

# ASTARTE

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## Deliverable 9.37 - Awareness and preparedness movie and leaflets dedicated to the tsunami threat in the Mediterranean

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<b>Author(s):</b>	<p><b>Responsible author:</b> F. Lavigne</p> <p><b>Contributors:</b> - F. Lavigne, D. Grancher, L. Goeldner, D. Brunstein, M. Burnel, M. Fressard, R. Quernez, A. Liotard (CNRS) - F. Zaniboni (UBO) - I. Aguirre Ayerbe (UC) - C. Bonnevie Harbitz (NGI), H. Gronas (Lyngen municipality)</p>
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<b>Deliverable</b>	<b>Number</b>	D9.37	<b>Title</b>	Report on: Awareness and preparedness movie and leaflets dedicated to the tsunami threat in the Mediterranean
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<b>Authors (Partner)</b>	CNRS			
<b>Responsible Author</b>	<b>Name</b>	Franck Lavigne	<b>E-mail</b>	Franck.lavigne@univ-paris1.fr
	<b>Partner</b>	CNRS	<b>Phone</b>	+33 6 26 53 02 27

<b>Abstract (for dissemination)</b>	<p>This report focuses on educative actions that aim to encourage the development of tsunami-resilient communities. This task consists in providing end-users with material adapted to their local cultural and geographical context. Collaboration between researchers and practitioners is a good means of reaching these objectives. This deliverable produces two kinds of tools: (i) leaflets introducing basic information about tsunami hazard (e.g. forewarning signs of an impending tsunami); more specific information about the tsunamis events that ever occurred in the Past in each Test site; modelled inundation zones; and advises, e.g. evacuation path, safe areas; (ii) a series of short documentary films dedicated to tsunami hazard in the Mediterranean in the context of low hazard but high vulnerability coastal areas.</p> <p>Evacuation drills were also organized in Heraklion, and were analysed in the frame of the WP9.</p>
<b>Keywords</b>	Risk sensitization to tsunami hazard; Educative actions; flyers, documentary film, evacuation drill.

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## BACKGROUND

At present, no specific leaflets introducing basic information about tsunami hazard around the Mediterranean Sea exists, except those provided by the Intergovernmental Oceanographic Commission in the NEAMTWS<sup>1</sup> framework. In Greece and Turkey, the civil Protection has printed a small booklet for all types on hazards including tsunamis. However, such booklets are not available for the other ASTARTE Test sites.

Among the list of existing short prevention movies (Table 1) and longer documentaries (Table 2) or about tsunamis, only a few films were dedicated to tsunami hazard in Europe. Indeed, most of the prevention spots or movies that exist refer to disaster risk reduction or risk prevention but are not specific to tsunamis and identified cities in the NEAM region.

**Table 1. List of prevention movies about tsunamis (0 to 10 minutes)**

- Sismi'k, prevention video in Guadeloupe : <https://www.youtube.com/watch?v=o6PSC Hd9Ofg>
- Territorial Center of Research and Educational Documentation (CRDP) of French Polynesia : <https://www.youtube.com/watch?v=ZGrSgkByMFg>
- ShantiUniverse: [https://www.youtube.com/watch?v=Yj\\_lzzMJdYQ](https://www.youtube.com/watch?v=Yj_lzzMJdYQ)
- Save the children, cartoon: <https://www.youtube.com/watch?v=KXNg-Fb-Smw>
- United Nations' video : <https://www.youtube.com/watch?v=P1UmHS9kJgc>
- Peruvian warning center, prevention spot for children : <https://www.youtube.com/watch?v=nodmurv5tog>
- « Les Témoins d'Outre-Mer (LTOM), with F. Schindelé : <http://www.dailymotion.com/video/x490e12>
- France TV education : <http://education.francetv.fr/matiere/decouverte-des-sciences/cp/video/c-est-quoi-un-tsunami-professeur-gamberge>
- Tsunami prevention in Polynesia, ARI project (Natural Hazard and risks, planning and information): <https://www.youtube.com/watch?v=plUxtTmc31o>
- National geographic : <http://video.nationalgeographic.com/video/101-videos/tsunami-101?source=relatedvideo>
- Mexican pot for children : <https://www.youtube.com/watch?v=QzazPnoGe38>
- IOC 2013 : <https://www.youtube.com/watch?v=w3hZ79lu6Hw>
- « Tsunami walking the last mile » : <https://www.youtube.com/watch?v=r5mj1VdNTwQ>
- Humanitarian Practice Network, "10 things you should know about disaster risk reduction" : <https://www.youtube.com/watch?v=y16aMLeh91Q>

**Table 2. Documentary or movies (more than 10 minutes)**

- Swiss TV, 24 minutes : [https://www.youtube.com/watch?v=1YrFynD\\_13l](https://www.youtube.com/watch?v=1YrFynD_13l)
- Canal U, Rennes 2 university (France), 28 minutes, with Jean Braun : [https://www.canalu.tv/video/universite\\_rennes\\_2\\_crea\\_cim/tsunamis.14541](https://www.canalu.tv/video/universite_rennes_2_crea_cim/tsunamis.14541)
- Unknown sources (Bangladesh meteo department, Bangladesh Water Development Board, Meteorological services of South Africa), 18 minutes: <https://www.youtube.com/watch?v=hiCoUAoTDzQ>
- « Notre planète », extract of a documentary about the landslide risk of the Palma islan's volcano in Canarias, 14 minutes : [https://www.youtube.com/watch?v=2jb\\_Wr6g1ns](https://www.youtube.com/watch?v=2jb_Wr6g1ns)
- « Expédition tsunami » Marüm mission, Arte TV, 50 minutes: <https://www.youtube.com/watch?v=EsRlpHlhWSc>
- « Planète Terre », "From the origin of tsunamis 'life", 44 minutes : <https://www.youtube.com/watch?v=mPqJxSdxMT8>
- "C'est pas sorcier », 26 minutes : <https://www.youtube.com/watch?v=jcrGcOLmqK4>
- « Mengetahui bencana tsunami », B. Coster, F. Flohic, Planet Risk, 2006.

## OBJECTIVES

This report focuses on educative actions that aim to encourage the development of tsunami-resilient communities. This task consists in providing end-users with material adapted to their local cultural and geographical context. Collaboration between researchers and practitioners is a good means of reaching these objectives.

## TYPES OF PRODUCTS

This deliverable produces different kinds of tools (Table 3):

Test site	Posters	Leaflets/booklet	Tsunami Educational Platform	Film	Evacuation drill
Heraklion	NOA	NOA (Greek, English)	NOA	NOA	NOA
Tangier	CNRS	CNRS (French)			
Sines		CNRS (English)			
Colonia Sant Jordi		CNRS, UC (English, French, Spanish)			
Nice		CNRS (French, English)		CNRS	
Siracusa	CNRS	CNRS, UNIBO (English, Italian)			
Lyngen		CNRS, NGI (English)			
Haydarpasa	METU	METU (Turkish)		METU	
Gulluk Bay	METU	METU (Turkish)		METU	
Eforie Nord		INCDFP RA			

Table 3. Educative documents and actions performed in the frame of the WP9, Task 9.5.

### 1. Posters

Two types of posters were produced:

#### (i) Educational posters

NOA, in collaboration with NEAMTIC/UNESCO, produced two Educational posters. The first, which was produced by NEAMTIC in several languages, was translated by NOA in Greek, focuses on the general public and provides information regarding the phenomenon of tsunamis and the protection measures. The second, in English language, is dedicated to hotel guests (Fig. 1).

(ii) Two posters presenting a proposition of evacuation plan in Tangier (Fig. 2) and Siracusa (Fig. 3). These posters display the tsunami hazard area based on the worst case scenario, safe places and evacuation routes.

### 2. Leaflets

Specific leaflets have been created in the frame of the WP9 in Tangier, Sines, Nice, San Jordi, Siracusa, and Lyngen (Fig. 4 to 11). They are available in English. After their validation by the Test site leaders, the leaflet will be proposed to the local stakeholders, especially to the Civil Protection. Then the leaflets will be translated in the local language under request by the end-users. They are already available in French (Nice, Tangier) and Italian (Siracusa). Some booklets are also available in Greek (Heraklion), Turkish (Haydarpasa and Gulluk – Fig. 12), and Romanian (Eforie Nord).

