

Geochronology of volcanic rocks from Umbria (Italy)

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ABSTRACT. — Although not strictly belonging to the Latium region the volcanic center of San Venanzo (Umbria) is to be considered linked to the Roman Comagmatic Region.

A few data are available concerning the age of its products. Fission track dating on apatite crystals from the pegmatoid facies of the venanzite yielded 470 ± 100 ka, while the first two K-Ar measurements on leucite and phlogopite gave contrasting results of 200 ± 10 and 500 ka respectively.

Recent K-Ar measurements on very fresh leucite crystals from the same pegmatoid facies gave an age of 460 ± 20 ka, in good agreement with the previous FT dating.

The volcanic activity of the San Venanzo center appears to have been contemporary with the activity of the main volcanic groups of Latium, in a time span in which intense effusive and explosive eruptions took place, in a climax of tectonic tension.

Key words: Italy, Umbria, volcanic rocks, geochronology, radiometric age.

RIASSUNTO. — Benchè non strettamente appartenente alla regione laziale il centro vulcanico di San Venanzo (Umbria) è certamente da porre in relazione con la Provincia Comagmatica Romana.

Pochi dati sono disponibili circa l'età dei prodotti di questo centro vulcanico. Una datazione con le tracce di fissione su cristalli di apatite separati dalla facies pegmatoidale della venanzite ha dato 470 ± 100 ka, mentre le prime due misure effettuate col metodo K-Ar su leucite e su flogopite hanno dato risultati discordanti di 200 ± 10 e 500 ka rispettivamente.

Recenti misure K-Ar su cristalli molto freschi di leucite separati dalla stessa fase pegmatoidale hanno dato un'età di 460 ± 20 ka, in buon accordo con la precedente datazione ottenuta con le tracce di fissione.

L'attività vulcanica del centro di San Venanzo sembra perciò essersi sviluppata contemporaneamente all'attività dei principali gruppi vulcanici del Lazio, in un intervallo di tempo in cui particolarmente intense erano le manifestazioni effusive

ed esplosive, in una fase culminante di tensione tettonica.

Parole chiave: Italia, Umbria, rocce vulcaniche, geocronologia, età radiometrica.

Although not strictly belonging to the Latium region the volcanic center of San Venanzo (Orvieto, Umbria) is to be considered linked to the Roman comagmatic region.

The San Venanzo volcanic complex, lying about 20 Km northeast of Orvieto is composed by the two volcanic centers of San Venanzo and of Pian di Celle. Shortly after its discovery the San Venanzo complex was thoroughly studied by CLERICI (1897), ROSENBUSCH (1899), SABATINI (1899). For the unusual melilite rock of San Venanzo ROSENBUSCH proposed the name of euctolite, but the name of venanzite introduced by SABATINI was the prevailing one.

Among the most recent geological and petrological studies the works of RODOLICO (1937), MORBIDELLI (1964), MITTEMPERGHER (1964, 1965), are to be mentioned.

In 1952 BANNISTER and SAHAMA were able to demonstrate experimentally in the San Venanzo lava the presence of the kalsilite, previously forecasted by HOLMES (1942) on the basis of the high potash: soda ratio of the bulk rock.

According to MITTEMPERGHER (1965) the volcanoes of San Venanzo produced two different rock types: a mantle derived katungite lava containing melilite, kalsilite and leucite, often referred to as «venanzite» and a pegmatoid facies characterized by the presence of melilite, kalsilite, leucite and

plogopite, rich in pneumatolithic minerals (fluorapatite, dark minerals, titanite and marialite) and hydrothermal carbonates and zeolites.

In 1973 BIGAZZI et al. for the first time attempted the dating of the San Venanzo volcanites. A fission track dating on apatite crystals yielded 470 ± 100 ka, while two K/Ar measurements gave two contrasting results of 200 ± 5 % and 500 ka.

More recently LAURENZI and VILLA (1984), operating on very fresh leucite crystals (15.6 % K) extracted from the very sample of the pegmatoid facies previously used by BIGAZZI et al. (1973) obtained a K/Ar age of 460 ± 20 ka, in good agreement with the previous value of 470 ± 100 ka. The coincidence between the two values suggests that no excess ^{40}Ar is present in the leucite and that the apparent K/Ar age of 460 ka may be considered as the real age.

A very close age of 480 ± 20 ka has been found for a pyroclastic flow from the Alban Hills near Vicovaro, an intraappenninic volcanic center lying 8 Km north east of Tivoli.

