Geophysical Research Abstracts,
Vol. 10, EGU2008-A-08393, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-08393
EGU General Assembly 2008

Cascading currents and distribution of deep-sea bedforms in the South Adriatic

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Dense cascading currents impact energetically the seafloor of the SW Adriatic margin, eroding and depositing large amounts of fine-grained sediment below a markedly erosional upper slope. These cascading currents are generated in the broad and shallow North Adriatic shelf through intense winter cooling and evaporation, which are responsible for the formation of the North Adriatic Dense Water (NAdDW), the densest water of the whole Mediterranean. Once its density exceeds the density of the surrounding water masses, the NAdDW flows southward along the Italian coast and reaches the shelf break, typically over a prolonged interval (several weeks) at the end of the winter season.

By cascading across the slope, the dense water impinges the seafloor and interacts with the complex margin morphology, generating patchy fields of large-scale mud waves that are spatially associated with a variety of erosional bed forms, such as moats, furrows and comet marks. Sediment cores and seismic correlations suggest that all these bed forms, both erosional and depositional, are primarily active during the modern interglacial as well as during the last interglacial, when climatic forcing also allowed the formation of the NAdDW on the shallow north Adriatic shelf.

A branch of the cascading NAdDW is confined and accelerated in the Bari Canyon System where it produces a strong current capable of reaching down-slope velocities greater than 60cm/sec, eroding the canyon thalweg and entraining large amounts of fine-grained sediment. At the exit of the canyon, in water depth greater than 900m, the

current becomes less confined, spreads laterally and generates an 80-km2-wide field of mud waves; these bedforms migrate up current and show amplitudes up to 50m and wavelengths of about 1km.

On the open slope, three other major fields of mud waves compare in size with those observed down canyon and also show up-current migration. All these fields are located down-slope of large erosional areas but occupy distinctive slope sectors characterised by dissimilar morphologies. Furrows and comet marks are spatially and genetically associated with the mud waves, particularly on their downslope (and down-flow) limbs, where current flows reach their maximum strength. Data regarding the distribution, morphology, orientation and stratigraphy of these patchy fields of mud waves are interpreted to record the long-term (millennial-scale) average of the seasonally variable direction and intensity of the NAdDW cascading currents, evidencing their preferred pathways across the slope.