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Deep-sea bedforms indicating increased Mediterranean bottom current activity during interglacials: an example from the Southwestern Adriatic Margin

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The Southwestern Adriatic Margin (SAM) offshore Bari is characterized by complex circulation pattern related to the interaction between two southward-flowing bottom-water masses: the cold and deep North Adriatic Dense Water (NAdDW) and the highly saline Levantine Intermediate Water (LIW). This complex bottom-circulation pattern impacts on a margin characterized by a markedly irregular morphology and fine-grained sediments supply creating an ideal condition for the development of bottom current deposits (e.g. contourite drifts and sediment waves).

In the Northern part of the SAM, VHR Chirp sonar profiles, TOBI mosaics, multi-beam data and sediment cores reveal the presence of an extensive field of upslope (upcurrent) migrating sediment waves. This field of sediment waves covers an area of 280 km^2 with a markedly irregular and eastward dipping slope shaped by previous erosion. Typical wavelengths are of 1-2 km and waves heights up to 50 m) with a decrease southward (downcurrent). The waves orientation appear strongly affected by the pre-existing seafloor morphology and shifts from parallel to perpendicular respect to the regional slope while waves crests change from slightly sinuous to barchan-like in plain view. Proceeding further eastward, the sediment waves field appear bordered by a stepped upper slope shaped in a broad erosional area, likely related to bottom current flow and/or previous events of sediment failure. To the east, instead, the sediment waves dimensions decrease, the wave asymmetry increases and bifurcated crests appear, presumably due to lateral reduction of bottom current energy.

To the south and proceeding into deeper waters, the sediment waves become more isolated and are progressively replaced by a large area of well-defined abyssal furrows

elongated for several km parallel to the main inferred flow of the bottom currents. The furrows are also superimposed on the sediment waves field and particularly on their southward (and downslope dippeing) flank and in the erosional trough between them.

The gradual change in bedforms types (from depositional and slope-parallel sediment waves to erosional furrows) and the occurrence of two crest direction suggest a southward variation of the bottom current flow accompanied by a possible increase in velocity or a change in sediment concentration. An increase in bottom current velocity is likely related to a constructive interaction between the two distinct south-flowing water masses (NAdDW + LIW) and may be enhanced by an increase in slope gradient proceeding downcurrent.

In cross section, the sediment waves reveal a complex internal structure and changing migration rates, through the time, induced by a change in bottom-current velocity possibly driven by the Late-Quaternary climatic variations. The combination of Chirp sonar profiles and core data suggest that during glacial times (corresponding to low stand of sea-level) bottom currents were less intense than they appear to be during interglacials.