

Deep crustal structures of the transition zone between the Pyrenees and the Gulf of Lion margin from magnetic and gravimetric data

Albane Canva (1), Anthony Dofal (), Aurélie Peyrefitte (1), Isabelle Thinon (1), Renaud Couëffé (1), Frédéric Lacquement (1), Agnès Maillard (2), and Laurent Jolivet (3)

(1) French geological survey - BRGM, DGR-GBS, Orléans, France (i.thinon@brgm.fr), (2) GET - Géosciences Environnement Toulouse, (3) iSTeP - Institut des Sciences de la Terre de Paris

To improve the knowledge of processes involved in the dismantling of a mountain chain during rifting the question of the play of transfer zones is of first order for the OROGEN research project (Total, BRGM, CNRS).

The study area is the transition zone between the Pyrenees chain and the Gulf of Lion (GoL) passive continental margin (France, western Mediterranean), linked to a NW-SE transfer zone, called Catalan Transfer Zone (CTZ). This CTZ is supposed to have played an important role during the opening of the Liguro-Provençal oceanic basin. From seismic interpretation, shifts in tectonic structures of the upper part of the continental crust are observed in the CTZ area.

This study focus on understanding deep-seated structures of the transition zone from gravity and magnetic data. Close to the CTZ, there is a major high-amplitude and huge magnetic anomaly, called the Catalan Magnetic Anomaly (CMA), not associated to any gravimetric anomaly. The CMA extends for 50 kilometres in a NW-SE direction from the continental shelfbreak to the abyssal plain in a context of thinned to hyper-thinned continental domain. Two cross-sections were made; one NW-SE, perpendicular to the margin and in the CMA's axis, and the other one SW-NE, parallel to the shelfbreak and perpendicular to the CTZ.

From gravity and magnetic modelling, we constrain the source of the CMA by testing different geometries of the deep crustal structure at the transition between the Pyrenees chain and the Gulf of Lion continental margin.

- The SW-NE cross-section shows a very narrow and localized dense and magnetic body on the western edge of a thinned continental domain characterized by a mantle upwelling, a thinned continental crust and a thick sedimentary basin.

- The NW-SE cross section shows the transition between the continental crust and the oceanic domain. It is worth noticing that the mantle upwelling and the crust thinning occurs in a more proximal domain than in the rest of the Gulf of Lion margin, probably offset by the motion along the CTZ.

The Catalan Magnetic Anomaly could be explained by intrusion and/or underplating of mafic magma in a thinned to hyperthinned continental domain. This intrusion could be induced by a combination of transtensional movements along the Catalan transfer Zone, linked to the opening of the Liguro-Provençal basin and the thinning of the crust, linked to the setting of the Gulf of Lion margin.