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Thermal evolution of the syn-tectonic Ainsa-Jaca basin (South Pyrenean Zone). New constraints from a multiproxy approach.

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Constraining the Thermal history of tectonically active basins is of special importance for the petroleum industry. Indeed, the estimation of geothermal gradients and their evolution are basic parameters to understand the tectono-sedimentary evolution of fold-and-thrust belts and associated foreland basins.
In this work, we focus on the turbiditic deposits of the Ainsa-Jaca basin (western part of the South Pyrenean Zone) which consist of an accreted foreland basin composed of Eocene syn-tectonic sediments. The aim is to quantify peak temperatures of the basin that underwent late diagenesis and low-grade metamorphism conditions during the Pyrenean activity. For this, turbiditic rocks and calcite veins (extensional and shear veins) were systematically sampled along a section over a thickness of 4 km through the Monte Perdido unit. In order to constrain the structures observed, sampling was accompanied with a detailed structural analysis.
We have combined three thermometric indicators to evaluate peak temperature of rocks: Raman thermometry on carbonaceous material, fluid inclusion microthermometry on calcite/quartz shear and extensional veins and compositional chlorite thermometry on Fe-chlorite observed in shear veins. The Raman temperatures obtained show variations ranging from <160°C to 270°C. As the quantitative Raman thermometry calibration is limited to 200°C, the peak temperatures belonging at 140-180°C range have been determined comparing Pyrenean Raman spectra to those of Glarus area. Indeed, Raman thermometry method has been calibrated recently using samples collected from Glarus Alps. To check the reliability of the Pyrenean Raman data, we confront Raman temperature to available temperatures estimated in this study using compositional chlorite thermometry and fluid inclusion methods. Temperatures determined by the three different methods converge. This result tends to confirm the efficiency of Raman thermometry in determining the maximum burial temperature of basin infill, taking into account that chlorite thermometry has been tested successfully in samples from the Monte Perdido thrust fault.
Although our results are preliminary, they suggest that the various published peak temperatures of the Ainsa-Jaca basin do not seem so obvious and need to be carefully used. In order to better constrain the thermal history of South Pyrenean Zone, we are currently working on the acquisition of more data.