The leaflets introduce basic information about tsunami hazard (e.g. forewarning signs of an impending tsunami); more specific information about the tsunamis events that ever occurred in the Past in each Test site; modelled inundation zones achieved in the frame of the WP8; and advises, e.g. evacuation path and safe areas which have been selected through scientific expertise and evacuation modelling in the frame of the WP9.

### 3. Documentary films

Short documentary films dedicated to tsunami hazard and risk perception in the Mediterranean were achieved in the context of low hazard but high vulnerability coastal areas.

#### ➤ Prevention spot on Nice

A 7 minutes sensitization film has been performed in Nice Test Site. Despite a low extent phenomenon compare to the events of Indonesia in 2004 and in Japan in 2011, the risk in Nice is actual. Indeed, according to the local population density and the urbanization of its coast, the human casualties and the damages for the city could be dramatic. That is the reason why Nice is preparing itself to face a tsunami, thanks to the cooperation of all the managers of the risk from France, the Mediterranean region and Europe. However, it is also up to everyone's responsibility, local authorities and local people, to get ready and develop the "culture" of the risk.

In this context, a 7-min. video has been performed by CNRS to sensitive the population and the tourists of Nice to the tsunami risk. It also aims to provide advises to them on how to react properly in case of tsunami warning. The film is available in free access online at the following link:

<http://www.lgp.cnrs.fr/spip/spip.php?article230>

#### ➤ Documentary for tsunamis in EM region (Heraklion)

In April 2016, in the test-site Heraklion, NOA collaborated with the TV channel ZDF (Germany), which organized a documentary for tsunamis in EM region. The documentary film in English and Greek is expected to be ready by the end of 2017.

#### ➤ Prevention movies for Istanbul

- ✓ A short video has been produced by KOERI in consultation with Japanese experts. To assess the effectiveness of the produced material, a pre- and post-questionnaire with 10 questions have been prepared, which comprised three sections as personal attributes, general questions and understanding tsunami.
- ✓ Another Documentary film for ASTARTE in collaboration with all partners of ASTARTE has been prepared by METU in the framework of WP10.
- ✓ A third film was realized in Istanbul in 2015 by the CNRS. This film is in French, with subtitles in English. The main purpose of this film is to sensitive the public to the seismic and tsunami risks in the region, but also to show the "precarious" situation of Istanbul increasing significantly its vulnerability.

### 4. Tsunami Educational Platform

In the frame of ASTARTE activities and funding, during 2015-2016 NOA developed a "Tsunami Educational Platform" (TEP), consisting of four components: (1) video shows, (2) quiz-game in Greek, English and Italian languages, with a series of questions and multiple-choice replies, (3) posters, (4) a special tank filled of water where someone is able to produce a simple "tsunami" in a mechanical way in the one side of the tank, and to see the impact in the coast on the other side (Fig. 13).

The TEP was installed and exhibited in various occasions of massive events including the next: (a) the Athens Festival on Science & Technology, held in Athens, 5-10 April, 2016; the TEP booth was very successful, and the tank attracted great interest and enthusiasm, particularly among school kids who visited the Festival, and among them the US Ambassador in Athens who also visited the booth and tried the tank; (b) the 81st International Thessaloniki Fair (Thessaloniki) (10-18 Sept. 2016) where the TEP booth of NOA attracted hundreds of visitors, including the Minister of Research & Technology; (c) the Researchers' Night (EU initiative) held in the Democritus Research Center, Athens (30th Sept. 2016), where again hundreds of visitors interacted with the NOA's TEP; also a public talk regarding tsunamis was given; (d) the visit at NOA's premises in Athens, 31st March 2017, of 160 high-school students from Bologna, Italy, in collaboration with the tsunami team of UNIBO ASTARTE partner.

# MINIATURES OF THE PRODUCTS

## 1. Posters

**A GUIDE TO TSUNAMIS FOR HOTEL GUESTS**

**NORTH-EASTERN ATLANTIC AND MEDITERRANEAN Tsunami Information Center**  
**NEAMTIC**

**WHAT IS A TSUNAMI**

- Tsunami is a Japanese word closely translating to "harbour wave".
- Tsunamis can happen during the day or night at anytime of the year.
- Tsunamis are generated as a result of water displacement usually triggered by a seismic event such as earthquake. Landslides, volcanic eruptions, nuclear explosions, and even impacts of objects from outer space (such as meteoroids, asteroids, and comets) can also generate tsunamis.
- Tsunamis are a series of waves that may impact coastlines for several hours. The first wave may not be the largest.
- Tsunami waves can come ashore in many different ways among which are: a wall of water (resembling white wash), a rapidly rising tide, and a series of surf like breakers.

**TSUNAMI RISK IN THE NEAM REGION**

Although less frequent than in the Pacific tsunamis can hit the Mediterranean and North East Atlantic coastal areas causing extensive loss of lives and properties. Major tsunamis with ten-thousands of casualties and severe damage to coastal cities happened for example in Crete in 365, Lisbon in 1775, Messina in 1908 and Aegean Sea in 1956. Even recently a tsunami has been generated in the Izmit Bay, and affected the coastline extensively following the 1999 Izmit earthquake. At some locality the inundation distance ranged up to 35 meters. Furthermore, tsunamis have been generated in 2002 in Stromboli and in 2003 in Algeria though fortunately not very damaging. The Mediterranean area represents the collision between the European and the African plates, and comprises a number of geodynamic regions affected by different seismic activity extended from West to East. Furthermore volcanic and geomorphological processes could be at the origin of tsunamis in the area.

**TSUNAMI EVACUATION PROCEDURES**  
IN CASE OF TSUNAMI EVACUATION FOLLOW THE PROCEDURES EACH STEP FOR THE SAFETY OF YOURSELF AND OTHER PEOPLE  
TSUNAMI EVACUATION INSTRUCTION HAS TO BE TAKEN SERIOUSLY EVEN IN THE CASES OF NON-DESTRUCTIVE EVENT.

- When you feel a strong earthquake and you can hardly stand, or you feel a slow shaking that continues for a longer time, a Tsunami may have been generated.
- Stay calm and do not panic.
- After the shaking stops, move calmly to the designated assemble area (always check evacuation area of the hotel), then wait for further instruction by the hotel officials / security.
- If the sea level receded, exposing fishes and corals, then you should move quickly to higher ground (check if the hotel is a designated vertical evacuation building). Do not go to the beach to confirm or to watch the tsunami.
- If you are swimming on the shore you might not feel the earthquake, always be mindful of what is happening on the beach. If you see people curiously gathered on the beach, move away from the sea and go to the assemble area.
- Hotel officials/security will evacuate all guests to higher ground and/or safe area that have been officially designated as tsunami evacuation area. All instructions will be given using a microphone system and/or a megaphone. Listen, follow all of the instruction and move in an orderly manner to the evacuation area.
- During a tsunami stay calm and do not panic. Do not leave the tsunami evacuation area until it is officially announced by the authorities that it is safe to leave the evacuation area. Tsunami will come in several waves and there are time gaps between the waves.
- During a tsunami emergency, the hotel staff, local disaster management office, police and other emergency organization will try to save lives please follow all their instruction and give your full cooperation

**It is not a question of "if" but when it is going to happen !**

For more information visit:  
**NEAMTIC.IOC-UNESCO.ORG**

Fig. 1. Educational poster in Greece (NOA)

