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Capturing flow transformation processes across an uneven seabed in coarse-grained sediment gravity flow deposits

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The upper part of the Jurassic stratigraphy of the Los Molles Formation corresponds to deep-water succession deposited with a regional marine transgression during the early post-rift stage of the Neuquén Basin. The present study conducted in the location of Chacay Melehue (Argentina) is used to document the interactions between coarse-grained sediment gravity flows and the depositional relief of a seismic-scale mass transport complex (MTC), with metre-scale mounds and decametric protruding clasts, as an analogue for similar configurations in subsurface systems.

The 60 m thick succession is exposed along a 6.5 km long oblique downdip longitudinal profile. Exposure quality permits walking out of individual beds. A total of 16 stratigraphic sections (15-60 m thick) spaced between 500 m and 100 m, were logged at 1:50 and 1:25 scale. The basal datum of the studied interval is the top of a MTC and the top marker bed is an extensive sandstone bed. Two units studied correspond to very coarse to fine-grained medium-bedded sandstones with abundant pebble-sized clasts (Unit1) and three thick plurimetric distinct beds of poorly-sorted, granular to medium-grained mud-rich sandstone matrix supporting polygenic gravels (Unit2). Distinct thick extensive beds in both units are intercalated with heterolithic successions of thin to medium-bedded very coarse- to coarse-grained or fine-grained sandstones, siltstones and mudstones.

The sandstone beds in Unit 1 abruptly pinch-out in the proximal part of study area. They are associated with evidence of erosion, sediment bypass and transformation of subaqueous sand-bearing flows. Stratigraphically, sandstone packages in the Unit 2 are increasingly more laterally extensive upwards in the succession. Thickness variations in these beds are related to compensational stacking.

The research will inform studies in the architecture of deep-water successions above an uneven seabed inherited from the top of a MTC. The detailed analysis of exhumed examples that record depositional changes in the structure of the flow can lead to the development of predictive stratigraphic models which incorporate details and complexities observed in outcrop and can be applied for the evaluation of the quality of subsurface reservoirs.

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Keywords: sampling, seafloor, porosity, reservoir characterization, deepwater

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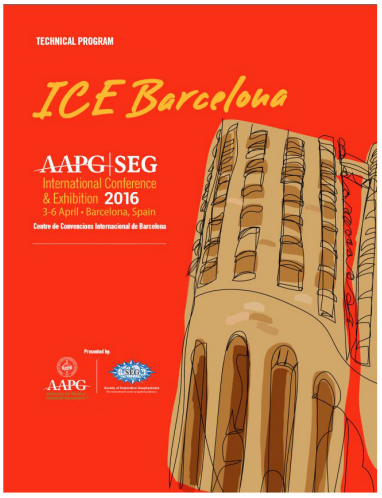

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