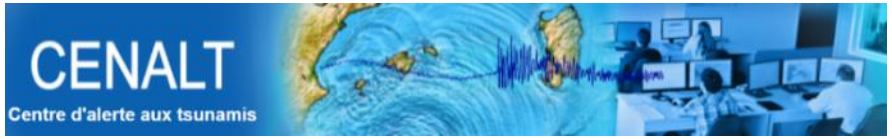
Report from TSP and NTWC Cenalt

Centre national d'alerte aux tsunamis



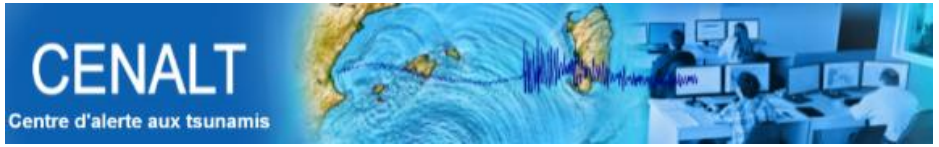
Hélène Hébert, CEA, DAM, DIF, Arpajon, France

ICG/NEAMTWS XVIII – Unesco, Paris , 6-8 February 2024

Outline

1. Cenalt operation and exercises
2. Recent advances
3. Scientific activities
4. Perspectives

Mandates

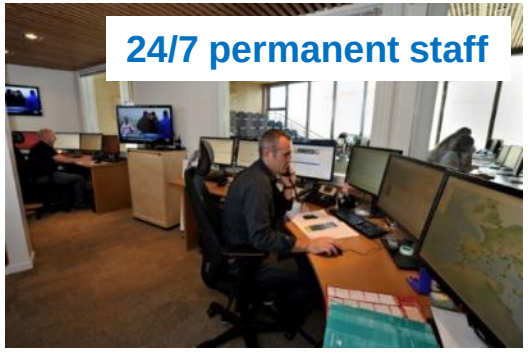


MINISTÈRE DE LA TRANSITION ÉCOLOGIQUE ET DE LA COHÉSION DES TERRITOIRES
Liberté Égalité Fraternité

MINISTÈRE DE L'INTÉRIEUR ET DES OUTRE-MER
Liberté Égalité Fraternité

National mandate

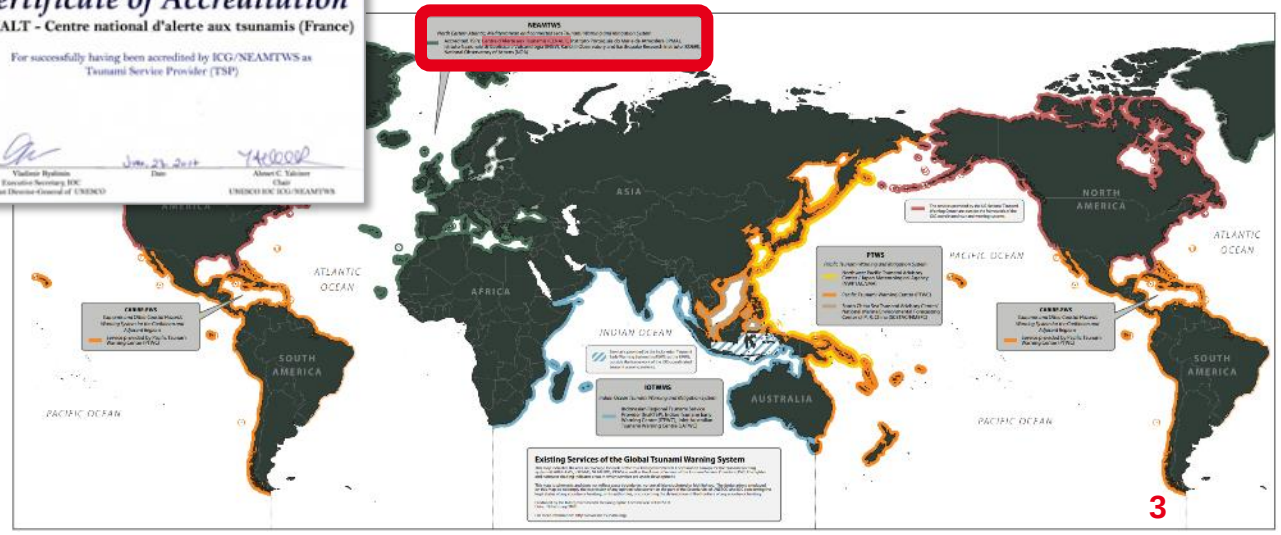
- To warn the French civil protection, within 15 minutes after a possible tsunamigenic seismic event in the NE Atlantic and Mediterranean
- To send confirmation / cancellation messages (depending on the availability of sea level data)
- To support French CPA to develop the downstream component



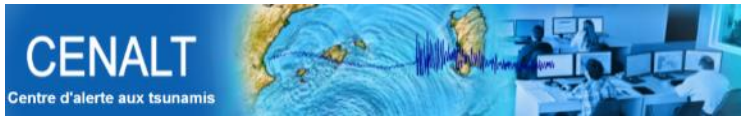
International TSP mandate

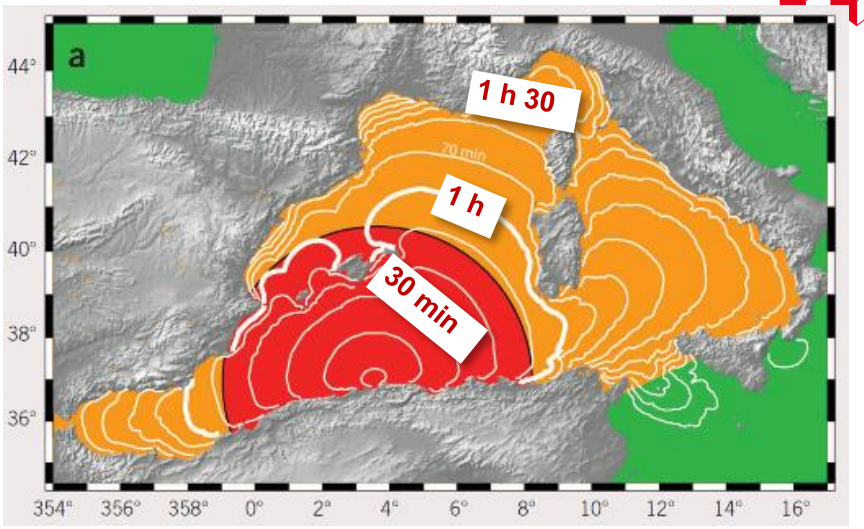
- Cenalt recognized as NEAM TSP in 2017
- To inform, as TSP, the national warning centers and the tsunami focal points that subscribed to the service
- To participate to the ICG framework


Certificate of Accreditation
CENALT - Centre national d'alerte aux tsunamis (France)
For successfully having been accredited by ICG/NEAMTWS as Tsunami Service Provider (TSP)