## Tsunami evacuation plan : Tangier

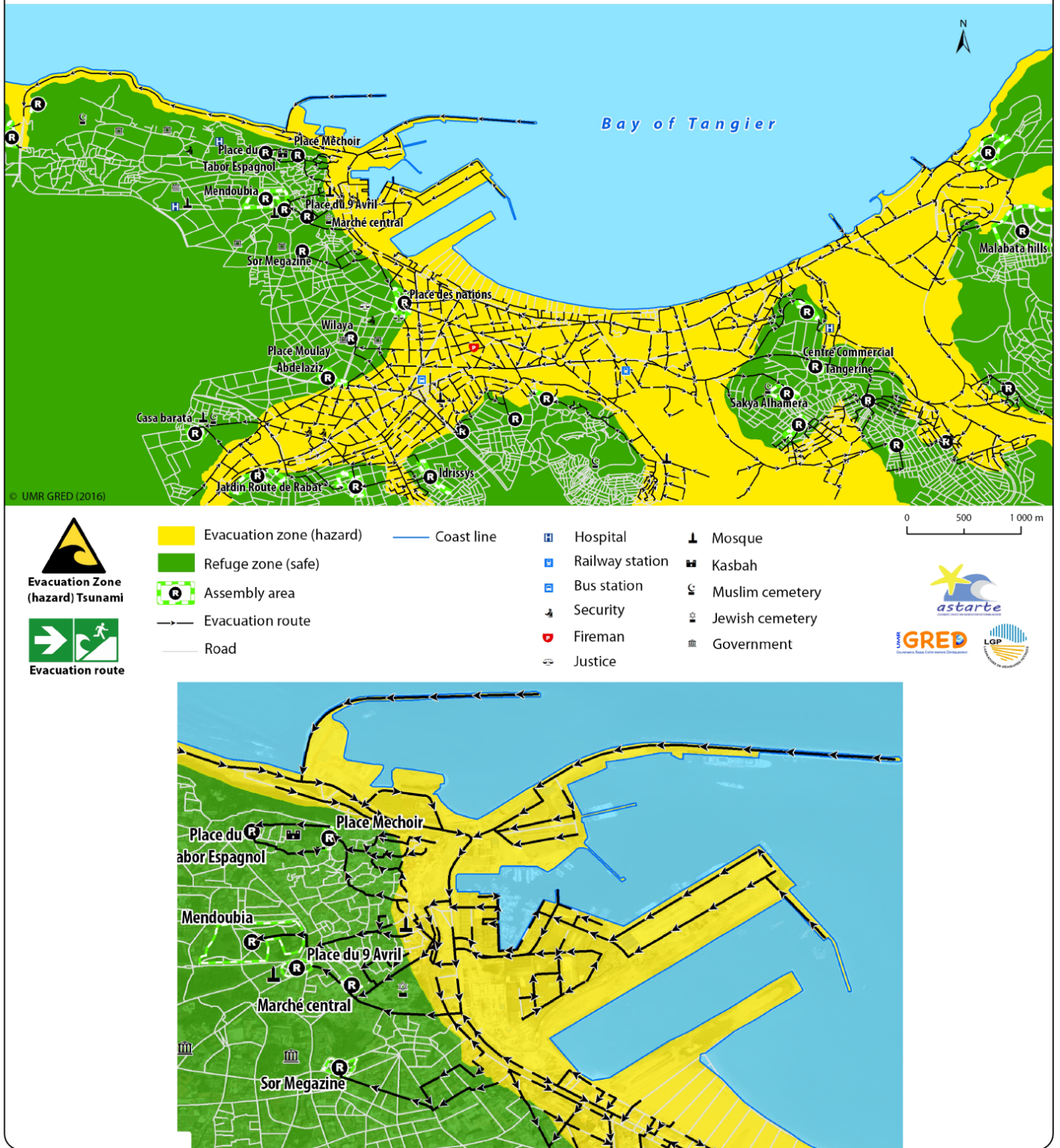


Fig. 2. Poster showing safe places and evacuation routes for tsunami in Tangier (CNRS)

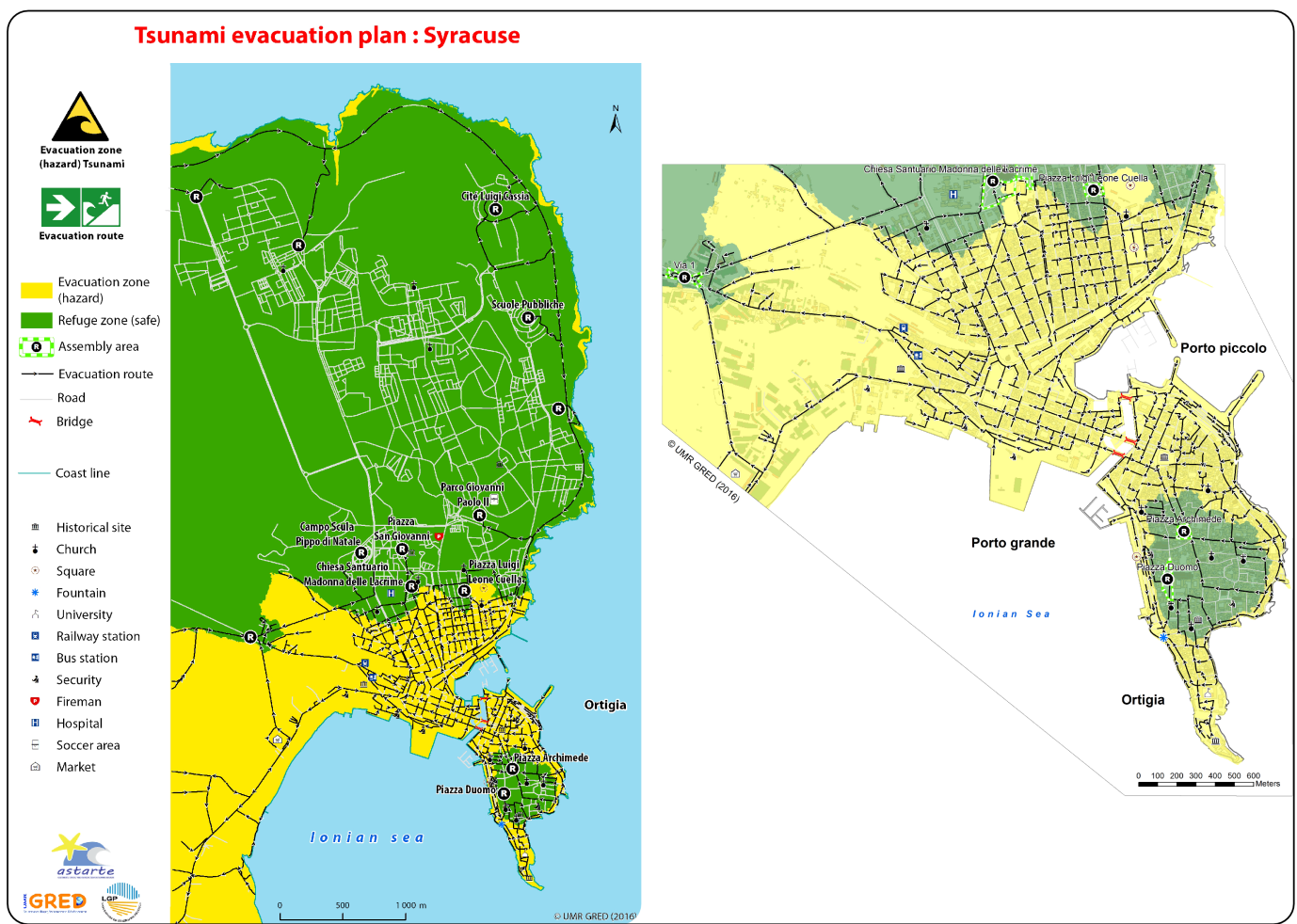


Fig. 3. Poster showing safe places and evacuation routes for tsunami in Siracusa (CNRS)



## 2. Leaflets (flyers)

**A project to protect YOU!**

The ultimate goal of ASTARTE is to reach a higher level of tsunami resilience in the NEAM (North East Atlantic & Mediterranean) region, to improve preparedness of coastal populations, and, ultimately, to save lives and assets.

**The main objectives were:**

- Assessing long term recurrence of tsunamis
- Improving the identification of tsunami generation mechanisms
- Developing new cost-effective computational tools for hazard assessment
- Ameliorate the understanding of tsunami interactions with coastal structures
- Enhance tsunami detection capabilities, forecast and early warning skills in the NEAM region
- Establishing new approaches to quantify vulnerability and risk and to identify the key components of tsunami resilience and their implementation in the NEAM region



This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 603839



Project coordinator:  
IPMA (Instituto Português do Mar e da Atmosfera)  
astarte@ipma.pt  
[www.astarte-project.eu](http://www.astarte-project.eu)



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Starting date: 1 November 2013  
Duration: 36 Months  
ASTARTE is a collaborative project within the FP7-ENV2013 6.4-3



**Assessment, Strategy And Risk Reduction for Tsunami in Europe**

The tsunami risk in Lyngen



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**What is a tsunami ?**

During a tsunami, the sea level rises very rapidly to abnormally high levels, causing the flooding of low-lying coastal areas by one or more tidal waves. Such a sea level rise can be preceded by an occasional sea withdrawal.

