Chronostratigraphy of the Lower Guadalquivir Basin: an update and future challenges

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Foreland basins represent one of the best locations to study the response of sedimentary environments to the interplay between lithospheric and surface processes. The first step towards addressing these topics is the construction of an age model with the highest possible coverage, accuracy and resolution. The Guadalquivir Basin (GB) in southern Spain is an ENE-WSW elongated foreland basin developed during the Neogene and Quaternary between the external units of the Betic Cordillera and the Iberian Massif. It is located at a strategic position for studying the role of tectonic and climatic processes in the functioning of the connection between the Mediterranean Sea and the Atlantic Ocean, which has played an important role on the Earth´s climate since the Late Neogene. The chronology of the GB in its westernmost sector, where the sedimentary filling is more complete, has been developed during the last three decades thanks to the application of different techniques. Biostratigraphic data of marine sediments studied in outcrops and recovered in boreholes have restricted the onset of deposition in the basin to Late Tortonian. Marine sedimentation continued through the Messinian and the Early Pliocene, when the basin underwent continentalization. In the last years, the magnetostratigraphic study of marine sediments recovered in boreholes has enabled validation and refinement of biostratigraphic ages of marine sediments, and have provided the first chronology for the fossil-barren continental sequence that broadly constitute the upper half of the sedimentary filling of the basin (dated as Late Pliocene to Early Pleistocene). Finally, radiocarbon dating has enabled dating of the final stages of sedimentation in transitional (marsh) environments as latest Pleistocene and Holocene. Further refinements of the age models have been based on the application of cyclostratigraphy to parts of the Messinian and Early Pliocene marine sediments. This chronostratigraphic framework suggests continued sedimentation in the central part of the basin with the exception of a major sedimentary hiatus between 1.6 and 0.3 Ma. In the passive (northern) margin of the basin, several other minor unconformities appear to record the tectonic evolution of the Betic Cordillera. Despite the efforts done in unravelling the chronology of the lower GB, several issues remain to be resolved. These issues, which will be addressed in the framework of the GUADALTYC project and other research initiatives, are: 1) the precise chronology of the onset of sedimentation in the basin. This will be addressed by combining magnetostratigraphic and biostratigraphic data; 2) the precise chronology of Early Pliocene

marine sedimentation. This will be tackled combining magnetostratigraphic, biostratigraphic and cyclostratigraphic techniques; and 3) the extent and duration of the major sedimentary hiatus identified in the Quaternary sequence. This will be addressed by combining magnetostratigraphic data and amino acid racemization of ostracod shells. An improved knowledge on the chronostratigraphy of the basin will be the starting point for disentangling the role of tectonic and climatic processes in the sedimentary evolution of the GB.

Keywords: Guadalquivir Basin, Neogene, Quaternary, chronostratigraphy, borehole, outcrop

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