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

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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 Tmax measured on boreholes and field samples. We obtained different paleogradient values increasing from proximal to distal rift domains: ~30-36°C/km for proximal margin 37-45°C/km for necking zone and 57-60°C/km for hyper-extended domain. In addition, the present-day thermal gradient, combined with the paleogradietns allows us to model the evolution of the thermicity from rifting to collision. nterpolating 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.