Tsunami waves are caused by underwater or terrestrial landslides, but also by submarine earthquakes or volcanic events.

**The particularities of the Lyngenfjord**

In the Lyngenfjord, two factors can cause a tsunami : an underwater landslide, or a rockslide in the fjord from the local Nordnes mountain.

In Norway, a tsunami is known as a *floedbalge*.

The instrumented Nordnes mountain in the foreground and the village of Lyngseidet in the background, on the opposite bank of the Lyngenfjord



**Warning signs**

In the Lyngenfjord, the warning signs of a "rockslide tsunami" differ from what they are elsewhere. Indeed, the Nordnes mountain is highly and permanently monitored by NVE (Norges Vassdrags-og Energidirektorat) because of the continuous displacement of its side.

If the displacement of the mountain's side accelerates, a warning level will be reached - which means that a rockslide tsunami could occur.

**What to know !**

A current modelling work by the Norwegian Geotechnical Institute (NGI) estimates the collapse of the Nordnes rocky mass as close as 11 million m<sup>3</sup>, with a resultant wave reaching up to 33 m in Lyngseidet.



Distribution of maximum inundation heights on land during the inundation phase in the Lyngseidet area. The inundation heights were modelised in the "rockslide scenario" concerning the Nordnes mountain in INGI ASTARTE program. Deliverable R.01

**The importance of the local history !**

On 30 June 1810, a large segment of the Pollfjellet mountain had already collapsed on the western bank of the fjord, south of Lyngseidet, leaving a large scar that is still visible today, two centuries later.



The consecutive tsunami waves caused 14 victims and some agricultural and maritime damage.

Approximate contours of the scar left by the Pollfjellet mountain's past rockslide.

Nowadays, the Lyngen municipality counts 3000 inhabitants, who live on agriculture, fishing, fish processing, light industry and tourism.



The village of Furufjellan on the western bank of the Lyngenfjord

**What you must do !**

**Before**

Whoever you are (an inhabitant, a local worker, a tourist), pay attention to information from the municipalities about a potential rockslide tsunami in the Lyngenfjord.

**Alert and evacuation**

The warning system is managed by the municipalities in cooperation with NVE - which is responsible for the mountain's surveillance. The population will be alerted and moved away before the rockslide.

According to the Norwegian Planning and Building Act, such a natural risk must be forecast at least 72 hours in advance, so that the region should not be prematurely abandoned and could even develop further.



Fig. 4. Leaflet produced for Lyngen test site (CNRS, NGI)

### Un projet pour VOUS protéger !

Le but ultime d'ASTARTE est d'atteindre un niveau de résilience aux tsunamis supérieur dans la région de l'Atlantique Nord-est et de la Méditerranée (NEAM), d'améliorer la préparation des populations sur la côte, et surtout, sauver des vies.

**Les principaux objectifs sont :**

- Evaluer la récurrence sur le long terme des tsunamis
- Perfectionner l'identification des mécanismes de génération des tsunamis
- Développer de nouveaux outils informatiques pour l'évaluation de l'aléa
- Améliorer la compréhension de l'interaction entre les tsunamis et les structures littorales
- Développer les capacités de détection des tsunamis, de surveillance et d'alerte dans la région NEAM
- Etablir de nouvelles approches afin de quantifier la vulnérabilité et le risque, ainsi qu'identifier les facteurs clés de la résilience, et leur mise en place dans la région.

Ce projet a reçu des financements de l'Union Européenne, dans le cadre du Septième Programme pour la Recherche, le Développement Technologique selon les accords de financements N° 603839.



**Coordinateur du projet :**  
IPMA (Instituto Português do Mar e da Atmosfera)  
astarte@ipma.pt

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## Assessment, Strategy And Risk Reduction for Tsunami in Europe

### Le risque tsunami à Nice



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### Qu'est-ce qu'un tsunami ?

Un tsunami est une série de grosses vagues qui ont pour origine un fort séisme ou un glissement de terrain. Ces vagues sont beaucoup plus puissantes que les vagues ordinaires, et se propagent dans les terres inondant les côtes.

En pleine mer, les vagues atteignent quelques dizaines de centimètres de hauteur et peuvent atteindre une vitesse de 500 à 1000 km/h. Mais, à mesure que les vagues se rapprochent des côtes, leur taille augmente et leur vitesse en arrivant sur le rivage équivaut à celle d'un cheval au galop (soit 30 km/h).



**Signes précurseurs**

- Un séisme (ressenti ou non) ...
- Un retrait inhabituel et rapide de la mer ...
- Un grondement venant du large ...

**A noter** que ces signes ne sont pas systématiques.

### Ce qu'il faut savoir !

Principales sources tsunamigènes pour Nice et sa région.



Dans le cas d'un tsunami déclenché par un séisme situé en Algérie, la vague la plus haute dépasserait 3 mètres, et la première vague arriverait en 1 heure environ à Nice!

Les plages et les ports seraient submergés. De plus, une telle vague emporterait tout sur son passage, il serait alors impossible de pouvoir se tenir debout dans l'eau ou de nager. La masse de débris contenue dans l'eau pourrait entraîner de graves blessures.

### Ce qu'il faut faire !

**Avant**

Les autorités locales peuvent vous renseigner ou allez sur [www.risques.gouv.fr](http://www.risques.gouv.fr)...

Sensibilisez votre famille, parlez autour de vous. Observez autour de vous et repérez les zones en hauteur les plus proches et loin de la plage, ainsi que leurs accès.

**L'alerte**

Elle est transmise par le centre d'alerte (CENALT) aux autorités qui préviennent la sécurité civile.

Le temps disponible pour donner l'alerte étant très court, soyez vigilants ! Si des consignes vous sont données, respectez les !

**L'évacuation ...**

- Soyez attentifs aux messages d'alerte.
- Eloignez-vous du rivage
- Emmenez le minimum.
- En cas d'absence d'alerte de la sécurité civile, n'attendez pas pour évacuer.
- N'approchez pas des fils électriques.
- N'attendez pas de tweeter, mettre à jour votre profil Facebook ou poster une vidéo sur Youtube pour évacuer.

La première vague n'est pas toujours la plus importante ! Une fois en sécurité, attendez les consignes officielles, l'inondation lors d'un tsunami peut durer plusieurs heures.



Fig. 5. Leaflet produced for Nice test site (CNRS)

### A project to protect YOU !

The ultimate goal of ASTARTE is to reach a higher level of tsunami resilience in the NEAM (North East Atlantic & Mediterranean) region, to improve preparedness of coastal populations, and, ultimately, to save lives and assets.

The main objectives are :

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- Enhance tsunami detection capabilities, forecast and early warning skills in the NEAM region
- Establishing new approaches to quantify vulnerability and risk and to identify the key components of tsunami resilience and their implementation in the NEAM region



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astarte@ipma.pt






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## Assessment, Strategy And Risk Reduction for Tsunami in Europe

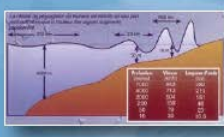
### Tsunami risk in Colonia Sant Jordi




### What is a tsunami?

Tsunamis travel from their source like a range of big waves. They can be distinguished from basic oceanic waves by the distance between each other, which can be over to 100 km, and the time who separate them which can be from 10 minutes to 1 hour.

The wave's height of a tsunami differs according to the oceanic depth. In deep water, waves reach several dozen centimeters and could have a speed from 500 to 1,000 km/h. But, when they come closer to the coastline, the amplitude of waves rise up and their speed on the coast can be equal to a galloping horse (about 30 km/m).

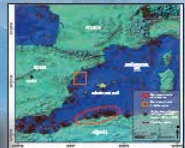
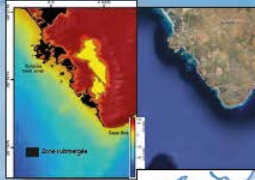


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### A bit of history ...

The last tsunami was on the 21st of May 2003, and has impacted the Balearic coasts following the earthquake of Zémmour – Boumerdès (along the Algerian coast). Due to the low attendance in the region during the non-touristic season and during the night, no human lives have been lost. HOWEVER, 200 boats have been sunk, and damages have been reported on harbor infrastructures. Shops, restaurants and roads along the coastline have been flooded as well.

