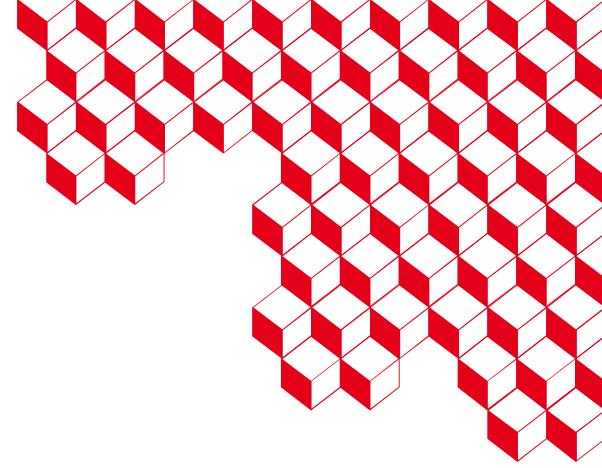
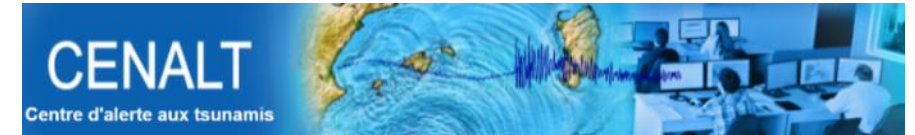




Report from TSP and NTWC Cenalt

Centre national d'alerte aux tsunamis



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

Aurélien Dupont, Audrey Gailler, Philippe Heinrich, Marine Ménager, Pascal Roudil (CEA, DAM)

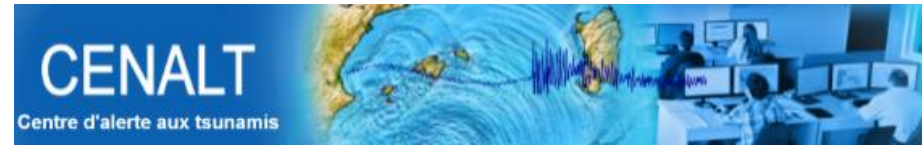
Marie Dauguet (Shom), Cédric Twardzik (Géoazur)

Matthieu Péroche, Louis Monnier (Univ. Montpellier)

Outline

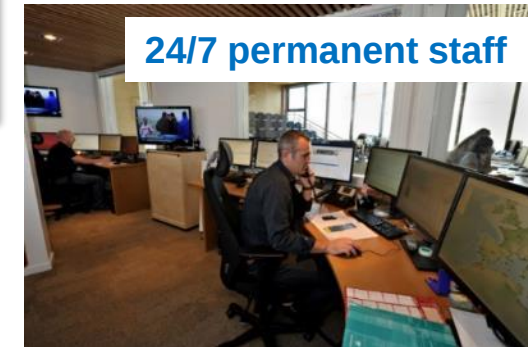
- 1. Cenalt mandates and operation summary**
- 2. Exercices and preparedness**
- 3. Tsunami Ready status**
- 4. Scientific activities**

