Geophysical Research Abstracts
Vol. 18, EGU2016-15281, 2016
EGU General Assembly 2016

Salt tectonics and thermal imprint along an inverted passive margin: the Montcaou anticline, Chaînons Béarnais, North Pyrenean Zone

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Resulting from the late Cretaceous-Tertiary Iberia-Eurasia convergence, the building of the Pyrenean belt followed a pre-orogenic period of rifting where the Eurasian margin was extremely stretched. The geometry and the evolution of this paleo-margin, now constituting the North Pyrenean Zone, remain however controversial. Although localized high-temperature deformation and isolated peridotite bodies have been related to crustal thinning, processes controlling the distribution of these hot paleo-temperatures and mantle outcrops are still unknown.

In this study we investigate the possible role of salt tectonics, recognized in the Aquitanian basin and the Pyrenean foreland, on the development of such thermal anomalies and the exhumation of peridotites bodies. We thus performed a detailed structural and thermal characterization of the region of the Montcaou anticline (Chaînon Béarnais, North Pyrenean Zone) where salt structures have been already described. We propose balanced geological cross-sections along this anticline displaying a peridotite body in its core, embedded in Triassic evaporitic deposits. In addition, to assess the thermal imprint occurring in this area, we measured a wide set of paleo-temperature proxies, using RAMAN spectrometry on carbonaceous material.

Intensively folded Jurassic and lower Cretaceous sedimentary formations (with evidences of overturned sedimentary sections), erosional unconformities and strong thickness variations in Urgonian limestones associated to the Montcaou anticline suggest a salt ridge or diapir growth since upper Aptian times. Superimposition of Pyrenees-related compressional deformation then allowed salt structure tilting and propagation of top-to-the-north thrust faults. In this region, the distribution of thermal anomalies (up to 420 °C), as well as occurrences of high-temperature scapolite minerals, seems correlated with these salt structures. Indeed, high thermal conductivity of salt material could enhance the ascent in the upper crust of high temperatures resulting from the extreme crustal stretching.

These results suggest that the early development of salt ridges and diapirs along the stretched Eurasian paleo-margin allowed to localize (1) rift-related thermal anomalies and (2) Pyrenees-related compressional deformation, thus controlling the present-day structuration of the Chaînons Béarnais. In addition, correlation of peridotites and salt occurrences in this area (e.g. the Sarrance anticline) also suggests that salt tectonics may be an efficient process to transport such mantle bodies as isolated rafts.