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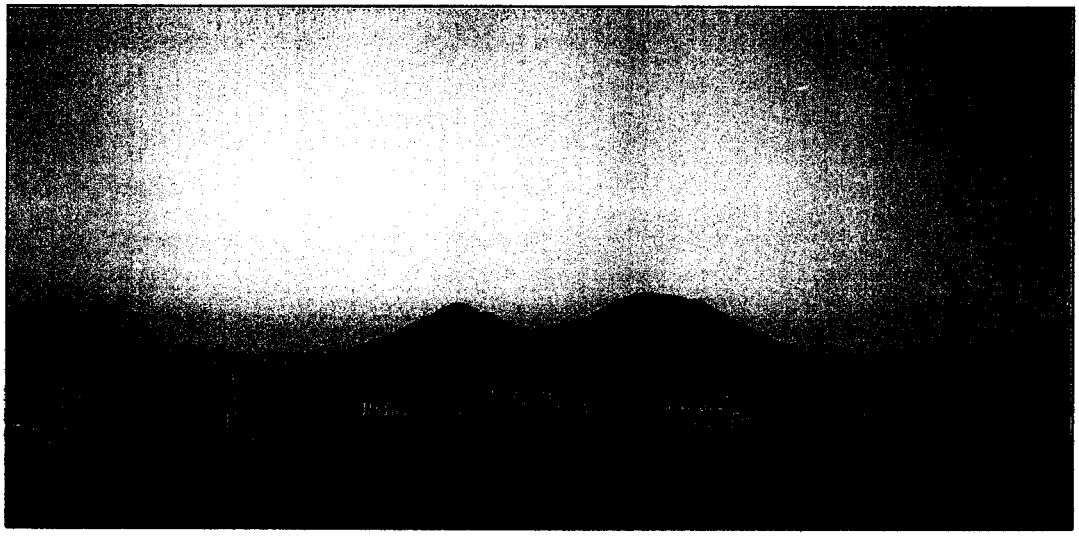
EARTH SYSTEM EVOLUTION AND THE MEDITERRANEAN AREA FROM 23 MA TO THE PRESENT



ABSTRACT BOOK

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New stratigraphic constraints for the Messinian-Pliocene transition in the Southern Alps

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The Messinian succession of the Southern Alps is widely exposed in the Venetian-Friulian Basin, whilst more westwards in the Po Basin only isolated outcrops are preserved in the Lake Garda and Lake Como areas. The Alpine Messinian deposits are characterized by the lack of evaporites and Lago-Mare type sequences and, because of the lacking of marine deposits, their chronology is still loosely constrained. Pliocene marine deposits are located in very confined outcrops at the outlet of the main valleys, from Friuli to Piedmont.

New investigations concerning many of these successions have yielded new chronological constraints for the stratigraphy of the upper Neogene in the Southern Alps area, as well as new provenance data, supporting the reconstruction of the drainage network evolution in response to the Messinian Salinity Crisis (MSC).

In Friuli, deposits of early Messinian age exposed along the Tagliamento River show a petrographic evolution across the Messinian-Pliocene unconformity. The occurrence of clasts from the Paleozoic successions of the Carnic Alps (up to 15%), completely lacking in the Messinian deposits, pinpoints to a widening of the drainage basin during the MSC because of stream piracy and tectonic activity. Deposition continues with alluvial fan facies within the Tagliamento Valley and in the upper piedmont plain until the Late Pliocene.

In the central Venetian sector, new provenance analyses on the Messinian conglomerate suggest a drastic drainage network reorganization, as a consequence of the MSC fluvial entrenchment. The Pliocene deposits at Cornuda, next to the present-day valley mouth of Piave River, indicate that the outlet of the river was still confined at that time several km to the east, and the southwestwards migration to the present location took place only later, during the Pleistocene. Westwards, in the catchment of the Brenta River an increase of crystalline rock fragments in the gross composition (from 30 to 60 %) is observed and interpreted as the enhancement of the crystalline basement exhumation, triggered by the system response to the sea level drop.

In the Lake Garda area, new investigations on the Sirmione continental conglomerate, doubtfully ascribed to the Messinian, shows the existence of three superimposed units, different in petrographic composition and sedimentology. The lower body consists of poorly-sorted, matrix-supported, coarse-grained gravels, with blocks exceeding the 0.5 m size; sand and gravel petrographic analyses point to a provenance from the Adige catchment, with porphyries locally reaching the 80% of the whole petrographic composition in the pebble fraction. The middle unit displays clast-supported, crudely-bedded gravels with a better sorting and enrichment in carbonate pebbles (up to 70%). The upper body is totally characterized by well-sorted limestone and dolostone pebbles, pointing to a drainage confined in the Southern Alps. The geologic survey allowed to detect several clayey silt layers interbedded in the conglomerate lower and middle units, that have been sampled for pollen analyses.

On the western bank of Lake Garda, the Mt. San Bartolomeo succession consists of Messinian?-Early Pliocene continental conglomerate with *Melanopsis*, overlain by Pliocene

shallow-water marine clays and an upper conglomerate unit. The lower conglomerate is clast-supported and poorly-sorted and suggests alluvial fan/intra-valley deposition settings, locally confined. Calcareous nannofossil analyses allowed to refer the marine clays to the late Zanclean (biozones NN14 and NN15). Shallow-water marine settings have been inferred also for the upper conglomerate on the basis of the occurrence of marine algae (Tasmanaceae and Prasinophyceae) and stratigraphic data suggest an heteropic relationship with the marine clay. Petrographic analyses point to a local provenance for the whole Mt. San Bartolomeo succession, with dominant carbonates and subordinate porphyries and volcanoclastic rocks in the pebbles.

The overall gathered data allow to cast light on the geomorphologic response of the fluvial systems to the MSC in the Venetian-Friulian Basin and on the Late Miocene paleodrainages in the Lake Garda area. In the Venetian-Friulian Basin the stratigraphic record documents the strong rejuvenation of the Tagliamento and Brenta rivers' headwaters, leading up to a stream piracy and to the basement exhumation increase, respectively. Taking into account the post-Messinian tectonic shortening and the former Messinian coastline position, we can estimate roughly in the order of 0.1 m/yr the upstream migration of the erosional signal triggered by the MSC dramatic sea level drop (~1500 m). More westwards, in the Lake Garda area high percentage of porphyries in the Sirmione conglomerate suggests that the Adige River flowed in Late Miocene times along Lake Garda valley with likely the Chiese River as tributary of the main trunk. The huge sand-rich bodies observed in the Po Plain subsurface and related to the Garda entry-point could be therefore referred to the Adige River catchment.

Keywords: Messinian Salinity Crisis, Pliocene, Southern Alps, drainage network, geomorphology, sediment petrography