Making unusual granites: just add water under or after cooking

P. FIANNACCA*, R. CIRRINCIONE, A. PEZZINO

Dipartimento di Scienze Biologiche, Geologiche e Ambientali Università di Catania, Corso Italia 57, 95129 Catania (*correspondence: pfianna@unict.it)

Granitoid rocks of varied and somewhat unusual features make up a small late Variscan plutonic complex (c. 20 km^2) in the Peloritani Mountains, southern Italy. Granitoids are intruded in upper amphibolite facies paragneisses and consist of dominant trondhjemites and minor granites ranging in composition from monzogranite to alkali feldspar granite. Trondhjemites vary in turn from s.s. trondhjemites, including high-Na types, to low-Ca trondhjemites, comprising high-Na types as well as high-K varieties transitional to granites. Granites and low-Ca trondhjemites have an equigranular medium-coarse grain size, while s.s. trondhjemites are coarse to very coarse grained, with plagioclase commonly exceeding 3 cm in lenght. Granitoids are on the whole weakly to strongly peraluminous, with the high-Na varieties tending to be less peraluminous than the other rock types. Fairly radiogenic initial $^{87}Sr/^{86}Sr$ ratios and highly negative εNd values for all the granitoids point to similar magma sources, with dominant contributions from old crustal rocks, such as the latest Precambrian paragneisses which crop out extensively across the Peloritani Mountains. Mm-sized metapelitic enclaves documenting Ms-dehydration melting occur in all the granitoid rocks, supporting a common genetic link with paragneiss-like sources. Major and trace elements features confirm possible magmatic relationships between low-Ca trondhjemites and granites, whereas s.s. trondhjemites appear clearly unrelated to the low-Ca granitoids. Compositions of s.s. trondhjemites are similar to those of melts produced by H_2O-saturated melting of greywackes, while low-Ca trondhjemites and granites have features consistent with derivation by partial melting of Bt-Ms schists under water-present and water-absent conditions, respectively. The high-Na granitoids have Na_2O contents mostly higher than 6 wt. %, which are rarely attained through magmatic processes in granite rocks. Evidence of subsolidus replacement of magmatic K-feldspar by secondary sodic plagioclase are in fact diffuse in all rock types, appearing in some cases to have turned original granites in Na-rich granodiorites and trondhjemites. This implies that water can play a double role in producing trondhjemitic rocks, by either favouring melting of plagioclase over mica at the magma source, or crystallizing secondary plagioclase at expense of K-feldspar by infiltration metasomatism after magma emplacement and solidification.