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VOLCANO GEOLOGY AND MAPPING

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ABSTRACT: Recent development in mapping of Italian volcanic areas, both ancient and active, within the framework of the CARG Project (Italian Geological Map 1:50000 scale) has allowed to define a stratigraphic approach that allows to correctly show the basic lithostratigraphy and the main internal organization of the volcanic succession including the essential periods of quiescence. Such innovative approach proves to be very effective for hazard studies, land-planning, management of the geo-cultural heritage.

KEYWORDS: Volcano stratigraphy, mapping, active volcanoes

1. INTRODUCTION

The complex internal architecture of volcanic successions, both at individual volcano scale and at volcanic province scale, is controlled by the interplay between the evolution over time of the volcanic activity, essentially related to the evolution and structure of the magmatic plumbing system, and both climatic and tectonic factors. Volcanic edifices may be simple (monogenetic or associated with fixed and short-lived point sources) or very complex (e.g. stratovolcanoes or caldera complexes), where polygenetic activity spans over long time periods and feeding systems are both time- and space-variable. Volcano-tectonic and gravitational collapses may not only substantially and instantaneously change the topography of volcanoes but also affect the feeding system by changing the lithostatic load. Erosion and remobilization of volcanic material during inter-eruptive periods and longer quiescent periods build large volcaniclastic aprons that grade into other continental and marine sedimentary environments.

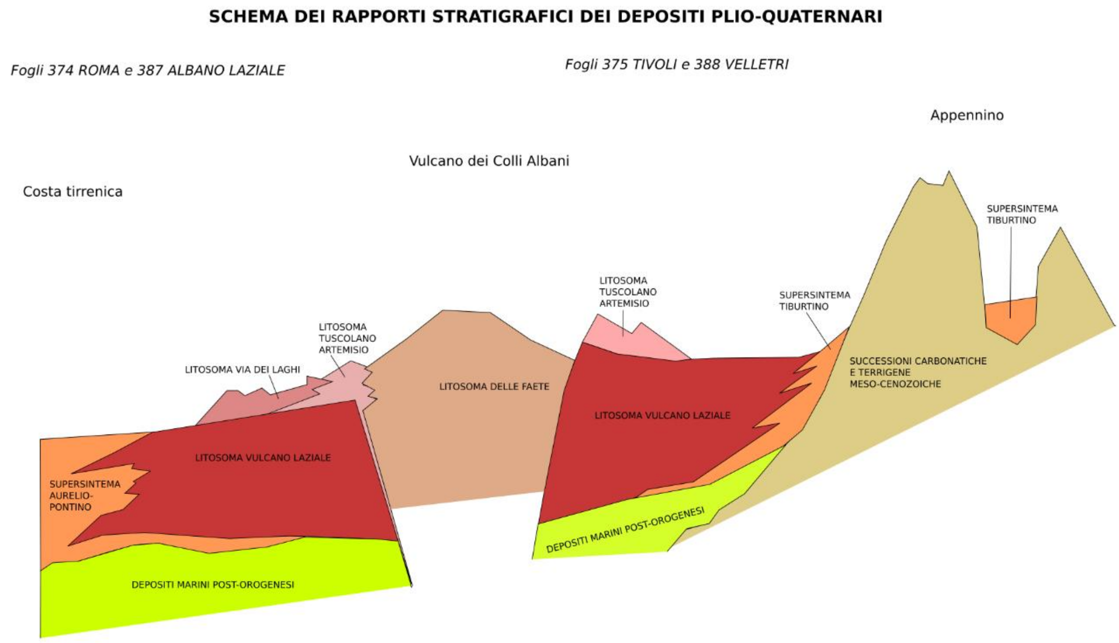

Fig. 1 - Example of correlation of Unconformity Bounded Stratigraphic Units (UBSU) and Lithosomes in the context of the National Cartography Project (CARG; sheets 374 Roma, 387 Albano Laziale, 375 Tivoli, 388 Velletri).

