



EXCHANGE OF EXPERTS
in civil protection



Tsunami risk mitigation in Stromboli

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Domenico Mangione and Antonio Ricciardi
National Civil Protection Department - Volcanic Risk Unit



PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile

TABLE OF CONTENTS

- Introduction
- Tsunami risk in Stromboli
- National tsunami risk management overview
- Conclusions





ITALIAN CIVIL PROTECTION FRAMEWORK



A

Natural or man-made events that could be managed locally by the competent administration;

MUNICIPALITY

B

Natural or man-made events that given the size and impact could be managed locally in coordination by more than one administration;

MORE MUNICIPALITIES, PROVINCES, REGIONS



C

Natural or man-made calamities that given the size and impact, must be managed rapidly with extraordinary efforts for a limited period of time

GOVERNMENT



GENERAL OVERVIEW



AEOLIAN ISLANDS

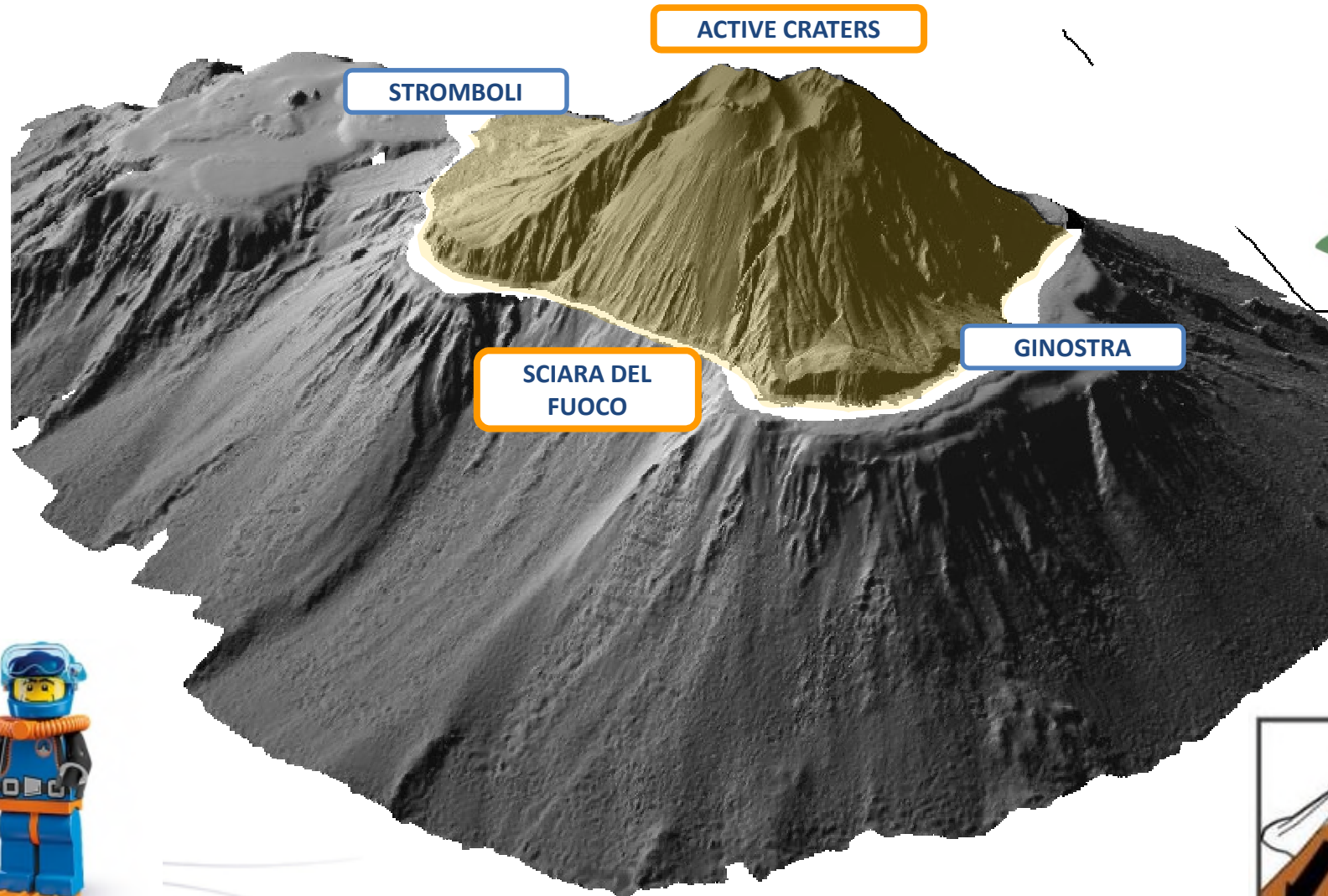


STROMBOLI

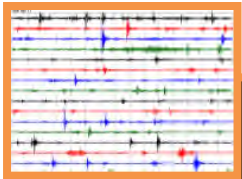
Volcano type: stratovolcano
Position: Sicilia – Mar Tirreno
Height: 924 m s.l.m.
Area: 12 km²
Eruptive activity beginning: 200.000 y.a.
Last eruption: 2014, effusive
Activity status: always active
Inhabited areas: Stromboli and Ginostra
Population involved: 800 - 5.000 units



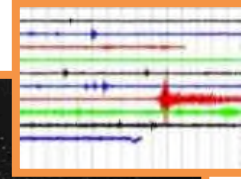
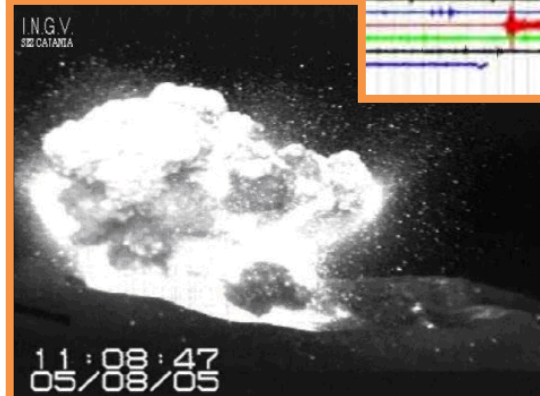
STRUCTURAL FEATURES AND POPULATED AREAS



