

A better view of far-field intraplate deformation in northern and eastern France thanks to calcite U-Pb geochronology

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The West European intraplate domain has been affected by convergence between the African and Eurasian plates since the end of the Cretaceous. The periods of deformation and fracturing of the rocks are important to determine for the development of geoengineering projects and the extraction of geothermal resources. However, the age of deformation affecting the Mesozoic sedimentary cover has long been uncertain. The pioneering articles by Ring and Gerdes (2016) and Parrish et al. (2018) paved the way for the investigation of the ages of brittle structures formed in the intraplate domain using calcite U-Pb geochronology. Since then, the temporal framework of the propagation of contractional stress has been reinvestigated within the Pyrenean and Alpine foreland basins, mainly through the dating of syn-kinematic calcite slickenfibres along fault planes (e.g., Bilau et al., 2023; Jullien-Sicre et al., 2025).

Here we present the ages obtained on calcite-cemented brittle structures in eastern France, around the site considered for the geological disposal of radioactive waste (Blaise et al., 2022). We will discuss the advantages and limitations of U-Pb dating of calcite cements in small veins and tension gashes a few hundred microns wide. We will then present and discuss the age of outcropping tectonic structures along the Opal Coast of northern France, where the sedimentary rocks form the eastern edge of the Weald-Boulonnais Basin. We will show that the ages obtained on calcite-cemented brittle structures provide a good estimate of the age of formation of the Weald anticline and therefore of the tectonic inversion of the basin. Finally, we will show an example of the superposition of cementing and fracturing events at the scale of a multi-metre outcrop, where each crystallisation phase has been dated, showing that the succession of fluid flows did not dissolve and recrystallise previous generations of calcite.

References :

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