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Simulation of landslides from the Stromboli volcano, Italy and evaluation of their tsunamigenic effects

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The recent South-East Asia disaster showed the lethal effects of the generation of waves by a large-size submarine earthquake, but tsunamis with catastrophic consequences can be generated also by mass failures, both submarine and subaerial. A mega-tsunami affecting the whole Tyrrhenian sea could have been generated in the volcanic island of Stromboli, South Italy, where less than 5 ka years ago a mass with volume in the order of 1 km^3 detached from the north-western flank of the volcano, forming the Sciara del Fuoco scar. In addition to large tsunamis, Stromboli can be the source of small- and medium-size events all attributable to mass instability. In the course of the ordinary volcanic activity most of the ejecta are channelled along the Sciara del Fuoco, with the result that the slope attains conditions of gravitational instability and landslides may occur with tsunamigenic effects. These events were shown to have occurred at least five times in the last century and to have caused locally high waves and serious damage, like in the case of the two 30th December 2002 tsunamis that affected the whole Stromboli coast. In this contribution

The goal of the study is to analyse the dynamical evolution of the mass bodies detaching from the north-west flank of the volcano. We consider several cases in order to study the effect of the mass geometry (e.g. shape, mass distribution, volume) and detachment position on the landslide motion, and to explore its tsunamigenic potential. In particular we compare the potential of subaerial to submarine landslides, and we study the time evolution of the landslide Froude number that is known to be related to the efficiency of the transfer of energy from the sliding body to the sea water waves. The mass dynamics is studied by means of a Lagrangian code, while the generation and propagation of the tsunami waves are analysed through a finite-element code based on a Eulerian approach.