MAIN HAZARDS



STROMBOLIAN ACTIVITY



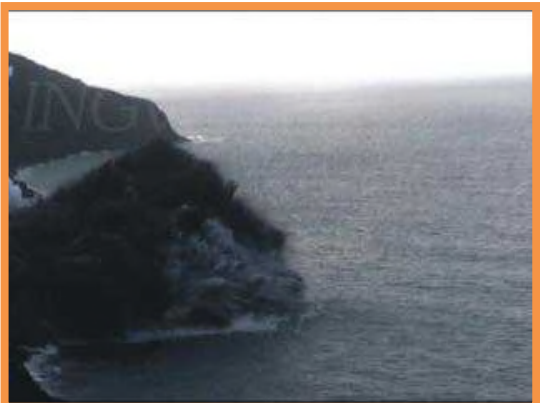
MAJOR EXPLOSIONS



PAROXYSMAL EXPLOSIONS



LAVA FLOWS



LANDSLIDES

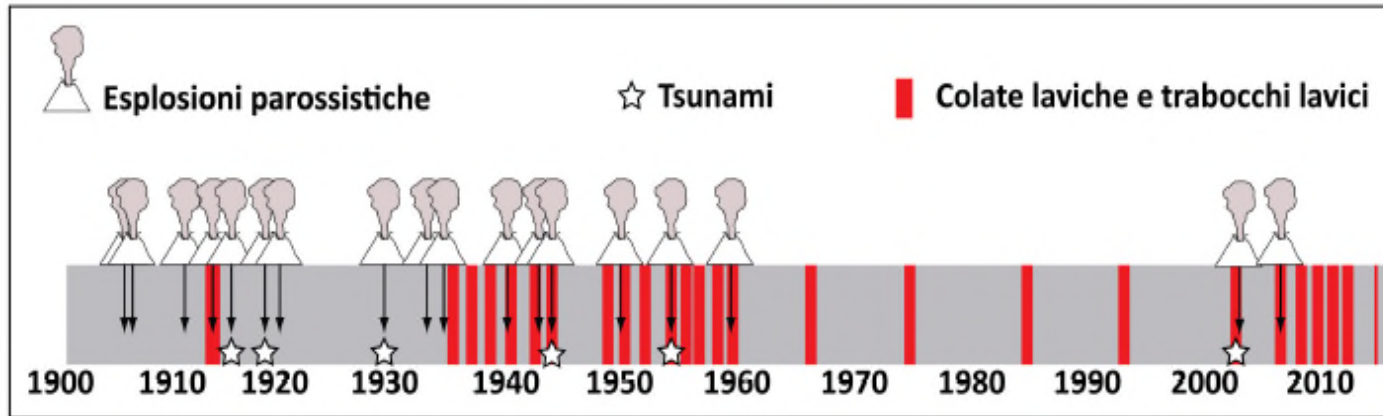


TSUNAMIS

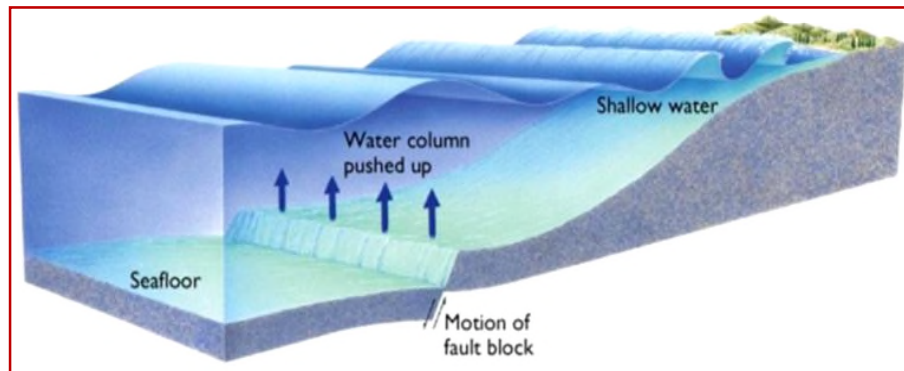
TSUNAMI RISK VULNERABILITY AND EXPOSURE



TSUNAMIS IN THE LAST CENTURY



Data
3 luglio 1916
22 maggio 1919
11 settembre 1930
20 agosto 1944
2 febbraio 1954
30 dicembre 2002



Submarine landslides



Volcanic eruptions



THE 2002 TSUNAMI EVENT

**2002-2003
ERUPTIVE CRISIS**



**2002 DECEMBER 28TH
OPENING OF EFFUSION VENTS**

**2002 DECEMBER 30TH
LANDSLIDE ALONG SCIARA DEL FUOCO**

**2002 DECEMBER 30TH
TSUNAMI**



TSUNAMI RISK MITIGATION : EMERGENCY PLAN



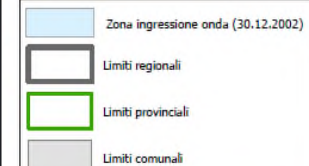
ISOLA DI STROMBOLI MAPPA DI INGRESSIONE DELL'ONDA DI MAREMOTO DEL DICEMBRE 2002

Piano nazionale di emergenza a fronte di eventi vulcanici di rilevanza nazionale 2015

Inquadramento Geografico



Legenda

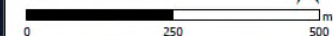


Note

FORNITORI DATI
 Elaborazione DPC su base dati del lavoro "Tinti S., Maramai A., Armigliato A., Graziani L., Manucci A., Pagnoni G., Zaniboni F. (2006): Observations of physical effects from tsunamis of December 30, 2002 at Stromboli volcano, southern Italy. Bull. Volcanol. 68, 450-461".

