

Seismostratigraphic reconstruction of the Messinian palaeotopography across the Northern Sicily Continental Margin (NSCM) and an overlying Zanclean megaflood deposit

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During the Messinian salinity crisis (MSC) (from 5.97 to 5.33 Ma), the Mediterranean Sea became disconnected from the world's oceans and a fast and continuous evaporation resulted in its partial desiccation. One of the theories for the end of the MSC postulates that a large volume of Atlantic waters entered the Mediterranean Sea through the Gibraltar Strait and rapidly refilled the Mediterranean basin in an event well-documented known as the Zanclean Flood. The pathway of the Zanclean flood during its passage from the western to the eastern Mediterranean Sea is unclear. The aim of this study is to understand the effects of the Messinian palaeotopography of the southern Tyrrhenian Sea on the dynamics of the Zanclean flood. We analysed a large number of multichannel seismic reflection profiles acquired in the Northern Sicily Continental Margin (NSCM), calibrated with stratigraphic log from the Agip/ENI wells, and high-resolution multibeam data showing the present-day morphology. A detailed seismostratigraphic and structural analysis of these data allowed us to identify two different types of chaotic bodies in the Plio-Pleistocene sedimentary succession. The first type consists of a very thick deposit characterised by chaotic to transparent seismic facies, deposited non-conformingly above an older substrate with a very high-amplitude reflector along its top. This older substrate correlates to the MES horizon (Lofi et al. 2011). The second type consists of thinner bodies having smaller volumes and chaotic seismic facies interbedded with the well-stratified Pleistocene-Holocene deposits. We interpret the Pleistocene-Holocene chaotic bodies as small-scale mass transport deposits (MTDs) that are mainly located at the foot of steep escarpments and partly triggered by the compressional, extensional, and strike-slip Plio-Pleistocene tectonics. We hypothesise that the larger chaotic body is a flood deposit, possibly emplaced by a branch that separated from the main flow transferring water and sediment through the Sicily Channel (Micallef et al., 2018). Based on the reconstructed Messinian palaeotopography of the southern Tyrrhenian Sea, the Zanclean flood flowed from west to east across an elongated depression that is now bordered by the "Elimi Chain" to the north and the Sicilian coastline to the south. The material transferred was finally deposited at the toe of Scuso bank and Solunto high.

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