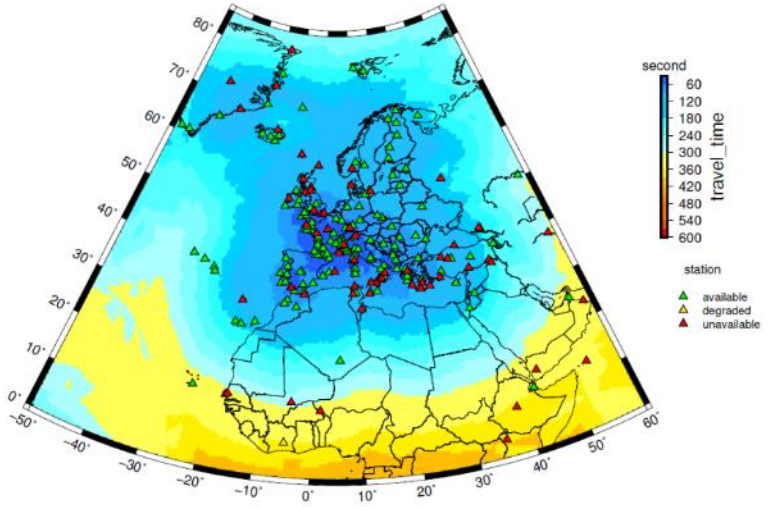
Tsunami monitoring in Cenalt

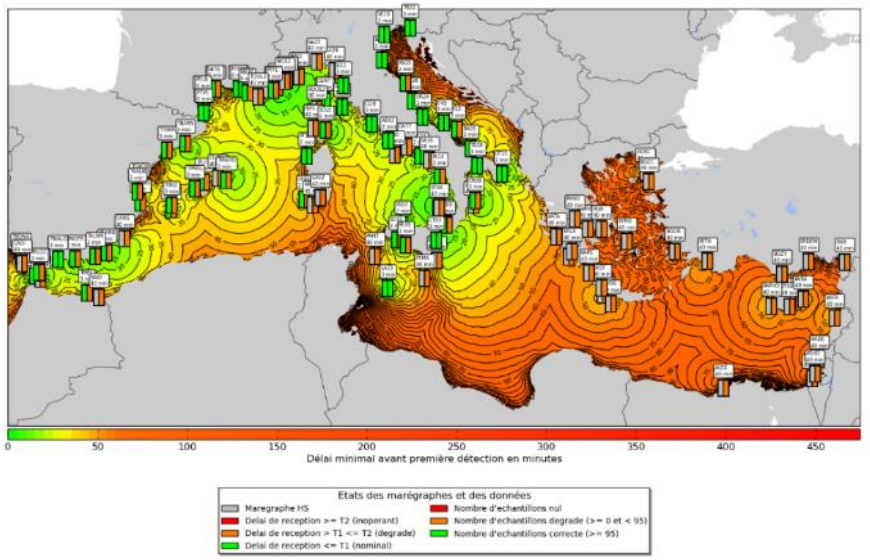




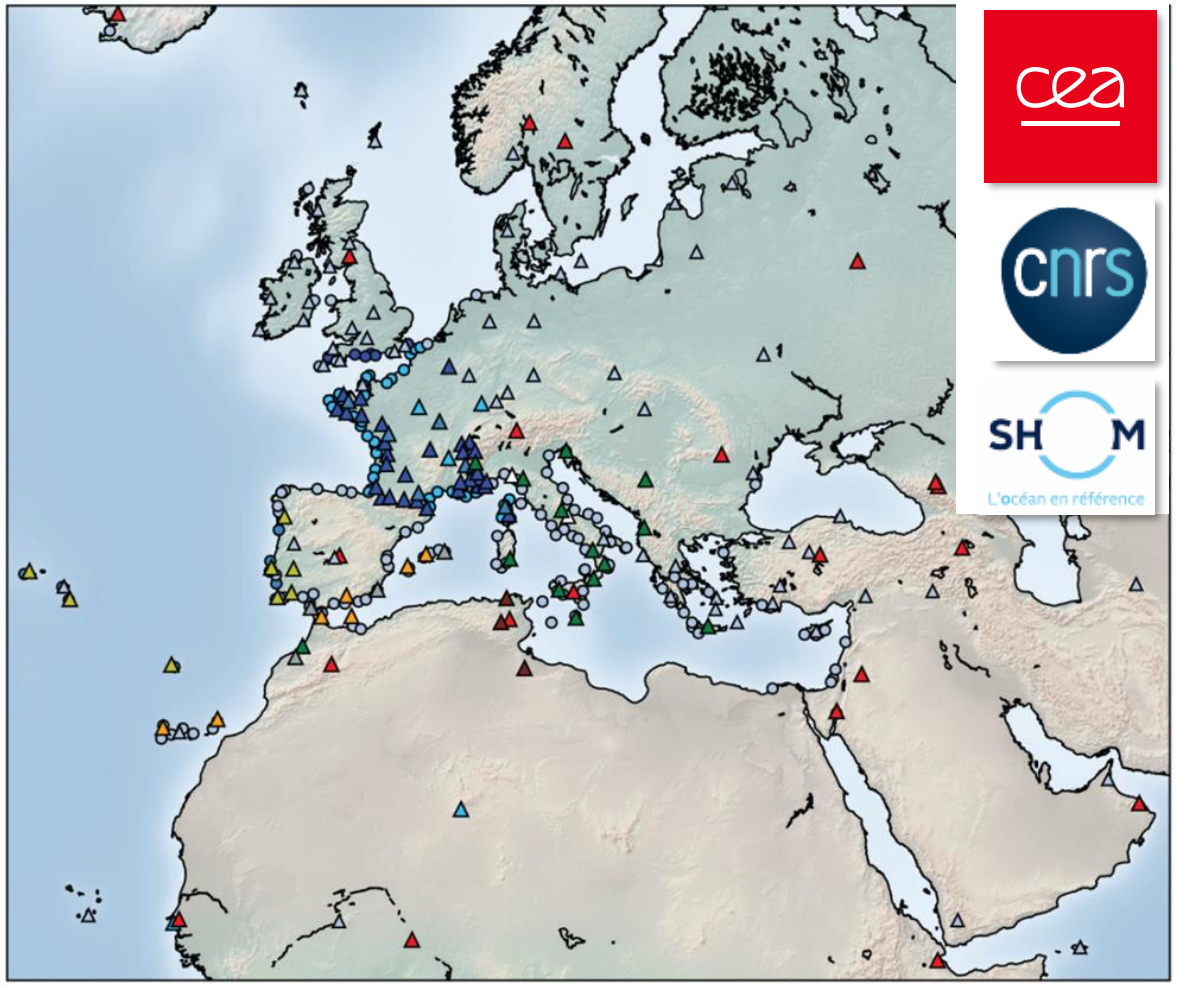
Operational networks with data made available in real time with redundancy and robustness to Cenalt

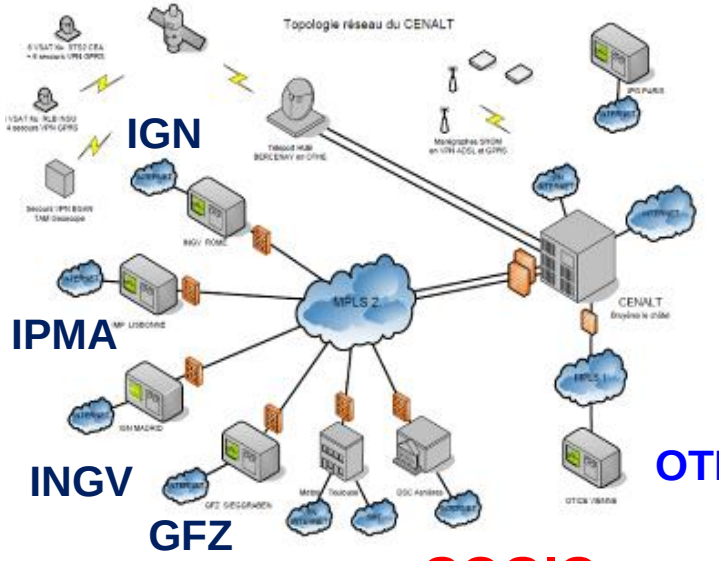
- National level
  - Seismic data (including CNRS stations)
  - Sea level data: major modernisation 2021-2022 (SHOM)
- International level, to subscribe to seismic and tide gauge networks
  - Cooperation with operational agencies
  - CTBTO framework





