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In search of the origin of quartz-diorites and tonalites in post-collisional batholiths (Capo Vaticano Promontory, Calabria-Peloritani Orogen)

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Quartz diorites and tonalites make up the deepest portion of the ca.13 km-thick late Variscan Serre Batholith, cropping out in the Serre Massif and Capo Vaticano Promontory (Calabria, southern Italy). Quartz diorites and tonalites were emplaced in metapelitic migmatites, with transitional contacts characterized by granitoids with large amounts of metapelitic enclaves and evidence of mingling/mixing with anatectic melt. These rocks pass upward to porphyritic two-mica granodiorites and granites; the rare visible contacts are sharp and, locally, the more mafic granitoids appear strongly disaggregated by the intrusion of the felsic magmas. Nevertheless, original space relationships between the different rock types are rarely preserved also due to Cenozoic to recent intense faulting. Quartz diorites and tonalites typically contain mafic microgranular enclaves of quartz-monzodioritic composition, decreasing in abundance and size toward the contact with the overlying two-mica granitoids; enclaves and host granitoids are characterized by a syn-magmatic foliation, becoming less marked in the upper portion of the quartz diorite-tonalite unit. Studied granitoids are magnesian, and dominantly calcic and weakly peraluminous. On Harker diagrams Al_2O_3, TiO_2, MgO, FeOt, CaO, P_2O_5, V, Sr and Y show negative correlation with silica, whereas K_2O, Rb, Th, LREE and ASI are positively correlated; trends for Na_2O, Ba and Zr are ill-defined. Trends observed in variation diagrams, including log(V) vs. log(Rb) and log(Sr) vs. log(Rb) diagrams, indicate possible relationships among the studied rocks by fractional crystallization of plagioclase, amphibole and biotite. Major element modeling reproduces the observed chemical variations by 30 % fractionation of an assemblage composed by plagioclase (51 wt.%), biotite (27 wt%) and amphibole (22 wt%). Comparison with composition of melts produced by experimental melting of different crustal rocks suggests a possible derivation of the parent magma by partial melting of metabasaltic source rocks.