

The Quaternary N-Apennine tectonics recorded in the Po Basin: stratigraphic and geomorphological evidences along a N-S traverse in Lombardy (Italy)

Riccardo Bersezio, Chiara Zuffetti, Emmanuele Cavalli, Mariangelo Baio, Martino Cantone, Silvia Inzoli, Mauro Mele, Fabrizio Pavia, Valentina Rigato, Yuri Rusnighi, Cecilia Rodondi, and Samuele Sozzi

Dipartimento di Scienze della Terra "A. Desio", Università degli Studi di Milano, via Mangiagalli 34, 20133, Milano, Italy

The stratigraphy and geomorphology of the Quaternary Po Basin fill record the tectonic evolution of the foreland shared by Apennine and Alpine mountain ranges. The study of N-S, 3-D cross-sections, orthogonal to the average axial strike of the basin, permits to investigate the interplay between the tectonics of the Apennine fold and thrust belt (the Quaternary southern active range of the basin) and the glacial-related dynamics along the Alpine side (the northern main source of sediments), that drove the evolution of the depositional systems and landscapes of the interposed basin.

Here we present a 25-50 Km wide, 3-D cross-section that parallels the Adda river course, connecting the Southern Alps foothills with the northernmost relieves of the Apennines, close to the present-day Po river. The GIS-based work integrates surface geology (1:10.000 mapping) with subsurface correlation of about 1000 borehole data points (20 to >1000 m deep, most ranging between 100–200 m b.g.s.) and geophysical surveys (VES, ERGI, GPR; about 200 data points, maximum investigation depth of about 300 m b.g.s.). Some radiocarbon and OSL age determinations, integrated by micropaleontological and petrographic analyses, brought additional constraints to the available stratigraphic calibration of the tectono-sedimentary evolution. The first release of the 3-D architectural model yields some suggestions:

1) In the Early Pleistocene, the northward propagation of the Apennine blind thrusts shaped the southern and central parts of the basin in a complex pattern of fault-propagation folds and intervening depocentres. The contemporary bulging of the northern Alpine side induced the progressive southward entrenchment and filling of alluvial valleys into the Plio-Pleistocene shallow marine units. A terraced landscape was confined to this northernmost part of the basin. In the depocentre, the coarse-grained depositional systems, fed by the Southern Alps, interfingered with the sands delivered by the about NW-SE striking axial rivers (fed by the Central and Western Alps). At the southern basin margin, folding, onlap and progressive truncation of the folded marine to transitional units occurred. The growing Apennine returned also some second-cycle, coarse-grained, alpine clasts to the marginal Early Pleistocene littoral units.

2) During the cyclical advances of the Alpine glacial Lario amphitheatres, the Middle Pleistocene glacio-fluvial depositional systems spread from the North, almost abutting onto the Apennines. The combination of glacial cycles and ongoing uplift in the northern Po Plain led the resulting terraced landscape to widen southwards and to progressively sculpture and seal the northernmost Apennine structures. Merging of the Middle and Late Pleistocene marginal discontinuities shaped a major composite unconformity above the uplifted, Early Pleistocene units.

3) Late Pleistocene landscape was reshaped plausibly after the latest uplift along more internal, out-of-sequence Apennine thrusts. As a consequence the Po river was displaced southwards, its alpine tributaries were entrenched and diverted, the Middle-Late Pleistocene sediments were uplifted and gently tilted and some isolated relieves remained scattered in the lowermost Plain.