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Sedimentary Markers : a window into deep geodynamic processes Examples from the Western Mediterranean Sea

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Deep Earth dynamics impact so strongly on surface geological processes that we can use sediment palaeo-markers as a window into the deeper Earth. Derived from climatic and tectonic erosive actions on the continents, and related to eustasy, subsidence and isostasy, the sediment in a deep basin is the main recorder of these processes. Nevertheless, defining and quantifying the relative roles of parameters that interact to give the final sedimentary architecture is not a simple task. Using a 3D-grid of seismic and wide-angle data, boreholes and numerical stratigraphic modelling, we propose here a quantification of post-rift vertical movements in the Provençal Basin (Western Mediterranean) involving three domains of subsidence: seaward tilting on the platform and the slope and purely vertical subsidence in the deep basin (Rabineau et al., 2014 ; Leroux et al., 2015). These domains fit the deeper crustal domains highlighted by previous geophysical data (Moulin et al., 2015 ; Afilhado et al., 2015). Post-break-up sedimentary markers may therefore be used to identify the initial hinge lines of the rifting phase, to quantify sedimentation rates and isostatic rebound (Rabineau et al., 2014) and redefine the subsidence laws. Similar work and results are obtained in the Valencia Basin (Pellen et al., 2016).
This Western Mediterranean Sea is a natural laboratory with very high total subsidence rates that enable high sedimentation rates along the margin with sediments provided by the Rhône and Ebro rivers flowing from the Alps, the Pyrennees and Catalan chains, which in turn archives the detailed record of climate/tectonic evolution during the Neogene. The Western Mediterranean Sea could therefore further probe deep-earth and surface connections using deep drillings of this land-locked ocean basin transformed into a giant saline basin (Rabineau et al., 2015).

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