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Outer shelf dynamics in a sediment-undersupplied margin: The Malta Plateau, central Mediterranean Sea

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The Malta Plateau is a shallow (100–150 m), asymmetric, north–south striking ridge located in the north-eastern part of the Pelagian Platform, central Mediterranean Sea. To the east, the plateau is bounded by the Malta Escarpment, a 250 km long and >3 km high carbonate cliff. Reconstructions of past sea-level changes and stratigraphic analyses have suggested that this margin has largely remained isolated from inputs of fluvial and littoral sediments, resulting in low sedimentation rates (6 cm per ka) in the last 6 Ma.

In this study we present geophysical and sedimentological data acquired during the CUMECS oceanographic cruise in 2012 to demonstrate that, in spite of its classification as a sediment-undersupplied margin, the outer Malta Plateau is a dynamic seafloor environment influenced by a range of erosional and depositional processes. We report the widespread occurrence of a range of mass movement deposits, submarine canyons and channels, contouritic drifts and uplifted blocks in an area of just 370 km^2. We explain such intense geomorphic activity by an interaction of sedimentary, tectonic and oceanographic processes. Submarine mass movements occur in stratified Plio-Pleistocene hemipelagic/pelagic sediments and are caused by loss of support associated with the erosion by gravity flows of canyons on the adjacent Malta Escarpment. At present, tectonic activity on the outer Malta Plateau is subdued in comparison to the seafloor offshore eastern Sicily, yet inherited structures such as horsts and fault scarps have provided an ideal setting for the development of channels flanked by thick (>200 m) contouritic drifts. Long-term flow of benthic currents – possibly associated with either Levantine Intermediate Water flows at present or Modified Atlantic Water flows during sea-level lowstands – is proposed as the agent responsible for the formation of both channels and drifts. The combination of horsts and benthic currents has also provided the ideal conditions for the development of black coral communities at depths of ~300 m.

These results have important implications for the integrity of the dense network of submarine cables and pipelines that cross the central Mediterranean seafloor.