

# Stratigraphic and Paleogeographic Reconstruction of Mount Arcuentu-Funtanazza Tertiary Succession (Central-Western Sardinia, Italy)

*Reconstrucción estratigráfica y paleogeográfica de la sucesión terciaria de Monte Arcuentu-Funtanazza (Cerdeña Centro-Occidental, Italia).*

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## ABSTRACT

*The stratigraphic, sedimentologic and geometric reconstruction of the Tertiary volcano-sedimentary succession cropping out in the Mt Arcuentu-Funtanazza area (Central-Western Sardinia, Italy) has allowed us to recognize three phases of its sedimentary and volcanic evolution. The succession starts with continental conglomerates and lava flows, followed by a sequence of interbedded subaqueous sediments and distal pyroclastic flow deposits. Volcaniclastic breccias, mostly reworked, form the succession upper part. The Mt Arcuentu-Funtanazza area represents a transitional zone between volcanic sources and sedimentary basins, the latter being mainly carbonatic (with sediment source probably in the west) during the second phase, and terrigenous (with a north-eastern sediment source) during the third.*

**Key words:** volcano-sedimentary deposits, stratigraphy, Sardinia.

## RESUMEN

*La reconstrucción estratigráfica, sedimentológica y geométrica de la sucesión volcán-sedimentaria terciaria aflorante en el área de Monte Arcuentu-Funtanazza (Cerdeña Centro-Occidental, Italia) nos ha permitido reconocer tres fases en su evolución sedimentaria y volcánica. En la base de la sucesión hay conglomerados continentales y flujos lávicos, seguidos por una secuencia de sedimentos subacuáticos y depósitos de flujo piroclástico distales. Las brechas volcánicas, en su mayoría retrabajadas, constituyen la parte superior de la secuencia. El área de Monte Arcuentu-Funtanazza es una zona de transición entre edificios volcánicos y cuencas sedimentarias que son principalmente carbonatadas en la segunda fase y terrígenas en la tercera.*

**Palabras clave:** depósitos volcán-sedimentarios, estratigrafía, Cerdeña.

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## Introduction

The area we have studied is located at the intersection between two coeval grabens cutting older (mostly Paleozoic) basement: the Oligo miocene rift of Western Sardinia, directed NNW-SSE, and the Funtanazza graben, directed ENE-WSW, whose formation is linked with the Provençal Basin opening, which led also to an anticlockwise rotation of Sardinia between 20.5 and 19 Ma (Beccaluva *et al.* 1980, Montigny *et al.*, 1981). This area is occupied by a Tertiary volcano-sedimentary succession lying unconformably on the basement. Previous Authors ascribed volcanic products cropping out here to a single eruptive centre (Mt Arcuentu). Volcanic activity in the Mt Arcuentu-Funtanazza

area belongs to the Oligo-miocene calc-alkaline volcanic cycle of Sardinia, which developed between 30 and 13 Ma (Assorgia *et al.*, 1984, Carmignani *et al.*, 1985).

The main purpose of this work is a more detailed subdivision, differently from previous works, of volcanic products, and the individuation of relations between volcanic activity and terrigenous-carbonatic sedimentation, leading to a paleogeographic reconstruction of the Mt Arcuentu-Funtanazza area.

Field definition of units has mainly been based on lithologic features visible in hand specimens, primary structures (both sedimentary and volcanic), and geometric relationships. Distinction between very similar carbonatic and volcaniclastic rocks has been greatly aided by

detailed stratigraphic sections.

As far as units ages are concerned, we have relied on existing data, and no new datings have been carried out yet.

## Stratigraphic description and reconstruction

Figures 1 and 2 show a simplified geological map and the stratigraphic correlation of units.

The oldest units, found at the base of the whole succession, are represented by a conglomerate of fluvial origin of Oligocene age (Barca 1973) whose clasts come from the basement, and by an extremely weathered basaltic lava 30-24 Ma old (Assorgia *et al.*, 1984).

