



HAL
open science

Thermal evolution from rift to collision: example of the Pyrenean intraplate orogen

Thierry Baudin, Abdeltif Lahfid, Nicolas Saspiturry, Laurent Guillou-Frottier

► To cite this version:

Thierry Baudin, Abdeltif Lahfid, Nicolas Saspiturry, Laurent Guillou-Frottier. Thermal evolution from rift to collision: example of the Pyrenean intraplate orogen. 2019. hal-02329368

HAL Id: hal-02329368

<https://brgm.hal.science/hal-02329368>

Preprint submitted on 23 Oct 2019

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.

Thermal evolution from rift to collision : example of the Pyrenean intraplate orogen

T. Baudin, A. Lahfid, N. Saspiturry ⁽¹⁾, L. Guillou Frottier

BRGM – 3 Avenue C. Guillemin – 45060 Orléans – France

⁽¹⁾ *ENSEGID Bordeaux*

The Pyrenees, at the border between France and Spain constitute a typical example of an intraplate orogen. They result from the closure and inversion of Albian rift basins during the upper Cretaceous to Eocene times. The Albian basins, result from the hyperextension of continental crust which sometimes led to the exhumation of subcontinental mantle and locally accompanied by a High-Temperature and Low-Pressure metamorphism. This metamorphic zone is currently located along the eastern half part of the chain in a narrow and highly deformed band known as Internal Metamorphic Zone (IMZ). The deformation observed in the IMZ is too intense to estimate the initial geometry of the former Albian basins. In this study, we used a new approach based on thermal data acquired by Raman Spectroscopy on Carbonaceous Material. We thus constrain the original dimensions and structure of the former basin. We determined 7 thermal paleogradients, across the only preserved rift-basin (Mauleon basin) using 156 T_{max} measured on boreholes and field samples. We obtained different paleogradient values increasing from proximal to distal rift domains: $\sim 30-36^{\circ}\text{C}/\text{km}$ for proximal margin $37-45^{\circ}\text{C}/\text{km}$ for necking zone and $57-60^{\circ}\text{C}/\text{km}$ for hyper-extended domain. In addition, the present-day thermal gradient, combined with the paleogradients allows us to model the evolution of the thermicity from rifting to collision. Interpolating the highest paleogradients, the temperature at the base of the basin reached 600°C . This is identical to temperature measured in the IZM. This thermal calibration of preserved Mauleon basin allows then to restore the geometry of the stretched IZM basin.