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Sulfide-Sulfate Mineralizations in Verzino Area (Crotone Basin, Southern Italy): New insights on localized hydrothermal fluid circulations and their relationship with tectonics.

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In this early stage of the work we present a preliminary study of hydrothermal mineralizations found in Verzino locality, Crotone Basin, Southern Appennines, (Calabria, Italy).
Both geochemical and petrographic investigations were developed with the aim of understanding the genesis of the sulfide-sulfate associations present in the "Argille Marnose del Ponda" formation, deepening their relationship with fluids circulation.
These mineralizations have been recognized only in two "Calanchi" morphostructures - Badlands like morphology developed by the differential erosional pattern of the "Argille Marnose del Ponda" fm. - and constituting the northwestern flank of a little valley evolved in the Miocene sedimentary sequence from "Conglomerato di S.Nicola" fm. to "Evaporiti Superiori" fm. The mineralizations are distributed along isooriented centimetric veins (with mean direction of N120) and in nodules diffused close to the veins.
These hydrothermal mineralizations are constituted by an associations of Pyrite spherical nodules (millimetric to centimetric in radius with occurrences of well developed octahedral habit single crystals), sulphate crystals (Gypsum, Jarosite, NatroJarosite), Oxides (Goethite mainly), millimetric veins of Barite and micrometric Ankerite specimens.
The data (mineral habits, semiquantitative compositions and x-Ray spectra), obtained by an integration of S.E.M and XRD investigations, permit us, at the current stage of the study, to hypothesize a possible hydrothermal origin (whose temperature range estimate needs further investigations) for the sulfide-sulfate mineral phases. At the moment, we exclude their primary or secondary sedimentary provenance.
The comparison of our results with the previous scientific literature focused on hydrothermal sulfide-sulfate systems (Vinogradov and Stephanov, 1964; Kostov, 1968; Plummer 1971; Boles, 1978; Ferrini and Moretti 1998) allows us to propose a possible "thermal window" ranging in the interval 50°C-230°C, characterizing an exalative-ephitermal facies condition for the genesis of the here presented mineralizations.
The supposed hydrothermal genesis, together with the localization and oriented distribution of the vein/nodule systems, suggest a strong control on the fluid circulation by the very local fault systems characterizing the tectonic of the investigated area. A very close relationship between faults and fluids in Calabria region has been recently claimed by Italiano et al (2010); the presence of thermal and sulphur-rich ground-waters farther south and west of the study area (Belvedere di Spinello, Verzino, Casabona and Cotronei), strongly supports our inferences.
The study area (and in general the Crotone basin) has suffered two destructive earthquakes in 1638 and 1832, with an estimated magnitude of 6.5-6.8. Moreover, recent paleoseismological studies (Galli and Bosi, 2003; Galli et al., 2008) re-evaluated the seismic hazard of the area, by detecting some historical strong earthquakes along previously unknown fault systems.
This work, with the reported results on mineral associations developed by important fluid/fault interactions, highlights the role and the timing of both localized stress and pore pressures cycles in an active tectonic setting, and may represent a new interpretation key and a clue reference for a deeper understanding of a not well known italian seismic area characterized, at least, by the presence of three regional active master faults: the Marchesato Fault, the Lakes fault the Cerenzia-San Nicola-Strongoli Line.
Geochemical and isotopic analyses on mineralizations, host rock and spring fluids are in progress to better define

and understand the local hydrothermal system and to propose a model of time and control of the tectonic on the fluid circulation.