Informazioni Cartografiche

Proiezione: UTM 32 N; Datum: WGS84
 Proiezione geografica: Lat/Lon; Datum: WGS84
 Scala: 1:16.500





Comune di Lipari



Dipartimento della Protezione Civile

Via Ulpio no. 11 - Via Vitorchiano, 4 - Roma
Centralino : +39.06.68.20.1
www.protezionecivile.it
comunicazione@protezionecivile.it

W E L C O M E

ON THE MOST BEAUTIFUL ACTIVE VOLCANO IN THE WORLD



Safely on Stromboli

Stromboli is a volcano in constant activity, generally interested by explosions of moderate energy with outbursts of lava fragments up to tens of meters high. Such explosions, which are called "stromboliens", occur with a frequency of 10-20 minutes and define the state of "ordinary" activity. Periodically and without any clear warning, the volcano may increase its explosive energy and alter its manifestations' characteristics, thus increasing its level of danger.

The volcano's state changes require flexible regulations in granting access to the higher parts of the mountain and to the coastal areas. The altitudes which can be reached by the trails, independently or accompanied by authorized guides, are established according to the volcano's current state of activity. Access to coastal areas may be temporarily forbidden for short periods of time, in case of imminent tsunami danger.

Official personnel of the Guardia di Finanza (Alpine Rescue Unit) and of Carabinieri control the territory in order to enforce the prevailing regulations.

ONCE ON THE ISLAND, IT IS ADVISABLE TO GATHER ALL AVAILABLE INFORMATION REGARDING THE CURRENT LEGISLATION AND REGULATIONS PROVIDED

Lava flows

Periodically the volcano's activity has an effusive nature; lava flows penetrate the Sciara del Fuoco slope. The high temperature of the lava entering the sea water causes the formation of thick whitish columns.



3

3



Rules of conduct

- Be informed on the locations to reach as to be able to observe the phenomenon safely.

Landslides along the Sciara del Fuoco

The phenomenon of masses rolling down the Sciara del Fuoco slope is rather frequent, and represents a major risk for visitors in the coastal area's proximity.



4

4



Rules of conduct

- Navigation and bathing are forbidden within 400 m of the coastline in front of Sciara del Fuoco.

Tsunamis

The coastline of Stromboli may rarely be affected by tsunamis. Tsunamis are caused by large landslides down the Sciara del Fuoco slope, and by powerful explosions or by earthquakes.



5

5



Rules of conduct

- If, while visiting the coastal area, the sea retreats from the shore, or an earthquake or a loud explosion should occur, or in any case at sound of sirens, the visitor must make his way inland following the "no" signs. If by boat take to the open sea.

