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The role of the Salon-Cavaillon fault in the structural framework of Provence region (SE France)

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The Provence region is located in the South-East France Basin, in the foreland domain of the Pyrenean and the Alpine mountain belts. The structural pattern of Provence is characterized by W-trending ramp anticlines and N- to NE-trending oblique reverse strike-slip faults. It results from the superimposition of Pyrenean (late Cretaceous to Eocene) and Alpine (Miocene to present-day) compressional tectonic regimes. In addition, extensional tectonics affected the region during Oligocene (W to NW-trending 3).
The Salon-Cavaillon strike-slip fault (SCF) separates two main E-trending ridges (Alpilles to the West and Luberon to the East). A structural study has been realized in order to characterize the post-Oligocene deformation of this domain. Field data and balanced cross-sections show that the post-Oligocene deformation drastically differs on both sides of the SCF. The Luberon ridge results from a fault propagation-fold developed on a S-verging ramp. Laterally, the western anticline termination is bended as a drag fold along the SCF. The Alpilles ridge results from a less developed fault propagation fold. Its eastern termination was affected by a rigid counter-clockwise rotation around a vertical axis, driven by a major curved right- lateral fault.
In addition, we integrated gravity data and reprocessed seismic reflection sections to image the sub-surface structures to the West of the SCF at a larger scale. It permits to precise the regional tectonic framework in term of structure and chronology and to detect several hidden E-trending S-verging ramp anticline.
The main shortening episode in Provence occurred during pyreneo-provençal phase from Late Cretaceous to Eocene, with 65 % of the total shortening to the East of the SCF and 95 % to the West. Alpine (Miocene to Present-day) shortening differs drastically on both sides of the SCF (2 km of shortening to the East, for less than 0.4 km to the West). This underlines the major role of the SCF in the transfer of southward alpine deformation within the Provence domain.
The differences between Alpilles and Luberon ridges in term of structural architecture are explained by the deep geometry of their respective ramp, inherited from the pyreneo-provençal tectonics. The regional décollement level is rooted at shallower depth in eastern side of the SCF (at 2-3 km depth), probably in Lower Cretaceous or Upper Jurassic marls, than in the western side, where the fault is rooted in Triassic series (more than 5 km depth). The deep-seated rooting of the structures located to the West of the SCF favoured large scale fault propagation type of folding, whereas shallow-seated rooting to the East favoured small scale fault propagation type of folding and rotational mechanism.
The SCF plays the role of a main transfer zone in Provence, separating two drastically different domains in terms of deformation behaviour. It could be explained by structural and/or lithological inheritance or by a stress field perturbation on both sides of the SCF.