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The Western Alps-Northern Apennines tectonic linkage: insights from the Voltri Massif (Ligurian Alps, Italy).

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The Western Alps and the Northern Apennines consist of two opposite-verging orogenic segments that have been progressively arched since the Oligocene. Contrasting models have been proposed through time to interpret their tectonic linkage and these reconstructions have been used to support different geodynamic scenarios for the subduction-related orogenic construction in the region. The eclogite-bearing metamorphic core of the Voltri Massif, located at the junction between the Western Alps and Northern Apennines, has been always claimed as a key area to understand such a tectonic linkage. In this work we present new structural, petrological and geochronological data from the Voltri Massif, providing elements for a reconsideration of the orogenic history of the Alps-Apennines system. The revision of the structural architecture of the Voltri Massif allow the reconnaissance of a major episode of post-orogenic, top-to-the-west extensional detachment tectonics that (i) caused tectonic elision of the original nappe stack and (ii) accompanied the late-stage exhumation of the high-pressure (HP) units (eclogitic-bearing serpentinites and enveloping metasediments). Quantitative thermobarometric estimates on the HP-units document (i) a nearly isothermal decompressional path, and (ii) the retrograde, exhumation-related metamorphic fabric to be equilibrated within the HP-greenschist facies metamorphic conditions. The SHRIMP U-Pb dating method was carried out on zircon and titanite grains separated both from the eclogites and the metasediments. Zircons preserve a magmatic zoning pattern in the core domains that provide Jurassic ages ($\sim$150-160 Ma), interpreted as the age of the crystallisation of the magmatic protolith. On the other hand, the REE patterns show that both the zircon rim domains and the titanite

grains grew during the Alpine metamorphism, with ages of 33.8 $\pm$ 0.8 Ma and 29 $\pm$ 5 Ma, respectively. Despite the large error affecting the titanite ages, micro-textural relationships documenting the syn-kinematic growth of titanite relative to the retrogressive greenschist fabric development allow us to consider the obtained ages to date the extension-related exhumation of the Voltri Massif metamorphic core. Based on the age coincidence between the onset of extensional tectonics in the Voltri Massif and the outward migration of the Alpine and the Apennine thrust fronts, we infer that (i) extensional detachment tectonics in the Voltri Massif was the consequence of the space created at the rear of the two migrating orogenic belts, and (ii) an extensional domain marks the Alps-Apennines junction tectonic zone.