Main tsunamigenic earthquakes sources for Colonia Sant Jordi. They are also used for numerical simulations in order to assess the risk.

**To notice**

According to most reliable simulation, the biggest wave could reach 4 meters high.

### How to react?

**Before**

- Get information from local authorities or on the civil protection website. Where are the safe areas ?
- Identify the fastest way to reach those areas or the closest highest points.
- Sensitize your family.

**The alerte**

Whenever possible, the alert is given by Medias and public services.

In case of a lack of alert from authorities, be attentive to the potential precursor signs, who may indicate the arrival of a tsunami !

Due to the geographic context, the available time to alert populations in Mediterranean region is very short ! Hear out the radio or T.V. etc. AND do trust only the Institutional sources !

**What to do ...**

- Be aware to the alert messages
- Go away from the shoreline
- The evacuation must be done by foot, go to the highest points !
- Take the minimum.

**The first wave is not always the biggest one!**

**Once in safety, wait for instructions from the civil protection, flooding can take several hours.**

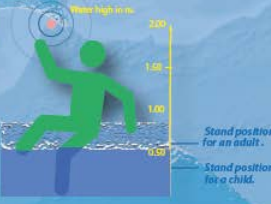
### What you need to know !

**Precursor signs**

To be noted, that those signs are not systematic

- You feel the ground shaking ...
- You can observe an unusual retreat of the sea ...
- You hear a rumbling coming from the seaward ...

**The move limit in the water ...**



Stand position for an adult.

Stand position for a child.

### Where to be safe?

Safe areas and their access identify thanks to those simulations !

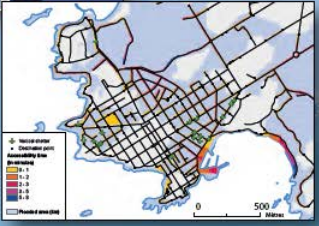


Fig. 6. Leaflet in English produced for Colonia Sant Jordi test site (CNRS)

### Un projet pour VOUS protéger !

Le but ultime d'ASTARTE est d'atteindre un niveau de résilience aux tsunamis supérieur dans la région de l'Atlantique Nord-est et de la Méditerranée (NEAM), d'améliorer la préparation des populations sur la côte, et, surtout, sauver des vies.

**Les principaux objectifs sont :**

- Evaluer la récurrence sur le long terme des tsunamis
- Perfectionner l'identification des mécanismes de génération des tsunamis
- Développer de nouveaux outils informatiques pour l'évaluation de l'aléa
- Améliorer la compréhension de l'interaction entre les tsunamis et les structures littorales
- Développer les capacités de détection des tsunamis, de surveillance et d'alerte dans la région NEAM
- Etablir de nouvelles approches afin de quantifier la vulnérabilité et le risque, ainsi qu'identifier les facteurs clés de la résilience, et leur mise en place dans la région.



Ce projet a reçu des financements de l'Union Européenne, dans le cadre du Septième Programme pour la Recherche, le Développement Technologique selon les accords de financements N° 603839.



Coordonateur du projet :  
**IPMA (Instituto Português do Mar e da Atmosfera)**  
astarte@ipma.pt






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Project number: 603839  
Project acronym: ASTARTE  
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Starting date: 1 November 2013  
Duration: 36 Months  
ASTARTE is a collaborative project within the FP7-ENV2013 6.4-3



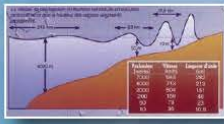
## Assessment, Strategy And Risk Reduction for Tsunami in Europe




### Qu'est-ce qu'un tsunami ?

Les tsunamis se propagent depuis leur source sous la forme d'une série de grosses vagues. Elles se distinguent des vagues océaniques ordinaires par leur espacement les unes des autres, qui peut dépasser les 100 km, et le temps qui les sépare qui peut aller de dix minutes à une heure.

La hauteur des vagues d'un tsunami varie selon la profondeur. En eau profonde, les vagues atteignent quelques dizaines de centimètres et peuvent atteindre une vitesse de 500 à 1000 km/h. Mais, à mesure que les vagues se rapprochent des côtes, l'amplitude des vagues augmente et sa vitesse sur le rivage équivaut à celle d'un cheval au galop (soit 30 km/h, environ 8 m/s).




**Ce qu'il faut savoir !**

**Signes précurseurs**

A noter que ces signes ne sont pas systématiques.

- Vous ressentez un séisme ...
- Vous observez un retrait inhabituel de la mer ...
- Vous entendez un grondement venant du large ...

**La limite de déplacement dans l'eau ...**

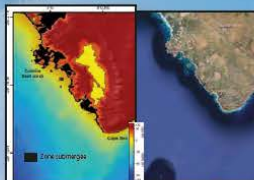


Debout pour un adulte.  
Debout pour un enfant.

### Un peu d'histoire ...


Le dernier tsunami remonte au 21 mai 2003, et a impacté la côte des Baléares suite au séisme de Zelmour – Boumerdes, survenu le long de la côte algérienne. Du à la faible fréquentation de la région en saison non touristique et durant la nuit, aucune vie humaine n'a été à déplorer. CEPENDANT, 200 bateaux ont été coulés, et des dommages ont été déplorés sur les infrastructures portuaires. Les magasins, restaurants et routes le long de la côte ont également été inondés.

Sources principales de séismes tsunamigènes pour Colonia San-Jordi. Elles sont aussi utilisées lors de simulations, afin d'évaluer le risque.



**A noter**

Selon les simulations les plus fiables et probables, la plus grande vague du tsunami pourrait atteindre 4 mètres.



**Où se réfugier ?**

Zones refuges et voies d'accès identifiées grâce à ces simulations.

### Comment se comporter ?

**Avant**

Renseignez-vous auprès des autorités locales ou sur le site ...  
Quelles sont les zones où je peux me réfugier ?  
Identifiez le trajet à prendre pour atteindre ces zones ou les points hauts les plus proches.

**L'alerte**

Dans la mesure du possible, l'alerte est diffusée par les médias et les services publics.

Dû au contexte géographique, le temps disponible pour alerter les populations en Méditerranée est très court ! Soyez donc à l'écoute de la radio, de la TV etc. ET ne faites confiance qu'aux sources institutionnelles !

En cas d'absence d'alerte des autorités, soyez attentifs aux éventuels signes précurseurs, pouvant permettre d'indiquer l'arrivée d'un tsunami !

**Ce qu'il faut faire ...**

- Soyez attentifs aux messages d'alerte.
- Eloignez-vous du rivage !
- L'évacuation doit se faire à pied, dirigez vous vers les points hauts !
- Emmenez le minimum.
- En cas d'absence d'alerte de la sécurité civile, ne pas attendre pour évacuer.
- N'approchez pas des fils électriques.

**Une fois en sécurité, attendez les consignes de la sécurité civile, l'inondation lors d'un tsunami peut durer plusieurs heures.**

**La première vague n'est pas toujours la plus importante !**

Fig. 7. Leaflet in French produced for Colonia Sant Jordi test site (CNRS)

### Project to protect YOU!

The ultimate goal of ASTARTE is to reach a higher level of tsunami resilience in the NEAM (North East Atlantic & Mediterranean) region, to improve preparedness of coastal populations, and, ultimately, to save lives and assets.

#### The main objectives were:

- Assessing long term recurrence of tsunamis
- Improving the identification of tsunami generation mechanisms
- Developing new cost-effective computational tools for hazard assessment
- Ameliorate the understanding of tsunami interactions with coastal structures
- Enhance tsunami detection capabilities, forecast and early warning skills in the NEAM region
- Establishing new approaches to quantify vulnerability and risk and to identify the key components of tsunami resilience and their implementation in the NEAM region

This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 603839

Project coordinator:  
IPMA (Instituto Português do Mar e da Atmosfera)  
astarte@ipma.pt

LABORATOIRE DE GÉOGRAPHIE PHYSIQUE  
IPMA  
LAGEOS

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Duration: 36 Months  
ASTARTE is a collaborative project within the FP7-ENV/2013.6.4.3

## Assessment, Strategy And Risk Reduction for Tsunami in Europe

### Tsunami risk in Sines

### What is a tsunami?

A tsunami is a series of big waves having for origin a strong earthquake or a coastal landslide. Those waves are **much more powerful** than the ordinary waves, and who spread themselves inside lands, **flooding the coasts**.

