3) South Eastern Sulcis (Teuladese and minor occurrences)

The more important mineralization related to skarn in this region are contained in the carbonate intercalations (Alternanze) of the Nebida Fm, metamorphosed extensively by intruding granites. These are two types of skarnized and mineralized carbonate bodies: the stratigraphically lower ones (Filone Morettu and Sideru Boi), beloging to the Matoppa Mbr, and the upper ones. in the P.ta Manna Mbr, shortly below the stratigraphic contact with the Gonnesa Fm. Considering the different lithologies of the carbonates, it seems quite clear that higher concentrations of metamorphic and metallic minerals are related to limestones with flaser texture. The metamorphic paragenesis is quite similar to the more northrn areas: Ca-garnet, epidote, tremolite, sericite, chlorite, quartz, fluorite, calcite. The ore minerals are variable in grade and ratio, but the most abundant are: pyrite, sphalerite, galena, magnetite, pyrrotite, marcasite, chalcopyrite. There are traces of sulphosalts, mackinavite, bornite and haematite. Generally in the Alternanze we could speak more about calcic hornfels than skarns, with certain exceptions as Sideru Boi. The latter can be classified as metamorphic skarns.

In conclusion, in the investigated areas are present and mineralized only the exoskarns, with the prevalence of metamorphic skarns (along stratigraphic contacts) on vein skarns and hornfels. The temperatures of the sharns range from 600°C (wollastonite eql.T) to about 400°C (hydrothermal phase with depostion of epidote and chloritization).

The bulk of the ore minerals is related to the hydrothermal phase, through a remobilization of metals contained in the Lower Paleozoic stratabound deposits, with a minor contribution of granofile elements from the intruding magmatic bodies.

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AURISICCHIO C.*, FIORAVANTI C.**, GRUBESSI O.**, ZANAZZI P.F.*** - *Reappraisal of crystal-chemistry of beryl*

The complex crystal-chemistry of beryl has been revisited on the basis of new chemical analyses and X-ray structural refinements on samples with different origins and different compositions.

The results show that the main substitutions concern Al in the octahedral sites, and Be in the tetrahedral sites, by divalent and Li ions respectively: both the substitutions are balanced by the entry of Na^+, K^+, Rb^+, Cs^+ cations into the 2a position whithin the channels (namely between the six-membered Si rings), whereas the 2b position (at the center of the ring) is preferentially occupied by water molecules. The extent of the Al and Be substitution is limited by the electrostatic unbalance arising from the bond strenght deficiency on 0 (2).

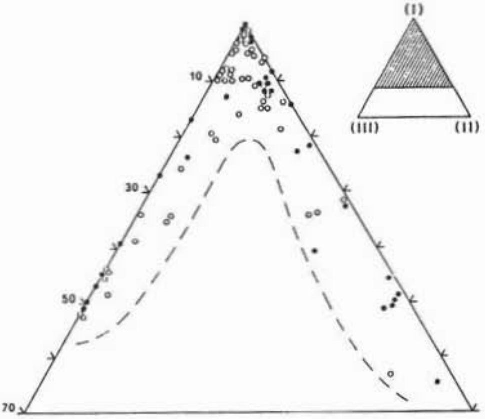

Fig. 1

The effect of these substitutions on the lattice parameters (particularly on the c/a ratio) allows the definition of different families of beryls: the «octahedral» beryls, i.e. beryls where Al-Me^{2+} represents the main isomorphous replacement, are characterized by c/a values in the range 0.991-0.996; the «tetrahedral» beryls, where Be-Li is the main substitution, with c/a values in the range 0.999-1.003; the «normal» beryls, with c/a ratios between 0.997-0.998, including the beryls where the two substitutions occur together, though to a limited extent. A gap of miscibility exists between «octahedral» and «tetrahedral» beryls, as shown in Fig. 1, where several analyses of beryls are plotted in a ternary diagram with the three end-members I, II and III (normal, tetrahedral an octahedral beryls, respectively).

The formation of beryls belonging to either series has been ascribed to the chemical constraints of the environment, as the bulk rock chemistry and the fluid phase composition, and to the physical-chemical conditions during the mineral growth.

