New data on the Tuscolano-Artemisio phase of the Alban Hills: some insights on climatic conditions

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ABSTRACT - A pyroclastic flow 14 m thick embedding well-preserved wood remains has been retrieved at a depth of 120 m from a borehole drilled near the village of Lanuvio, about 9 km south of the Lake of Albano. ⁴⁰Ar/³⁹Ar analyses on a leucitic lava flow immediately overlying the drilled ignimbrite, gave an age of 485 ± 1ka. Facies and age constraints are consistent with pyroclastic products of the first Tuscolano-Artemisio phase.

The new findings presented here contribute toward reconstructing the early eruptive history of the Alban Hills. New chronological data further define the time interval and spatial distribution of the extrusive phase, coinciding with the transition from the first to the second Tuscolano-Artemisio phases.

It is also suggested that the pyroclastic products of the Latium region (Rome) with their embedded wood remains, represent an important "archive" of arboreal expansion, allowing better definition of the climatic conditions characterizing interglacial stages 13-15 of the Oxygen Isotope Curve.

KEY WORDS: Alban Hills volcano, Tuscolano-Artemisio phase, geochronology, Pleistocene, central Italy, arboreal fluctuations

INTRODUCTION

The Alban Hills are one of the main volcanic districts of the potassic and ultrapotassic magmatic province extending along the Tyrrhenian sector of Italy. For many years, this area, characterized by frequent seismicity of low or very low magnitude, has been considered of great interest because of its proximity to Rome (less than 15 km) and because of the ongoing debate as to whether it should be interpreted as an extinct volcanic center (Voltaggio and Barbieri, 1995) or only quiescent (De Rita et al., 1995; Funiciello et al., 2003; Freda et al., 2006; Mariucci et al., 2008). Extensive urbanization and agriculture (the area is famous for its white wines) often makes it difficult to sample and analyse the deposits in order to reconstruct the detailed geological evolution and history of volcanic activity. In addition, because of the general lack of observable outcropping sites, little information on the products of the early stages of the Tuscolano-Artemisio phase are available. This is why the results of data analysis from the 120-m borehole drilled a few decades ago near the village of Lanuvio, south of Ariccia, provides the opportunity for insights into the pre-caldera activity which emplaced very large volumes of pyroclastic deposits. Fortunately, however, field logging and some samples have been obtained.

Reconstructions of paleoclimatic changes are commonly based on pollen records, essential in identifying vegetation changes in the past. Long continental sequences are, however, exceptional, because their formation and preservation only occur in particular conditions and very few data are available for the time interval considered in this study. We report here the possible paleoclimatic significance of the wood remains recovered from the borehole and their potential future use in verifying the expansion of vegetation.

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GEOLOGICAL SETTING

The Plio-Quaternary volcanism which developed widely along the Tyrrhenian coast of central Italy is a consequence of extensional tectonics affecting the internal Apennine chain in a post-collisional setting (Beccaluva et al., 2004). According to petrological and geochemical data, it has been subdivided into several magmatic provinces (Pecceirillo, 2003). The magmatism found from Latium to Campania is known as the Roman Province and is of large compositional variability, from shoshonitic basalt to trachyte and leucite (Conticelli et al., 2002). The Alban Hills district belongs to the Roman Province.

The Alban Hills volcano, located about 15 km south-east of Rome, exhibits a central morphological shape dominating the surrounding countryside (the Campagna Romana) (Fig. 1). Volcanic activity ranges between about 0.6 and 0.02 Ma, and is now considered quiescent by some authors (e.g., De Rita et al., 1995; Funiciello et al., 2003; Freda et al., 2006; Mariucci et al., 2008). The history of the volcano is subdivided into three main phases of activity (De Rita et al., 1988, 1995) (Fig. 2):

- The Tuscolano-Artemisio phase (T-A phase), which occurred between 600 and 350 ka, mostly derives from the central Tuscolano-Artemisio area. It is characterized by at least four major explosive eruptions, for a total volume of about 280 km³ of material (De Rita et al., 1992), ending with the final collapse of the large central caldera.

- After this collapse, a small stratovolcano built up from the center of the caldera, emplacing the Faete succession. This phase mainly developed between 308 and 250 ka (Marra et al., 2003) and is made up of far lower volumes of material (not exceeding about 6 km³) (De Rita et al., 1992).

- The last period of activity, starting at about 200 ka (Marra et al., 2003), is known as the Final Hydromagmatic Phase (De