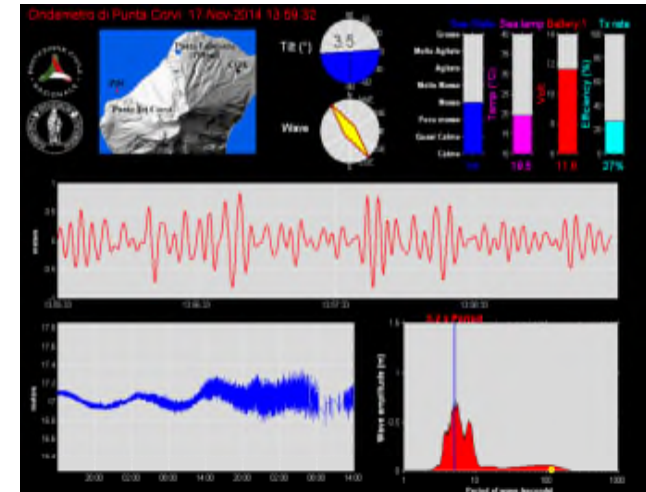
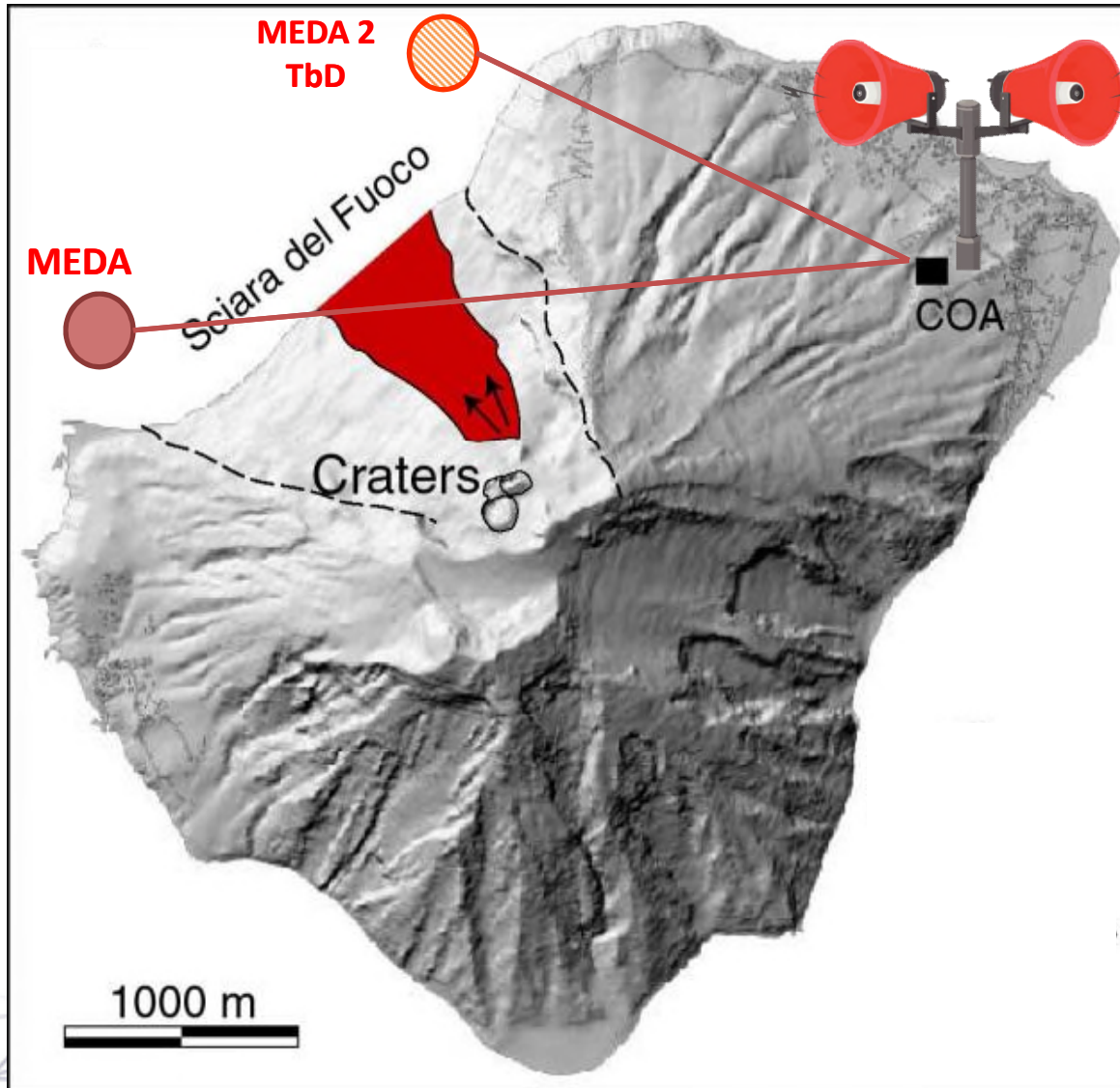


TSUNAMI RISK MITIGATION : SIGNALS



- ✓ Signals show the behaviour rules in case of tsunamis.
- ✓ Arrows indicate the fastest path to reach safe areas.

TSUNAMI RISK MITIGATION: INSTALLATION OF TWO BUOYS



NATIONAL TSUNAMI RISK OUTREACH CAMPAIGN: IO NON RISCHIO



IO NON RISCHIO maremoto

What to do DURING a tsunami

If you are at the beach or in a coastal area

and receive an alert message that indicates the possible arrival of a tsunami wave, or recognize at least one of these phenomena:

- A strong earthquake you have felt or that you have heard about
- A sudden and unusual retreat of the sea, a rapid rise in sea level or a big wave extending across the whole horizon
- A deep and increasing noise coming from the sea, like that of a train or a low flying aircraft



← Move away from the water and quickly reach the nearest elevated area (such as a hill or the upper floors of a building).