Contacts between these units and the overlying ones don't crop out in the field,

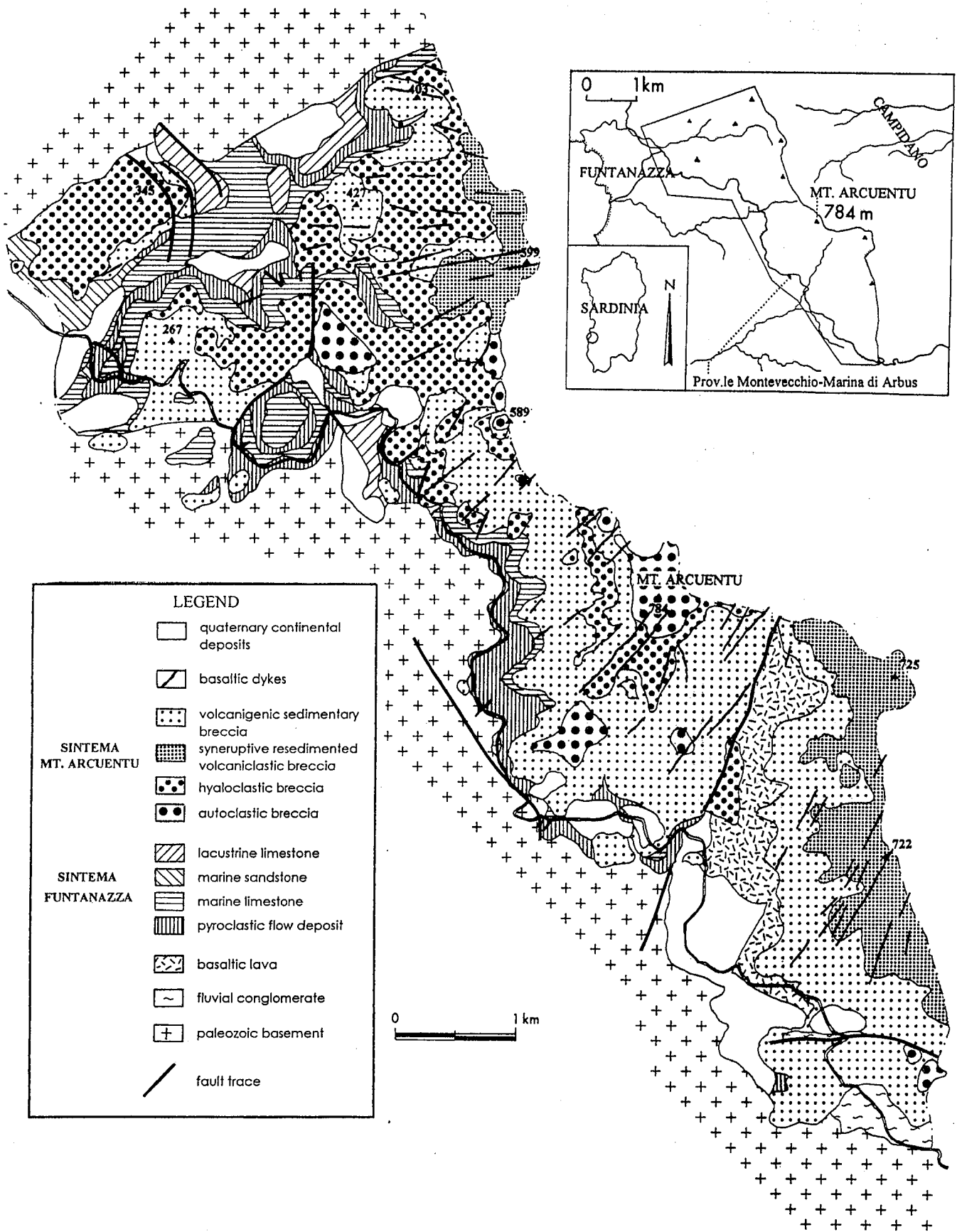


Fig. 1.-Simplified geological map of Mt Arcuentu-Funtanazza Tertiary volcano-sedimentary succession.

Fig. 1.-Mapa geológico simplificado de la sucesión volcán-sedimentaria terciaria de Monte Arcuentu-Funtanazza.

therefore their stratigraphic position has been inferred from age data and geometric characters as attitude of strata and topographic altitude.

Conglomerates and lavas are unconformably followed by the succession that we have called "Sintema Funtanazza", consisting of marine carbonatic sediments interbedded with acidic distal pyroclastic flow deposits, lacustrine limestones, and marine terrigenous sandstones. Bedding within the "Sintema Funtanazza" is generally conformable, with only minor unconformities. Its maximum thickness is about 150 m.

Pyroclastic flow deposits dominate in the lower part of this "Sintema", and they probably originated outside the area, coming from the west (Assorgia, pers. comm.).

From the paleontological record, the sediments are Aquitanian in age, except for those at the top, whose age is uncertain (Cherchi 1974).

The overlying volcano-sedimentary units, that we have grouped under the name of "Sintema Mt Arcuentu", rest unconformably on the "Sintema Funtanazza". The "Sintema Mt Arcuentu" is composed of mainly subaqueous volcanoclastic basaltic breccias, with subordinate lavas and volcanoclastic sandstones. Its maximum thickness is about 400 - 450 m.

