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Tectono-sedimentary relationships, geometry and kinematical evolution of the Utrillas thrust in the Montalbán-Castel de Cabra area (NE Iberian Peninsula).

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The WNW-ESE striking and basement-involved Utrillas thrust is the westernmost N-verging structure within the Portalrubio-Vandellós fold-and-thrust belt (Iberian Range). It separates the Aliaga (piggy-back) and Montalbán (foreland) Cenozoic basins and was developed during the Alpine cycle as a result of the positive inversion of the Mesozoic Iberian rift basin (Casas et al., 2000; Liesa et al., 2018). NE-SW and NW-SE trending normal faults strongly conditioned basin inversion, which took place under two main shortening directions: NE-SW and NW-SE (Simón and Liesa, 2011). The stratigraphic succession consists of Mesozoic sin- and post-rift sedimentary cover and five Cenozoic tectono-sedimentary units (TSU) recording thrust evolution (Casas et al., 2000). On the basis of both tectono-sedimentary units and field macro and mesostructural study, a new geological map, kinematical evolution and transport direction dataset is presented for the Utrillas thrust in the Montalbán-Castel de Cabra area, as well as for the Río Ancho thrust developed within the Montalbán basin. Study consisted on mapping of TSU units and folding and thrusting structures and field data collection of thrust kinematics (striae and S-C structures), followed by both cross-section construction and data interpretation.

The tectono-sedimentary relationships point the northward displacement of the Utrillas thrust started at Lower Oligocene and finished at Lower Miocene. In this sector, the structure consists of an imbricate thrust system that shows several changes in trend between WNW-ENE and NE-SW (drawing the extensional northern margin of the Early Cretaceous Las Parras sub-basin), and the occurrence of two main superposed fold sets trending NNW-SSE (earlier) and NE-SW (later). Local structure allowed us to recognize a westward increase of the Utrillas thrust ramp dip, which favoured transmission of deformation to the hinterland and the development of the Rio Ancho thrust. Kinematical indicators and their cross-cut relationships show an anticlockwise rotation time sequence of the thrust transport direction from NE (030-040°), then NNE (010-020°), and finally NNW (340-350°).

These results lead us to propose a kinematical evolution for the Utrillas thrust based on the intraplate stress fields (ISF) defined by Liesa and Simón (2009). Firstly, the thrust system moved towards NE and, then, NNE under the NE-SW stress field (Eocene-Late Oligocene) during the Oligocene times. In Lower Miocene times it displaced towards the NNW under the NNW-SSE stress field.

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