Warn those around you of imminent danger



Run on foot following the fastest escape routes. Do not go by car, it could become a trap →

If you are at sea,

you may not be aware of the phenomena accompanying the arrival of a tsunami, so it is important to always listen to radio press releases:

If you are in a boat and you get news of an earthquake on the coast or at sea, move further offshore; if you are in a port, leave the boat in port and move to safety in a higher place. →



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IO NON RISCHIO maremoto

What to do AFTER a tsunami

Stay in the area you have reached and discourage anyone from going back to the coast: the first wave might be followed by more dangerous ones. →



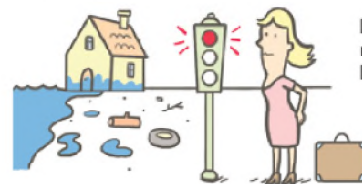
← Check the health conditions of the people around you and, if possible, give first aid assistance.

Listen to the authorities to find out when it's safe to leave and what you need to do. →

Use the phone only for emergencies.



If your home has been affected by the tsunami, do not return without permission. ↓



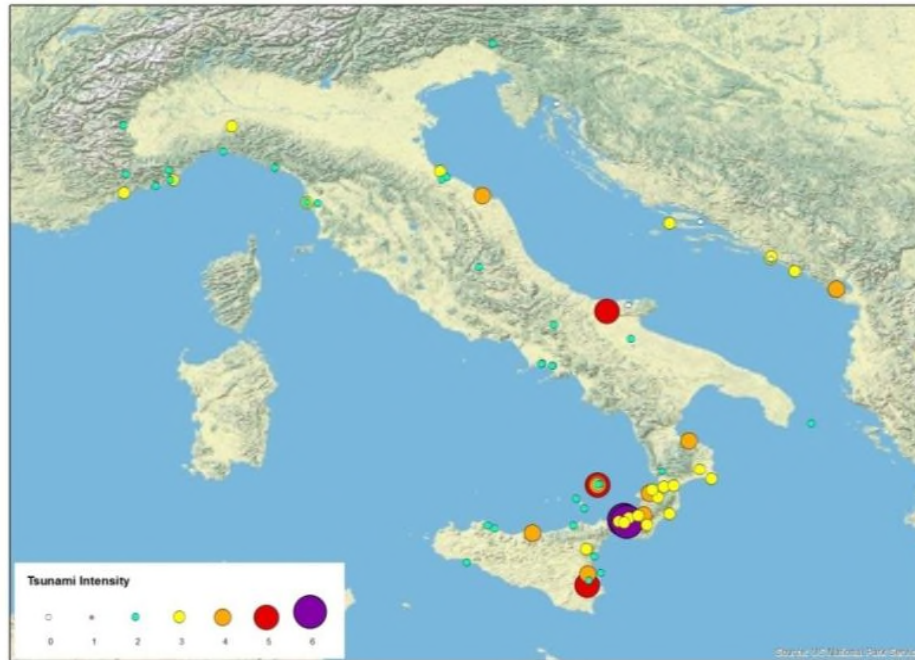
Do not eat foods that have come into contact with the water and materials transported by the tsunami: they may be contaminated. Do not drink tap water. →



A tsunami can be generated by an earthquake or volcanic activity: be informed, therefore, about what to do in case of an earthquake or eruption.

Hang this card in a place visible to all the members of your family: it will help you to remember some useful tips in case of emergency

