TECTONO-METAMORPHIC EVOLUTION OF CRYSTALLINE BASEMENT CROPPING OUT IN THE PALIZZI MARINA AREA (ASPROMONTE, CALABRIA)

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Palizzi Marina in the Southern Aspromonte (Calabria) is an area of a great importance for the reconstruction of the Variscan tectono-metamorphic evolution of the Calabrian continental crust. This area is, in fact, characterized by a well exposition of the intrusive contact between the metamorphic basement and the late Variscan granites.

The continental crustal section exposed in Palizzi Marina is composed by paragneisses and micaschists with intercalations of amphibolic gneisses and augen gneisses. Paragneisses and micaschists are overlain by fine-grained phyllites of very low metamorphic grade.

According to Bonardi *et al.* (1984) two distinct tectonic units outcrop in Palizzi Marina area: the Stilo Unit (that consists of paragneisses, micaschists and phyllites) and the Aspromonte Unit (that is composed of paragneisses, micaschists, intercalation of amphibolic gneisses and augen gneisses).

Field, petrographic and microstructural observations in this work suggest that the paragneisses, micaschists, intercalations of amphibolic gneisses and augen gneisses of the Aspromonte Unit *sensu* Bonardi *et al.* (1984) and the paragneisses and micaschists of the Stilo Unit *sensu* Bonardi *et al.* (1984) are marked by similar structures and metamorphic characters; this permits to consider all these rocks as belonging, together with augen gneisses, to an unique unit: the Aspromonte Unit. This conclusion is also proved by the intrusion of late Variscan granitoids in metamorphic rocks of Aspromonte Unit and Stilo Unit *sensu* Bonardi *et al.* (1984). In this work only the phyllites are considered as a pertaining to the so-called Stilo Unit.

The structural, petrographic, thermobaric and geochronologic studies indicated that the metamorphic rocks of Aspromonte Unit recorded a clockwise P-T-t path (Ky-Sil-And), that consists of a prograde evolution followed by isothermal decompression and cooling (Fig. 1).

During the prograde stage, developed in a compressive regime, the rocks underwent two deformative phases, associated with metamorphic crystallization (D_1-M_1 and D_2-M_2). The S_1 foliation, characterized by alternating quartz-feldspar-rich and mica-rich layers, developed during the D_1-M_1 phase. The M_1 mineral assemblage includes kyanite (Fig. 2), biotite, muscovite and plagioclase that display an oblique orientation to the main S_2 foliation. It was not possible to establish the T and P conditions during this phase, because of the lack of suitable mineralogical phases. The S_1 crenulation and the formation of the S_2 axial foliation occurred during the D_2-M_2 phase. Based on microstructural observations, kyanite may have been still stable during this phase. Moreover, the D_2-M_2 mineral assemblage also includes garnet (central and intermediate zone of the crystal) and staurolite porphyroblasts (besides biotite, muscovite and plagioclase that display a parallel orientation to the S_2 foliation). Geothermobarometric estimates of the D_2-M_2 assemblage, gave conditions of T = 450-490°C and P = 0.55-0.63 GPa. Electron microprobe chemical dating of monazite crystals aligned along the main S_2 foliation plane, in a garnet-biotite-bearing paragneiss, yielded an age of 336±14 Ma (±2σ) for the development of S_2 foliation. LA-ICP-MS analyses on zircons, from an amphibolic gneiss interlayered in the paragneisses, gave a concordant age 324±14 Ma (±2σ) in agreement with results of electron microprobe chemical

dating of monazite. These ages are related to a Variscan tectono-metamorphic event and prove a geochronological similarity of the Calabrian basement with the European Variscides.

