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A review of the stratigraphy of Rome (Italy) according to geochronologically and paleomagnetically constrained aggradational successions, glacio-eustatic forcing and volcano-tectonic processes

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ABSTRACT

In this paper we provide a critical review of the studies conducted on the geology of Rome since the first half of the 20th century, aimed at presenting an updated state of the art on the stratigraphy of this area. Following this introductory summary, we present a complete reconstruction of the geological evolution and the resulting chrono-litho-stratigraphic setting of the greater area of Rome, according to a series of works that in the last 20 years have adopted an innovative methodological approach based on the conceptual model of aggradational successions deposited in response to sea-level rise during the glacial terminations, and on the strict geochronologic constraints to the sedimentary record achieved by paleomagnetic investigation of clay sections and $^{40}Ar/^{39}Ar$ dating of interbedded volcanic materials. We also present a complete overview on the chronostratigraphy of the two volcanic districts of Colli Albani and Monti Sabatini, located SE and NW of Rome respectively, that has been achieved integrating the field work with the large number of radiometric ages provided in these years on their eruptive products. Moreover, we propose a revised stratigraphic column to compare the most recent official 1:50,000 and 1:10,000 geologic mapping of Rome, which is intended as a tool of correlation for an international audience of Quaternary scientists to approach the study of this area. A detailed discussion of the proposed revisions is also provided as supplementary information to this paper.
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1. Introduction

During the last decades the greater area of Rome has represented a natural laboratory in which a series of multidisciplinary studies, aimed at understanding the geological processes acting at a global scale in Quaternary times, have been conducted.

In this paper we present a complete review of these studies and a detailed description of the stratigraphic setting of this region, aimed at providing the local professionals and the international academic audience the tools to undertake further investigations, either in the light of a correct urban planning and engineering projecting, as well as in the light of pursuing the study of global natural phenomena, including relationships between sedimentation and sea-level fluctuations, climate changes, volcano-tectonic processes.

The area of Rome is located on the Tyrrhenian Sea coast of central Italy and is crossed by a river draining the Apennines mountain range and feeding a large delta, which in turn is located between two large volcanic districts that have been active during the last 0.8 ma (Fig. 1). Sedimentary processes have been therefore strongly controlled by glacio-eustatic fluctuations and by their interplay with volcanic activity and regional tectonics. Indeed, continuous emplacement of tephra layers provided a mean to geochronologically constrain the aggradational successions of the Paleo-Tiber (Paleotiber) River (Fig. 2), by performing a large number of $^{40}Ar/^{39}Ar$ age determinations, and to construct an independent chronology for the glacial terminations (Karner and Renne, 1998; Karner and Marra, 1998; Marra et al., 1998a 2008, 2016a; Florindo et al., 2007; Marra et al., 2016a). Moreover, such a detailed geochronologic background allowed at reconstructing the eruptive history of the volcanic districts near Rome (Karner et al., 2001a; Marra et al., 2003, 2009; Freda et al., 2006; Giaccio et al., 2009; Sottili et al., 2010; Gaeta et al., 2011, 2016; Marra et al., 2014a), and to link their evolution with the geodynamic

