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Magnetostratigraphy and stable isotopes stratigraphy of the middle-upper Eocene deposits of the Ainsa basin (Spain): new age constraints and implications for Pyrenean mountain building

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Understanding the origin of stratigraphic cycles preserved in sedimentary successions is one of the main goals of sequence stratigraphy. Cyclicities in sediments are controlled by local and regional tectonics, global sea level and eustatic variations themselves linked to climate and global tectonics, as well as sediment supply also related to tectonics and climate. The Ainsa foreland basin (southern central Pyrenees, Spain), is composed of very well preserved syn-tectonic deep marine deposits in which stratigraphic cycles are characterized by an alternance of hemipelagic intervals and sediment gravity flow (SGF) deposits. The origin of stratigraphic cyclicity in the Ainsa basin has been largely discussed, however the absence of accurate chronostratigraphic constraints on the sandy systems of the basin remains one of the main issues to tie these pulses of coarse sediments with external factors. In this work, two age models were developed based both on new magnetostratigraphic data and stable isotope stratigraphy. New carbone and oxygen isotope data for the upper Hecho group were compiled with existing isotope profile of the lower Hecho group to provide a complete record for the entire deepwater succession of the Ainsa basin. The first age model considers continuous depositions in the basin and places our magnetostratigraphic results in the light of existing paleomagnetic studies previously performed in the Ainsa basin (Bentham and Burbank, 1996 ; Mochales et al., 2012a). It provides new time lines for the basin in agreement with the age model currently accepted for the South Pyrenean foreland basin. In the second age model, we used stable isotope signal combined with published large foraminifer biostratigraphic constraints (Scotchman et al., 2014). The obtained stable isotope curves show significant similarities with global isotopic records, with in particular a negative oxygen excursion towards the top of the succession that could be attributed to the Mid-Eocene Climatic Optimum. This age model is thus controversial as it is in significant disagreement with previous age models developed in the area and implies several important hiatuses in the slope depositional environments of Ainsa turbiditic series. In this presentation, we will discuss the two ages models and their implications for mountain building processes in the Pyrenees. Finally, we will use them to compare the stratigraphic record of the basin with sea-level fluctuations and discuss the possible primary drivers of stratigraphic signals.

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