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Geology and Geophysics of reservoirs

“Facies and sequence stratigraphy of the lower Belsué-Atarés delta, northern limb of the Basa anticline (Eocene, South-central Pyrenees)”

### Abstract

The lower Belsué-Atarés delta system developed during the middle to late Eocene (Bartonian to early Priabonian times) of the Jaca basin (Southern Pyrenees). In the studied zone (northern Basa anticline) this system is characterized by prodelta mudstones and delta front sandstones (Pamplona Marls and Belsué-Atarés Fm, respectively). Vertically this system evolves to the Santa Orosia alluvial system (Campodarbe fm).

Sedimentological and architectural observations show that the studied interval may be classified as an inertia mouth dominated river delta with, built up by jet-flow processes delivering hyperpycnal flows from river floods. Physical correlation permit to study the detailed lateral facies changes throughout a ramp, from distal mouth bars to lobe fringe jet-flow lobes, passing through intermediate facies derived from jet flows forming delta front sandstone lobes. The elemental facies associations form a tract of 5 facies expanding throughout several sub-environments building the delta front and prodelta: (F1) mouthbar ss., (F2) jet-flow lobe, or delta front sandstone lobes, (F3) jet-flow lobe fringe, (F4) prodelta mudstones and (F5) prodelta condensed (bioclastic) layers.

The combination this facies tract with 3<sup>rd</sup> order magnitude sequence stratigraphy, permits facies changes prediction, which can be applied in deltas with similar origins. In terms of hydrocarbon reservoir analog, this delta is an example of lateral continuity in mouth bars dominated by hyperpycnal flows. Correlation plot (in dipping direction, i.e, paleocurrent parallel) shows extremely low angle of the depositional surfaces, getting slightly increased in the relatively proximal part. Connectivity and permeability is enhanced in the proximal areas. Porosity (due to sorting) is very good in distal areas. On the contrary, porosity is reduced in proximal areas, but reservoir properties is improved in terms of sandstone bed thickness and connectivity.

The studied succession is stacked with the following system tracts: Transgressive, Highstand, Lowstand and top Transgressive.