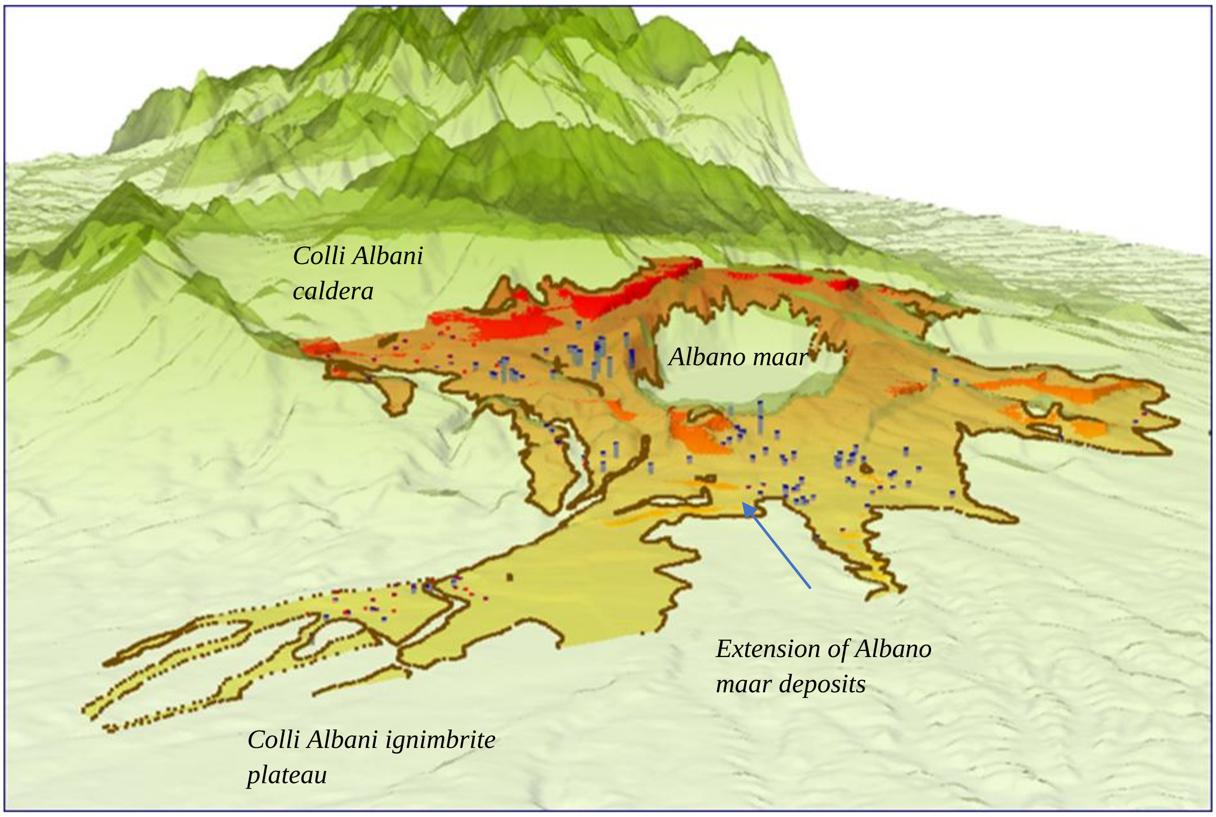

Fig. 2 - 3D shaded relief, perspective reconstruction of the Albano maar succession from surface and bore-hole data (from Diano et al., 2010). The view is perspective and southeastward. Green colours are the shaded relief (vertical exaggeration 3x, comprised between 100 m a.s.l. and 900 m a.s.l.). The brown-orange and red colours inside the continuous (certain) to dotted (extrapolated) line are thicknesses of the Albano maar succession retrieved from outcrop and bore hole stratigraphies (vertical blue to pale blue lines).

2. METHODS

In order to represent such complexity, within the framework of the Italian Geological Map at the 1:50000 scale (CARG Project, ISPRA), the common lithostratigraphic approach to mapping of volcanic areas has been sided by other stratigraphic tools able to organize the stratigraphic successions based on the hierarchy of unconformities and on the morphology of the volcanic structures. Formal units that can be used to this purpose are the Unconformity Bounded Stratigraphic Units (UBSU) and Lithosomes. UBSU are able to represent objectively the extent and physical expression of unconformities, implicitly related to the extent and duration of the associated geological processes, e.g. an unconformity related to the change of global climate affecting the sea level versus a regional tectonic uplift versus a local caldera collapse (Fig. 1). Lithosomes represent individual edifices at various scales allowing to associate parts of the volcanic successions to specific sources and eruption styles.

4. RESULTS AND DISCUSSION

The experience of the last twenty years of mapping in volcanic areas of the Italian volcanological community has established a sound approach for the representation of volcanic successions, which greatly enhances the role of geological maps as ground reference work for civil protection purposes in active areas and resource assessment in recent or extinct areas.

At the same time, geological mapping of active volcanic areas is fundamental for hazard assessment. This is especially true at long-dormant volcano like Vesuvius, Ischia, Campi Flegrei, Lipari, Vulcano, Pantelleria, Colli Albani, where most if not all of the objective data available rely on the rock-record. This makes it essential that geological mapping is made as quantitative as possible and that the relative data are stored in open-source databases. For example, outcrop and sample data on thickness, grain size, lithofacies, chemistry, mineralogy etc. would be of great use for extracting information necessary for modeling of several processes such as lava invasion and pyroclast dispersals in the atmosphere. In addition, 3D data should be made available, both as raw Zdata and as thematic maps (Fig. 2).

In essence, while field-based studies are becoming less and less fashionable, the digital revolution opens up a significant opportunity where the quantitative reappraisal of fundamental mapping of volcanic units can and should become an essential tool for hazard studies.

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REFERENCES

Branca S., Coltelli M., Groppelli G., Lentini F. (2011) - Geological map of Etna volcano, 1: 50,000 scale. Italian Journal of Geosciences, 130(3), 265-291.

De Rita D., Fabbri M., Giordano G., Rodani S., Trigari A. (2000) - L'utilizzo delle unità stratigrafiche a limiti inconformi in ambiente vulcanico e vulcanoclastico; proposta di una metodologia di terreno e di organizzazione informatica dei dati. Bollettino della Società Geologica Italiana, 119(3), 749-760.

Diano G., Bonamico A. Giordano G. (2010) - Three-dimensional reconstruction of the main unconformities of the Colli Albani stratigraphy and deposit volume calculations. In: Funiciello R. and Giordano G. (eds) The Colli Albani Volcano. Special Publication of IAVCEI, 3. The Geological Society, London,

Giordano G., Mattei M., Funiciello R. (2010) - Geological map of the Colli Albani volcano. Insert of Geol Soc London, IAVCEI series 3.

Lucchi F. (2013) - Stratigraphic methodology for the geological mapping of volcanic areas: insights from the Aeolian archipelago (southern Italy). Geological Society, London, Memoirs, 37(1), 37-53.

Salvador A. (Ed.). (1994) - International Stratigraphic Guide - A Guide to Stratigraphic Classification, Terminology, and Procedure, Second Edition. Boulder, Colorado, The International Union of Geological Sciences and The Geological Society of America, p. 214.

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