Geophysical Research Abstracts, Vol. 7, 03659, 2005
SRef-ID: 1607-7962/gra/EGU05-A-03659

Tectonic and climatic controls on the stratigraphic record of a nonmarine rift basin: the Cameros Basin (Upper Jurassic-Early Cretaceous), Soria-La Rioja provinces, Spain

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The interaction between tectonics and climate at various scales of time (10^1-10^4 kyrs) and space (1-100 km) is investigated in the Cameros Basin. Its 8-km-thick nonmarine sedimentary filling, which includes extensive lacustrine deposits, provides a terrestrial climate record for the European subtropical zone during the Early Cretaceous. Two time-scales are investigated:
At a million-year time-scale, the stratigraphic architecture of the synrift series is characterised by two regional angular unconformities, formed by subaerial weathering surfaces at basin margins grading into a thick succession of lacustrine evaporites (Berriasian to Valanginian). These unconformities are interpreted as recording drastic falls in accommodation space related either to tectonic or climate forcing. Investigation of the temporal evolution of the basin structure pattern indicates that the delayed activation of the Cameros border fault cannot account for falls in accommodation space. The roles of eustasy, subsidence rates and sediment supply on falls in accommodation space are then discriminated through stratigraphic modelling. Results suggest that coupled changes in lake level and sediment supply are primarily responsible for variations in accommodation space. The stratigraphic architecture of the basin is a consequence of hydrological crises in Lake Cameros, interpreted as a record of two regional severe aridity crises, Berriasian to Valanginian in age.
At a ten-thousand-year time-scale (Upper Barremian-Aptian) the characterisation of the sedimentary environments of the Enciso Group indicates that the basin was occupied by a shallow holomictic lake filled with carbonate and siliciclastics. The fit be-

tween the stratigraphic genetic pattern and the vertical changes in carbon and oxygen isotopic composition of the limestones demonstrates the hydrological origin of elementary base level cycles. This strategy allows the genetic reconstruction of the lake-level curve for the 1000 m-thick sedimentary succession of the Group. Two scales of lake-level fluctuation were distinguished: (1) orbitally-tuned lake-level changes throughout the Upper Barremian-Aptian interval and (2) a period of repeated lake lowstands so far dated between Upper Barremian and Upper Aptian and interpreted as a hydrological deficit akin to a moderate regional aridity crisis.

Two severe aridity crises (Berriasian and Valanginian) and a moderate one (Aptian) are suggested, on the basis of water budget changes in Lake Cameros; these terrestrial aridity events seem to be contemporaneous with episodes of decreasing SST in Tethys, and global cooling interludes suspected from the Early Cretaceous marine sedimentary record. The dynamics of this Mesozoic system echoes the teleconnections found to exist between lake systems and climate in the Quatenary.