Real time seismic and tide gauge network



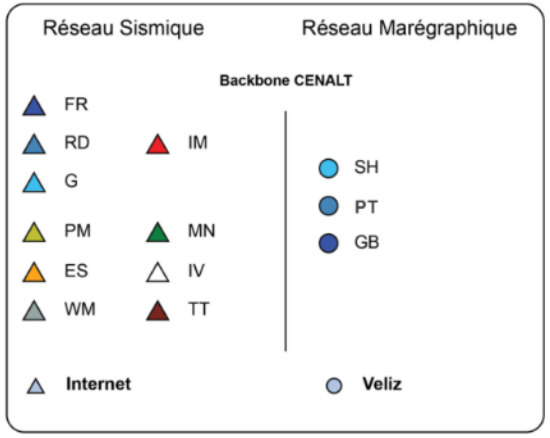


Météo France

SMT – GTS

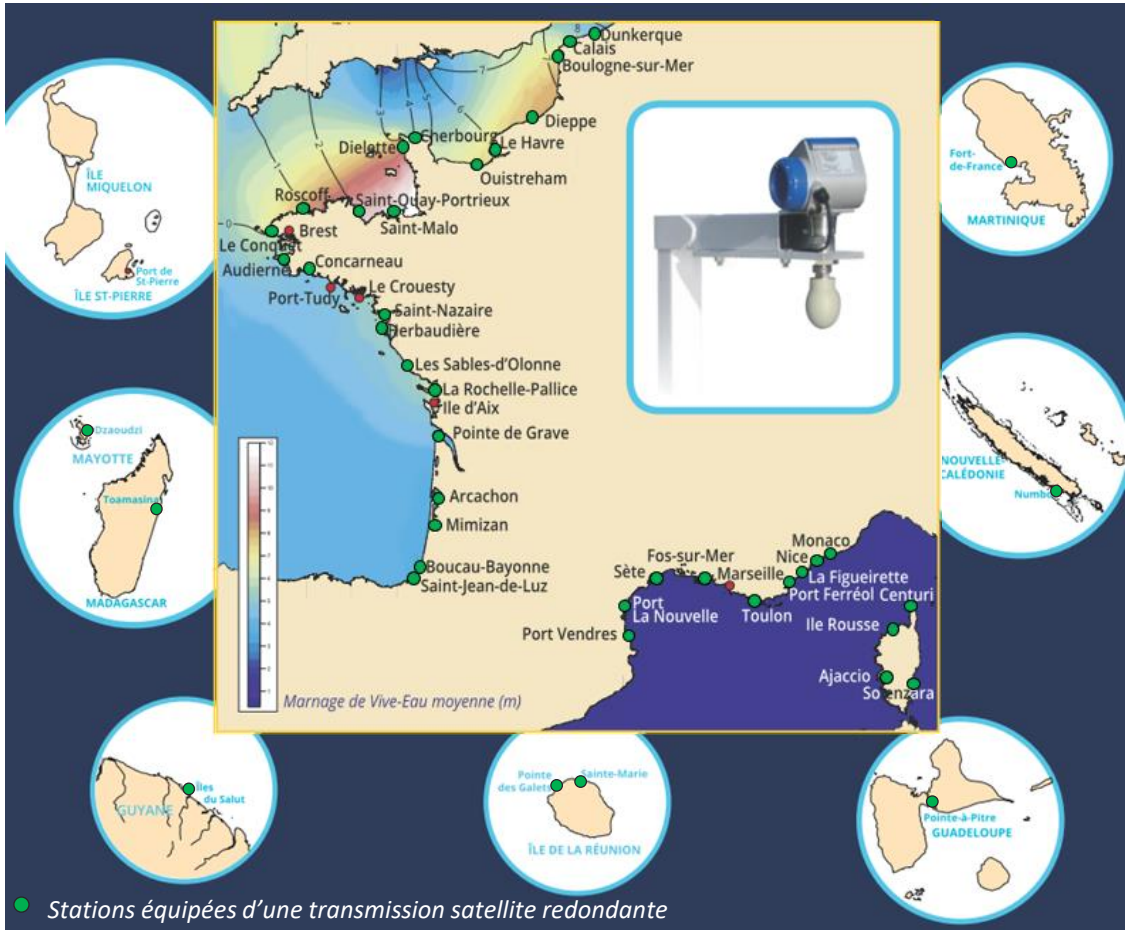
COGIC Centre Opérationnel de Gestion Interministérielle des Crises

Ministry of Interior



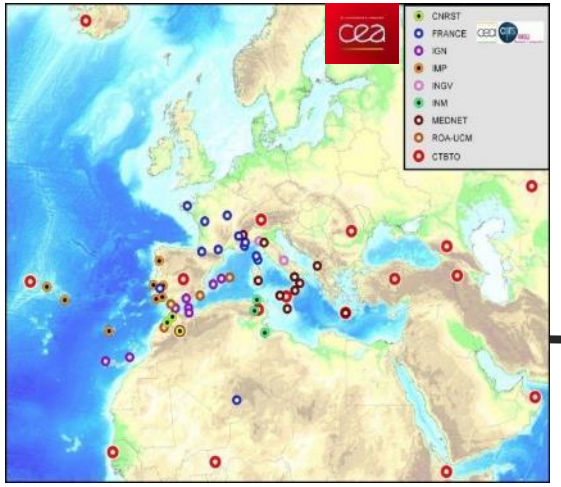
French tide gauge network

- French tide gauge network (RONIM): 41 stations available at Cenalt (VPN)
- **Part of RONIM** (Réseau d'Observation du NIveau de la Mer)
  - 50 tide gauge stations for numerous applications : hydrography, oceanic tide prediction, extreme events monitoring, tsunami warning, risk prevention, global sea level rise monitoring
- **Major modernisation** has been completed in 2022
  - Replacement of data-loggers and transmission systems, new sensors, improvement of supervision and network reliability
- SHOM has secured in 2023 a long term support from French government, to fulfill its mandate



Timeline of a tsunami alert

Detection



Seismic network

1

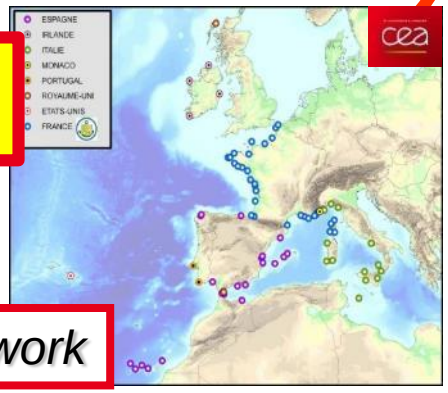
CENALT
Bruyères-le-Châtel

Data processing detection, localisation, magnitude, expected amplitude

Validation by the 24/24 operator, issuing official message

2

Confirmation



Tide gauge network

Civil Security

→ Warning to population
→ Evacuations

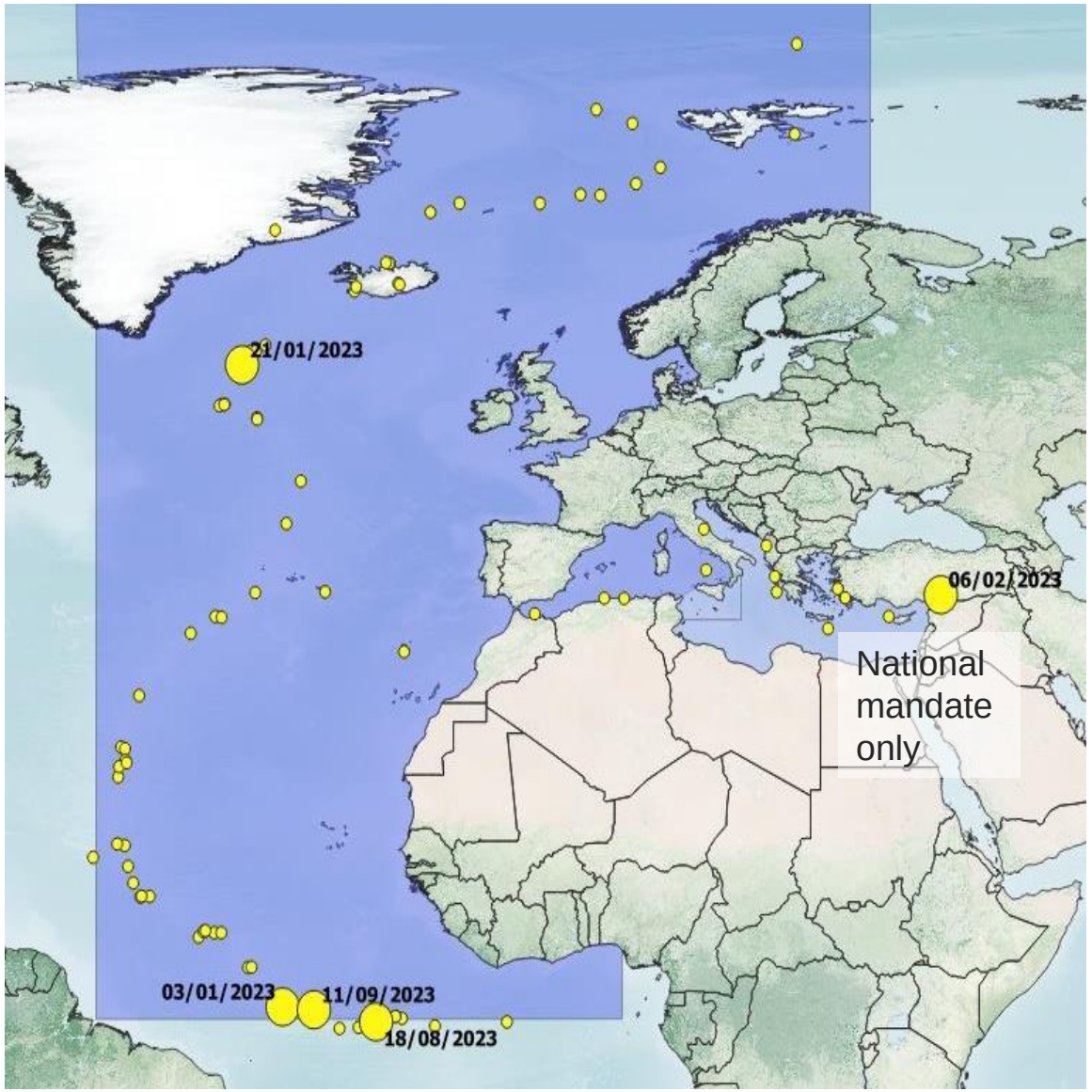
3

2 min — 5 min — 10 min — 15 min — 60 min

2023 Summary

- 4 Information messages in 2023 (Atlantic Ocean)

