

High-Resolution Deformation Rates in Spain

David Anastasio » Earth and Environmental Sciences, Lehigh University

Ken Kodama » Earth and Environmental Sciences, Lehigh University

Josep Pares » Geological Sciences, University of Michigan

Using growth strata mapped with GPS and high-resolution age determinations constrained by magnetostratigraphy and cyclostratigraphy we show that folding at Pico del Aguila anticline in the Spanish Pyrenean foreland was non-steady over a 5 Myr period. Growth strata at Pico del Aguila include Middle Eocene carbonates (Guara Fm.), marine slope (Arguis Fm.), and deltaic (Belsué-Atarés Fm.) deposits. Anhyseretic remanent magnetization (ARM) data from the Arguis Fm. show hierarchical cyclicity in deposition consistent with all predicted orbital Milankovitch frequencies. We refine the magnetostratigraphic time scale by tuning band-passed ARM data to the precession index according to the new La2004 model providing 10,000 yr age resolution for 760 m of flysch which records 47° of limb rotation. Ages for the initial 5° and final 3° of folding are based solely on magnetostratigraphic data. Growth strata record limb rotation during folding and mountain building. Synorogenic strata were mapped using precision GPS in post kinematic surveys with support from UNAVCO. Mapping the strata is important in constraining the amount of rotation. We divide 55° of westward limb tilting into 9 increments of ~180 to ~730

kyrs duration. Limb rotation increased from 8°/Myr at 41.6 Ma to 28°/Myr, then decreased to 5°/Myr at 38.5 Ma. Subsequently, limb rotation returned to 26°/Myr, then stopped for 300 kyr at 37.8Ma before slowly accumulating the last 3° of folding, which ended at 36.6 Ma.

Publications:

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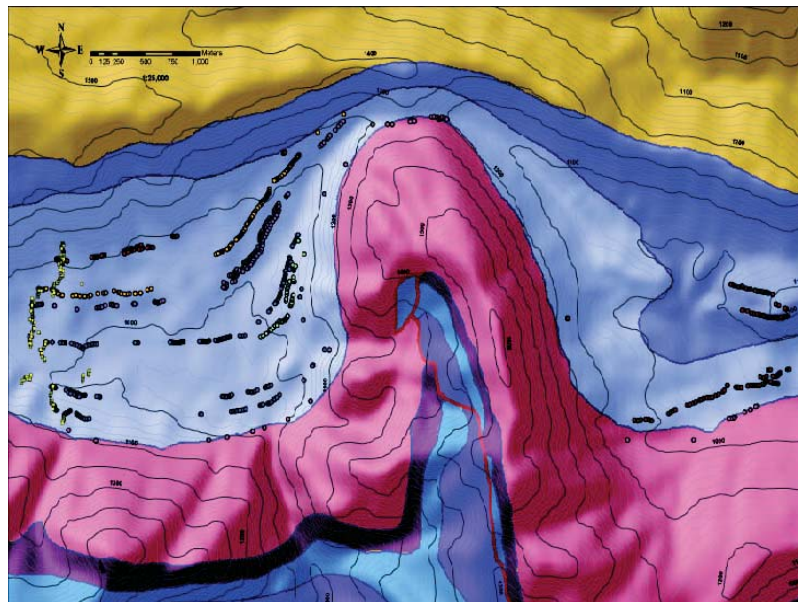


Figure 1. Pico del Aguila, Spanish Pyrenees Geology, topography, and surveyed growth strata used to determine folding rates.