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Title of article: Discovery of a Plinian Basaltic Eruption of Roman Age at Etna Volcano, Italy

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Characters of unit A of the 122 B.C. Etna eruption

Basal ash deposit (unit A), the lowermost layer of the pyroclastic succession of the 122 B.C. Plinian eruption of Etna, is a black thin layer made of sideromelane (50 vol%) and tachylite (40 vol%) clasts, and loose crystals (10 vol%).

Morphoscopic study by SEM revealed that grains forming this bed, show typical features of Strombolian products. The sideromelane are glassy clasts highly vesiculated with smooth surfaces, often stirred. They show a coalesced vesicles which form a delicate partially open framework (Fig. 1). Tachylite clasts are less vesiculated and completely crystalline, showing at higher magnification a network of fine crystals of plagioclase (Fig. 2). Tachylite surfaces are rough, reflecting the crystalline matrix.

The cumulative grain-size curves of unit A along the main dispersal are shown in Fig. 3. We note that the deposit is quite coarse, well sorted and the fragmentation is quite low (Md is comprises between 1 and about 2 ϕ), on the contrary to that of phreatomagmatic ash which is generally higher. Moreover, phreatomagmatic ashes include many accidental lithics, whereas unit A does not contain any lithic fragments.

Basal ash deposit does not show any layering and has a large dispersion for a classical Strombolian activity (Fig. 4). Moreover, in the proximal sections located at 2-3 km from the vent there are no ballistic ejects. The proximal deposit shows a fine grain-size without bombs and coarse lapilli, ruling out the origin by fire fountains.

Heiken and Wohletz (1985) report on an eruption from Cinder Cone-Lassen Volcanic National Park, CA which formed the same kind of deposit as unit A of the 122 B.C. eruption. They also report that a similar deposit has been described by McGetchin et al. (1974) during a Strombolian eruption from the Northeast Crater of Etna. Heiken and Wohletz (1985) explain the contemporary formation of sideromelane and tachylite clasts by clogging of the vent during the Strombolian activity. If the vent is clear and the lava flux is high a supply of high temperature and low viscous magma may produce highly vesicular sideromelane pyroclasts. When the vent is blocked either by pooling of lava or slumping of talus in the vent, explosive activity could be eventually suppressed. Lava within the crater could have cooled and lost volatiles. The new explosion would disrupt it forming pyroclats of sideromelane and poorly vesicular tachylite.

Because of a major dispersion of unit A with respect to the Cinder Cone eruption, we suggest that the deposit was produced by a vigorous jet of gas that formed a high ash column dispersed by the wind that blew in the same direction, southeast, of the Plinian phase of the 122 BC eruption. This kind of volcanic activity is observed at Etna during the drain-back and deep degassing of the magmatic column inside the summit craters, normally after a long lived Strombolian activity phase. This phenomenon produce a coarse-ash fallout during a continuous puffing. Its grain-size is related to the degassing depth; the jet is not able to throw out bomb-size clasts but it carries on both fine hot juvenile clasts and the fine portion of the material collapsed into the vent during the drain back of the magma.

During the 1986 fire fountain episode several ash emissions came before the column-forming paroxysmal phase (Romano et al., 1986), unfortunately we have only a macroscopic description of ash features. Conversely, ashes of the1989 eruption was sampled by authors and compared with the unit A. They show very similar clast features even if the relative proportions of sideromelane and tachylite, and loose crystals are different. The ash emission of the 1989 eruption occurred at the end of the fire fountains phase of the eruption, when an eruptive fissure opened in Valle del Bove and the magmatic column drained-back into the Southeast Crater (Bertagnini et al., 1990). A pulsing ash column produced a coarse ash bed deposit that covered the southern summit area and copious ash fell down to Catania. Unit A of the 122 B.C. eruption has a remarkable minor decaying of thickness and a larger dispersion respect to both 1986 and 1989 ash fallout, suggesting a larger magnitude of similar phenomena.