- 90 messages issued since 2012
  - 80 Information messages in Atlantic
  - 4 Information messages in western Mediterranean
  - 6 Advisory
    - 3 for Alboran Sea, Jan 25, 2016
    - 3 for Algeria, March 18, 2021



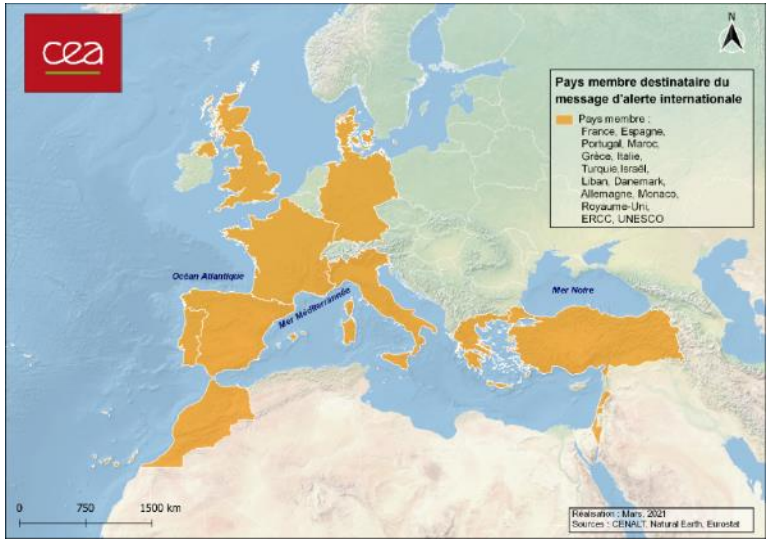
Exercises (1/4)

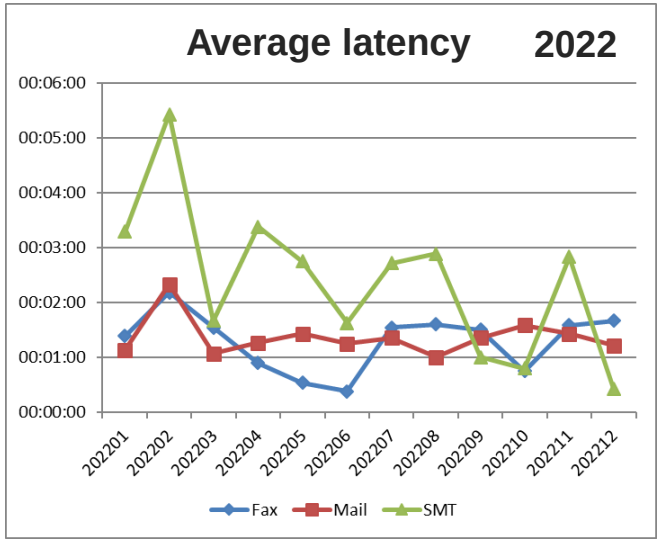
National communication tests

- Monthly communication test
  - With partial evolution of the message text
- Quaterly exercise with local procedure testing

International communication tests

- Monthly tests





Exercises (2/4)

International Day for Disaster Risk Reduction

- Frontignan, October 13, 2023 (préfecture Hérault)
- Test of warning procedures and FR-Alert system
- Raise public awareness, public conference
- Alert message issued by Cenalt at 14:38, evacuation drill at the Frontignan beach (15h02, T0 + 24 min)

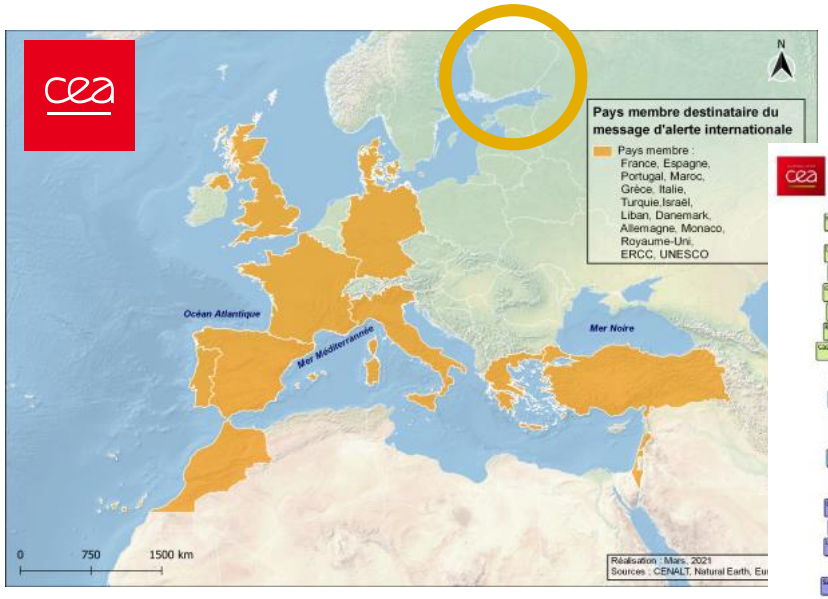
World Tsunami Awareness Day

- Scheduled on Nov 3rd, 2023, postponed to December
- Two phases
  - Dec 12th, 2023: regional exercise along the Mediterranean coastline
  - Jan 19th, 2024: large scale regional FR-Alert testing
- Close interaction with Cannes municipality, risk prevention actions

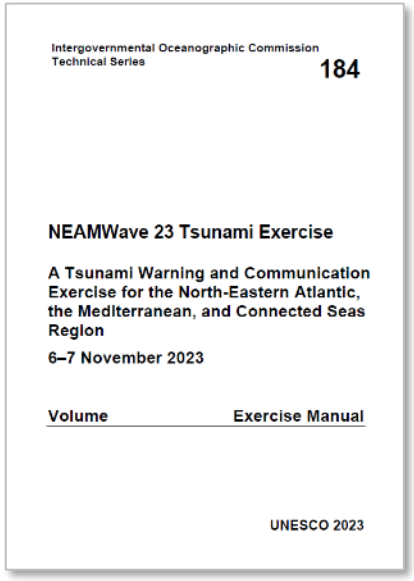
Exercices (3/4)

NEAMWave23

- Joint scenario with IPMA (TSP Portugal) and participation to TT Exercises
- International recipients + Finland



Recipients


Intergovernmental Oceanographic Commission
Technical Series
184

NEAMWave 23 Tsunami Exercise

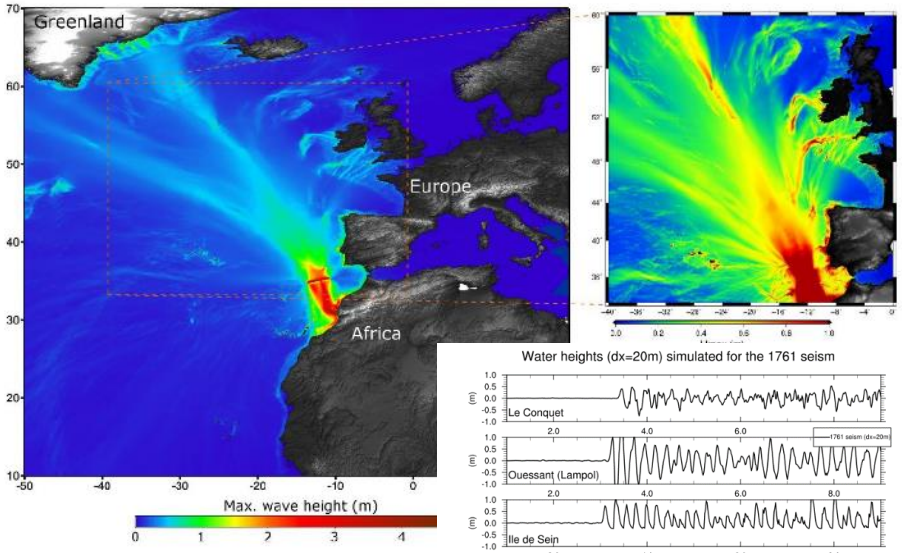
A Tsunami Warning and Communication Exercise for the North-Eastern Atlantic, the Mediterranean, and Connected Seas Region

