



The Stromboli tsunamis of the December 30, 2002

S. Tinti (1), A. Armigliato (1), A. Manucci (1), G. Pagnoni (1), F. Zaniboni (1), A. Maramai (2), L. Graziani (2)

(1) Department of Physics, Sector of Geophysics, University of Bologna, Italy

(2) Istituto Nazionale di Geofisica e Vulcanologia (INGV), Sezione Roma 2, Unità Funzionale “Ricerche Interdisciplinari Geo-marine”

Stromboli island is one of the islands of the Aeolian group, NE of Sicily, Italy. On the 30th of December 2002 it was attacked by two tsunamis, generated by two distinct landslide-episodes that took place in the northern part of the Sciara del Fuoco, which is the scar of a Holocene sector collapse involving the north-west flank of the volcano. The seismic network recorded two main landslides, at 13:14:05 and 13:22:38 local time. The total volume of the failure is difficult to ascertain and was estimated by means of bathymetric and aerophotogrammetric surveys that were performed before and after the event: it is roughly between $2\text{-}3 \cdot 10^7 \text{ m}^3$, with the submarine scar much larger than the subaerial one. Both mass failures produced a tsunami. The landslides and tsunamis occurred unexpected. The instrumental data available are insufficient to allow a precise reconstruction of the events. To this, invaluable contributions come from the accounts of the eyewitnesses that were collected through specific interviews. The reports reveal that the first slump occurred underwater and that it generated a train of waves that produced a first sea withdrawal and a subsequent sea return. The second slump was totally or mainly subaerial and it generated three big waves associated to the second tsunami. The tsunami waves were most violent along the northern and north-eastern coast where a maximum run-up height of about 11 m was measured during the post-event field surveys. The tsunamis are modelled by means of numerical simulations that make use of two distinct models, one for the landslide, a Lagrangian model, and one for the tsunami propagation that is based on a finite-element technique. The simulations explain how the tsunamis, that were generated in the Sciara del Fuoco area, attack the entire coastline of Stromboli with effect larger on the northern coast, as observed in field surveys. The calculated water elevations at the coast are in good

agreement with the collected run-up heights.