Products of volcanic origin are compositionally and texturally fairly homogeneous, ranging from basalts to basaltic andesites. Paragenesis are monotonous, and phenocrysts include plagioclase, clinopyroxene, orthopyroxene, and occasionally opaques.

We have focused on the distinction between different breccias, recognizing four fundamental types:

1) autoclastic breccias formed in a subaerial environment; they typically form small domes, more seldom flows;

2) hyaloclastic breccias, both with and without a crystal-rich matrix; associated pillow-shaped bodies can sometimes be detected;

3) syneruptive resedimented volcanoclastic breccias, both subaerial and subaqueous; they show fairly regular reverse-graded thick beds, and are mostly monogenic. There are often sandstone layers interbedded with breccia; lava flows are also usually associated with this type of breccia;

4) volcanigenic sedimentary breccias, formed in a subaqueous environment. They have a mainly tabular geometry and are mostly polygenic. Sandstone layers are more widespread and thicker than in type 3 breccia, and reworked fossils may occur. In some outcrops near the southern edge of the area there are basement clasts too.

From a stratigraphic point of view, nearly all volcanigenic sedimentary breccias occur at the base of the "Sintema Mt Arcuentu". Hyaloclastic

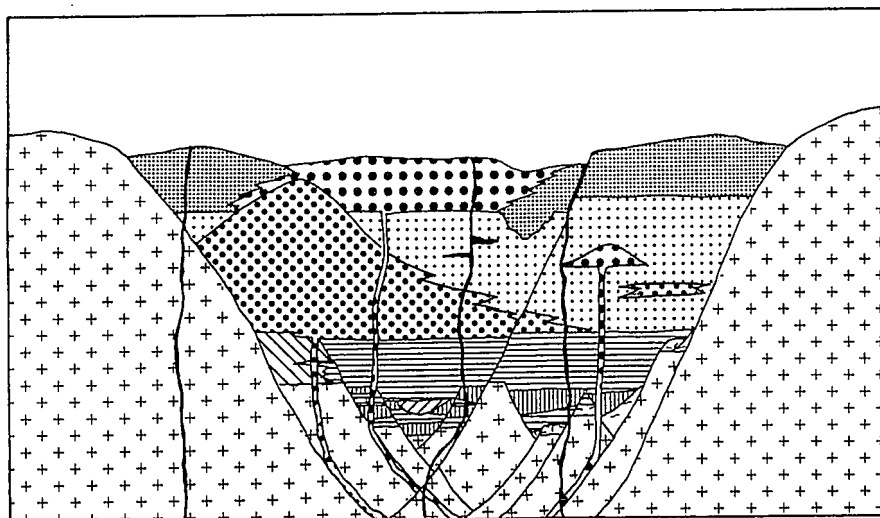


Fig. 2.-Simplified stratigraphic scheme (not to scale) oriented approximately NW-SE. Legend in fig. 1

Fig. 2.-Esquema estratigráfico simplificado (sin escala) orientado aproximadamente NW-SE. Leyenda en fig. 1.

and autoclastic breccias, on the other hand, can be found both within the previously mentioned basal breccias and at the top of the whole succession. Finally, syneruptive resedimented volcanoclastic breccias are limited to this "Sintema" upper part.

Among breccias, types 3 and 4 are widely distributed than types 1 and 2.

All these products have ages falling in the range 24-18 Ma (Assorgia *et al.*, 1984).

Eruptive centres are few and small; they are either strombolian type edifices in the northern part of the area, or dome-like bodies along its southern border.

The last volcanic activity recorded in the Mt Arcuentu-Funtanazza area is represented by the emplacement of radial basaltic dykes, aged 18-16 Ma (Assorgia *et al.*, 1984) and reaching lengths more than 1 km.

### Conclusions

The work carried out so far has allowed us to determine that most of volcanic products were more or less strongly reworked, while evidences of primary activity are areally very limited.

By considering the large volume of these products and their general characteristics, we have assumed the existence of several relatively large eruptive centres just eastward of Mt Arcuentu.

Unfortunately, the easternmost part of the Mt Arcuentu-Funtanazza volcano-sedimentary succession was greatly affected by the Plio-Quaternary extensional tectonics of the Campidano graben, which would have caused

any volcanic centres to be disrupted and almost completely buried under a thick cover of continental deposits.

Therefore, we have concluded from collected data that the studied area was a connecting zone between the volcanics source area, possibly lying directly on a Paleozoic normally-faulted basement, and some terrigenous-carbonatic sedimentary basins which, because of tectonic vertical movements, witnessed several marine and continental episodes.

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