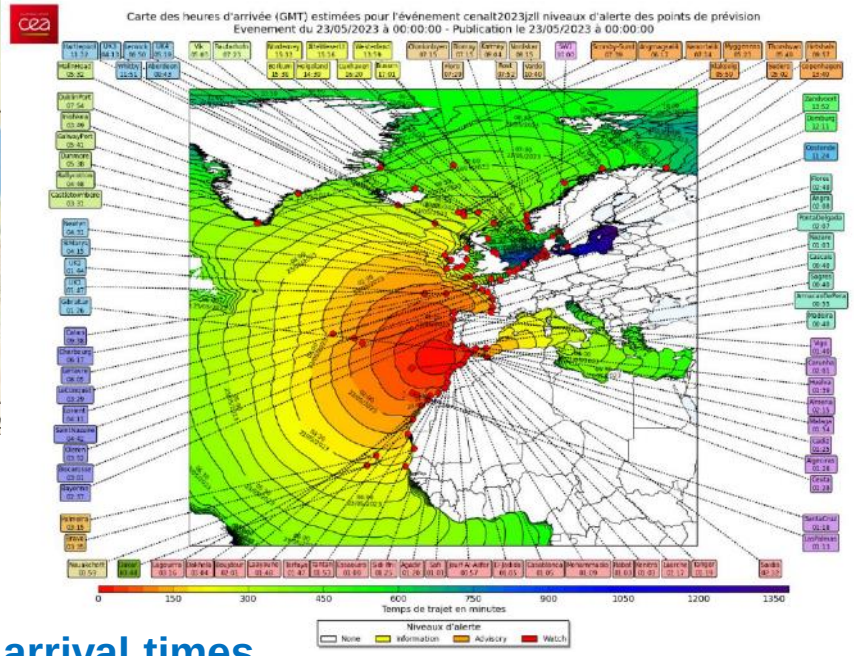
6–7 November 2023

Volume Exercise Manual

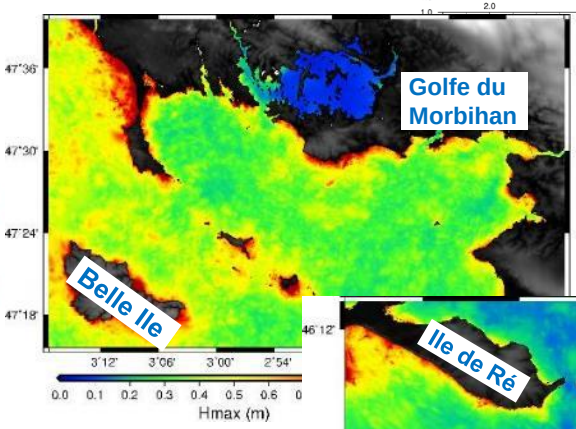
UNESCO 2023

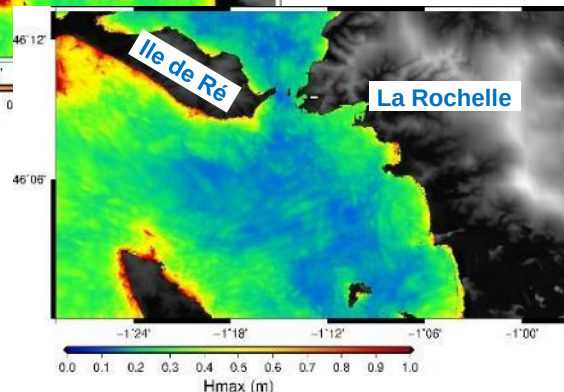
Exercise manual





Estimated arrival times





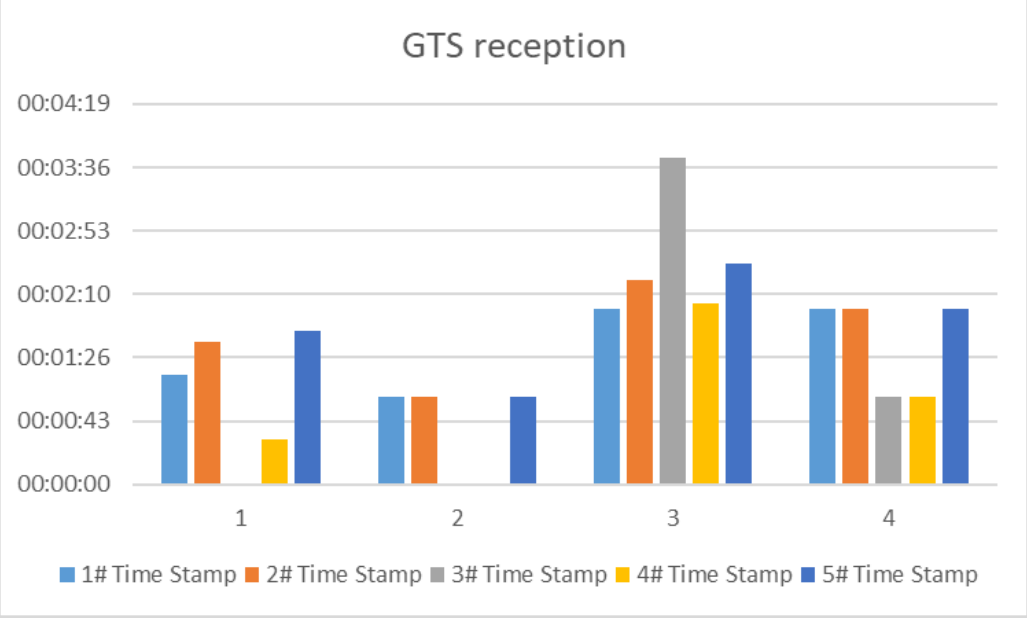
Exercices (4/4)

NeamWave23 message was issued on Nov. 6th, 9:10 GMT

- 5 messages have been disseminated (fax, GTS, dedicated line to Cogic)
- Email dissemination was late due to local blackout in CEA

No local exercise for this Neamwave23 edition

- Agenda conflict with WTAD initiatives



De: tsunami <tsunami.dase@cenalt.cea.fr>
Envoyé: lundi 6 novembre 2023 10:13
Objet: TSUNAMI EXERCISE MESSAGE NUMBER 002

TSUNAMI EXERCISE MESSAGE NUMBER 002
NEAM CENALT TSUNAMI SERVICE PROVIDER
ISSUED AT 0910Z 06 NOV 2023

... TSUNAMI WATCH ONGOING ...
THIS ALERT APPLIES TO BELGIUM ... CAPE VERDE ... DENMARK ... FRANCE ...
GERMANY ... ICELAND ... IRELAND ... MAURITANIA ... MOROCCO ...
NETHERLANDS ... NORWAY ... PORTUGAL ... SENEGAL ... SPAIN ... SWEDEN ...
UNITED KINGDOM

... TSUNAMI INFORMATION ONGOING ...
THIS ALERT APPLIES TO ALBANIA ... ALGERIA ... BULGARIA ... CROATIA ...
CYPRUS ... EGYPT ... ESTONIA ... FINLAND ... GEORGIA ... GREECE ...
ISRAEL ... ITALY ... LEBANON ... LIBYA ... MALTA ... MONACO ...
MONTENEGRO ... POLAND ... ROMANIA ... RUSSIAN FEDERATION ... SLOVENIA
... SYRIA ... TUNISIA ... TURKEY ... UKRAINE

THIS MESSAGE IS ISSUED AS ADVICE TO GOVERNMENT AGENCIES. ONLY NATIONAL AND LOCAL GOVERNMENT AGENCIES HAVE THE AUTHORITY TO MAKE DECISIONS REGARDING THE OFFICIAL STATE OF ALERT IN THEIR AREA AND ANY ACTIONS TO BE TAKEN IN RESPONSE.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS
ORIGIN TIME - 0800Z 06 NOV 2023
COORDINATES - 35.00 NORTH 12.00 WEST
DEPTH - 10 KM
LOCATION - AZORES CAPE ST. VINCENT RIDGE
MAGNITUDE - 8.6

EVALUATION OF TSUNAMI WATCH
SEA LEVEL READINGS INDICATE A TSUNAMI WAS GENERATED.
THIS TSUNAMI CAN STRIKE COASTLINES WITH A WAVE HEIGHT GREATER THAN 0.5M AND/OR CAUSE A TSUNAMI RUN-UP GREATER THAN 1M.
THIS CENTER WILL CONTINUE TO MONITOR SEA LEVEL GAUGES NEAREST THE REGION AND REPORT IF ANY ADDITIONAL TSUNAMI WAVE ACTIVITY IS OBSERVED.
AUTHORITIES SHOULD TAKE APPROPRIATE ACTION IN RESPONSE TO THIS POSSIBILITY.
A TSUNAMI IS A SERIES OF WAVES AND THE FIRST WAVE MAY NOT BE THE LARGEST. TSUNAMI WAVE HEIGHTS CANNOT BE PREDICTED AND CAN VARY SIGNIFICANTLY ALONG A COAST DUE TO LOCAL EFFECTS. THE TIME FROM ONE TSUNAMI WAVE TO THE NEXT CAN BE FIVE MINUTES TO AN HOUR, AND THE THREAT CAN CONTINUE FOR MANY HOURS AS MULTIPLE WAVES ARRIVE.

