



## **Influence of slab rollback on the curvature of the Western Alps**

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The Western Alps presents a remarkable curvature. Although the formation of the curved geometry along the Western Alps is debated, it may be largely influenced by the Ionian subduction. However, the influence of slab rollback of Ionian subduction on the tectonic evolution of the Western Alps is still poorly known. In particular, constraining mantle deformation beneath the Alpine arc is a particularly important objective of mantle tectonics that may bring a depth extent to the Earth's surface observation. Here, we use a 3D high-resolution petrological and thermo-mechanical numerical model to quantify the relative contribution of oceanic and continental subduction/collision, slab roll-back and tearing to topographic signature and tectonic processes of the Western Alps. Results involving collision and lateral subduction indicate that vigorous asthenospheric flow due to slab roll-back and differential along-strike kinematics may contribute to the rotation and surface strain at collision-subduction transition zones. We argue that protracted trench migration during Ionian subduction might have produced a similar asthenospheric flow. Therefore, we suggest that the tectonics and topographic signature west of Alpine arc are controlled not only by crustal and lithospheric deformation but also by asthenospheric dynamics. We also calculated the strain-induced lattice preferred orientation (LPO) developed in 3D models of subduction/collision and found that in the mantle layer entrained with the downgoing slab the seismic anisotropy is trench-perpendicular, and becomes trench-parallel deeper, where the toroidal flow accommodates slab retreat. All suggests that the anisotropy is likely dominated by sublithospheric mantle flow. We propose that the observed anisotropy pattern in the Western Alps can be explained by recent mantle flow driven by Ionian slab retreat.