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Accessory mineral record of hybridization processes in the Ivrea-Verbano Zone lower crust.

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The contributions of mantle and/or crustal components to granitic magmas are still elusive[1], since access to the deep magma factories is limited. The crustal section in the Ivrea-Verbano Zone (IVZ) represents an exceptional opportunity to investigate these processes. In the IVZ, upper crustal Permian granites are described as hybrids between the Mafic Complex (MC) and lower crustal rocks [2],[3]. However, this is only based on Sr-Nd bulk-rock data on both components (MC and crustal rocks) and the end-product (granites). Moreover, the location and mechanisms where hybridization occur, and the proportions of the components involved are still debated.

In this study, we have investigated the lower crustal magmatic sources of the IVZ using a combination of field mapping and petrology with dating, elemental and isotopic analysis on accessory minerals (apatite and zircon), both from heavy mineral separates and thin sections. These data will be complemented with Electron Backscatter Diffraction (EBSD) analysis.

In the southern portion of the MC, gabbros and charnockites present intermingling textures. Paragneiss occur as highly deformed lenses within the charnockite-gabbro package. Whole rock major elements data show that charnockites are intermediate in composition between the MC and the granites. Accessory mineral systematics show that charnockite and gabbro are comparable in terms of textures, dates and chemical-isotopic composition, yet with charnockite data trending towards the crustal component. Zircons in both gabbro and charnockite exhibit complex core-rim relationships, indicating either a potentially inherited component; or a long-lived history of hybridization, crystal accumulation and/or re-equilibration, as suggested by the development of zircon rims preferentially along ilmenite crystals. Preliminary results at the lower crust section suggest that interaction between mantle-derived magma from the Mafic Complex and crustal melts occur in a hybridization zone, that produces charnockitic rocks. Instead of crustal anatectic product, charnockites may therefore represent the “missing” link between the lower crustal rocks and the granites at the upper crust.

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