The late Quaternary evolution of the Arno Coastal plain (northern Tuscany, Italy): unravelling the interplay between glacio-eustatic andtectonic signals.

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Abstract

Through the integration of sedimentological, radar interferometry and structural studies, a complex mid-late Quaternary coastal evolution related to Milankovitch-scale glacio-eustatic oscillations and local tectonics was reconstructed for the southern margin of the Arno coastal plain(APC, Tuscany, Italy). A set of 14C and ESR ages combined with SAR data, paleontological and archaeological proxy support the chronological framework. At a regional scale, the ACP straddles at the SW termination of a regional-scale fault, a crustal expression of lithospheric-scale tear segmenting the deep structure of the northern Apennines. GPS data, historical and present-day seismicity testify the activity of the fault zone. The thickness (up to 3000 m) and the age (Upper Miocene-Holocene) of the APC fill deposits reflect the accommodation space through time north of the Livorno-Sillaro line (LSL), in contrast to the recent uplifting documented south of the it.The uppermost 100 m of subsurface in the APC shows a Pleistocene incised-valley system (IVS), ca. 4 km wide and 45 m deep. The IVS fill is composed of floodplain clays passing upwards to estuarine deposits, dated to MIS 7. Above, a succession of amalgamated fluvial-channel sands record both depositional and erosional events of post-MIS 7 age. Upwards, a Holocene

alluvial-deltaic succession overlies an indurated horizon related to a younger IVS system that formed at MIS 3/MIS 2 transition. The Holocene succession becomes thin in proximity of an isolated relief, Upper Pleistocene in age, rising up to 15 m above the present-day plain, ca. 6 km south of the Arno River. ERS and Envisat SAR data were acquired between the 1992 and the 2010 and processed by using the PSInSAR technique. The subsidence rates along the southern boundary of the ACP, reach 28 mm/y even if this data may be partially enhanced by water exploitation. Our results document that the transition between the subsiding and uplifting areas does not coincide with the traditionally defined surface trace of LSL, but is located ca. 20 km northward, close to the present day Arno river course. The complex interplay between sediment accumulation and erosional processes documented in the subsurface of ACP reflect changes in the eustatic rate, connected to the Milankovitch cyclicity, and local activity of the surface splay of LSL.

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