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Geologic mapping of The Lucretili and Sabini Mountains (Italy), sedimentary lithofacies and Jurassic paleogeographic reconstruction

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INTRODUCTION

This study is part of a geological survey in the central Apennines fold and thrust belt in the sector of the Lucretili and Sabini Mountains (Fig. 1). In this paper, taking into account both stratigraphic data and structural data, we provide an explanation of the relationships between the sedimentary lithofacies and the inheritance of the Mesozoic-passive margin architecture.

GEOLOGICAL SETTING

The study area is characterized by Meso-Cenozoic limestones and marls of the Sabina succession. The sedimentary succession in the study sector ranges from the Upper Triassic with the *Dolomia Principale* up to the Messinian Flysch (Fig. 2).

The structural style of the area is characterized by NW-SE and N-S trending fault propagation folds. The N-S compressional structures are oblique with respect to the NE-SW orientation of the maximum compression that

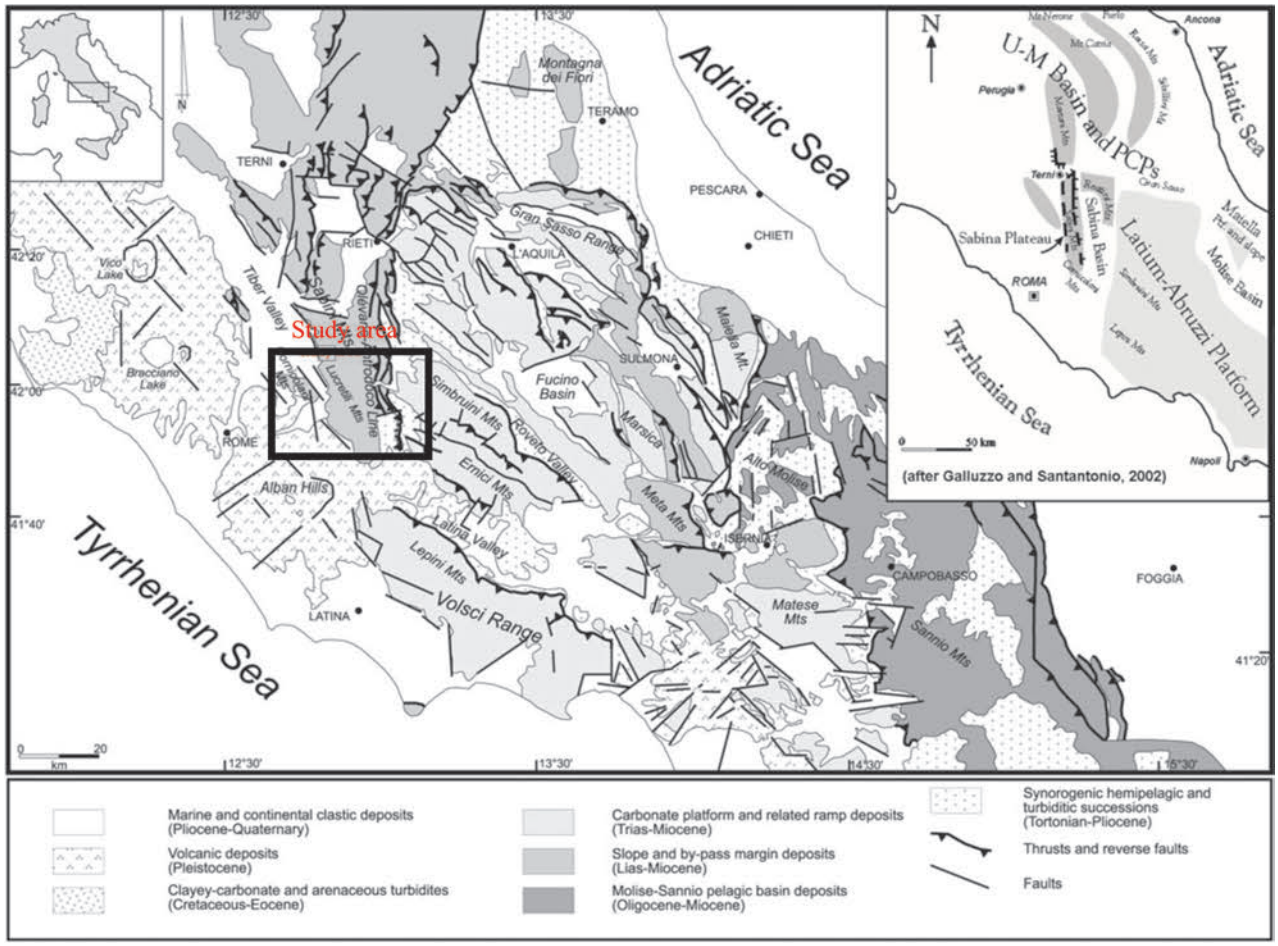

Fig. 1 - Schematic geological map of the central Apennines with the study area in the box (Modified Bollati et al., 2012).

