



## **Sector-Collapses inducing Tsunami Hazard in Madeira Island, NE Atlantic - Numerical Simulation of the 1930 Tsunami**

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Madeira, the main Island of the Madeira Archipelago with an area of 728 km<sup>2</sup>, is a North East Atlantic volcanic Island highly susceptible to flank instability. Historical records contain accounts of a number of mass-wasting events along the Island, namely in 1969, 1804, 1929 and 1930. Sector collapses of cliffs are major hazard in oceanic Islands as they involve large volumes of material, generate fast running debris avalanches, and even cause destructive tsunamis when entering the sea.

On March 4th, 1930, a sector of the Cape Girão cliff, located in the southern shore of Madeira island, collapsed in the sea and generated an 8 m tsunami wave height. The landslide-induced tsunami propagated along Madeira's coast and flooded the Vigário beach, 200-300 m of inundation extent, causing 20 casualties.

In this study, we investigate the 1930 subaerial landslide-induced tsunami and its impact on the nearest coasts using numerical modelling. We first reconstruct the pre-event morphology of the area, and then simulate the initial moving of the sliding mass, the propagation of the tsunami wave and the inundation of the coast. We use a multi-layer numerical model, in which the lower layer represents the deformable slide, assumed to be a visco-plastic fluid, and bounded above by air, in the subaerial motion phase, and by seawater governed by shallow water equations.

The results of the simulation are compared with the historical descriptions of the event and we, furthermore, evaluate the coastal impact of a similar event in present-day conditions of the Island.

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