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Geochemistry and geochronology of alkaline dykes from the Finero Phlogopite Peridotite (Ivrea-Verbano Zone): insights into the Triassic-Jurassic tectono-magmatic events of the Southern Alps

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The Ivrea-Verbano Zone (IVZ, westernmost sector of the Southern Alps) represents a unique opportunity to investigate the Paleozoic to Mesozoic geodynamic evolution of the Gondwana and Laurasia boundary from the perspective of the lower continental crust. Only recently, the petrochemical record of Triassic-Jurassic magmatism has been recognized. It mainly affected the northernmost tip, the Finero Complex, where the continental crust was tectonically thinned before opening of Alpine Tethys. However, the Mesozoic magmatism in the Finero Complex is still poorly-constrained. Firstly, its extent is largely unknown, because the mantle and crustal intrusives were already enriched by Paleozoic processes. Secondly, Mesozoic melts migration started when the Finero Complex was still placed at P-T conditions typical of a continental crust-mantle transition (1 GPa): this has promoted the reopening of the geochronological clocks in both Paleozoic and Mesozoic rocks, which usually provides wide time intervals. Lastly, the finding of Mesozoic magmatism as composite veins/pods and metasomatised layers has not allowed an exhaustive reconstruction of the primitive melts geochemistry. To place further constraints on such issue, a new dyke swarm cropping out in the Finero Phlogopite Peridotite mantle unit has been investigated. Dykes usually cut at high angle the mantle foliation and are up to 60 cm thick. They are composed by coarse-grained hornblendite to anorthosite, both phlogopite/biotite-bearing. Many dykes are composite, showing variable proportions of hornblendite and anorthosite. In places, the dyke swam was affected by volatiles overpressure as late magmatic stage, which produced plastic flow and development of a porphyroclastic structure by deformation of the early cumulates, with widespread segregation of a fine-grained mica matrix.

Dykes mainly consist of pargasite, phlogopite/biotite, albite (An 8-10), in association with apatite, monazite, ilmenite, zircon, Nb-rich oxides, carbonates. Enrichments in Fe (amphibole and biotite) and Na (plagioclase) suggest segregation from evolved melts, strongly enriched in H_2O, P, C. The large LILE and LREE contents in amphiboles, sometimes associated to high Nb, Ta, Zr and Hf concentrations, as well as the mineral assemblage, support an alkaline affinity of the melts. The strongly positive εHf_t (+10) of zircons and the isotopic Sr composition of amphiboles (0.7042) point

to a derivation of the melts from mildly enriched sources, possibly located at the crust-mantle interface.

Zircons from anorthosite layers are mostly anhedral fragments. They show homogenous internal structure or sector zoning. Concordant $^{206}Pb/^{238}U$ zircon ages vary from 221 ± 9 Ma to 192 ± 8 Ma. The results of this study confirm that mantle input to the Southern Alps magmatism was of alkaline affinity from Norian to Sinemurian. A widespread fluids circulation induced by such magmatism at high P-T conditions was likely the main cause of the diffuse geochronological reset towards Mesozoic ages of the northern IVZ.