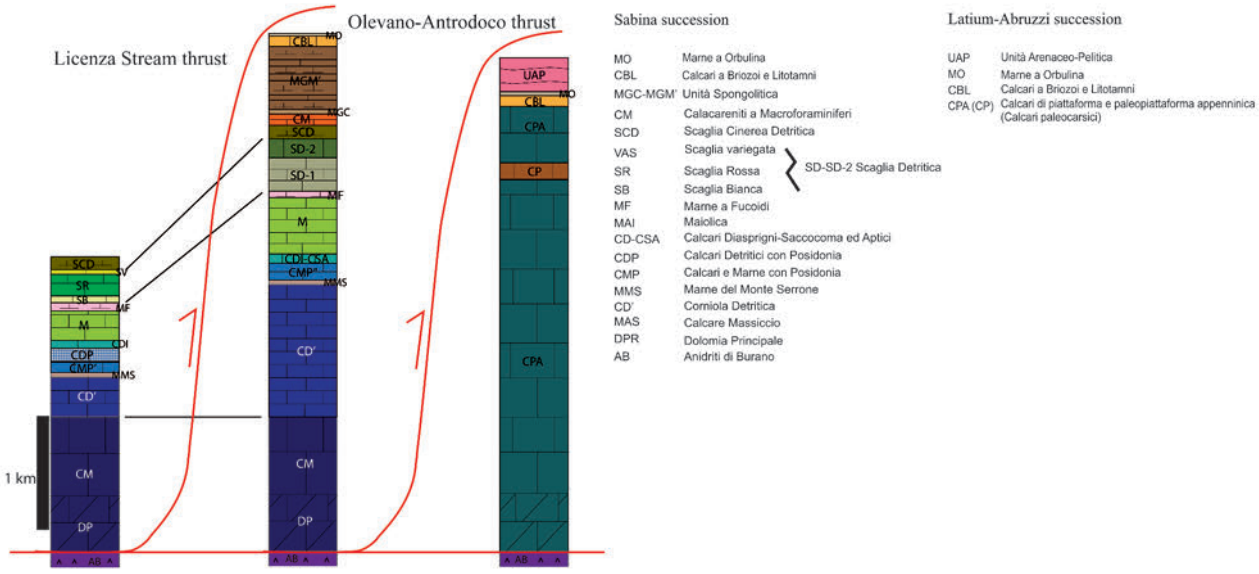

Fig. 2 - Stratigraphy of the study area: (A) Stratigraphy of the Sabina Succession at the hangingwall of the Licenza Stream thrust; (B) Stratigraphy of the Sabina Succession at the footwall of the Licenza Stream thrust and at the hangingwall of the Licenza Stream thrust; (C) Latium-Abruzzi Succession of the Simbruini Mountains.

generated them. Therefore right-lateral transpression is inferred along these segments. Thrust propagation moved from west to east and younger stratigraphic sequences outcrop in the eastern side of the study area. Later normal faults follow and crosscut the SW dipping thrust sheets (Cosentino, 1986; Cosentino et al., 2010).

DATA AND DISCUSSION

The study area is characterized by four main thrust faults: M. Morra thrust, M. Marcone-M. Arcaro thrust, Licenza Stream thrust and Olevano-Antrodoco thrust. In the hangingwall of the M. Morra thrust outcrops the *Dolomia Principale* (Rhaetian).

The *Calcare Massiccio* (Hettangian-Sinemurian p.p.) and the *Corniola Detritica* formations (Sinemurian p.p.-Pliensbachian) characterize the stratigraphic succession between the footwall of the M. Morra thrust and the hangingwall of the M. Marcone-M. Arcaro thrust.