Thus the magmatic activity of San Venanzo Center appears to have been contemporary with the activity of the main volcanic groups of Latium in a time span in which an intense effusive and explosive eruptions took place, of which many lava flows in vulsinian, sabatian districts and in the Alban Hills (pre caldera fissural lava flows) and the ignimbrite C from the Vico volcano are among the most significant examples.

According to LAURENZI and VILLA (1984) such an intense activity suggests a climax of tectonic tension, responsible of wide-

spread uprising of deep seated melts and of triggering the activity of the intra appenninic volcanic centers such as those of San Venanzo and of Vicovaro, lying at the eastern margin of the Roman comagmatic region.

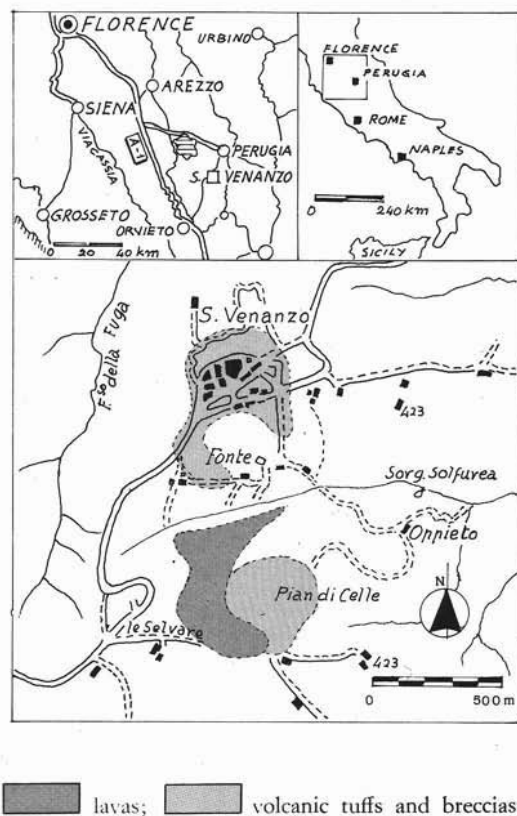


Fig. 1. — Location of the volcanic centers of San Venanzo (after F. RODOLICO, 1937).

REFERENCES

- CLERICI E. - Boll. Soc. Geol. It. (1897), 16, 252.
 17, CXVIII (1898).
 BANNISTER F.A., SAHAMA TH. (1953) - *Kalsilite in venanzite of San Venanzo*. Mineral. Mag., 30, 46.
 BIGAZZI G., BONADONNA F.P., RADICATI DI BROZOLO F. (1973) - European Colloquium of Geochronology and Isotope Geology, Oxford, 9, 26.
 FRANCO P. (1895) - *Augite e peridoto delle sabbie vulcaniche di San Venanzo*. Note mineralogiche. Rend. R. Acc. Sc. Fis. e Mat. di Napoli.
 HOLMES A. (1942) - Geol. Mag. Hertford, 79, 225.
 LAURENZI M.A., VILLA I.M. (1984) - *Datazione K-Ar dei Centri vulcanici di Vicovaro e di San Venanzo*. Soc. Ital. di Mineral. e Petrol., Convegno di Pisa, Abstracts. In press in Rendiconti Soc. Ital. Miner. Petrol.
 MILLOSEVICH F. (1942) - *I neks a pozzolana della media valle dell'Aniene*. Period. di Mineral., 13, 255-271.
 MITTEMPERGHIER M. (1964) - *Volcanism and petrogenesis in the San Venanzo area*. Sommer meeting IAV.
 MITTEMPERGHIER M. (1965) - *Volcanism and petro-*

- genesis in the San Venanzo area.* Bull. Volcanol., 28, 85-94.
- MITTEMPERGER M. (1965) - *Vulcanismo e petrogenesi nella zona di San Venanzo (Umbria).* Atti Soc. Toscana di Sc. Nat., 72, 437-479.
- MORBIDELLI L. (1964) - *Contributo alla conoscenza della venanzite: la facies differenziata di Podere Pantano e la phillipsite che l'accompagna.* Periodico di Mineral., 33, 199-221.
- RODOLICO F. (1936) - *Sulle forme granulari delle rocce melilitiche.* Rend. R. Accad. Lincei, 6, 24, 471-473.
- RODOLICO F. (1937) - *Le rocce vulcaniche di San Venanzo e di Cupaello.* Boll. Soc. Geol. It., 56, 53-66.
- ROSENBUSCH H. (1899) - *Ueber Euktolith, ein neues Glied der theralitischen Effusivmagmas.* Sitzungsber. der K. Preuss. Akad., 7, 110-115.
- SABATINI V. (1899) - *I vulcani di San Venanzo.* Riv. Miner. Cristall. Ital., 22, 3-12.