



The temporal evolution of the Cenozoic Southalpine magmatic activity in North-East Italy: evidence from $^{40}\text{Ar}/^{39}\text{Ar}$ geochronology

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tarting in the early Cretaceous, a change in Africa and Europe plate kinematics led to the closure of the Tethys ocean and to the continent-continent collision that triggered the Alpine orogeny. During the late phases of orogenesis (Eocene-Miocene) significant magmatic activity affected the Southalpine domain, particularly the effusive to sub-volcanic igneous activity of the so-called “Veneto Volcanic Province” (or VVP). In the VVP, five main volcanic districts can be defined from north-west to south-east: Val d’Adige, Lessini Mts., Marosticano, Berici Hills, and Euganean Hills, characterized by relatively undifferentiated lava, ranging from mela-nephelinites to quartz-normative tholeiites (Beccaluva et al., 2007). Only in the Euganean Hills volcanic and hypabyssal rocks range from subordinate basalts to volumetrically dominant acidic types, mostly quartz-trachytes and rhyolites (Milani et al., 1999). Here we report the first $^{40}\text{Ar}/^{39}\text{Ar}$ radioisotopic ages for the VVP aiming at i) reconstructing the temporal evolution of the Cenozoic Southalpine magmatism and ii) shedding light on the Adria/Europe geodynamic relationships.

The first eruptions occurred in the late Paleocene in the western districts where the magmatism was widespread also during the Eocene (Val d’Adige: 41.98 ± 0.20 Ma – 40.73 ± 0.24 Ma; Lessini Mts: 41.21 ± 0.11 Ma – 38.73 ± 0.44 Ma). During the early Oligocene, both basic and acidic eruptions took place in the Euganean Hills in a time-span possibly shorter than 0.2 Ma (32.35 ± 0.09 Ma – 32.09 ± 0.29 Ma). Finally, the youngest volcanic products were erupted in the Marosticano district during the early Miocene (~22 Ma).

This magmatism has been generally related to the break-off of the subducted Tethyan oceanic slab and upwelling of plume-like mantle diapirs through a slab window after the continental collision, in the late Cretaceous. Alternatively, it may be envisaged that the mantle material beneath the subducting slab escaped laterally and upwelled frontally producing a vigorous toroidal/poloidal flow (i.e. horizontal and vertical rotational vortex-like components of mantle motion), which induced melting in the mantle wedge beneath the VVP and triggered the magmatism.

References:

- Beccaluva, L., et al., 2007. GSA Spec P 418, 131-152.
Milani, L., et al., 1999. European Journal of Mineralogy 11, 379-399.