
Eocene to Oligocene tectonic inheritance in the front range of the Jura fold-and-thrust belt (Avant-Monts, Besançon, France).

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Résumé

The Jura mountains are a classic example of a fold-and-thrust belt formed via thin-skinned deformation during the Alpine convergence from ca. 15 Ma to 4 Ma. The Mesozoic sedimentary cover is detached from the basement along Triassic evaporites. However, recent U-Pb dating of syn-tectonic calcite mineralization (44-48 Ma) and 3D seismic data suggest a more complex polyphased evolution. Reactivation of basement-rooted faults and their propagation into the cover challenges the traditional model of thrusts solely rooted at the base of the sedimentary pile.

The "Avant-Monts" zone, at the front of the Jura near Besançon, is key to understanding the influence of inherited structures. It contains hidden Permian grabens and major crustal faults oriented \sim N070, as well as \sim N010 to N030 faults. This area also coincides with the Rhine-Bresse left-lateral transtensive transfer zone formed during the Oligocene rifting. All these structures may have experienced inversion during later Jura thrusting.

We divided the area in three structural domains : (1) the "La Serre zone" characterized by N070 basement faults and horst-graben geometry; (2) The Corcondray–Miserey fault system, marked by dense N020-030 faults exposing Triassic formations; and (3) The "Chailluz domain", with a more classic fold-and-thrust geometry. All are bounded to the north by the Ognon normal fault.

In-situ LA-ICP-MS U-Pb dating of calcite veins from the N020-030 faults yields consistent late Eocene - early Oligocene ages (32- 38 Ma). Samples near the Ognon fault show two age groups: obtained : Middle Eocene (39–47 Ma) and Early Oligocene (32–35 Ma), matching those from the N020–030 faults. No Miocene-Pliocene were detected. Clumped isotope thermometry indicates formation temperatures of 40–70°C, implying deep-seated, basement-rooted faulting.

We propose that the Avant-Mont finite geometry is largely predetermined by successive Middle Eocene (ca. 40-45 Ma) and Early Oligocene (ca. 32-34 Ma) tectonic events, linked to the far field tectonic effect of Alpine orogeny and the onset of the European Cenozoic Rift System with the development of the Rhine-Bresse transfer zone respectively.

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Mots-Clés: Jura, U/Pb calcite, héritage tectonique