In open sea, waves reach several dozen of centimeters high and can reach a speed of 500 to 1,000 km/h. But, when they are coming closer to the coasts, their height increase, and their speed on the coastline is equal to a galloping horse (about 30 km/h).

#### Precursor signs ...

- An earthquake (felt or not) ...
- An unusual and quick retreat of the sea ...
- A rumbling coming from seaward ...

**To be noted that those signs are not systematic**

#### A bit of history in Sines ...

On the 1st of November 1755, the Lisbon's earthquake, caused a tsunami which is still an event of reference for the risk assessment for the northeastern Atlantic coasts. The waves of this tsunami have reached **10 and 15 meters** in Lisbon. Moreover, today, with the touristic density of the beaches during the summer, the urban development, and specially the harbor infrastructures located in the submersion area, **the risk is now very important.**

### What to know!

**Main tsunamigenic sources for Sines and its Region.**

**Flood areas map for Sines**

It would cause a high risk of secondary effects such as pollution or explosion and affect population of the city center.

Moreover, such wave would take away everything on her path, and then it would be impossible to stand up in the water or to swim. The debris mas in the water may cause important injuries.

**Move limit in the water flow ...**

For an adult, 70 cm are enough to be taken away, when it's 40 cm for kids, by the tidal flow who is always very strong!

### What you must do!

#### Before

The local authorities can inform you or you can go on [neamtic.ioc.unesco.org](http://neamtic.ioc.unesco.org).  
**Sensitize your family**, talk about it around you. Observe around you and spot the highest and closest sites far enough from the beach as well as their access.

#### The alert

It's transmitted by the tsunami warning center (IPMA) to the authorities who alert the civil protection services.  
The available time to give **the alert is very short**, be reactive! If instructions are given to you, **respect them!**

#### The evacuation ...

- Be aware to alert messages
- Go away from the coastline
- The evacuation must be done by foot, go to the highest points!
- Take the minimum.
- In case of a lack of warning message from the authorities, don't wait to evacuate!
- Don't get closer to the electric wires!
- Don't wait to tweet, update your facebook profile or post a clip on youtube to evacuate.

**The first wave is not always the biggest one!**

Once in safety, wait for official instructions, the tsunami flood can take several hours.

Instituto Português do Mar e da Atmosfera

Fig. 8. Leaflet produced for Sines test site (CNRS)

### A project to protect YOU!

The ultimate goal of ASTARTE is to reach a higher level of tsunami resilience in the NEAM (North East Atlantic & Mediterranean) region, to improve preparedness of coastal populations, and to save lives and assets.

The main objectives are

- Assessing long term recurrence of tsunamis
- Improving the identification of tsunami generation mechanisms
- Developing new cost-effective computational tools for hazard assessment
- Upgrading the understanding of tsunami impacts on coastal structures
- Enhancing current level of tsunami early detection and propagation forecast, in order to increase the capabilities of warning skills in the NEAM region
- Establishing new approaches to quantify vulnerability and risk identifying the key components of tsunami resilience and evaluating their implementation in the NEAM region

This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 603839

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astarte@ipma.pt

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Duration: 36 Months  
Website: www.astarte-project.eu  
ASTARTE is a collaborative project within the FP7-ENV2013 6.4-3

## Assessment, Strategy And Risk Reduction for Tsunami in Europe

### The tsunami risk in Siracusa

### What is a tsunami?

Tsunamis travel from their source like a sequence of long waves. They can be distinguished from ordinary oceanic waves by the distance between each other, which can be over to 100 km, and the time who separate them which can be from 10 minutes to 1 hour.

The wave amplitude of a tsunami depends on the ocean depth. In deep water, amplitudes are some tens of centimeters and could have a speed exceeding 700 km/h. But, when they come closer to the coastline, wave amplitude increases and their speed in the coastal zone can be equal to that of a galloping horse (about 30 km/h).

### A bit of history...

Siracusa is located in a region with high seismicity and high tsunamiogenic potential. It was hit by the tsunami generated in Crete in 365, that affected most of the coasts of the eastern Mediterranean Sea. The most relevant events involving Siracusa are the tsunamis of 1867, 1908 and 1909. The most recent tsunami occurred in 1990.

● Main tsunamiogenic areas  
● Earthquake of magnitude higher than 3 from 1980 to 2015

### How to react?

#### Before

Get information on safe areas from local authorities or on the Civil Protection website. Identify the fastest way to reach safe areas or the closest high point. Sensitize family and acquaintance.

#### The alert

Whenever possible, the alert is given by public services. In case of lack of alert from authorities, pay attention to the possible precursors, that may indicate the arrival of a tsunami!

#### What to do...

- Pay attention to the alert messages
- Go away from the shoreline
- The evacuation must be done by foot, move to the closest high points!
- Take the minimum
- In case of no warning message from the authorities, don't wait to evacuate!
- move away from electric wires!

Once safe, wait for instructions from civil protection. Be aware that flooding can take several hours.

### What you need to know

#### Possible precursors

- An earthquake (felt or not)
- An unusual and fast retreat of the sea
- A rumbling noise coming from the sea

To be noted: these signs do not always occur

#### When reached by the water...

For adults, 90 cm of water are enough to be taken away, for kids the level drops down to 40 cm.

### To notice

According to the most recent simulations, the biggest tsunami wave could reach 10 meters and a speed at the coast of 30 km/h. Precautionarily, the safe elevation could be fixed at 15 meters.

#### Where to be safe?

In yellow: AREAS TO EVACUATE  
In green: SAFE AREAS  
Black circles: ASSEMBLY POINTS

Fig. 9. Leaflet produced in English for Siracusa test site (CNRS, UNIBO)

### Un progetto per proteggerti!

Lo scopo principale del progetto ASTARTE è di incrementare la resilienza da tsunami nel Nord Est Atlantico e Mediterraneo (NEAM), di incrementare la consapevolezza delle popolazioni costiere, e, in sintesi, di preservare vite e risorse.

#### Obiettivi principali

- Stimare la ricorrenza a lungo termine degli tsunami
- Progredire nella comprensione dei meccanismi di generazione degli tsunami
- Sviluppare nuovi strumenti di calcolo per la stima della pericolosità da tsunami
- Migliorare la comprensione dell'impatto dello tsunami sulle strutture lungo la costa
- Incrementare l'attuale livello di rapida detezione e previsione della propagazione degli tsunami al fine di rafforzare la capacità di lanciare un pronto allarme nella regione NEAM
- Stabilire nuovi approcci per quantificare vulnerabilità e rischio, identificando le componenti chiave della resilienza da tsunami e valutare la possibilità di una loro implementazione nella regione NEAM.



Questo progetto ha ricevuto finanziamenti dall'Unione Europea, Settimo Programma Quadro per la Ricerca e lo Sviluppo Tecnologico accordo n. 603839



Coordinatore del Progetto  
IPMA (Instituto Português do Mar e da Atmosfera)  
astarte@ipma.pt






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Progetto numero: 603839  
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Titolo: Assessment, Strategy And Risk Reduction for Tsunamis in Europe  
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Durata: 36 Mesi  
Sito Internet: www.astarte-project.eu

ASTARTE è un progetto di collaborazione nell'ambito FP7-ENV2013 6.4-3



Redazione e traduzione in italiano a cura del Dipartimento di Fisica e Astronomia Alma Mater Studiorum - Università di Bologna



## Assessment, Strategy And Risk Reduction for Tsunamis in Europe

### Il rischio tsunami a Siracusa



### Che cosa è uno tsunami?

Gli tsunami si propagano dalla sorgente sotto forma di una serie di onde lunghe. Si distinguono dalle classiche onde marine in base alla distanza tra due oscillazioni successive, che può oltrepassare i 100km, e al tempo che le separa, dal 10 minuti a 1 ora.



L'elevazione di uno tsunami dipende dalla profondità dell'acqua in cui si propaga. In mare aperto, le onde possono raggiungere alcune decine di centimetri e velocità anche superiori ai 700 km/h. Avvicinandosi alla costa, l'ampiezza dell'onda aumenta e la velocità diminuisce, a valori simili a quelli di un cavallo al galoppo (30 km/h).

