EGU2020-1004
https://doi.org/10.5194/egusphere-egu2020-1004
EGU General Assembly 2020

Upstream versus downstream changes in a natural sediment routing system from source to sink

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The Middle Eocene Climatic Optimum (MECO) represents an episode of widespread warming occurring ~40 million years ago. It is characterized by gradual warming over a period of 500,000 years, leading to a rise in ocean temperatures of about 5° C in the mid and high-latitudes (Sluijs et al., 2013). Contrary to the traditional understanding and consensus that accommodation space or downstream factors control stratigraphic architecture in fluvial successions, we test the hypothesis that upstream factors, rather than downstream factors, control fluvial architecture through changes in the median grain size, sediment supply and water discharge with paleoslope being a measurable proxy to quantify these changes. We test our hypothesis utilizing the natural system of the Escanilla sediment routing system, encompassing the Middle Eocene Climatic Optimum. The Escanilla system is an overall prograding system, consisting of 1000 m thick alluvial and fluvial deposits at the southern-margin of the Tremp-Graus Basin in the south/central Pyrenees, Spain. Multiple lateral measurements for grain size distributions and cross-set measurements, flow direction and channel geometry are taken close to the source (Coll de Vent), at an intermediate location (Lascuarre), and at a distal part (Olson) of the system for paleohydraulic reconstructions. Drone flight missions are also undertaken to capture aerial photographs of the field area, which are required for the construction of 3D photogrammetric models. At Olson, alternating sequences of laterally continuous amalgamated channel bodies and several small sequences of vertically stacked isolated channel bodies have been identified. Preliminary results show distinct values of median grain size, dune height, flow depth and paleoslope for the amalgamated and vertically stacked isolated channel sequences across the MECO; the addition of our 3D models provide further insight into the lateral connectivity of the amalgamated units. Our results suggest different paleohydraulic conditions during the deposition of amalgamated and nonamalgamated units. This data will also be supported by numerical simulations carried out to better understand the response of fluvial

systems to changes in upstream factors.