



## **Facies architecture of perched lobes deposited by expanding supercritical density flows – field examples from the Eocene Sant Llorenç del Munt fan-delta complex (Ebro Foreland Basin, NE Spain)**

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The morphodynamics of supercritical density flows have a large impact on the dispersal of sediment and the resulting depositional architecture. Coarse-grained delta-foreset deposits represent ideal field examples of deposition by supercritical density flows on steep slopes. Field examples were studied in the Eocene Sant Llorenç del Munt fan-delta complex at the southeastern margin of the Ebro Foreland Basin (NE Spain). The fan-delta slope deposits, which are dominated by marlstones and fine-grained sandstones, include coarser-grained facies that indicate deposition by supercritical density flows. The formation of the perched lobes is interpreted as related to the expansion of supercritical density flows on the delta slope.

Deposits of supercritical density flows form 2-4.5 m thick lobes, which are perched on the delta foreset. Lobes are bounded at the base and top by erosional surfaces that are characterized by long-wavelength geometries with irregularly spaced scours. Internally, the lobes are organized into 0.5-3 m thick lobe elements that pinch-out upslope and show backstepping stacking in dip sections and compensational stacking in strike sections. Lobe deposits include conglomerates, pebbly sandstones and sandstones and display lateral grain-size fining both in downflow direction and in across flow sections. Beds typically onlap the downslope dipping erosion surfaces at the base of a lobe or lobe element, respectively. Proximal lobe deposits are characterized by amalgamated scour fills, displaying backset cross-stratification or concentric stratification. Some scours are infilled by structureless sandstone or marlstone, containing pebble-sized clasts and large sandstone slabs derived from the underlying beds, and are commonly associated with laterally more extensive erosional surfaces. Amalgamated scours with backsets are interpreted as related to the occurrence of hydraulic jumps. Extensive scoured surfaces are interpreted as indicating phases of bypass. Downslope the scour fills pass into more sheet-like beds with sinusoidal or subhorizontal stratification, indicating deposition by antidunes. These antidune deposits dominate the more distal parts of the lobe deposits.