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Pleistocene megaflood deposits infilling the incised valley of the Lower Ebro

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The Móra Basin is a small marginal sedimentary basin located near the south-eastern margin of the Ebro Basin formed during the Paleogene Alpine Compression in the domain of the Catalan Coastal Ranges. The Low Ebro river flows through the Móra Basin from north to south. Both the entrance to the basin and the outlet incise into Mesozoic carbonates which have originated two gorges, El Pas de l'Ase in the north and L'Estret de Barrufemes in the south. Every of both channel constrictions produces a significant backwater effect. The Comte Stream flows into the Ebro River from the left just before L'Estret de Barrufemes. At this point, the Ebro Delta is about 50 km far.

There exist at least five Ebro terraces just before the narrowing of L'Estret de Barrufemes. Research focuses on the two lower units which are found into the lower valley of the Comte Stream. The oldest of the two (Unit Two) is made up of fluvial multistorey clast-supported, polygenic rounded conglomerates, and sandstones. The lower Comte Stream, near its mouth, incises into the Unit Two which is at this point 17 m thick. Upstream, this unit forms the channel floor which is unconformably overlaid by Unit One, preserved in the stream riverbanks. Unit One is made up of a multistorey layer 15 m thick of gravels and sands. An outcrop of both units reaches until 3.5 km upstream from the Comte Stream mouth and near 40 m over the current Ebro River. At this point, slackwater deposits of cross-laminated sands and sandstones from both units finish the fluvial sediments into the Comte Stream channel.

A 2D flow numerical model can simulate a megaflood arriving at L'Estret de Barrufemes and visualise its hydraulic behaviour in the constriction and its evolution into the Comte Stream channel. Modelling water discharges greater than those considered as extreme floods allows to understand the presence of fluvial deposits of the Ebro River up to 3.5 km upstream from the mouth of the Comte stream and the slackwater deposits that are at this point about 40 m above the current Ebro river channel. The interpretation of the Comte Stream deposits can be made on the basis of sequence stratigraphy. It comprises the analysis of terraces' properties and textural features and their vertical and lateral relations. Therefore, on the one hand, the different units have been characterised to deduce fluid dynamics and sediment transport processes, and on the other hand, stratigraphical relations between units have been established. The analysis focuses on the two lower units which are those which flowed into the current Comte Stream channel but not dismissing the older fluvial units. It is significant to emphasise that the Lower Ebro River in the Móra Basin is an incised fluvial system influenced by climatic marine base-level changes and the megafloods' deposits were placed in a setting of the rising base level.