Geophysical Research Abstracts
Vol. 21, EGU2019-10947, 2019
EGU General Assembly 2019

Mechanisms of continental breakup: comparison between the South China Sea and Iberia-Newfoundland rifted margins

Geoffroy Mohn (1), Michael Nirrengarten (1), Hans-Christian Larsen (2,3), Anders McCarthy (4), Weiwei Ding (5), and Frank Despinois (6)

(1) Université de Cergy-Pontoise, Departement de Geosciences et Environnement, Neuville sur Oise, France (geoffroy.mohn@u-cergy.fr), (2) School of Ocean and Earth Sciences, Tongji University, 1239 Siping Road, Shanghai 2000092, China, (3) Geological Survey of Denmark and Greenland, Oestervoldgade 10, 1350, Copenhagen, Denmark, (4) Institute of Earth Sciences, University of Lausanne, Geopolis, Switzerland, (5) The Second Institute of Oceanography State Oceanic Administration, China 36 Baochu Road(North), Hangzhou, 310012, (6) Total SA, CSTJF, Avenue Larribau, 64000 Pau, France

Continental breakup mechanisms are recorded in the Continent-Ocean Transition (COT) at the edge of passive margins hosting the transition from continental extension to localized accretion of oceanic crust. Seismic images of rifted margins unravel large variability of COT structure inferring different types of origin. However, without drilling data, the interplay in time and space between crustal deformation, thinning and magmatism remains unresolved.

In that perspective, the Iberia-Newfoundland and the South China Sea (SCS) margins represent two critical natural laboratories both constrained by scientific drilling since 2017. The two systems have previously been interpreted as magma-poor margins. ODP expeditions (103, 149, 173, 210) determined basement nature, the timing of deformation, stratigraphic record and depositional environments at the COT at Iberia-Newfoundland conjugate margins, and defined the model of magma-poor continental breakup. IODP expeditions 367 and 368 (2017) at the COT of the northern South China margin now provide a new and important dataset supporting more detailed comparison of the developments of the two margins. The SCS results suggest that the Iberia-Newfoundland model, despite some similarities, cannot be directly applied to the SCS margin.

The COT of Iberia-Newfoundland margin shows a wide zone of exhumed subcontinental mantle (>100 km) between crustal plate rupture and accretion of igneous oceanic crust by seafloor spreading implying a large delay between initial rifting and substantial magmatism. Drilling results and seismic data from the SCS margin by contrast suggest that crustal thinning was decoupled from the mantle lithosphere and lead to basaltic magmatism even before crustal plate rupture. Moreover, the transition from the most thinned continental crust to new, largely igneous crust is narrow ($\sim$20 km), altogether suggesting more or less coincident plate rupture of crust and mantle, and rapid onset of seafloor spreading. We address the differences between the two margins systems with regards to the timing of the magmatism relative to the evolution of the rift, the amount and nature of crustal thinning prior to breakup, the extension rate and the pre-rift conditions of the continental lithosphere.