Mandates



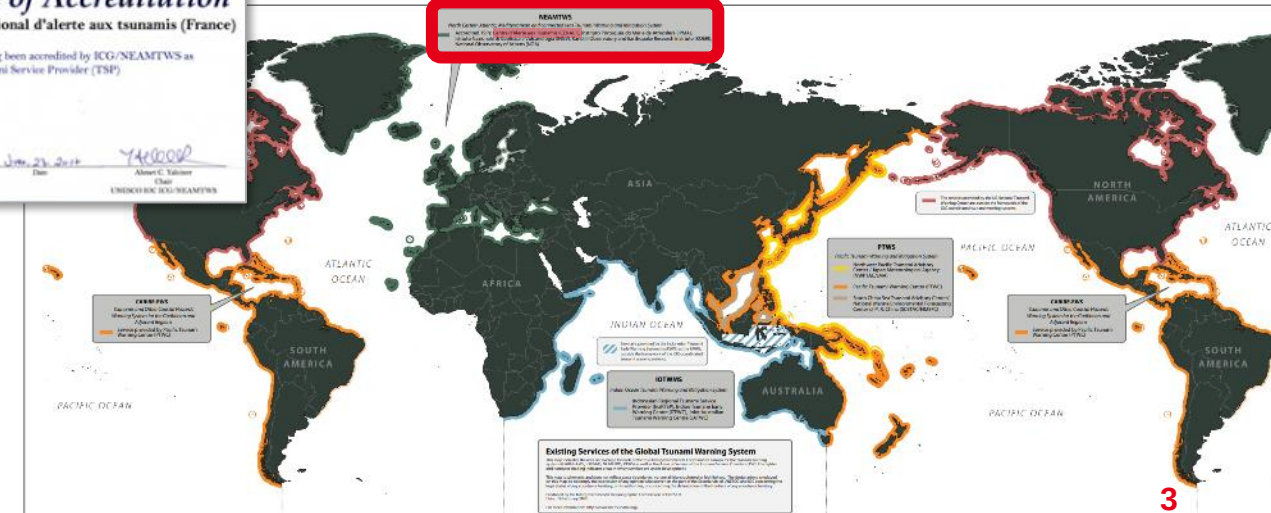
National mandate

- 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

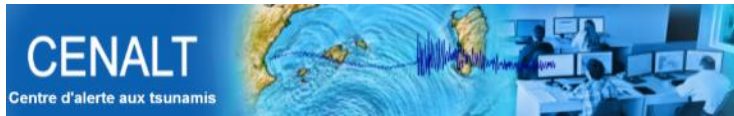


International TSP mandate

- 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 NEAM/ICG framework

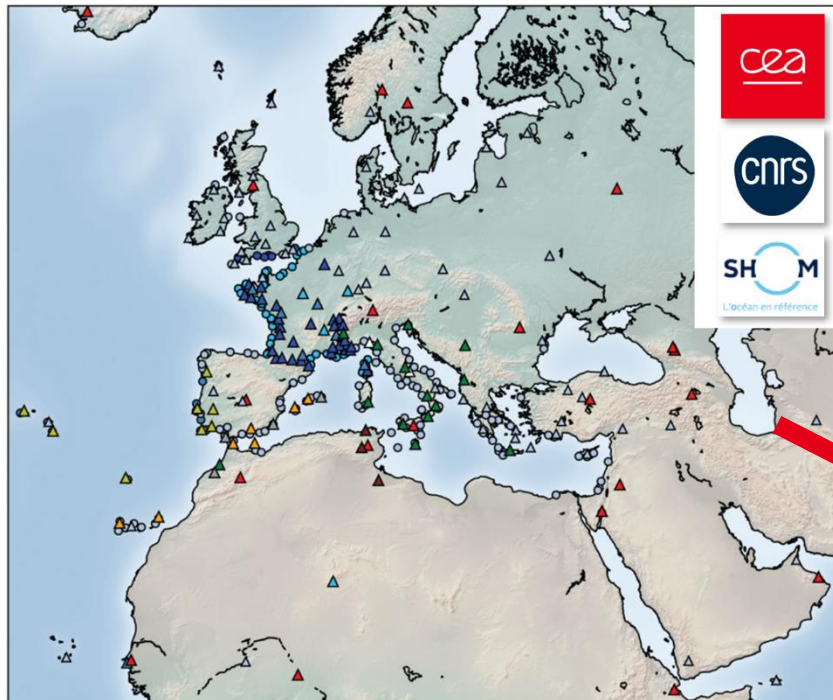


Tsunami monitoring in Cenalt

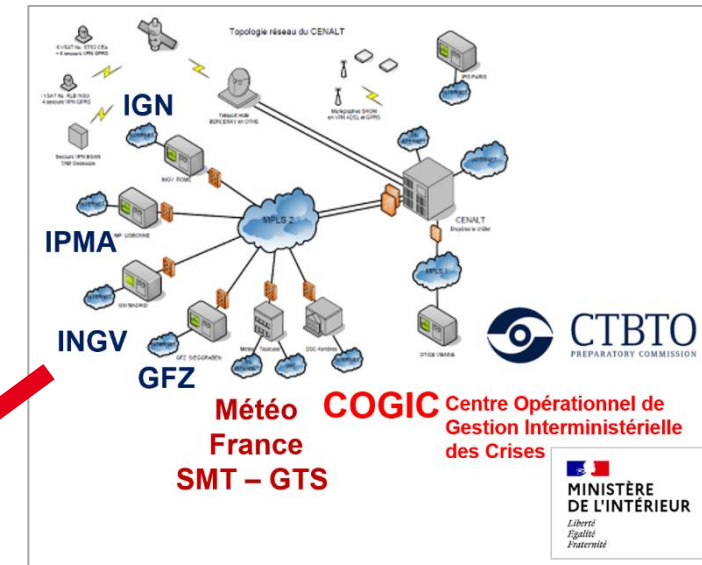