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BARBAGELATA S.*, MESSIGA B.**, PICCARDO G.B.*, VANNUCCI R.** - *Proterozoic post-orogenic plutonism in SE Greenland: trace element evidence for mantle-crust interaction*

In the Angmagassalik District (Se-Greenland) post-tectonic plutons represent the last event in Nagssugtoquidian belt and follow the second major phase of deformation 1900 M.y.old.

The investigated intrusive complex is mainly represented by a stratigraphic lowermost mafic-ultramafic rock sequence (peridotites, norites, gabbro-norites) and an uppermost intermediate-acidic sequence

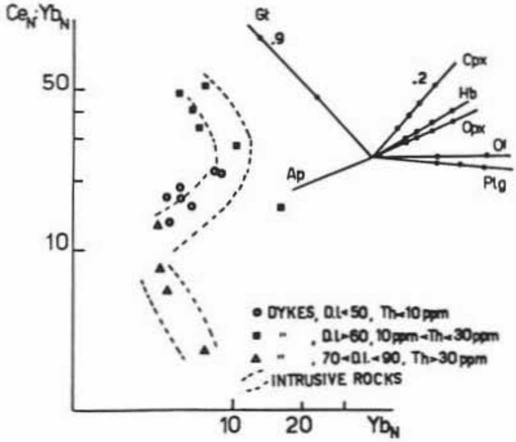

Fig. 1

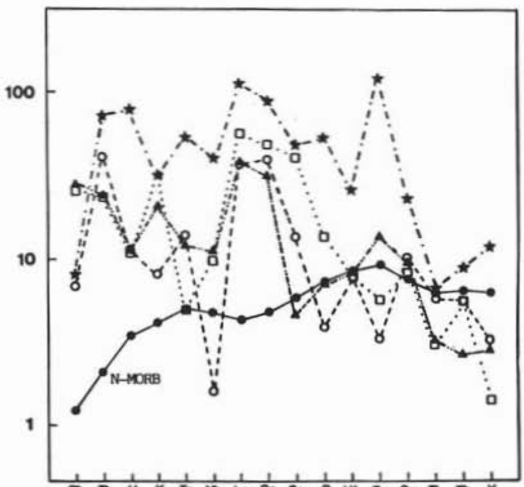

Fig. 2

(monzonites to granites): the latter one locally shows intrusive contacts towards the basal sequence and abundant magmatic stoping.

Dykes compositionally ranging from picrite to alkaline granite and aplite veins crosscut both the sequences.

Mineral, major and trace element chemistry suggest that intrusive rocks and dykes may be referred to the same petrogenetic processes (Fig. 1):

— ultramafic-mafic rocks and dykes were derived by crystal fractionation starting from a magnesium-rich, bronzite-picrite magma;
— most of diorite-granite rock sequence was produced by partial melting of amphibolitic lower crust leaving some garnet in the residue.

Subordinate mixing processes and fluid activity played a significant role.

HYGE distribution of most primary melts, showing (Fig. 2) LILE enrichment without Ta and Nb enrichment, is indicative of strong similarity with present day calcalkaline or island arc basalts.

The petrogenesis is highly complex suggesting contemporaneous presence of two different magma types either from mantle and deep crust.

The mantel derived magmas should have provide the high heat flow responsible of the melting on lower crust.

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Barbarin B.* - *Role of magma mixing in the evolution of mafic magmatic enclaves and enclosing granitoids of the central Serra Nevada, California*

From the petrographic, modal, mineralogical, chemical, and isotopic data obtained from five plutons in the central Sierra Nevada, a general model based on magma mixing is proposed for the origin and evolution of mafic magmatic enclaved, eclonsing granitoids, and associated mafic rocks.

A mantle-derived mafic component mixes with a felsic crustal component to create hybrid magmas, which then fractionate to produce the different facies of the granitoid plutons. When contrasting rheological conditions inhibit mixing of the mafic and felsic components, mingling occurs and leads to the formation of mafic magmatic enclave. Late surges of mafic magma mix with evolved granitic magmas to produce the hybrid magma of the mafic dikes. Coarse-grained mafic-rich rocks represent mechanical segregations of mafic minerals and accessory phases from evolved granitic magmas. Mafic magmatic enclaves are commonly included in these segregations. Similar segregations can also be derived from the mafic magma and produce enclaves unusually rich in mafic minerals.

