

## **Fluid circulations and diagenesis of carbonate reservoirs in a foreland basin: impact of the structural evolution (Upper Cretaceous, southern Aquitaine basin, France)**

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Fluids circulating in foreland basins can have strong impacts on petroleum systems and reservoir properties. This applies to the Upper Cretaceous Lacq reservoir of the Aquitaine Basin in southwestern France, located north of the Pyrenean mountain chain. A recent revisiting of the geodynamic model of the Pyrenean and South Aquitaine domain, involving Early Cretaceous hyperextension with mantle exhumation, led to question the impact of deeply sourced hydrothermal fluids on the diagenesis of reservoirs [1-2]. The targeted 650m-deep Lacq oil reservoir offers a suitable case study to document how the evolution of a foreland basin, behind a hyper-extended domain, affected fluid circulation and eventually reservoir diagenesis. Using core samples, we employ petrographic observations, fluid inclusions microthermometry studies coupled with AIT-PIT modelling, isotopic and REE elemental studies, as well as basin modelling to investigate and describe fluid types, P-T evolution and timing of fluids involved in diagenesis. Fluid inclusions data suggest the same thermal regime was established between dolomites and calcites with identical very low salinities. Isotope and REE geochemistry point towards the same modified marine fluids involved in dolomitization and calcite cementation under slightly reducing conditions. Though AIT-PIT and basin modelling, we argue that these fluids are hydrothermal with temperatures at least 40°C hotter than the ambient host rocks. This hydrothermal activity was made possible during the Eocene compression, whereby orogeny-driven fluid-flow squeezed and pushed deeper hot fluids along thrust faults upwards towards the crest of Lacq's anticline.

[1] Vacherat *et al.* (2014) *Earth Planet Science Letters* **408**, 296-306. [2] Salardon *et al.* (2017) *Marine and Petroleum Geology* **80**, 563-586