibility is dominated by paramagnetic clay minerals. In general, the maximum and intermediate principal susceptibilities (k_1 and k_2) lie in bedding and the minimum principal susceptibility (k_3) is oriented nearly normal to bedding. Layer-parallel shortening (LPS) produced a N-S magnetic intersection lineation in bedding on anticline limbs and in the adjacent Belsue and Arguis synclines by deforming the depositional-compaction fabric. The degree of anisotropy is higher in hinges than on limbs. At the anticline hinge, more oblate magnetic ellipsoids with an E-W lineation and bedding parallel magnetic foliation demonstrate the overprinting of the LPS magnetic fabric during the emplacement of the underlying thrust sheet. AMS patterns record fold kinematics characterized by constant limb length rotation about pinned hinges and are compatible with kinematics recorded by growth strata geometries. This study emphasizes that AMS is a very sensitive measure of depositional, compaction, and tectonic fabrics in marine clastic rocks even in the diagenetic realm at less than 100°C and a few km depth of burial.

Keywords: Magnetic Anisotropy, marls, sandstones, deformation, growth strata, Pyrenees