### Un pò di storia...

Siracusa si trova in una regione dove la sismicità è molto alta, con elevata capacità di generare tsunami. È stata interessata dal maremoto del 365 originato a Creta, che colpì pure le coste dell'Egitto. I maggiori tsunami che l'hanno colpita sono quelli del 1908 e del 1909. Il maremoto più recente si è verificato nel 1990.



Principali aree tsunamigeniche  
● Terremoti di magnitudo maggiore di 3 dal 1980 al 2015

### Come comportarsi?

**Prima**  
Informarsi sulla localizzazione delle aree più sicure tramite le Aree Sicure Locali o il sito della Protezione Civile. Identificare il percorso più veloce per raggiungere tali aree o il punto elevato più vicino. Sensibilizzare famiglia e conoscenti.

**L'allarme**  
Quando possibile, l'allarme viene lanciato dalle autorità pubbliche. A causa del contesto geografico, il tempo utile per allertare la popolazione nel Mar Mediterraneo è molto breve! Informarsi tramite TV, radio, ecc. **F APPEARSI UNICAMENTE AGLI PUNTI ISTITUZIONALI!**

In caso di mancato allarme da parte delle autorità, **prestare attenzione ai segnali istituzionali** che possono indicare l'arrivo di uno tsunami!

La prima onda non è sempre quella più elevata!

### Cosa c'è da sapere...

**Possibili precursori**

- Un terremoto (avvertito o meno)
- Un inusuale e rapido ritiro del mare
- Un boato che proviene dal mare

**Se si viene raggiunti dall'acqua...**



Nota bene: questi segnali non sono sempre presenti

Per un adulto: 70cm d'acqua sono sufficienti per essere trascinati via, per un bambino bastano 40 cm.

### Importante

Basandosi sui risultati delle simulazioni più recenti, le onde più alte che possono interessare Siracusa possono raggiungere i 10 metri e una velocità alla costa di 35 km/h. In modo cautelativo, si può quindi considerare una quota di sicurezza di 15 metri.

### Dove fuggire?

In giallo: AREE DA EVACUARE  
In verde: AREE SICURE  
Cerchi neri: PUNTI DI RIFUGIO



### Cosa fare...

- Prestare attenzione ai messaggi di allarme
- Allontanarsi dalla costa
- Meglio muoversi a piedi, raggiungendo il punto più alto
- Portare con sé solo lo stretto necessario
- In caso di mancata allerta da parte delle autorità, **non aspettare a fuggire!**
- Allontanarsi da cavi elettrici!

**Una volta in sicurezza, attendere istruzioni da parte della Protezione Civile, l'inondazione può avvenire anche dopo ore!**

Fig. 10. Leaflet produced in Italian for Siracusa test site (CNRS, UNIBO)

**Un projet pour VOUS protéger !**

Le but ultime d'ASTARTE est d'atteindre un niveau de résilience aux tsunamis supérieur dans la région de l'Atlantique Nord-est et de la Méditerranée (NEAM), d'améliorer la préparation des populations sur la côte, et, surtout, sauver des vies.

**Les principaux objectifs étaient :**

- Evaluer la récurrence sur le long terme des tsunamis
- Perfectionner l'identification des mécanismes de génération des tsunamis
- Développer de nouveaux outils informatiques pour l'évaluation de l'aléa
- Améliorer la compréhension de l'interaction entre les tsunamis et les structures littorales
- Développer les capacités de détection des tsunamis, de surveillance et d'alerte dans la région NEAM
- Etablir de nouvelles approches afin de quantifier la vulnérabilité et le risque, ainsi qu'identifier les facteurs clés de la résilience, et leur mise en place dans la région.



Le projet a reçu des financements de l'Union Européenne, dans le cadre du Septième Programme pour la Recherche, le Développement Technologique selon les accords de financements N° 603839.



**Coordinateur du projet :**  
IPMA (Instituto Português do Mar e da Atmosfera)  
astarte@ipma.pt






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**Assessment, Strategy And Risk Reduction for Tsunami in Europe**

**Le risque tsunami à Tanger**



**Qu'est-ce qu'un tsunami ?**

Un tsunami est une série de grosses vagues qui ont pour origine un fort séisme ou un glissement de terrain. Ces vagues sont beaucoup plus puissantes que les vagues ordinaires, et se propagent dans les terres inondant les côtes.



En pleine mer, les vagues atteignent quelques dizaines de centimètres de hauteur et peuvent atteindre une vitesse de 500 à 1000 km/h. Mais, à mesure que les vagues se rapprochent des côtes, leur taille augmente et leur vitesse en arrivant sur le rivage équivaut à celle d'un cheval au galop (soit 30 km/h).

**Signes précurseurs**

- Un séisme (ressenti ou non) ...
- Un retrait inhabituel et rapide de la mer ...
- Un grondement venant du large ...

**A noter** que ces signes ne sont pas systématiques.


**Un peu d'histoire à Tanger...**

Le tsunami de Lisbonne du 1er novembre 1755 est l'événement le plus dévastateur dans la région Nord-atlantique. La vague, d'environ 3,5 mètres à Tanger, provoqua des dégâts importants dans de nombreuses villes marocaines entre Tanger et Agadir et tua environ 5000 personnes.

Plus récemment, le 28 février 1969, les côtes marocaines ont été impactées par une vague de tsunami d'1 m20.

**Ce qu'il faut savoir !**

Principales sources tsunamigènes pour Tanger et sa région.



Dans le cas d'un tsunami déclenché par un séisme situé au large du Portugal, la vague la plus haute dépasserait 6 mètres et atteindrait Tanger en moins d'une heure.

De plus, une telle vague emporterait tout sur son passage, il serait alors impossible de pouvoir se tenir debout dans l'eau ou de nager. La masse de débris contenue dans l'eau pourrait entraîner de graves blessures.

Zone à évacuer (en jaune) et sites refuges à Tanger.



**La limite de déplacement dans l'eau ...**

Il ne suffit que de 70 cm d'eau pour qu'un adulte soit emporté, et 40 cm pour un enfant, par le courant qui est toujours très fort !



**Ce qu'il faut faire !**

**Avant**

Les autorités locales peuvent vous renseigner ou aller sur [neamtico-unesco.org](http://neamtico-unesco.org), **stabilisez votre famille, parlez autour de vous**. Observez autour de vous et repérez les zones en hauteur les plus proches et loin de la plage, ainsi que leurs accès.

**L'alerte**

Elle est transmise par le centre d'alerte aux autorités qui préviennent la sécurité civile. Le temps disponible pour donner l'alerte étant très court, **soyez vigilants** ! Si des consignes vous sont données, respectez les !

**L'évacuation ...**

- Soyez attentifs aux messages d'alerte.
- Eloignez-vous du rivage
- L'évacuation doit se faire à pied, dirigez vous vers les points hauts
- Emmenez le minimum.
- En cas d'absence d'alerte de la sécurité civile, n'attendez pas pour évacuer.
- N'approchez pas des fils électriques.
- N'attendez pas de tweeter, mettre à jour votre profil Facebook ou poster une vidéo sur Youtube pour évacuer.

**La première vague n'est pas toujours la plus importante !**  
Une fois en sécurité, attendez les consignes officielles, l'inondation lors d'un tsunami peut durer plusieurs heures.





Fig. 11. Leaflet for Tangier test site (CNRS, CNRST)



## TSUNAMI

HAKKINDA BİLİNMESİ GEREKENLER

Nisan 2015

### TSUNAMI NEDİR? NASIL OLUŞUR?

Tsunami sözcüğü, 1996 yılında Japonya'daki Büyük Meiji Tsunami afetinde yaklaşık 22.000 kişinin ölümüne neden olmasından sonra, Japonların tüm dünyaya yaptıkları yardım çağrısı içinde yer alan sözcük olarak tanınmış, o tarihten beri de birçok dilde aynı adla "tsunami" olarak kullanılmaya başlanmıştır. Tsunami sözcüğü Japonca kaynaklı olup, tsu (liman) ve nami (dalga) sözcüklerinin birleşiminden oluşarak, "liman dalgası" anlamında gelmektedir. Bunun nedeni, zayıf bir tsunaminin bile kıyılarda ve sığ sularda şiddetli akıntılar oluşturması ve özellikle limanlarda hasara yol açmasıdır.

