Tectonics and sedimentation interplay in the eastern Tertiary Piedmont Basin (Arquata Scrivia, NW Italy): insights from new seismo-stratigraphic analysis

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The Tertiary Piedmont Basin (TPB) is an episutural basin located on top of the junction between the Western Alps and the Northern Apennines. This work combines geological mapping and interpretation of a seismic line provided by Eni S.p.A. aiming at investigating the sedimentary succession of the Arquata Scrivia-Carrosio area, a key sector separating the Alto Monferrato sector to the west from the Borbera-Curone sub-basin to the east.

The seismo-stratigraphic analysis of a 33 km-long SE-NE striking seismic line extending from Carrosio to Alessandria and tied to a well, allowed recognizing seven key stratigraphic surfaces, which define six unconformity-bounded stratigraphic units. These could be tied to the outcrop by identifying component lithostratigraphic units at surface. This works contributes to better understanding of the tectono-sedimentary evolution of this sector of TPB, which can be summarized as follows: during the early Oligocene (Unit 1), coarse-grained deltas (Conglomerati di Savignone and Molare Fms.) established, which passed distally (i.e. to the NE) into turbidites and hyperpycnites (Monastero Fm). Following the swift late Oligocene transgression, these marginal fan deltas were onlapped SE-wards by hemipelagic marlstone, containing isolated channelized turbidites (Unit 2; Gremiasco Fm.). Coarse clastic supply was re-established during the Aquitanian-early Burdigalian, with deposition of confined turbidites, mass transport deposits, and channelized turbidites (Unit 3; Castagnola and Costa Montada Fms). In Unit 4 (Costa Areasa Fm., upper Burdigalian-lower Langhian) a basin plain environment established all over TPB, reflecting an increase of the accommodation space driven by southward tectonic tilting of the basin. A further event of basin inversion is that of the intra-Langhian sea level fall, driven by tectonic uplift to the south and recorded by Unit 5 (upper Langhian-lower Messinian), which comprises a range of shelfal systems (Marne di Cessole, Arenarie di Serravalle and Marne di S.Agata Fossili Fms.) making northward transition into turbidites (Cassinasco Fm.). Lastly, Unit 6 (upper Messinian-Pliocene) encompasses a basal package of conglomerates (Conglomerati di Cassano Spinola Fm.), followed upward by early Pliocene clays (Argille di Lugagnano Fm.), over which the shelf margin prograded depositing the Sabbie d'Asti Fm.

In addition, the analysis of velocity data from four additional wells from other sectors of the TPB allowed defining a P-wave velocity and seismic wave propagation model. Besides the increase of velocity with depth, conglomeratic facies were found to show higher velocities (in the range 3500-4200 m/s at depths between 350 and 2800 m) than arenaceous and pelitic facies (in the range 2000-3370 m/s at depths between 350 and 3500 m below surface). Results will help time-depth conversion of seismic lines detailing the subsurface of TPB, contributing to accurate reconstruction of basin fill architecture.