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Lower Oligocene Alpine geodynamic change: tectonic and sedimentary evidences in the western arc

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The formation of the western Alpine arc started during the earliest Oligocene, after a drastic kinematic change in the collisional regime. (A) Previously, south-southeast dipping subduction of the European lithosphere (including Briançonnais) underneath Adria resulted in an underfilled flexural basin propagating towards the north-northwest on the European foreland, which had already been moderately deformed due to the Iberian microplate motion. This propagation appears consistent with the Africa-Europe relative motion (Rosenbaum et al., 2002). During this early stage of collision, some oceanic units were obducted over the southern part of European continent (Corsica, Briançonnais). (B) From the early Oligocene on, the western Alps kinematics were dominated by lateral (westward) escape of the Internal Alps indenter, whose displacement with anticlockwise rotation progressively formed the arc. The structures of this mature stage of collision crosscut the buildup issued from (A), and its kinematics were probably more driven by local lithospheric forces of the Mediterranean domain (Jolivet et al., 1999) than by Africa-Europe convergence.

The western and southern parts of the western Alpine arc display many evidences for this major syn-collisional change:

- Structural interferences are found at various scales. For example, the circular-shape Pelvoux massif resulted in part from crossed shortening stages (SE-NW and E-W; Dumont et al., 2008). It is located in the footwall of two nappes stacks having propagated northwestwards and west- to southwestwards, respectively. The latter crosscuts the former south of Briançon city.
- Tectonic transport directions are strongly variable both in the external and in the internal zones, but they consistently display anticlockwise rotation through time. The most important changes are found in the southern part of the western Alps, giving birth to a radial distribution propagating into the external zone.
- Instead of beeing gradual, the propagation of syn-orogenic basins changed abruptly in earliest Oligocene times. In the southern Subalpine domain, previously SE-NW gradients (sedimentary transport, onlaps, thickness changes) shifted to westwards or southwestwards ones.

This major syn-collisional change must have occurred in a short time interval bracketed between thrusting of the earliest, gravity-driven nappes over the Paleogene flexural basin, whose youngest sediments are dated as lowermost Oligocene, and eastwards underthrusting of the Pelvoux basement in the footwall of the Internal Alps indenter, having yielded Ar39/Ar40 ages of 31,2 $\pm$ 0,3 Ma to 33,7 $\pm$ 0,2 Ma (Simon-Labric et al. et al., in press). This 32 to 34 Ma old event can be traced all over the Alpine chain through its kinematic, structural, metamorphic and magmatic consequences. It played a key role in the generation of the modern, arcuate shape of the Western Alps.

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