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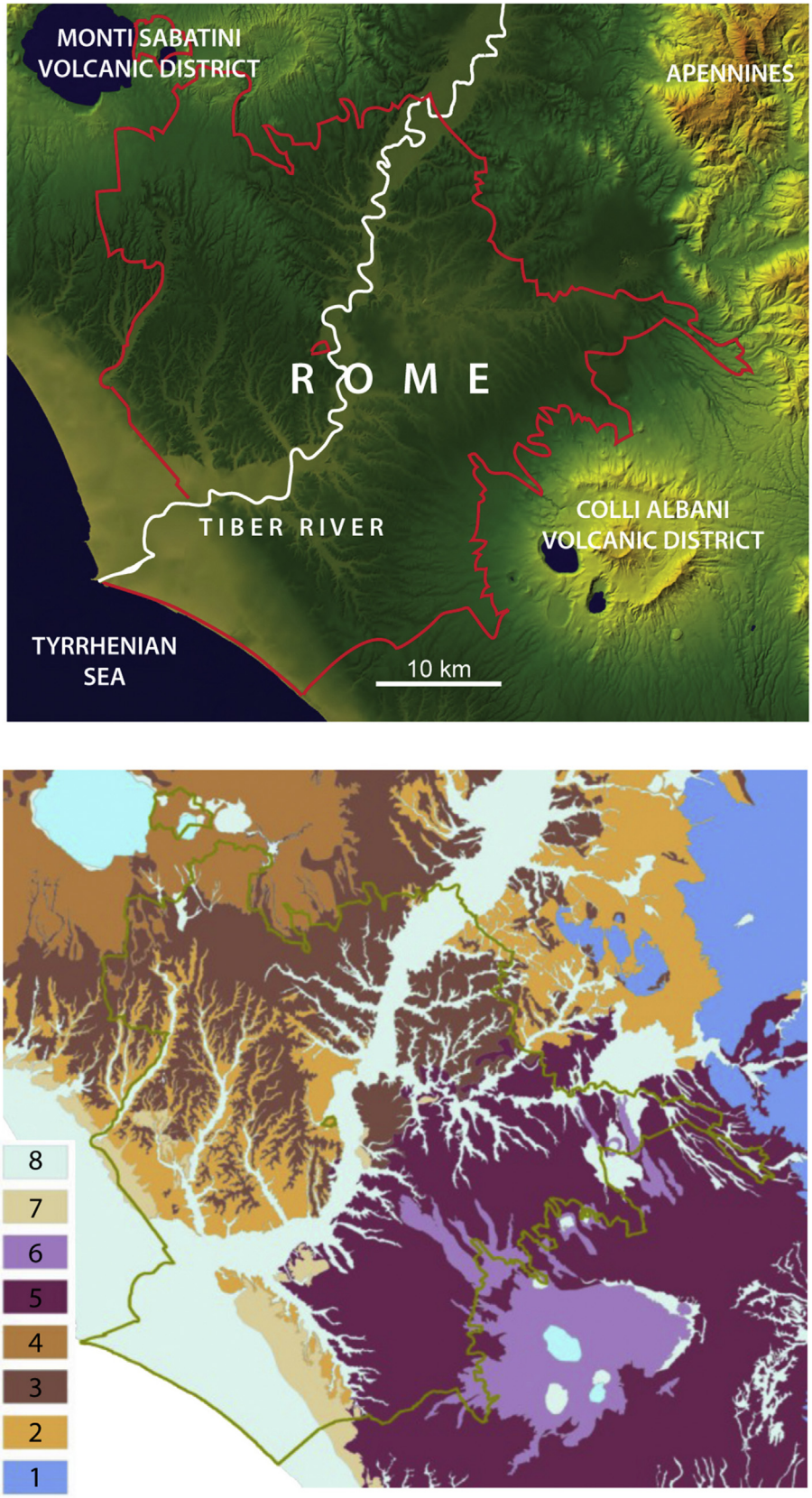

Fig. 1. Digital elevation map (top) and geologic sketch (bottom) of the investigated area showing the Rome Municipality border (red and green lines, respectively). Legend: 1 - Apennines orogenic system (Upper Triassic-Miocene), 2 - Post-orogenic marine, and MIS 21–11 transitional and continental deposits (Zanclean-Middle Pleistocene), 3 - Monti Sabatini mainly pyroclastic-flow and -fall deposits (802–389 ka), 4 - Monti Sabatini pyroclastic-flow, -surge and -fall deposits, and lava flows (325–85 ka), 5 - Colli Albani mainly pyroclastic-flow deposits and subordinated lava flows (608–355 ka), 6 - Colli Albani mainly pyroclastic-surge, -fall deposits, and lava flows (308–36 ka), 7 - MIS 9-5 sedimentary deposits (Middle-Upper Pleistocene), 8 - MIS 1 sedimentary deposits (Upper Pleistocene-Olocene). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

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