

New evidence of Early Triassic volcanism in the southern Alps: basic dykes in Valsugana (Italy)

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The southern Alps in the Province of Trento (Italy) are constituted by a Paleozoic crystalline basement covered by Mesozoic sedimentary units. Volcanism is also represented, as testified by Permian (calcalkaline products, mainly rhyolitic in composition), Triassic (basic to intermediate shoshonitic products) and Paleogene (tholeiitic and Na-alkaline basalts) episodes. In this framework, the updated 1:50,000 geological map of Trento revealed in Valsugana (a lateral valley respect to the main Adige valley) the presence of a series of basic dykes crosscutting the crystalline basement, ignored by the previous researches. These dykes, outcropping close to the towns of Pergine and Levico Terme, could represent evidence for an independent volcanic episode so far overlooked in the literature. To discover the nature of these dykes 10 whole-rock samples have been analyzed by XRF and ICP-MS to have a major and trace element characterization, as well by TIMS for the analysis of Sr-Nd-Pb isotopes. Plotted in a Total Alkali Silica (TAS) diagram, samples include subalkaline and transitional products, that according to the K₂O vs SiO₂ diagram pertain to the calcalkaline and shoshonite series, respectively. The incompatible trace element distribution invariably displays the negative anomalies in High Field Strength Elements (HFSE) typical of subduction related magmas. The Sr-Nd-Pb isotopic composition (carried out on leached whole rock powders) displays a marked crustal signature, with ⁸⁷Sr/⁸⁶Sr 0.7093-0.7464, ¹⁴³Nd/¹⁴⁴Nd between 0.5122-0.5121, ²⁰⁶Pb/²⁰⁴Pb 18.6-19.6, ²⁰⁷Pb/²⁰⁴Pb 15.6-15.7, ²⁰⁸Pb/²⁰⁴Pb 38.9-40.5. Preliminary dating of two samples, performed by ActLabs, gives K-Ar ages of 236±6 and 251±7 Ma. On the whole, considering the observed spatial location, the timing, and the geochemical signature, we propose that the studied dykes represent a transition between the Permian and the Triassic volcanism that are known in neighbouring sectors of the southern Alps, as result of post-collisional magmatism following the end of the Variscan orogenic cycle. On the other hand, a possible relation between these dykes and the Cenozoic (Alpine) tectono-magmatic phases (an hypothesis proposed in the notes of the geological map) seems to be unwarranted.