Denizi herhangi bir bölgesinde yerel olarak oluşan deprem, volkan patlaması ve bunlara bağlı taban çökmesi, zemin kaymaları gibi taban hareketleri veya başka çeşit kütle hareketleri biçimindeki olaylarda açığa çıkan enerjinin kısa sürede denize aktarılması ile gerçekleşir. Denize geçen enerji, su kütlesi içinde akıntılar ve su düzeyi değişimine neden olarak tsunami dalgası oluşturur.

### YAKLAŞAN TSUNAMI BELİRTİLERİ

Şiddetli bir deprem sarsıntısı.

Su yüzünde gözlenen ve suyun kaymasına benzeyen büyük miktarda gaz kabarcıkları.

Deniz suyu alışılmadık biçimde sıcak olması.

Suyun çürük yumurta (hidrojen sülfür), yağ ya da petrol gibi kokması.

Gök gurultusüne benzer bir gültürme duyulması. (Bunlar jet uçağı, helikopterin sesi, rüzgâr sesi gibi seslere benzeyebilir.)

Denizin kıyından önemli mesafe geri çekilmesi, deniz tabanı ve deniz canlıları açığa kalması. (Merak edip izlemek çok tehlikelidir. Çünkü hemen ardından yıkıcı tsunami dalgası gelecek demektir.)






### TSUNAMIYE HAZIRLIK

#### Neleri yapmalıyız?

Afet ve Acil Durum aile planı hazırlayınız ve bir tahliye durumunda nerede toplanacağınıza önceden karar veriniz. En yakın geçici konaklama yerinin nerede bulunduğunu öğreniniz.



#### Tsunami uyarısı verildiğinde;

Telvizyon, radyo, telefon veya sosyal medyanın resmi kurum hesapları gibi kanalları dikkatlice takip ediniz.

Tsunami uyarısı yapıldığında kıydan hemen uzaklaşmak ve yüksek bir yere ulaşmak zorunludur.

Bulduğunuz evden ya da binadan çıkmadan önce vakitiniz varsa su baskınlarına ve yangınlara karşı önlem olarak elektrik şalteri, gaz ve su vanalarını kapatınız.

**"Bulduğunuz yerden çıkmadan önce elektrik şalteri, gaz ve su vanalarını kapatınız."**

#### Neleri yapmamalısınız?

Kıyıda deniz çekildiğinde merak edip izlemeye kesinlikle gitmeyiniz. Çünkü can kayıplarını büyük bir bölümü bu sırada yaşanmaktadır.

Resmî açıklamalar yapılmaya kadar tehlikenin geçtiğini düşünmeyiniz. Tsunami dalgaları denizlere, okyanuslara ulaşan derinler, nehirler boyunca karaya doğru ilerlerler.

**Kıyıya yakın iseniz ve bastığınız yer ayakta duramayacak kadar çok güçlü bir şekilde sarsılmaya başlarsa;**

Güçlü bir depremin sonrasında kıyıya tsunami gelebilir. Eğer olancağınız varsa kosarak, bisikletle ya da arabaya kıydan en az 250m uzaga ve yüksek yerlere gidiniz. Eğer betonarme binanın içindeyseniz ve binanız hasarsızsa depremin geçmesi ile birlikte 2 veya daha üst katlara çıkınız.



**Bulduğunuz yerde şiddetli bir deprem meydana gelmişse ve kıyıya yakın bir yerde iseniz mutlaka yüksek bir yere kaçınız.**









### DEMLİKLER VE DENİZDEKİLER İÇİN UYARILAR:

Eğer denizdeyseniz ve bir tsunami uyarısı aldıysanız, açık denizde tsunami dalgası hissedemeyeceğinizden ya da göremeyeceğinizden limana ya da kıyıya kesinlikle dönmeyiniz. Tsunami sığ sularda su düzeyinde hızlı değişimlere ve çok şiddetli akıntılara neden olacağından tekneleriniz ya da gemileriniz hasar görebilir.

Limanda teknede iken eğer bir tsunami uyarısı verilmişse ve vaktiniz varsa sakin ve diğer deniz trafiğini de dikkate alarak düzenli bir biçimde teknelerinizi açık denize sürünüz. Küçük teknelerin sahipleri iskeledeki teknelerini terk etmeleri, karaya çıkmaları can güvenliği açısından daha emniyetlidir. Eğer liman dışında kötü hava koşulları varsa, bu durumda küçük teknelerin tsunamiden kaçmak için limanı terk etmeleri daha tehlikeli olabilir. Bu da tek seçeneğinizin karada yüksek ve güvenli bir yer bulmak olduğunu gösterir.

Tsunaminin kıyıya varmasını takiben hasar verici dalga hareketleri ve kestirilemeyen akıntılar kıyıya belli bir süre etkileyebilir. Güvenli bir şekilde limana dönmeye önce yetkililerle haberleşin ve limandaki koşulların uygun olduğundan emin olunca limana dönüş karar verin.

**Denizcilere öneri: "Bir Tsunami uyarısı aldığınızda eğer kıyıya yakınsanız ve vaktiniz de varsa deniz aracınızı en kısa zamanda açık denize doğru hareket ettirin."**

### TSUNAMI KONUSUNDA TEMEL KURALLAR

- Tsunami dalgası tek bir dalga değildir. Genellikle dört veya beş dalgadan oluşan bir dalga dizisi biçimindedir. Genellikle ikinci ve üçüncü dalgalar en tehlikelidir. Devam eden dalgaların etkisi daha azdır. İlk gelen çentiklenmiş dalga, kıyılarda birkaç dakika içinde oluşan dışı su yükselmesi veya alçalışması (çekilmesi) yaratır. Bu ilk dalga, arkadan gelebilecek olan bir veya iki ebbeli dalga için haberci niteliktedir. Deniz çekildiğinde merak edip kıyının durumunu izlemeye kesinlikle gitmeyiniz. Çünkü can kayıplarının büyük bir bölümü bu sırada olmaktadır.
- Zarar verici dalgaların kıyıya varmasından sonraki birkaç saat sonra da tehlike devam edebilir. Resmî açıklamalar yapılmaya kadar bekleyiniz ve kıyıdan daima uzakta kalınız.
- Tsunami dalgası ferkedildiğinde ya da uyarı alındığında en kısa zamanda kıyı çizgisinden uzaklaşmak zorunludur. Karada bulunan kişilerin kıyıdan en az 150-200 m. uzaklığa, denizde teknedeki bulunan kişilerin ise su derinliği en az 50 m. veya daha derin yerlere doğru tekne ile uzaklaşarak olası dalga ve akıntı etkilerinden kurtulabilirler.
- Unutulmamalıdır ki, dalgaın karada ilerleme hızı, insanın koşma hızından daha fazladır. Merak edip izlemek çok tehlikelidir. Kaçmak için zaman geç olabilir.
- Tsunami dalgaları dereler, imkânlar ya da denize bağlantılı kanallardan içerilere doğru kilometrelerce ilerleyebilirler.
- Tsunami dalgası konusundaki uyarıları ciddiye almak zorunludur.
- Tsunami dalgasının tırmanma yüksekliğinin 2 m'yi geçmesi durumunda küçük tekne bariyerlerinde çok şiddetli akıntılar nedeniyle hasarlar ve önemli düzeyde mal kaybı olabilir.

**Türkiye kıyılarında tarih içinde defalarca tsunami dalgaları oluşmuştur. Bundan sonra da oluşması beklenmelidir. Günümüzde kıyıların çeşitli amaçlarla çok sayıda tesislerle donatılmış ve çok yağın kullanılıyor olması, tsunami dalgasının, tarihteki etkilerine göre günümüzde çok daha unutulmaz izler bırakması olasıdır.**










Fig. 12. Leaflet produced for Turkish test sites (METU, KOERI)

### 3. Tsunami Educational Platform



Fig. 13. Educational activities with the “Tsunami Educational Platform” of NOA in Athens (upper left), in Thessaloniki (upper right), September 2016, and in NOA’s premises, Athens (lower left) with the Italian school students, March 2017. In one side of the tsunami water tank the contribution of ASTARTE is acknowledged (lower right).