REFERENCES CITED

Bertagnini, A., Calvari, S., Coltelli, M., Landi, P., Pompilio, M., and Scribano, V., 1990, The 1989 eruptive sequence, in Barberi, F., Bertagnini, A, and Landi, P. eds., Mt Etna: the 1989 eruption: Pisa, Italy, Consiglio Nazionale delle Ricerche - Gruppo Nazionale per la Vulcanologia, p. 10-22.

Heiken, G., and Wohletz, K., 1985, Volcanic ash: Berkeley, University of California Press, 246 p.

McGetchin T. R., Settle M., Chouet B. A. (1974): Cinder cone growth modeled after Northeast Crater, Mount Etna, Sicily. J. Geophys. Res., 79, p. 3257-3272.

Romano, R. et al., 1986, Etna volcano: Smithsonian Institution, SEAN Bulletin, v. 11, n. 9, p. 4-8.

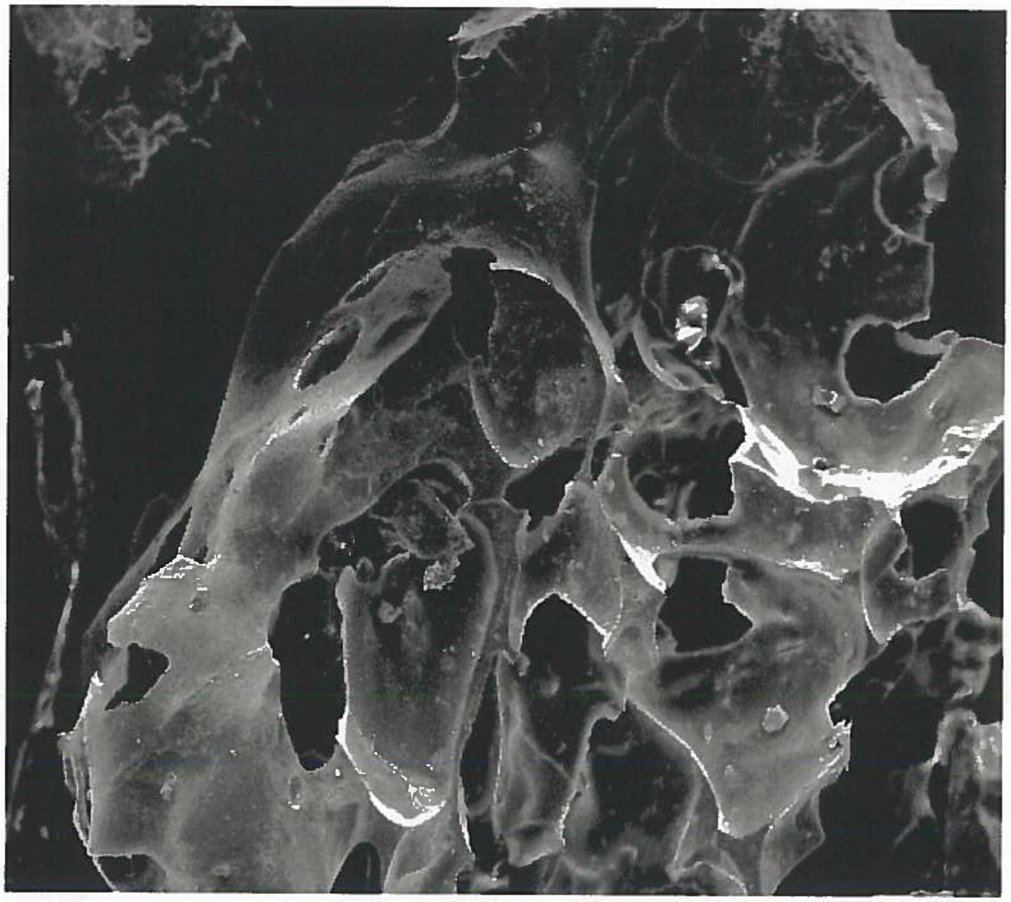

Figure 1. SEM photograph of a syderomelane clast from basal ash (field of view 500 x 450 μm).

