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Neogene crustal shear zone triggering gravity sliding processes along the western Gulf of Mexico margin? Evidences from 2D and 3D multichannel seismic data

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Along the western Gulf of Mexico (GOM) margin, we have studied offshore 2D and 3D industrial multichannel seismic reflection data, provided by PEMEX, in order to study a Cenozoic tectonic reactivation of the Mesozoic margin fabric. Such reactivation may have triggered the often described gravity sliding process along the GOM margin: a coupled system of shelf-wide extension initiated during the early Miocene and deep water contractional growth-fold-belts (known as the Perdido and Mexican Ridges) is associated with gravity sliding on the major décollement level.

We show that two type of deep rooted deformations appear to control the structure of the deep margin under this decollement (6 to 8s-twt):

Into the north, a NE-SW extensional system demonstrates the existence of Cenozoic crustal thinning, extending northwards in offshore Texas where it is evidenced by a heat flow high (*Husson et al., in press*). This system progressively merges southwards with a deep-seated reverse fault zone that demonstrates the existence of crustal shortening. This N170˚ rectilinear fault zone approximately follows a NNW-SSE trending margin flexure. N50˚E tension gashes along this deep-seated fault indicate the presence of a significant amount of oblique dextral strike-slip motion. The total amount of gravity sliding along the décollement and above this transpressional fault does not exceed 2 km of motion.

We infer the existence of a strong coupling between shortening below the décollement,

and superficial gravity sliding processes. Locally, this deep-seated fault zone crosscuts the décollement and extends up into the Mexican Ridges growth-fold-belts. This deep-seated deformation provides natural pathways for fluids and hydrocarbons, deeply favouring the gravity sliding processes.

References:

Husson, L., Le Pichon, X., Henry, P., Flotté, N., Rangin, C. Thermal regime of the NW of the Gulf of Mexico. 2) Heat flow, in press to EPSL.