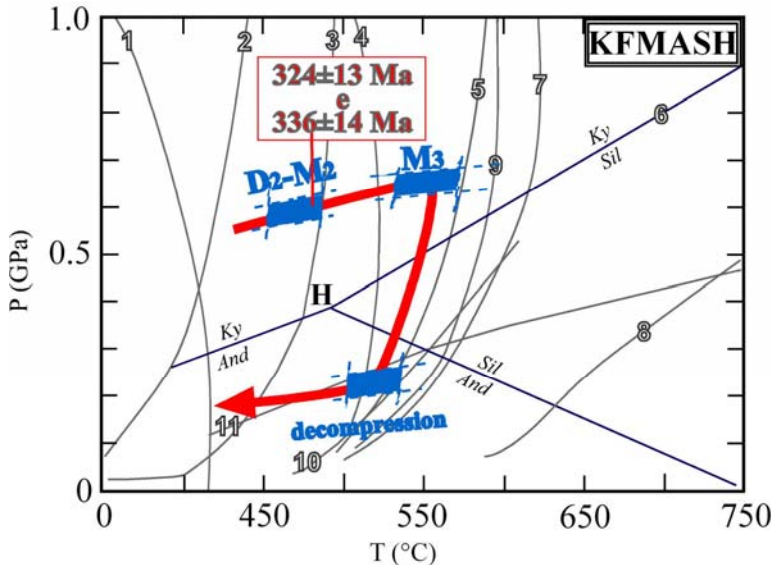

Fig. 1 – P-T-t path for continental crust cropping out in the Palizzi Marina area. P and T estimates has been obtained by conventional thermobarometry. Ages (±2σ) along the prograde path correspond to determinations on monazite and zircon crystals. The figure indicate the assumed reactions for the reconstruction of the tectono-metamorfic evolution: 1) Kfs + Chl = Bt + Ms + Qtz + H_2O; 2) Prl = Ky + Qtz + H_2O; 3) Chl + Ms = Ky + Bt + Qtz + H_2O; 4) Chl + Ms + Qtz = Grt + Bt + H_2O; 5) Chl + Ms = St + Bt + Qtz + H_2O; 6) Ky = Sil; 7) St + Chl + Ms + Qtz = Bt + And + H_2O; 8) Bt + And + Qtz + Pl = Crd + Grt + Kfs + H_2O; 9) Ms + Bt + Qtz = Grt + Kfs + H_2O; 10) Crd + Bt + H_2O = Chl + Ms + 2Qtz; 11) Crd + Ms = And + Bt + Qtz.

The M_3 phase (static crystallization) followed the D_2-M_2 stage and was characterized by the crystallization of garnet (rim) together with idioblastic staurolite (besides randomly oriented biotite, muscovite, plagioclase). This mineral assemblage is related to a peak metamorphic conditions at T = 530-560°C and P = 0.65-0.67 GPa.

The prograde path is well constrained by the presence of garnet, staurolite and kyanite relics. It should be noted that the occurrence of kyanite, developed during the Variscan prograde metamorphism, has never been reported before in the Aspromonte area.

After the prograde phase, the crystallization of sillimanite first, followed by andalusite and cordierite, occurred. For this crystallization event T = 500-540°C and P = 0.20-0.24 GPa have been estimated. This implies that studied rocks underwent a nearly isothermal decompression after the peak conditions.

Following the decompression, a cooling in greenschist facies conditions is suggested by reaction texture such as the Ms-corona around porfyroblastic staurolite and by crystallization of chlorite after biotite, of sericite and epidote as an alteration product of plagioclase.

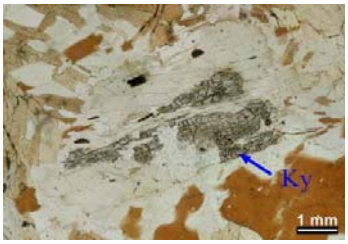

Fig. 2 – Thin section micrograph (natural light) showing a kyanite relic in a staurolite-bearing micaschist. The kyanite has been linked to Variscan prograde metamorphism.

Finally, the rocks are refolded during the D_3 phase without metamorphic crystallization.

REFERENCES

Bonardi, G., Messina, A., Perrone, V., Russo, S., Zuppetta, A. (1984): L'Unità di Stilo nel settore meridionale dell'Arco calabro-peloritano. *Boll. Soc. Geol. It.*, **103**, 279-309.