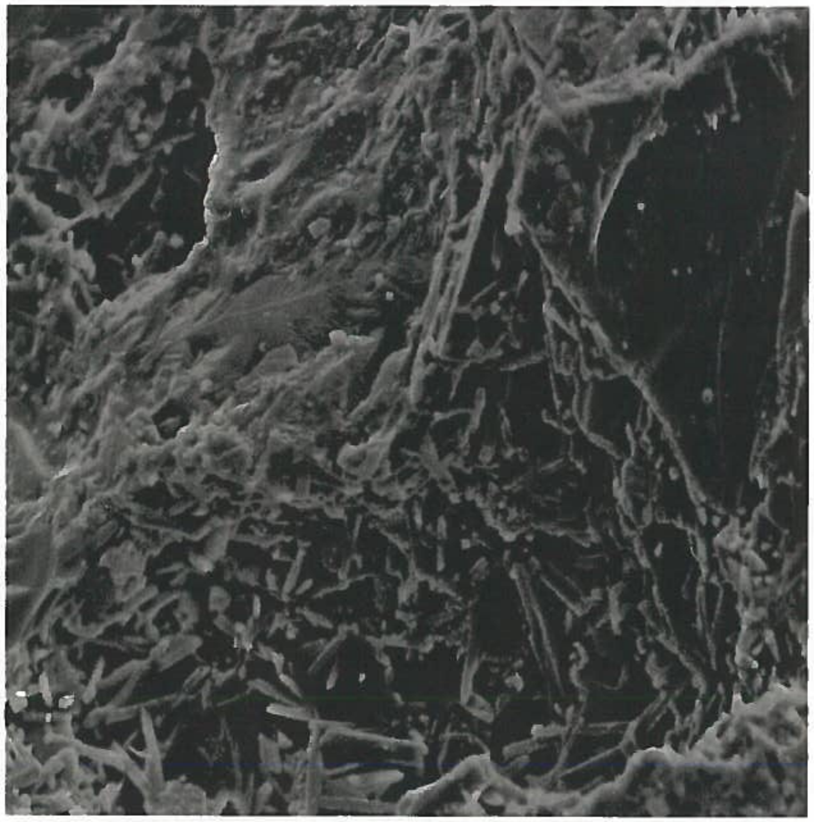

Figure 2. Detail of tachylite grain surface showing the plagioclase crystal network (field of view 50 x 50 μm)

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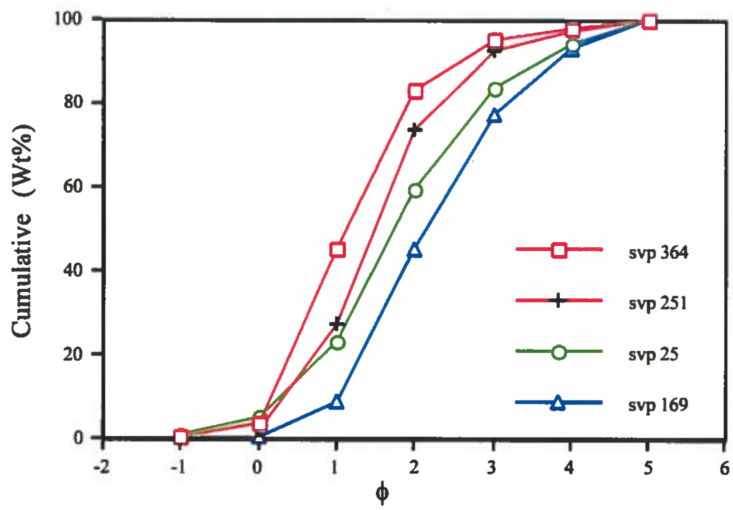

Figure 3. Cumulative curves (Wt%) of the basal ash deposit; sample svp 364 collected in section 164 (2.5 km from the vent); sample svp 251 collected in section 129 (3.5 km from the vent); sample svp 25 collected in section 35 (8.5 km from the vent); sample svp 169 collected in section 26 (9.5 km from the vent). In Figure 4 location of the sections.