EVALUATION OF TSUNAMI INFORMATION
BASED ON HISTORICAL EARTHQUAKE AND TSUNAMI MODELLING THERE IS NO THREAT THAT A TSUNAMI HAS BEEN GENERATED THAT CAN CAUSE DAMAGE OR

Tsunami Ready recognition in Cannes

Long term commitment of Cannes to tsunami preparedness

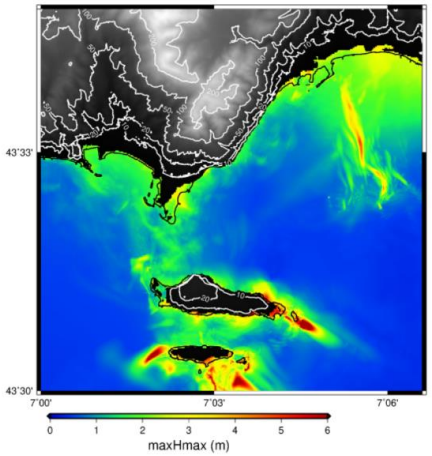
- French national and local projects
- Tsunami charter including local stakeholders
- Repeted outreach and capacitiy building activities
- ICG/NEAMTWS XVI held in December 2019

Local TR Board established in 2022

- Application to get TG recognition in 2023

NTRB established in 2023

- Positive assessment of Cannes application in December 2023
- Ceremony, January 19, 2024

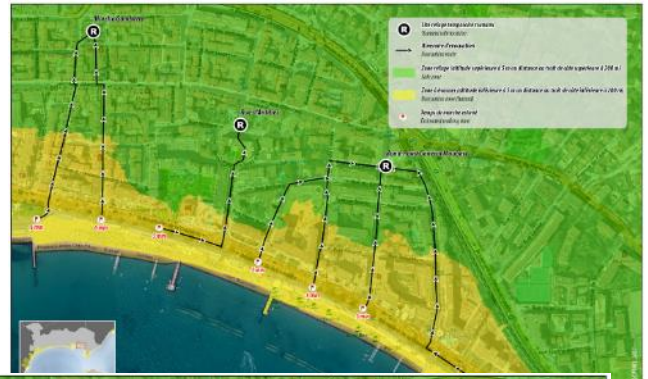



MINISTÈRE DE L'INTÉRIEUR ET DES OUTRE-MER

Direction générale de la Sécurité civile et de la gestion des crises

Paris, le 28 AOUT 2023

Monsieur le secrétaire technique,



https://arcg.is/0ifqmH

Other recent national updates

National message format evolution

- Indicating tide gauge name
- Indicating watch end, without all clear (local responsability)

EXERCICE D'ALERTE TSUNAMI 08/06/2022
Origine : CENALT
Message n°3 du 08/06/2022 à 14:28:59 (heure de Paris) EXERCICE - EXERCICE - EXERCICE

Fin d'alerte

Levée des mesures de surveillance

Plus d'autre message

Mesures du Tsunami :
Marégraphe lat lon heure d'arrivée amplitude période
--- --- --- --- --- ---
MONC 43.73N 7.42E 1213Z 3.12M 9MN Monaco
MONC2 43.72N 7.42E 1213Z 3.12M 9MN Monaco
IMO1 43,87N 8,01E 1215Z 1,01M 12MN Imperia
IMO2 43,87N 8,01E 1215Z 1,01M 12MN Imperia
PTFE 43.35N 6.71E 1217Z 1,56M 10MN Port Ferreol
PTFE2 43.35N 6.71E 1217Z 1,56M 10MN Port Ferreol

EXERCICE - EXERCICE – EXERCICE

EXERCICE D'ALERTE TSUNAMI 06/11/2023
Origine : CENALT
Message n°5 du 06/11/2023 à 13:44:42 (heure de Paris) EXERCICE - EXERCICE - EXERCICE

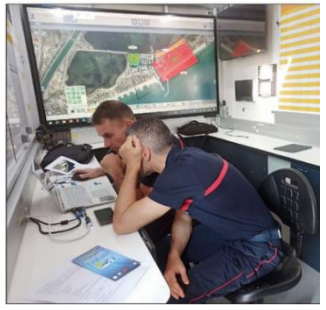
Fin de surveillance du CENALT

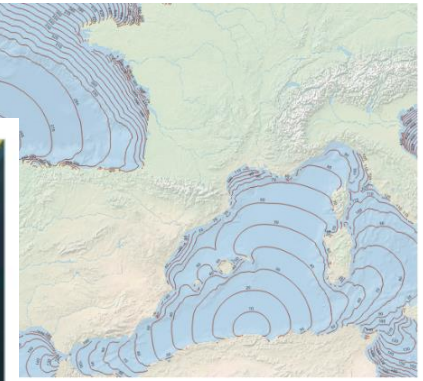
Attention, des effets peuvent perdurer dans les ports et dans certaines baies.
La fin d'alerte et des mesures de sauvegarde seront émises par la préfecture.

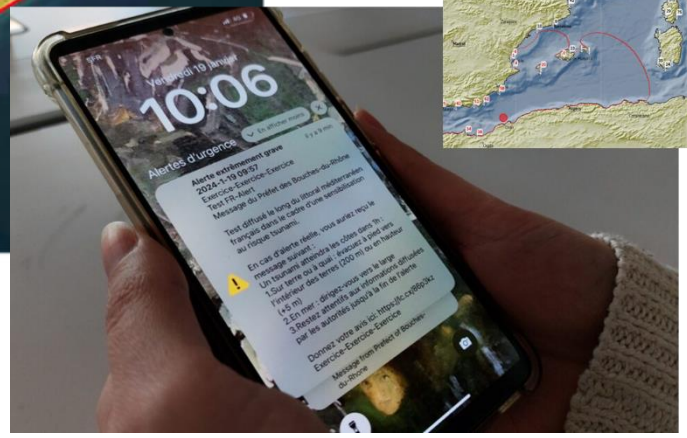
Plus d'autre message.

FR-Alert

- Coordination by Civil Security (DNUM)
- Cooperation within national academic projects (Exploit, Tasoma)
- 2023
  - Exercise in Frontignan (Hérault) (Oct 13)
  - French Mediterranean exercise (Nov 3 → Jan 19)



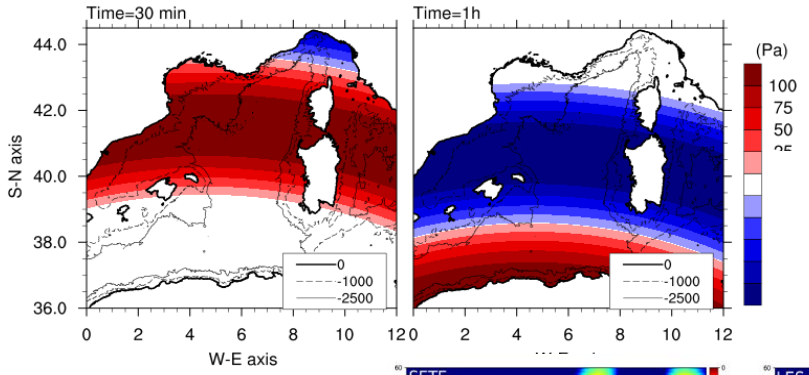




Scientific studies

Tsunami triggered by the Tonga explosion (Jan. 2022)

