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Stratigraphic signature of millennial-scale climate and sea level changes (Rhone deltaic margin, NW Mediterranean)

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The Rhône deltaic margin (Gulf of Lions) was under the influence of a very high sedimentation flux during the last climatic cycle. The vicinity of major fluvial systems fed the outer shelf during the glacial period whereas depot-centers shifted to the inner shelf during the deglacial period. Both areas provide a complete sedimentary record of depositional events from 130,000 cal. yr BP to present. This sequence represents the sedimentary expression of the glacial/interglacial cycle (100 kyr cyclicity) within the Late Quaternary succession.

Millennial-scale changes of Earth climate occurring during the last 130,000 years have been described in ice cores[1] and in deep marine sedimentary archives[2]. Related sea-level variations, more than 10 m in magnitude, have been reported worldwide[3,4]. However, the impact of these short-term events on the Quaternary stratal geometry of continental margins has not been documented to date. We present here with unprecedented detail how shallow marine deposits developed in response to such rapid sea-level fluctuations are linked to millennial-scale climatic oscillations.

In the Gulf of Lions, a set of prograding sedimentary units corresponds to these sea-level changes. Very-high resolution seismic profiles and borehole data from the European PROMESS1 Project show on the upper slope coarse-grained condensed level that formed during highstand periods and coincides with the longest DansgaardOeschger

interstadials. Each unit, up to 20 m thick, is bounded on the outer shelf by an erosional surface that formed in response to sea-level falls just prior to Heinrich events, and by its seaward correlative conformity. Finally, our study independently confirms the existence of millennial-scale sea-level changes in phase with Bond cycles, and shows the stratigraphic expression of such cycles. They represent up to 15-20 m thick para-sequences formed in relation with 6^{th}-order glacio-eustatic cycles.

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