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The infill timing of a quaternary intermontane basin: new chrono-stratigraphic and palaeoenvironmental data by a 900 m deep borehole from Campochiaro (central-southern Apennine, Italy)

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The axial zone of the central-southern Apennine (Molise sector), is characterized by the presence of several quaternary tectonic depressions (Venafro, Isernia, Carpino, Sessano, Boiano and Sepino), generally NW-SE and NE-SW elongated, filled by very thick fluvial-marshy successions. Transtensive and extensional tectonic phases, alternating by relative stable tectonic periods with prevailing climatic variation induced processes, contributed to the infilling. In fact, during Early Pleistocene, the transtensive tectonic phases and, from the end of Early Pleistocene, the extensional tectonic phases, were responsible to enhance the subsidence into the basins, thanks to the activity of the high angle faults, generally NW-SE, NESW and E-O oriented, influencing also their environmental and sedimentary evolution. Between the late Middle Pleistocene and the early Upper Pleistocene, the subsidence reduced, and alluvial plain and alluvial fans environments improved.
In the last years, several studies on the Boiano intermontane basin, bounded at south by Matese massif, were carried out. A detailed morpho-stratigraphic and tectonic evolution of the basin was proposed since Middle Pleistocene (MIS 13, 500 ka BP), thanks to field surveys and boreholes facies analyses, supported by Ar/Ar datings, tephrostratigraphical and pollen data.
However, still now, the presence of Early Pleistocene eposits was only supposed. Succession. A deep continuous core (900 m) was carried out in the Campochiaro sector of the basin. Facies analyses, supported by preliminary paleomagnetic and tephrostratigraphic data, allow us to recognize the top of the prequaternary bedrock (Molise Flysch, Miocene) at 240 m of depth and to divide the whole succession in 4 main stratigraphic units.
From the bottom to the top, the infilling is made of: Unit 1 (240-150 m), presenting lacustrine-palustrine environments, alternating clays and clayey-silts layers, constrained to Early Pleistocene; Unit 2 (150-123 m), presenting alluvial fan environments, alternating gravels and silty-sands layers, partially referred to Early Pleistocene (at least to 140 m of depth); Unit 3 (123-80 m), presenting fluvial marshy environments, alternating sandy-silts and silty-clays layers, constrained between the late Early Pleistocene and Middle Pleistocene; Unit 4 (80-0 m), presenting alluvial fan environments, being made of gravels and sandy-gravels layers, referred partially to Middle Pleistocene and partially to Upper Pleistocene, as testified by the interbedded tephra layers of the Neapolitan Yellow Tuff (15 ka BP).
Starting from these data it is possible to hypothesize that lacustrine-palustrine environments were established during the Early Pleistocene, being enhanced by subsidence due to transtensive tectonic and by a endhoreic basin. Between the end of Early Pleistocene, the NE-SW extension established, enhancing the first cycle of sedimentation of the Campochiaro alluvial fan and fluvial-marshy environments. The enhancing of the subsidence rate due to the more intense extensional tectonic phase, chronologically constrained after 600 ky BP and after 400 ky BP was responsible, together with Upper Pleistocene climatic variations, of sedimentation of the second cycle of the Campochiaro alluvial fan.