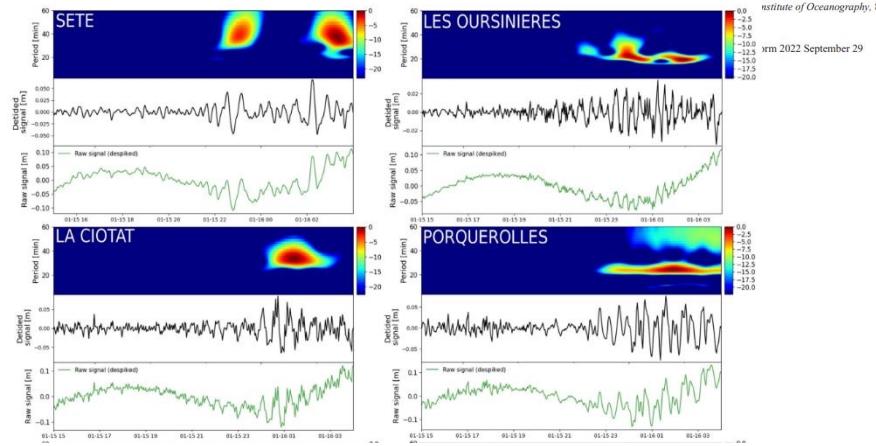
- Observations on the French Mediterranean coastline
- Coastal modeling (Heinrich et al., 2023)

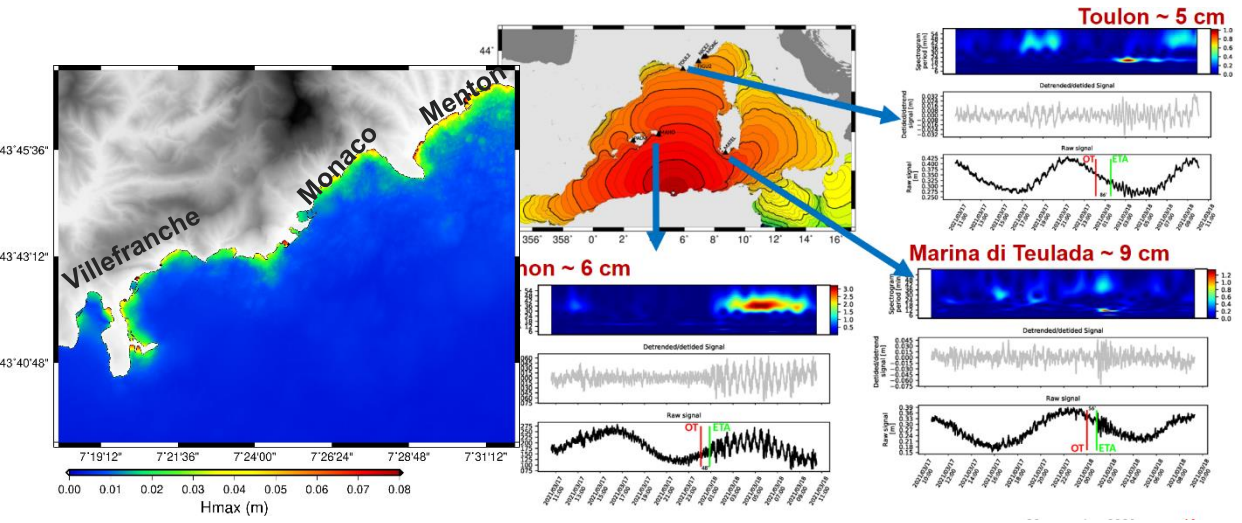



Geophysical Journal International
Geophys. J. Int. (2023) 234, 903–914
https://doi.org/10.1093/gji/ggad092
Advance Access publication 2023 March 02
GJI Applied and Marine Geophysics

Observations and simulations of the meteotsunami generated by the Tonga eruption on 15 January 2022 in the Mediterranean Sea

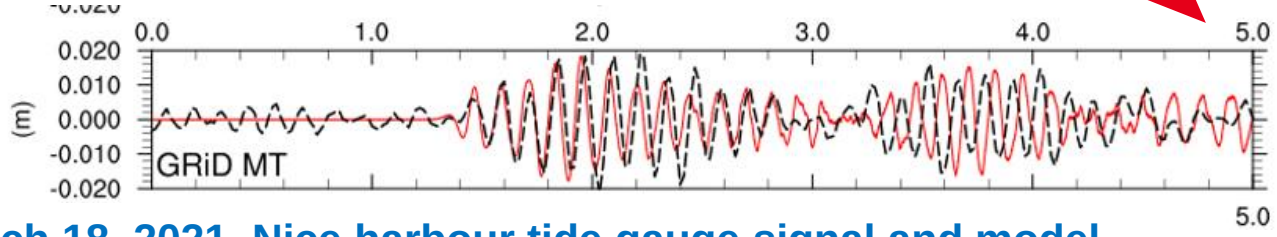
P. Heinrich,[1] A. Gailler,[1] A. Dupont,[1] V. Rey,[2] H. Hébert[1] and C. Listowski[1]
[1]Commissariat à l'Energie Atomique et aux Energies Alternatives. Centre DAM-Ile-de-France, 91297 Arpajon, France. E-mail: philippe.heinrich@cea.fr
[2]Institute of Oceanography, 83041 Toulon, Cedex 09, France





Earthquake and tsunami off Algeria, M 6.0, March 18, 2021

- Tsunami observed in France
- Seismological and tsunami study

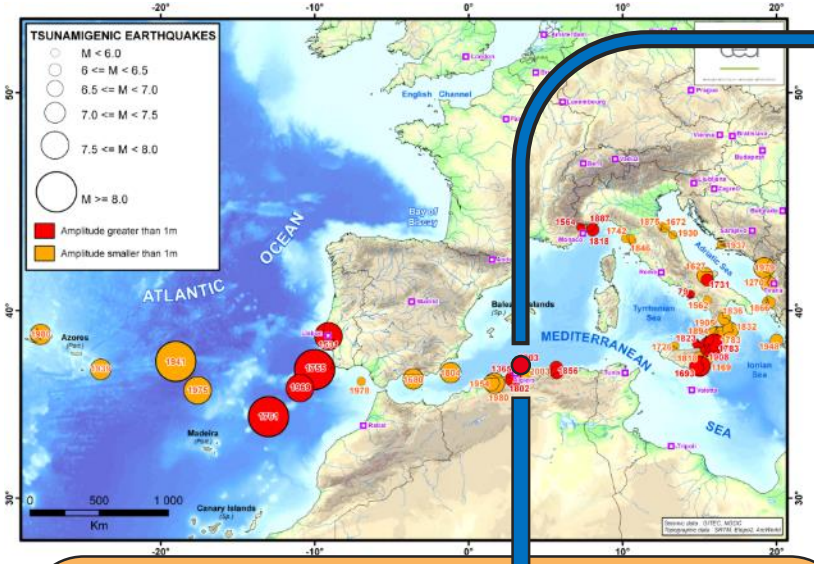


March 18, 2021, Nice harbour tide gauge signal and model

Various case studies contributing to improve modeling methodology (Taitoko, Heinrich et al., 2021)

- PTHA application (Souty et al., 2021)
- Local amplification laws (ongoing PhD work)

