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Paleothermal history of the Digne and Embrunais-Ubaye thrust sheets in the southwestern Alps

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Constraining the thermal history of mountain chains is a major challenge for understanding tectonic mechanisms and timing of deformation of orogens. Whereas many Alpine domains have been studied in this way, very few data exist for the French southern Alps. The sedimentary pile of the Digne thrust sheet is characterized by a major schistosity and an anchizone-type metamorphism up to the Eocene-Oligocene Annot sandstones, accompanied by important fluid circulations. To obtain a regional view of temperature peaks and their distribution in the Digne and Embrunais-Ubaye thrust sheets, we performed a paleo-thermicity analysis by RAMAN spectroscopy on the carbonaceous material (RSCM) in Triassic to Eocene-Oligocene sedimentary rocks. The rocks recorded temperature peaks between 260 and 350°C. The Annot sandstones recorded temperature peak of ~300°C. In contrast, Miocene deposits of the Valensole foreland basin have not recorded major heating. Cross section construction suggests that the recorded high temperatures cannot be only explained by sedimentary burial associated with the tectonic stacking of Embrunais-Ubaye thrust sheets. Sedimentation of the Annot sandstones occurred in a strongly subsident foreland basin with synchronous extensional structures. Recent tomographic models suggest mantle flow related to subduction and/or to the propagation of the front of the orogen. Our new temperature peaks data support such models in the southern Alps. We propose a geodynamic model where the thermal history of the Digne and Embrunais-Ubaye thrust sheets was controlled by an Eocene-Oligocene asthenospheric flow, caused by the mantellic suction of the Appenninic slab-retreat. During this process, the deposition of thick syn-orogenic Eocene-Oligocene strata together with the tectonic covering of the inner thrust sheets detached above Triassic evaporites might have acted as a thermal insulator.

Mots-Clés: Orogen, Southwestern Alps, Paleothermicity, RSCM

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