NATIONAL SCALE: TSUNAMIS IN THE MEDITERRANEAN



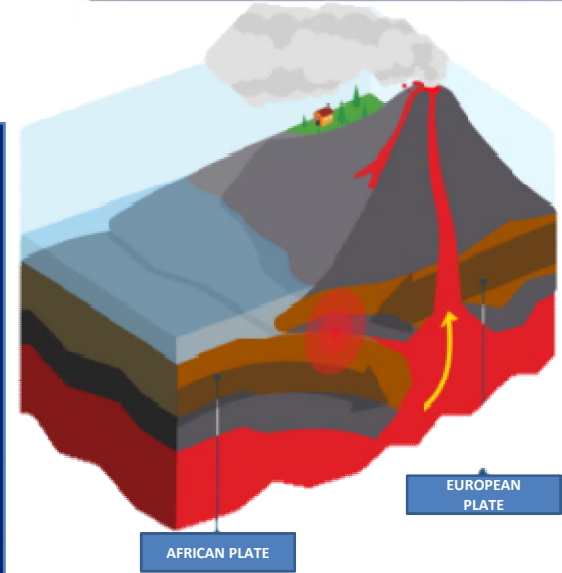
Ann o	Mese	Giorn o	Area	Intensit à	Causa	Effetti del maremoto
1169	Febbraio	4	Sicilia Orientale	IV	Terremot o	A Catania e Messina, ritiro del mare seguito da forte inondazione con danneggiamenti.
1627	Luglio	30	Gargano	V	Terremot o	Ritiro del mare, prosciugamento del Lago di Lesina. Inondazione a Manfredonia.
1693	Gennaio	11	Sicilia Orientale	V	Terremot o	Inondazione di tutta la costa orientale, maggiori danni a Augusta e Siracusa, vittime a Catania.
1783	Febbraio	5	Calabria tirrenica	IV	Terremot o	Forte ritiro del mare e inondazione nelle coste dello Stretto di Messina. Danni e qualche vittima.
1783	Febbraio	6	Calabria tirrenica	V	Frana da terremoto	Caduta in mare di parte del Mt. Campalla a Scilla. Onde 6-9m, gravi danni e 1500 vittime a Scilla.
1823	Marzo	5	Sicilia Settentrional e	IV	Terremot o	A Cefalù alcune grandi onde, barche trasportate a terra e distrutte.
1836	Aprile	25	Calabria Ionica	IV	Terremot o	A Rossano e Corigliano. forte ritiro del mare e inondazione con danni a barche e capanne di pesca .
1905	Settembr e	8	Calabria Tirrenica	IV	Terremot o	Inondazioni fino a 30m a Pizzo, Scalea, Bivona, Tropea, con danni a barche e baracche sulla spiaggia.
1908	Dicembre	28	Stretto Messina	VI	Terremot o	Forte ritiro e inondazione dalla Sicilia orientale alla Calabria ionica. Onde fino a 13m. Distruzione, almeno 10000 vittime.
1930	Ottobre	30	Adriatico Centrale	IV	Terremot o	Inondazione e lievi danni nel porto di Ancona.
1944	Agosto	20	Isole Eolie	IV	Eruzione	A Stromboli caduta di materiale eruttivo in mare. Onde, inondazione fino a , 1 casa distrutta.
2002	Dicembre	30	Isole Eolie	V	Eruzione	A Stromboli caduta di materiale eruttivo in mare. Run-up 10m, gravi danni a case e alberghi.

79 d.C. – today 72 events

- ✓ 54 triggered by earthquakes
- ✓ 12 happened during volcanic eruptions
- ✓ 2 by landslides
- ✓ 4 undefined



ITALIAN VOLCANOES





Tsunami Risk Mitigation in Stromboli: Conclusions

- ❑ Starting from the 2002 eruption and tsunami in Stromboli the National Civil Protection System and Local authorities made a great effort in increasing prevention and mitigation actions;
- ❑ Leaflets and other information material were given to hotel owners and other touristic facilities in order to be distributed to tourists and increase awareness among them;
- ❑ Most of the local people were convinced that giving this information to the visitors would have had a negative effects on the tourism, but this never happened and Stromboli is still nowadays a 12 month destination from all over the world.
- ❑ An increasing involvement of the local population in civil protection activities led to establish two groups of civil protection volunteers on the island;
- ❑ These two groups took active part in the tsunami information campaign “Io non Rischio” in 2015 and 2016, which were right in the middle of the summer period.

FURTHER ACTIVITIES:

- ❑ Updating of the National emergency plan scenario and of the Municipality emergency plan;
- ❑ Exercise to be arranged as soon as possible (Spring 2018?).





Points of Contacts

domenico.mangione@protezionecivile.it

antonio.ricciardi@protezionecivile.it



**MUCHAS
GRACIAS!!**