However, the succession between the footwall of the M. Marcone-M. Arcaro thrust and the hangingwall of the Licenza Stream thrust consists of the stratigraphic interval *Marne del Monte Serrone* (Toarcian)-*Scaglia Cinerea Detritica* (Priabonian p.p.-Rupelian p.p.) formation. In this sector outcrop also the *Scaglia Bianca* (Cenomanian-Turonian p.p.) and the *Scaglia Rossa* (Turonian p.p.-Ypresian) formations in their typical pelagic lithofacies.

The stratigraphic succession, located between the footwall of the Licenza Stream thrust and the hangingwall of the Olevano-Antrodoco line, is characterized by strongly detritic slope facies ranging from the *Scaglia Detritica* (Cenomanian-Priabonian p.p.) and the *Unità Spongolitica* (Aquitanian p.p.-Langhian p.p.), which passes upward and laterally to carbonate platform deposits (Langhian p.p.-Serravallian p.p.) across the Olevano-Antrodoco thrust.

In the footwall of the Olevano-Antrodoco line outcrop the Marne Orbulina (Serravallian p.p.-Massinian p.p.) and the Messinian flysch formations.

Near M. Arcaro, Madonna dei Ronci and Marcellina, the stratigraphic succession ranges from the pelagic units of the *Corniola Detritica* to the *Calcari Detritici con Posidonia* and it is characterized by the presence of *Calcare Massiccio* olistoliths (Fig. 3), often silicized, with dimensions of several meters. These olistoliths show erosive tractive basal contacts with pelagic sediments and are often associated with accumulations of centimetric calcareous clasts and oolitic banks.

The *Calcare Massiccio* olistoliths, the oolitics banks and the calcareous clasts are related to the presence of Jurassic structural highs. The olistoliths and calcareous clasts are due to the erosion of the Jurassic paleoescarpements; however the oolitic banks are rather apparently to a productive carbonate platform (Latium-Abruzzi platform).

The Jurassic structural highs are due to the Hettangian and Sinemurian rifting, which fragmented the Apenninic Paleoplatform in horst and graben structures (Mariotti, 1992).

In the study area are located several Jurassic horsts: the Monteflavio structural high (Bollati et al., 2012), the Sabina Plateau and the Cornicolani Mountains structural high, that represents the ideal southward continuation of the Sabina Plateau (Galluzzo and Santantonio, 2002); furthermore the study area is nearby the northern-western margin of the Latium-Abruzzi platform. According to Santantonio (personal communication), Calcare Massiccio olistoliths may occur several kilometers far from a paleoescarpement. As a consequence, all the previous mentioned paleohighs represent a possible

source area both for the olistoliths and for the resedimented deposits.

Based on field work data and the literature (e.g., Galluzzo and Santantonio, 2002; Cosentino et al., 2010 and references therein) it is possible to recognize a less detritic and thinner Sabina succession at the hangingwall of the Licenza stream thrust with respect to the Sabina succession in the footwall of the same thrust. Moreover, the Licenza Stream thrust and the related hangingwall fold show a N-S direction, different respect to the typical NW-SE Apenninic typical trend. Furthermore, the Jurassic normal faults in the study area show a N-S structural trend. The Ancona-Anzio line (Castellarin et al., 1978) and the Sabina Plateau (Galluzzo and Santantonio, 2002) present a N-S orientation.

In the central Apennines the variation from the NW-SE structural trend can be explained by the reactivation of Jurassic extensional paleofault as reverse thrust faults (Ghisetti and Vezzani, 1987; Calamita et al., 2011). As a consequence, it is possible to argue that the Licenza Stream thrust was emplaced in correspondence of a N-S Jurassic paleofault.

This paleofault divided this area of transition platform-basin in two sectors (Fig. 4). The first sector, west of the Licenza Stream thrust, represented a structural high characterized by minor accommodation space, partially protected by the gravity sedimentary flows from the Latium-Abruzzi platform. In fact the sedimentary succession is less detritic and thinner respect to the nearby and deeper area east of the Licenza Stream thrust. Consequently, this buried structural high may represent at the same time a new source area for the studied olistoliths and a barrier for the sedimentary flows from the Latium-Abruzzi platform.

