AAPG Annual Meeting
March 10-13, 2002
Houston, Texas

Lies Loncke[1], Bruno C. Vendeville[2], Virginie Gaullier[3], Jean Mascle[4] (1) Géosciences Azur, 06235 Villefranche-sur-mer, France (2) University of Texas at Austin, Austin, TX (3) Universite de Perpignan, Perpignan, France (4) Geosciences Azur, Villefranche-sur-Mer, France

Contribution of Physical Modeling to Understanding Salt Tectonics in the Eastern Nile Deep-Sea Fan

Recent multibeam-bathymetry, backscattering-imagery and seismic-reflection data indicate that the structural pattern of the east part of the Nile deep-sea fan differs drastically from that of its central and west parts. Such differences may result from combined thick-skinned, crustal-scale tectonics and thin-skinned, gravity-driven spreading of the Messinian evaporites and their Plio-Pleistocene overburden. The eastern deep-sea fan comprises a long (200 km) NW-SE deformation corridor that was first interpreted as the possible northern prolongation of the rift of Suez. Along dip, the corridor exhibits a structural progression typical of salt-bearing passive margins undergoing gravity spreading, including small distal buckle folds, midslope minibasins surrounded by salt ridges, and proximal normal growth faults. Less typical is the corridor's being bounded by narrow, NW-SE fault zones underlain by narrow salt ridges. We used physical models to test whether such pattern was caused by the presence of NW-SE dormant or active subsalt relief or of a bathymetric high (the Eratosthenes seamount) acting as a buttress during spreading. Model results clearly indicate that the presence of a passive subsalt relief and/or of a buttress, rather than that of an active subsalt relief, has caused this peculiar structural pattern. Early gravity spreading caused radial thin-skinned extension and the formation of minibasins and NW-SE and ENE-WSW salt ridges, a pattern also enhanced if basement steps are present. Later, buttressing by the seamount opposed further northeastward extension. The salt and overburden spread northwestward, reactivating the NW-SE salt ridges as strike-slip zones bounding the corridor.