

## **Seismo-Stratigraphy of Deep Messinian Incisions in the North West Sector of the Sicily Channel and North East Tunisian Offshore**

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### **Abstract**

Geomorphological features such as buried valleys are pervasive structures documented by many studies across the circum-Mediterranean basins in most cases related to the Messinian salinity crisis event (MSC). However, the origin and evolution of these valleys are still not completely resolved. This in most cases arises due to limited availability or accessibility of high-quality geophysical datasets. This research focuses on understanding the origin and development of incised valleys identified from a suite of 2-D seismic reflection data and borehole data acquired in the Northwestern portion of the Sicily channel and offshore of Tunisia in the Central Mediterranean Sea. This was achieved by performing a detailed seismic-stratigraphic analysis and interpretation of the Plio-Quaternary succession in the study area located to the Northwest of the Adventure Plateau. Four large-scale NWSE and NE-SW trending valleys were identified in the Plio-Quaternary succession in the study area. The morphology and longitudinal profile of these valleys indicate that they evolved from the Adventure Plateau (proximal part) and developed in a NW direction. The valleys have a width ranging between 14 to 18 Km and depth of between 1.9 to 2.5 Km. In the study area, the valleys span between 574 to 1221 Km<sup>2</sup>, having sediments infill volume ranging between 340 to 392 km<sup>3</sup>. The valleys present a Vshape morphology in the proximal part in contrast to a U-shape morphology in the distal portion. The evolution of these valleys mapped arise from an interplay between tectonics and erosion related to: (1) creation of accommodation space at the thrust front during the Alpine compressional phase of the pre-MSC (Mesozoic and Eocene), folding-thrusting of the flysch and rifting; (2) major episode of erosions/incision occurring during the MSC and (3) reflooding of the valleys and syn-tectonic controlled sedimentation in the Plio-Quaternary. Likewise, a remarkable structure is documented in the study area related to fluid flow induced collapse of the overburden. The findings from this study beside shedding light on the role of the MSC and tectonic events in shaping the subaerial landscape architecture, which separated the Western from the Eastern Mediterranean have also implication for hydrocarbon exploration. These incised valleys in fact acted as an important sediment's conduits or storage during the MSC lowstand and subsequent early transgressive system tract may hold potential for trapping hydrocarbons. Possibilities for mixed structural and stratigraphic traps might occur by the combination of sand accumulation within the valley and/or at the termination of these incisions and subsequent deformation associated with post MSC compressive tectonic.