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Stratigraphic signature of sea-level changes during the last 500 ka. The Gulf of Lions revisited by the Promess 1 drilling operation

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Correlative conformities of shelf-edge Late Pleistocene depositional sequences have been precisely dated by the EC-funded PROMESS 1 GL1-4 borehole in the Gulf of Lions (western Mediterranean). This hole, situated at 300 m water depth, is 301 m deep with full recovery, and provides a continuous and expanded record of the last ca. 500 ka. It offers a unique opportunity to test the concepts of sequence stratigraphy at the high-resolution scale, for a time period where sea-level changes are better constrained as for older intervals. Shelf sedimentary facies, including sandy clinoforms formed during sea-level falls, have been drilled by a second borehole (Bassetti et al., this session). Finally, the 2 boreholes, together with more than 10,000 km of high- and very-high resolution seismic data, allow us to establish a robust Late Quaternary geological model in the Gulf of Lions. Using seismic discontinuities and their correlative conformities as time-lines, we have been able to propagate our chrono-stratigraphic constraints to the entire shelf/upper slope.

The upper continental slope displays a continuous record of fine-grained sediment, with expanded intervals corresponding to glacial periods and condensed levels during interglacials. The most distinct seismic reflections are maximum flooding surfaces (*mfs*), corresponding to the top of these condensed intervals. They display distinct amplitude anomalies, often underlined by pockmarks. In contrast, sequence boundaries (*sb*) have no seismic expression on the slope, and can only be identified through multi-proxy analysis. Landward, sequence boundaries become detectable on seismic profiles, first as submarine erosion surfaces, then as polygenic erosion surfaces. On

the outer shelf, transgressive deposits are not detectable, except for some transgressive sand ridges. Except for this case, *mfs* and *sb* are merged over most of the continental shelf. Within the last major sequence, these surfaces separate only on the very proximal part of the shelf, allowing to identify a true highstand systems tract, most of the so-called Holocene deposits being in fact early transgressive (deglacial) sediments. Very little highstand sediments of the previous cycles have been preserved. Our results demonstrate that the major stacking pattern is controlled by glacio-eustatic 100-kyr cycles, ruling out the hypothesis that shorter-period sea-level changes (20 and 40-kyr cycles) could be the dominant factor. However, these cycles, as well as Bond cycles, also have a stratigraphic signature, both on the shelf and on the slope (Jouet et al., this session). The impact of 400-kyr cycles, namely Marine Isotope Stage 12, is also observed.