

Modern Examples of Mass-Transport Complexes, Debrite and Turbidite Associations: Geometry, Stratigraphic Relationships and Implications for Hydrocarbon Trap Development

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Two modern mass-transport deposits are present along the northeastern Sicilian margin in the Tyrrhenian Sea. They are the result of the failure of slope and channel-levee complex deposits. The eastern, Villafranca MTC occurred through repeated failures that resulted in the stacking of successive mass transport deposits. The main deposit is a frontally confined landslide with a basal shear surface exhibiting ramp and flat geometry. Thus, the geometry of the landslide provides a lateral seal of pre-landslide units both along the sidewalls and along the frontal region of the landslide. The headwall region of the Villafranca MTC is scoured by channels that are 1 km wide and are filled by thick deposits that are transparent in subbottom profiles. Since the shelf facing the headwall region is very narrow they are likely the result of deposition from coarse grained sediment gravity flows fed directly from nearby rivers. The transparent deposits are also found downslope from the channel mouth where they pinch out against the relief behind the confined front of the MTC. The frontal elevated region of the MTC also serves as partial confinement to flows that are fed from a nearby actively building channel-levee system.

The main body of the western, Capo d'Orlando MTC also possesses a ramp and flat geometry but its front was able to spread above the paleoseafloor and thus represents an example of a frontally emergent landslide. Thus the MTC can represent a lateral seal to pre-landslide units along the sidewalls and a top seal in the distal toe region where it overlies basin plain turbiditic lobe units. Beside the large landslide, thick transparent layers are also present in the western part of the basin plain that can be interpreted as debrites on the basis of their blocky reflective character on the side scan sonar data. The debrites have central channalized areas that erode as much as 10 m into the underlying succession, as well as conformable, wing-like margins. In the eastern area on the contrary, a turbiditic lobe is fed by an actively growing channel levee system. Therefore in large parts of the basin plain debrites and turbidites alternate in the subbottom sedimentary column. The detailed sidescan sonar and subbottom data capture an high resolution image of the character of their relationships and therefore have the potential of represent a good analog to help in the prediction of hydrocarbon trap potential in areas with a similar stratigraphic setting.