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Volcano- and neoectonic-related slope failures in the north-western Sicily Channel (central Mediterranean Sea): Implications for understanding and assessing geohazard risk

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The southern Sicily coasts represent an important contribution to Italian tourism and marine geological processes in the Sicily Channel could pose a significant risk to neighbouring populations and goods.

In this work, we are presenting the first results of the data collection that allowed us to identify and map several geological elements that can be used to assess submarine geohazards in the Sicily Channel. By using multibeam data and high-resolution seismic reflection profiles acquired during the ACUSCAL 2015 Cruise, we defined the characteristics of the morphostructural highs, and the morphology of slope failures and the stratigraphy of the mass transport deposits (MTD).

In particular, we studied in detail the Graham Bank, which is located in a shallow sector of the north-western Sicily Channel at a distance of 45 km from the Sicilian coastline, where seven seamounts (M1-M7) have been identified and studied in detail within a small area, between 10 and 350 m deep. Their morphometric parameters allowed classification to be implemented on a shape basis. The volcanoes are 115-180 m high and 500-1500 m wide. M2 and M3 (3.5 km X 2.8 km) form the Graham Bank. Most of them show strongly inclined flanks with an average slope of 30°. Most of these seamounts are aligned along two trends (NW-SE and N-S), parallel to the main tectonic structures of the Sicily Channel. The identified structures show physical characteristics, which are very similar to several submarine volcanoes described elsewhere on the seafloor, allowing to conclude that they are volcanic seamounts. In this regard, it is important to highlight that the Graham Bank was affected in the last 100 years, by many eruptions (Colantoni et al. 1975).

Furthermore, we distinguished slope failures relating to different mechanisms. In the western flanks of the M2 and M3, volcanic activity and concurrent up-slope triggered mass failures. In the eastern flank M2 gravitational collapse of volcanic edifices is mainly linked to neotectonic activity and volcanism. In the central part of the study area, a MTD is linked to neotectonic activity and to the rise up of volcanic rocks. These MTDs were mapped and described as potential tsunamigenic elements and their volumes were estimated. This work allowed us to understand geological features and processes in a tectonic-volcanic environment, which may represent a threat for coastal areas of the southern Sicily.

Colantoni P. 1975. Note di Geologia Marina sul Canale di Sicilia. Giornale di Geologia (2), 40, 1, 181-207.

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