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Tsunamigenic potential of mass sliding in the Gorringe Bank (Gulf of Cadiz, SW Iberia)

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Landslides along continental margins represent a significant source for tsunami generation, due to the oversteepened slopes where they are usually located, enhancing mass velocity and then their tsunamigenic potential. These phenomena represent a threat due to their usual closeness to the coast, involving short travel times, and also because they are scarcely detectable in their incipient phase. From the mitigation point of view, then, it is really important to explore the seafloor in search of evidences of past slide events, in order to understand their entity and to evaluate their impact on the coast through proper modelling. This approach can be useful also for defining scenarios and for assessing future possible threats.

One of the possible areas for such landslide generated tsunami is located west of the Portuguese margin, in the Atlantic Ocean, and specifically along the Gorringe Bank. The North Gorringe rock and debris avalanche is located in the south-eastern edge of the Tagus Abyssal Plain, at the north-eastern flank of the Gorringe Bank. This mass movement, with a total surface of 378 km2, is composed by a massive rock and debris avalanche, developing for 35 km in a depth range of 2900-5100 m, for a consequent height drop of almost 2200 m. The main source area is a 7 km large 11º steep headwall scar located at a depth range of 2900-4500 m and covering a surface of almost 100 km2. The corresponding depositional area is characterized by a much lower slope (1.5º). It is composed by a proximal rock cluster area and a distal lobe totalizing a surface of 280 km2 and maximum run-out distance of 27 km. Based on the interpretation of multichannel seismic profiles and interpolation of bathymetric data we estimated the volume of the North-Gorringe rock avalanche in 70-80 km3. The aim of this work is to evaluate the generation of tsunami from the reconstructed slide mass and assess if such landslide, generated in really deep water (at about 3000 m below sea level) and hundreds of km far from the coast, can represent a potential threat for the coastal communities. The landslide motion is simulated through the UBO-BLOCK2 code, developed by the University of Bologna team, splitting the mass into a set of blocks and solving the motion equations on their centre of mass. The slide motion provides the impulse, filtered through the sea depth, for the tsunami generation and propagation code, UBO-TSUFE, solving the shallow water approximated equations.

The results are really interesting: the coasts of Portugal are reached by considerable waves, up to 10 m high, in around 30 minutes, and the tsunami reaches the Spanish and African coast after about 60 minutes.