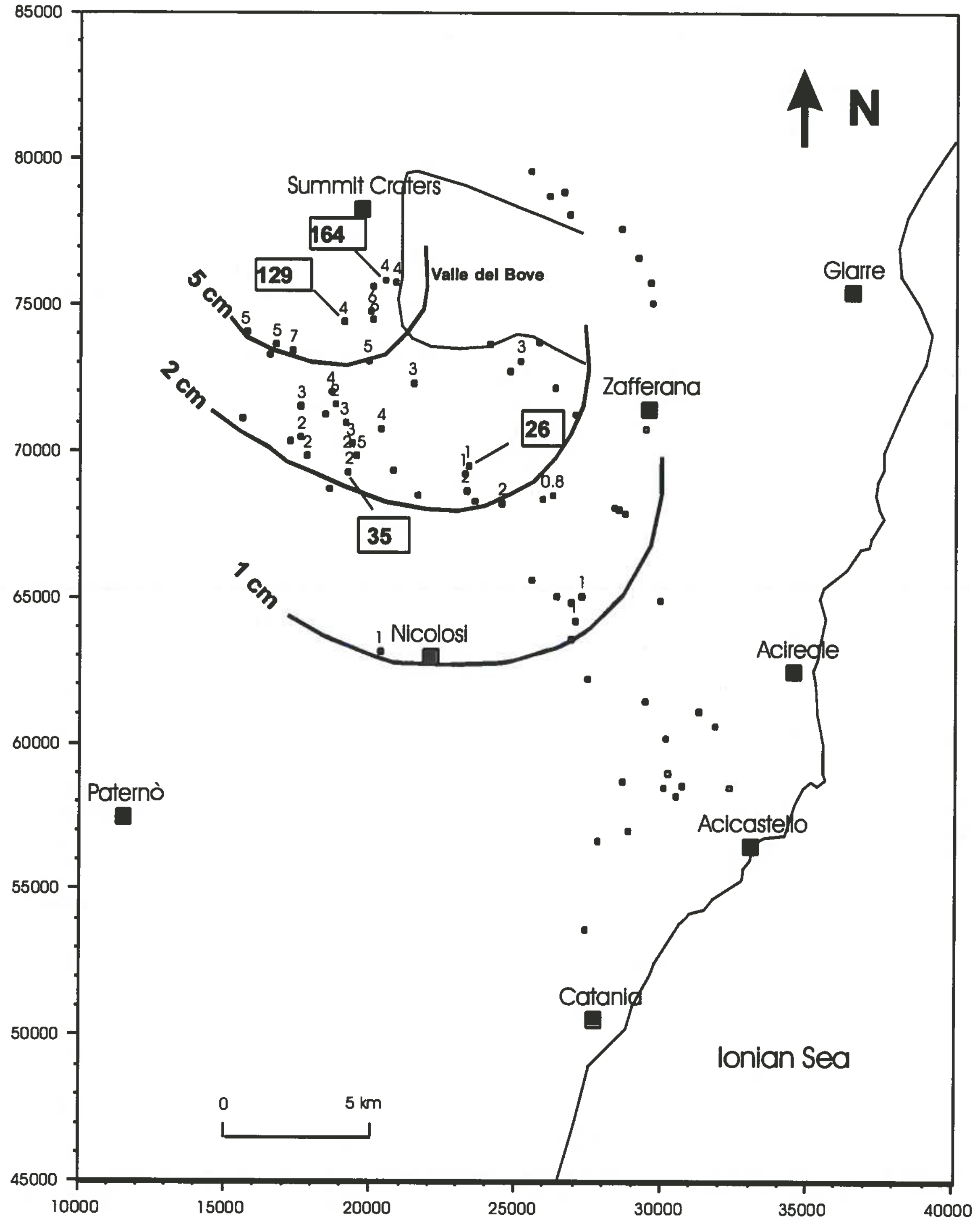

Figure 4. Isopach map of the basal ash deposit. Squared numbers are stratigraphic sections.