Sedimentary architecture and evolution of the central Po Plain through integrated stratigraphic and petrographic analyses.

Alluvial plains are densely populated areas, which store in the subsurface information on past environmental changes related to distinct controlling factors (e.g. climate, eustasy, tectonics). About one third of the Italian population lives in the Po Plain, an area hit by earthquakes and exposed to river flooding. This large alluvial plain, is surrounded by two active orogens, the Alps and the Apennines, which are drained by hundreds of rivers and creeks. Late Pleistocene and Holocene stratigraphy have been explored in recent stratigraphic works, based on the sedimentological analysis and correlation of shallow cores (50-120 m depth, Campo et al., 2020 and references therein). Most of these works were carried out in the coastal area, where a complex mosaic of facies testifies to sharp environmental changes forced by climate and eustatic oscillations during the last glacial-interglacial cycle (Amorosi et al., 2017). A relatively poorer literature exists on late Quaternary stratigraphy of the central Po Plain. This area has been object of detailed geomorphological studies (Castaldini et al., 2019) whereas subsurface investigation is at the industrial seismic scale (10^2-10^3 m depth). Based on petrographic and geochemical analyses on single cores (Fontana et al., 2015, 2019; Amorosi & Sammartino, 2018) sediment sourced by distinct areas of Alpine and Apenninic watersheds were differentiated. However, this changes in sediment in composition were not anchored to a regional-scale stratigraphic framework.

The aims of this project are: (i) the high-resolution reconstruction of the late Quaternary stratigraphy of the central Po Plain (lower Modena, Reggio Emilia and Mantova provinces); (ii) the assessment of the source areas of buried sediment bodies through petrographic analyses. (iii) the reconstruction of the patterns of the sediment dispersal in key evolutionary stages of the Po Basin sedimentary history and the impact of distinct controlling factors.

Several drillings and geophysical surveys have been carried out after the 2012 earthquake systems for the definition of the local seismic response. Most of these data have been georeferenced (and available online) in the database of the geological surveys of Emilia Romagna and Lombardia regions. In the 2500-km^2 wide area, which we aim to investigate, more than 15 thousands subsurface data are available, with an exceptional data density along the route of new transport infrastructures (Cispadana and TAV). These raw data, together with those from published papers, will permit a preliminary survey of the area through their interpretation and correlation in stratigraphic cross section. The second step will consist in the drilling of new boreholes, which will allow the sedimentological and petrophysical characterization of subsurface deposits. Samples for absolute dating (^{14}C and OSL) will also be collected. The third step will consist in the 3D geological modelling and the realization of thematic maps (paleogeographic, thickness maps, facies and grainsize distribution).

The expected scientific outcomes of the research are: (i) to unravel the sedimentary response of fluvial systems to late Quaternary climate change, (ii) to discuss the relative role played by other controlling factors (differential subsidence, variations in sediment supply and factors intrinsic to the fluvial system) and (iii) to understand the relationships between axial river and tributary systems through time. The results of this research will hopefully represent a robust geological basis for future applications (eg. reservoir characterization, assessment of liquefaction hazard).

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