

## **Upper flow-regime structures in a Pleistocene carbonate ramp (Favignana, Italy): diagnostic criteria and implications**

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This work presents key diagnostic criteria for the recognition of upper flow-regime sedimentary structures in clastic cool-water carbonate accumulations, illustrated by the excellent exposures of the Pleistocene carbonate ramp succession of Favignana Island (Italy). Cool-water carbonate sedimentation has dominated Mediterranean shelves since the Early Pliocene. Of the various types of marine limestones, cool-water carbonates behave most similar to siliciclastics. They typically develop ramp morphologies with skeletal sand and gravel, consisting of the remains of heterozoan organisms. Resedimentation of this loose carbonate debris during high-energy events such as storms and, more rarely, tsunamis is the norm. Off-ramp supercritical sediment density flows are important contributors to basinward sediment transport as evidenced by the prevalence of backset-stratification bounded by composite erosion surfaces, locally defining spoon-shaped scours-fills, in beds exceeding several metres in thickness. Sedimentary structures created by upper flow-regime bedforms like antidunes, chute-and-pools and cyclic steps as seen on Favignana Island, which form in association with in-phase waves and hydraulic jumps, are not commonly mentioned in carbonate ramp depositional models. For each of the bedforms we present diagnostic criteria to explain otherwise enigmatic sedimentary structures. Thick beds deposited by supercritical sediment density flows have major implications for the distribution of porosity and permeability in carbonate sandstone bodies, especially where they host hydrocarbon and/or water accumulations. The correct identification of upper flow-regime sedimentary structures in carbonate ramp accumulations is therefore important.