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From proximal to distal margin in a backarc setting : the hyper-extended Eastern Sardinian Margin

Virginie Gaullier (1), Frank Chanier (1), Agnès Maillard (2), Isabelle Thinon (3), Johanna Lofi (4), Gaël Lymer (5), and Bruno Vendeville (1)

(1) Univ. Lille, CNRS, Univ. Littoral Côte d'Opale, UMR 8187, LOG, Laboratoire d'Océanologie et de Géosciences, F59000 Lille, France (virginie.gaullier@univ-lille1.fr), (2) Univ. Toulouse / GET, France (maillard@lmtg.obs-mip.fr), (3) BRGM Orléans, France (i.thinon@brgm.fr), (4) Univ. Montpellier – Géosciences Montpellier, France (Johanna.Lofi@gm.univ-montp2.fr), (5) Univ. Birmingham, U.K. (g.lymer@bham.ac.uk)

The Eastern Sardinian passive continental margin developed during the opening of the Tyrrhenian Sea, a neogene backarc basin created by continental rifting and oceanic spreading related to the eastward retreat of the Apennine subduction system.
We present and discuss the structural characteristics of a complete section of this continent-ocean transition, from the upper margin onland toward the deep oceanic basin. This whole margin shows a succession of structural domains that correspond to major steps in the crustal thinning toward the Tyrrhenian Sea. The proximal margin includes the onshore domain (Eastern Central Sardinia) and the offshore East Sardinia Basin that is bordered on its eastern side by a pre-eminent step that has to be considered as the main necking zone. The distal margin is an hyper-extended domain corresponding more or less to the Cornaglia Terrace that is separated with the domain of exhumed mantle and oceanic crust by a clear morphological step with some large faults and some isolated tilted blocks.
In terms of timing of the deformation, rifting in the hyper-extended domain was considered to be pro parte coeval with the Messinian Salinity Crisis (MSC, 5.96-5.32 Ma). We use the MSC seismic markers and the deformation of viscous salt and its brittle overburden as proxies to better delineate the timing of rifting and post-rift reactivation, and especially to quantify vertical and horizontal movements. On this young, highly-segmented margin, the Messinian Erosion Surface and the Upper and Mobile Units are systematically associated, respectively, to basement highs and deeper basins, showing that a rifted deep-sea domain already existed by Messinian times. Therefore a major pre-MSC rifting episode occurred across the entire domain. Data also show that there are no signs of Messinian syn-rift sediments, hence no evidence for rifting after Late Tortonian times. Moreover, because salt tectonics creates fan-shaped geometries in sediments, syn-rift deposits have to be carefully re-examined to distinguish the effects of crustal tectonics (rifting) and salt tectonics. We also precise that rifting is clearly diachronous from the upper margin (East-Sardinia Basin) to the lower margin (Cornaglia Terrace) with two major unconformities, attributed respectively to the necking and to the lithospheric breakup unconformities.
The onshore part of the upper margin has been also investigated in order to characterize the large crustal faults affecting the Mesozoic series (geometry, kinematics and chronology) and to decipher the role of the structural inheritance on the early rifting deformation. Seaward, we also constrain the structural style and timing of the main boundaries such as the necking domain and the continent-ocean transition, between the hyper-extended continental crust and the early oceanic crust or exhumed mantle.