



## High-Resolution Deformation Rates Spain

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

Using growth strata 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 consistent with all predicted orbital Milankovitch frequencies. Differential lithologic decompaction was applied using empirical calibration of anisotropy of anhysteretic remanence (AAR) to volume loss from laboratory compaction experiments on comparable lithologies. The ARM depth domain is converted to time by scaling the data to a revised magnetostratigraphy within the growth section. We refine the magnetostratigraphic time scale by tuning bandpassed 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. 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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Pares, J.M., Kodama, K.P., Anastasio, D.J., Newton, M.L., 2006, Magnetic Reversal Stratigraphy of Eocene Growth Strata, South Pyrenean Fold-and-Thrust Belt, *Eos Trans. AGU*, 87(36), Jt. Assem. Suppl., Abstract GP41B-03.

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