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Tectonic and climatic control of late Pleistocene-Holocene alluvial sedimentation in the southern Po river basin (Italy)

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The southern Po River basin is the thrust-deformed margin of a foreland basin which axial drainage is represented by the east-west oriented Po River course. Its major tributaries, flowing in the south-north direction, are the Taro, Secchia and Panaro Rivers. The dimension of the catchment area of the Po River tributaries is variable, the largest one being the Taro River basin extending for 1470 km^2.

This work presents a geologic cross-section normal to the depositional axes of the Po River tributaries; its orientation is parallel to the roman *Via Emilia* and in large part adjacent to the Milano-Bologna highway. The cross-section follows the track of the *High Speed* train where stratigraphic boreholes have been drilled at distances of 100-150m and reach depths of 40-50m. The cross-section spans from Piacenza to Bologna, over a distance of 153km; its trace runs along the Intermediate Plain where the topographic slope is 2-4$^\circ/\circ\circ$ whereas in the area south of the *Via Emilia*, the so-called High Plain, the slope is generally $>4^\circ/\circ\circ$.

The data here presented consist of (1) sedimentologic descriptions of sediment cores, (2) thin-section petrographic analysis of cored sands and (3) conventional radiocarbon datings of cored vegetal remains. A good number of botanical (palinomorphs) and archaeological data are available from the literature. Sedimentary architecture has been reconstructed by distinguishing the following deposits: (1) braided-channelbelt gravels and sands, (2) river-channel sands and gravels, (3) natural-levee and crevasse-splay

sands, (4) overbank and floodbasin muds and (5) wet alluvial plain and pond organic clays and peat.

In the Po River basin Late Quaternary sedimentation is controlled by tectonics modulated by 100ka astro-climatic cycles (Calda et al, 2007). These climatically forced alluvial cycles are allostratigraphic units that can also be interpreted as Hydrostratigraphic Units consisting of sedimentary couplets such as aquifers and associated confining layers (Valloni and Calda, 2007).

The investigated depths allow the recognition of the latest Late Pleistocene-Holocene alluvial cycle. The upper part of the cycle, extending from ground surface up to 30m depth, is an essentially fine-grained body with a 12ka old base; its depositional style is that of an alluvial plain which active elements are braided and meandering perched rivers. The lower part of the cycle, extending at depth within 50m, represents extensive braided-channelbelt gravels and sands with an erosive base as old as 24 ka (MIS 2, last glacial); its depositional style is that of an alluvial fan.

During warm humid (interglacial) climatic phases coarse-grained sediment transport is confined to the river channel areas whereas fine-grained alluvium fills interchannel areas. River channels are nested on topographically elevated alluvial ridges (perched rivers) and are prone to avulsion. In the subsurface coarse-grained channel deposits and crevasse-splay gravels and sands are embedded in overbank muds and commonly host perched aquifers.

In cold (glacial) phases sedimentation is particularly effective during late-glacial times in the form of coalescent alluvial fans. Along the 153km long cross-section, the petrographic study of cored sands allows the distinction of seven alluvial fan domains. From Piacenza (west) to Bologna (east), the succession is: (1) Nure Fan, (2) Arda Fan, passing to the structurally uplifted Salsomaggiore area, (3) Taro Fan, coalescing with the (4) Parma Fan, (5) Enza Fan, passing to the structurally uplifted Reggio Emilia area, (6) Secchia Fan, coalescing with the (7) Panaro Fan.

In the studied, topographically intermediate, portion of the southern Po River basin the thickness attained by the post-glacial fine-grained sediment body is strongly variable. In the structurally uplifted areas sediment accumulation rates are of the order of 0.2 mm/a whereas in the strongly subsiding areas accumulation rates may exceed 2 mm/a.

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