Diffusive processes, which are dominant during the later stages of crystallization, induce uniform mineral composition, isotopic equilibration, and similar chemical affinities of the enclaves, host granitoids, and mafic-rich rocks. However, mafic dikes emplaced during late stages of crystallization of the granitoid magmas and which cut across foliations, have not equilibrated with the other rocks. Although similarities which finally appear between the various types of rocks mainly come from these diffusive preocesses, they could also be interpreted as due to the two initial components being cogenetic.

This model is consistent with most available data for the central Sierra Nevada and with data from calc-alkaline granitoid plutons elsewhere. Variations from one pluton to another are primarily related to proportions of the two components involved in the mixing process and to the relative efficiency of the different mechanisms involved in a magma mixing event. The exchange processes are of several types and range from mixing with homogenization of large volumes of magmas, through mingling to local mixing around small enclaves. The different processes are effective at various stages during magmatic evolution; their appearance and succession are chiefly related to the relative volumes of the two components, to their compositions, and to their physical properties (e.g. temperature and viscosity). During crystallization of the magmas, mixing mechanisms change because these factors vary.

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BARBARIN B.* - *Use of zircon typology to solve some granite problems in the Massif Central (France)*

Use of the zircon morphology method (PUPIN 1976 & 1980) facilitates solution of several kinds of regional problems related to the petrology of granites in the Massif Central. This method, based on the relative development of the main faces of zircon crystal, is simple, fast, and relatively economic.

The zircon method commonly reveals a determinant argument or represents an additional constraint in comparing granites exposed in the same area. Thus, this method permitted distinction between the Margeride porphyritic monzogranite with its various facies and the other porphyroid granitoids surrounding the Margeride laccolith (LABOUE, 1982). Zircon morphology also indicates that the enclaves of porphyritic granitoids enclosed in the nearby and younger Velay pluton do not represent fragments of the Margeride porphyritic monzogranite, but of other, distinct porphyritic granitoids (PUPIN, 1976; DE MONTRAVEL, 1987). In another case, this method showed the identity of two plutons displaced by a major thrust fault (the Gelles and the Meymac porphyroid monzogranites displaced by the Sillon Houllier; MEZURE & NÉGRONI 1983).

Furthermore, study of many populations from the same pluton gives an indication of temperature and composition changes in the magma during crystallization. In the Hermitage two-mica granite (Forez), similar variations are obtained from the populations of the contrasted facies of the pluton and from the successive zones visible in single crystals (BARBARIN, 1983).

Study of zircons can also provide a general outline of the magmatism in a large granitic area. Thus, typologic study of zircon populations from the Forez granitic horts allows the different plutons to be grouped into two main types, one formed of hybrid granites and the other formed of crustal granites (BARBARIN, 1983 & 1984).

These data indicate that the zircon morphology method is a convenient and useful tool in granite petrology. It complements the petrographic and geochemical methods, and often plays a fundamental role in either relating and discriminating between plutons. It can be applied to a few granite plutons or to a larger area such as the Forez Mountain or the entire Massif Central (PUPIN, 1985).

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BATINI F.*, BERTINI G.*, DINI I.*, GIANELLI G.**, NICOLICH R.***, PANDELI E.*, PUXEDDU M.** - *Geological model of the Monte Amiata volcano-plutonic system (Italy)*

Geological, geophysical and petrologic data point to the presence of a granitic body below geothermal region of Monte Amiata (Central Italy).

1) Geological data: a broad area of about 900-1300 km^2 centered on Monte Amiata volcano shows a remarkable regional uplift of the Pliocene shore

Fig. 1. 1) Quaternary Volcanics. 2) Lower Pliocene sediments. 3) Upper Miocene sediments. 4) Ligurid flysch complex. 5) Tuscan Nappe. 6) Minium uplift of Mio-pliocene sediments. 7) Gravimetric profiles.

Fig. 2

sediments up to 950 m (Fig. 1). The extend of the area, with major axes of 25-30 km (NW-SE) and 45-50 km (NE-SW), is consistent with the emplacement of a large intrusive body in shallow levels of the crust. The uplift begum during lower Pliocene, with a prograde regression