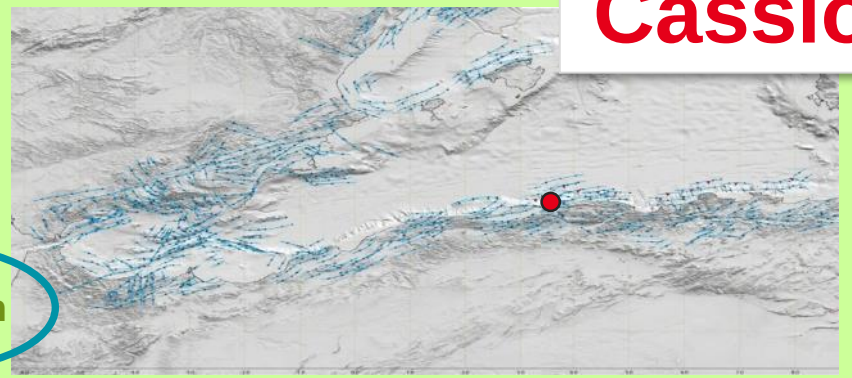
Tsunami modeling



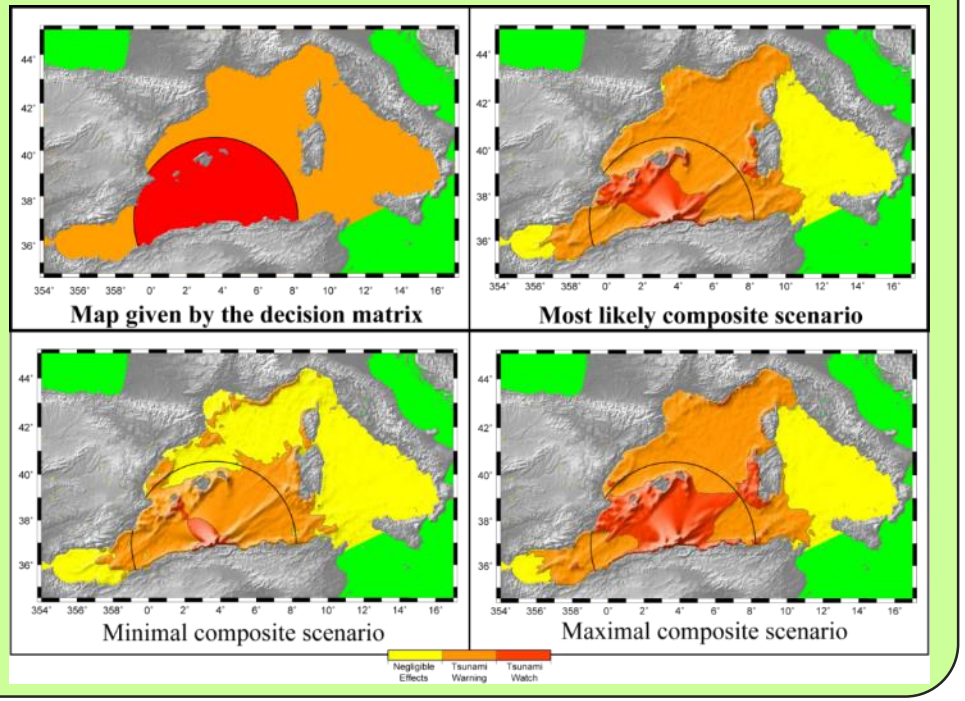
Precomputed database (unit scenarios)
Uncertainties on location and magnitude

Cassiopee

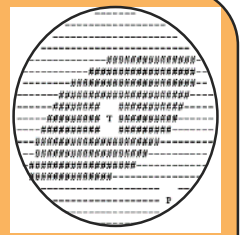
2

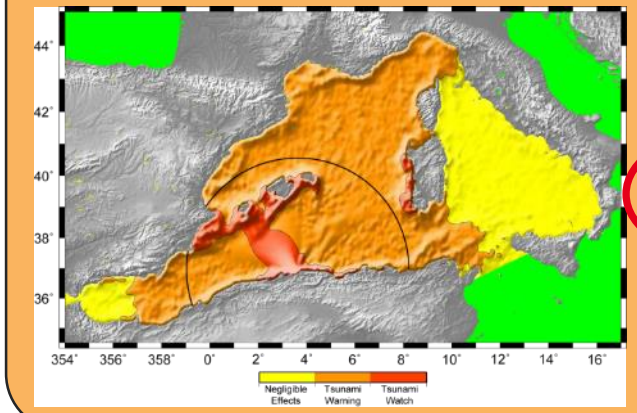


5 min



Real time modeling
Once the focal mechanism is computed





40 min

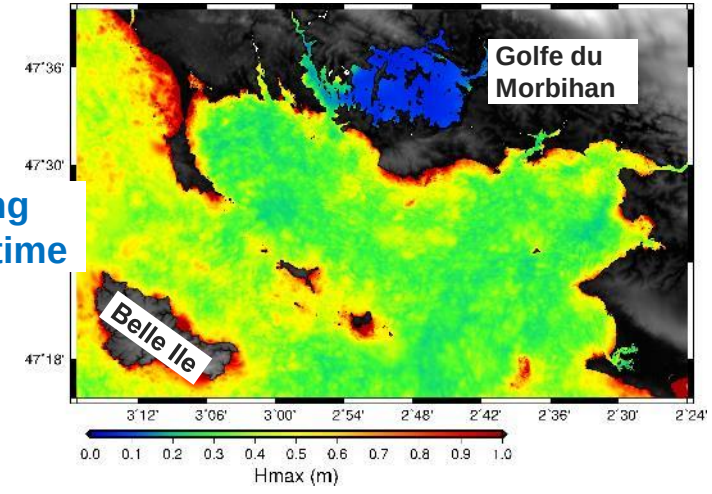
1

Taitoko

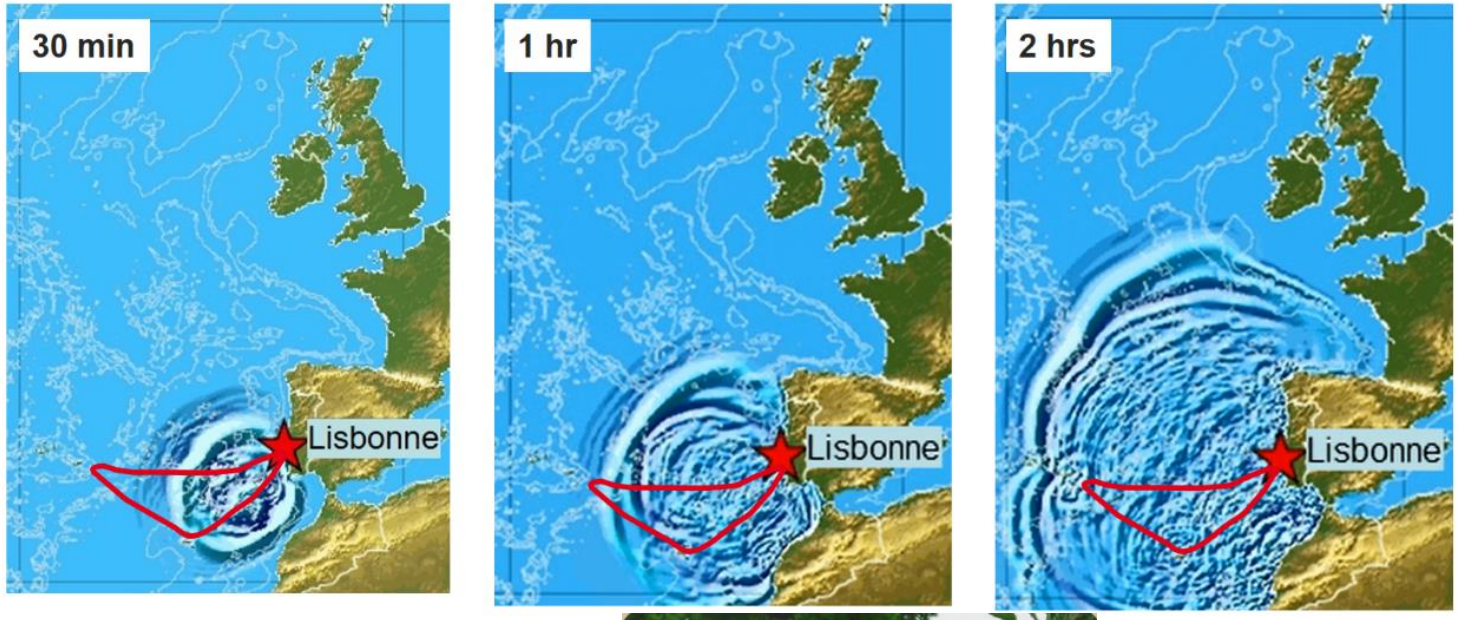
Other perspectives

SMART cable off Portugal

- **Early detection and characterization** of a tsunami triggered by an 1755-like earthquake off Portugal
- Contribution of **numerical modeling** to improve warning
  - Improvement of precomputed databases
  - Improvement of forecast tools

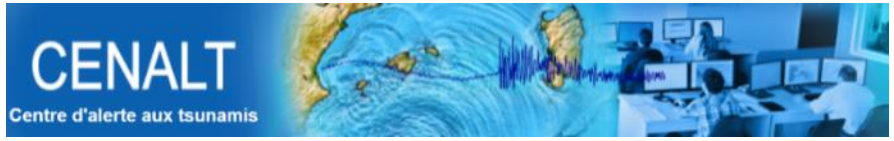


Offline computing
➔ towards real time



EPOS TCS Tsunami

- Interest in the initiative since 2018 / Drafting the CA document
- Opportunity for French institutes within Epos-France
  - National working group on tsunami studies



Thank you for attention