This work proposes a paleogeographic reconstruction of the southern Sabina domain, with a further Jurassic horst localized between the southernmost part of the Sabina Plateau and the Latium-Abruzzi platform.

This paleogeographic reconstruction of the Sabina domain is comparable with the paleogeography of the Umbria-Marche domain described by Santantonio and Carminati (2011), in which also in this case the Jurassic horsts are spaced by a distance of about around ten kilometers (Fig. 4).

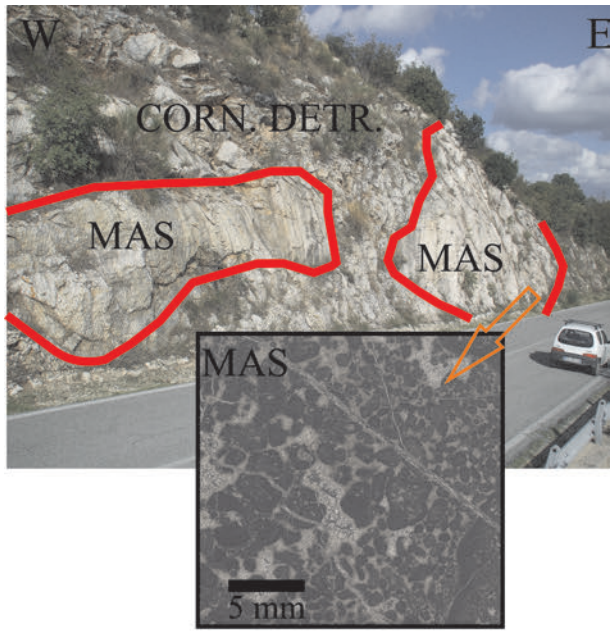

Fig. 3 - Calcare Massiccio olistoliths (Monte Arcaro locality, San Polo dei Cavalieri) and relative Calcare Massiccio thin section.

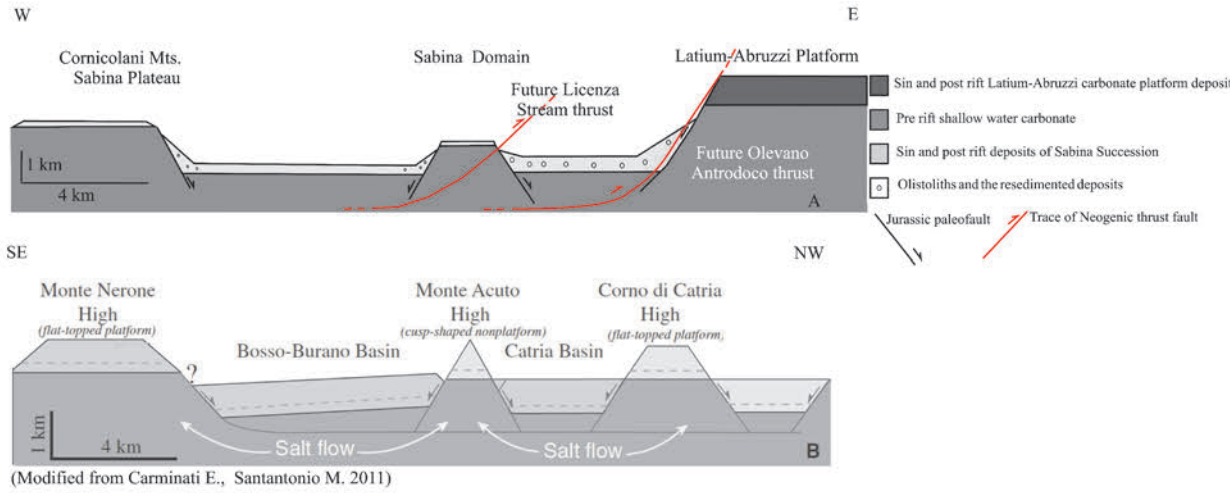

Fig.4 - Cartoon showing the inferred pattern of the lower Jurassic paleogeography along two different tracts of the central-northern Apennines: (A) Lower Jurassic paleogeography of the Sabina domain, with the future Neogenic thrust faults; (B) Lower Jurassic paleogeography of the Umbria-Marche domain. (Modified from Carminati et al., 2012).

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