



Thermal record of hyperextended rifted margins: the fossil record of the Pyrenees

Maxime Ducoux, Laurent Jolivet, Romain Augier, Emmanuel Masini, Sylvain Calassou

► To cite this version:

Maxime Ducoux, Laurent Jolivet, Romain Augier, Emmanuel Masini, Sylvain Calassou. Thermal record of hyperextended rifted margins: the fossil record of the Pyrenees. EGU General Assembly 2020, May 2020, Online, France. 10.5194/egusphere-egu2020-20094 . hal-03554404

HAL Id: hal-03554404

<https://hal.science/hal-03554404>

Submitted on 4 Feb 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

EGU2020-20094

<https://doi.org/10.5194/egusphere-egu2020-20094>

EGU General Assembly 2020

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



Thermal record of hyperextended rifted margins: the fossil record of the Pyrenees

Maxime Ducoux¹, Laurent Jolivet², Romain Augier³, Emmanuel Masini¹, and Sylvain Calassou⁴

¹M&U SAS, 3 Rue des Abattoirs, 38120 SAINT-EGREVE, France

²Sorbonne Université, CNRS-INSU, ISTeP UMR 7193, F-75005 Paris, France

³Université d'Orléans, ISTO, UMR 7327, 45071 Orléans, France

⁴Total SA, CSTJF, Avenue Larribau, 64000 Pau, France

The thermal architecture of late rifting to breakup along the deep passive margins is still poorly known. This is mostly because of the limited access to industry drillhole data that, anyway, calibrate topographic highs and rarely the deepest rift domains (and even less the basement). However, unravelling this evolution is a fundamental requirement to define the ultimate exploration potential of these frontier domains. An alternative way to document this thermal evolution is to describe fossil analogues onshore. In this study, we use the fossil hyperextension record of the Pyrenean belt that was sampled by orogenic deformation into the North Pyrenean None and Nappe des Marbres alpine units. Previous studies have shown that the rift came into hyperextension and recorded locally mantle exhumation. These rift domains are associated with a HT-LP metamorphism event that was shown to vary spatially within the rift basin as well as into the basement. In order to restore the late rift thermal architecture of the Pyrenean hyperextended rift, we use a new compilation of Raman Spectroscopy measurements on Carbonaceous Material (RSCM) and Vitrinite Reflectance data. This method allows to record the palaeo-maximum temperatures in the sedimentary basins spatially as well as vertically and can be superposed to geological sections. This method was applied in almost 200 samples collected all along the belt at different stratigraphic level as well as into the Paleozoic basement. When the base of the rift basin is exposed, RSCM Tmax range between 450 and 620°C below a <5km thick sedimentary pile. Western Pyrenees was shown to be an exception as RSCM Tmax are less than 300°C on the outcropping superficial part of the rift basin. However; Vitrinite Reflectance data from wells that are calibrating the deep basin demonstrate that the same thermal intensity was actually reached. These results discard any lateral variation in thermal regime and is pointing out that it is a burial function into a (very)high late rift thermal gradient that largely exceed 100°C/km. Far from being restricted to the Pyrenean case, such a thermal evolution with the same amplitude gradient within the same exhumed mantle domains were documented in the Northern Red Sea example.