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Interaction between sedimentation and salt tectonics in the deep-water NW Mediterranean: insights from the PROGRES cruise, North Balearic basin

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Plio-Quaternary tectonics in the Northwestern Mediterranean is dominated by gravity-driven gliding-spreading associated with thick Messinian evaporites, characterized by proximal extension, mid-slope translation, and distal shortening. In the North-Balearic Basin, the distal region comprises numerous circular or elongate diapirs whose rise was driven by combined shortening and sediment loading, rather than density inversion. Although these salt structures have been identified previously, very few high-resolution academic data were available until now to precisely determine their geometry and the associated structural features in the overburden. During the PROGRES cruise (R/V "Suroît", July - August 2003) we collected bathymetric data and back-scattering imagery using SIMRAD EM300 multibeam sounding system, 3.5 kHz profiles (CHIRP) and 6-channels seismic lines over the deep-water North-Balearic Basin, including in and west of the Rhône deep-sea fan. Dip profiles (2000-2900 m water depths) clearly illustrate the different salt provinces (upslope domain, with listric normal growth faults, salt rollers, and rollover folds; midslope region with broad undulations; and downslope province with salt-cored anticlines and diapirs). Distal shortening is concentrated in a highly-deformed belt comprising, first a huge salt-cored anticline, a squeezed, thick sediment depocenter, and, more distally, a very large salt emergent diapir. At least three regional unconformities have recorded successive salt tectonics pulses. Downslope, the overburden is less deformed, except along the flanks of diapirs, whose size and number decrease basinward. Strike lines also show contractional features, indicating that shortening was multidirectional and was mainly ac-

commodated by squeezing salt ridges whose stems often are pinched off entirely. We established two maps: an isochron map of the salt top (i.e., the ductile layer) and an isopach map of the Messinian Upper Evaporites + the Plio-Quaternary sediments (i.e., the brittle layer). The morphology of the salt top results from the combination of two main processes. First, the progressive regional deepening reflects the initial morpho-structure of the basin, i.e., variations in shape and orientation of the continental margin and the later basin evolution, i.e., the subsidence of the sedimentary series. Second, the local perturbations were caused by salt tectonics and especially the numerous diapirs in the deep part of the basin. The regional thickness variations in the brittle layer are due to the distributary channel-levees system of the Rhone deep-sea fan, whereas local variations are directly associated with salt deformation (segmentation in salt ridges and minibasins).