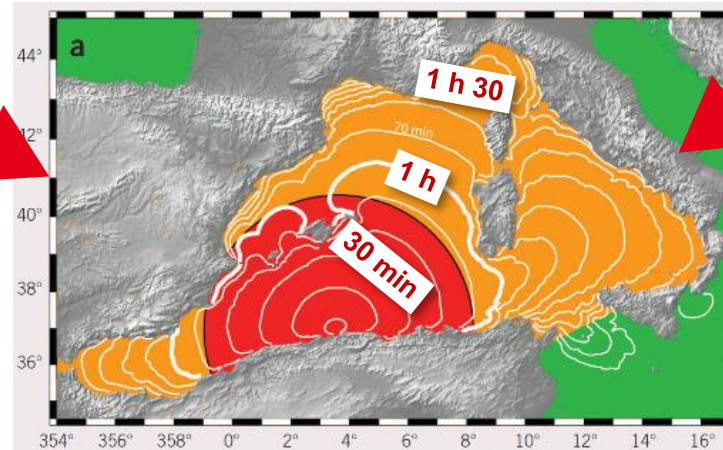
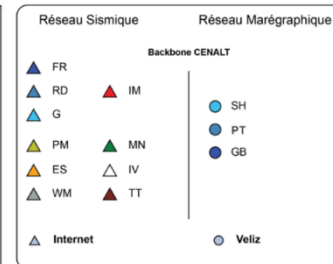


Operational networks / Data available in real time with redundancy and robustness

- National level : seismic data (including CNRS stations) and sea level data (Shom)
- International level : cooperation with operational agencies + CTBTO framework

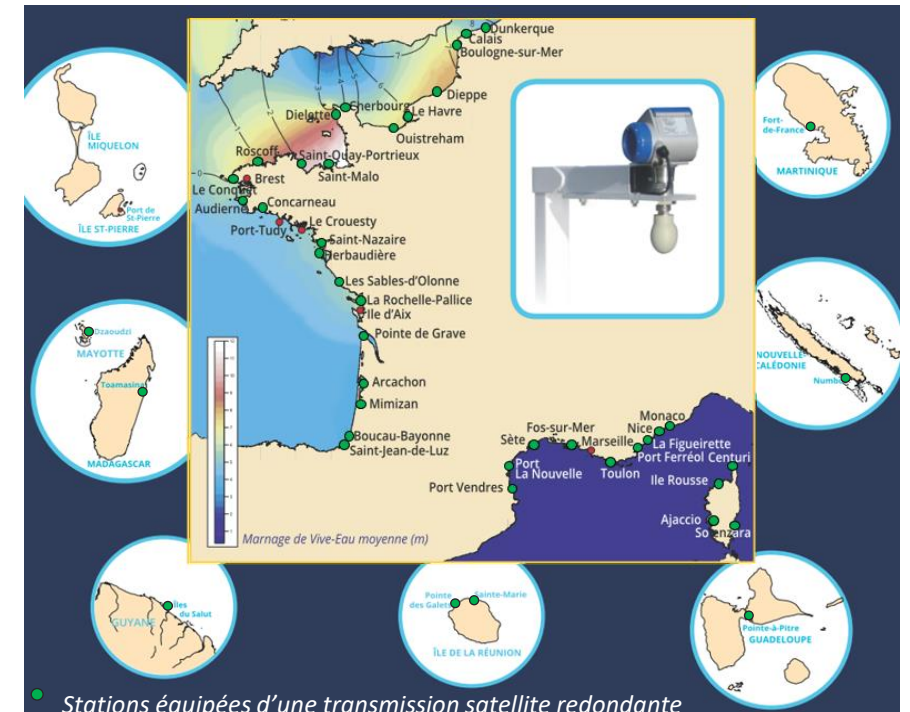


Operational networks

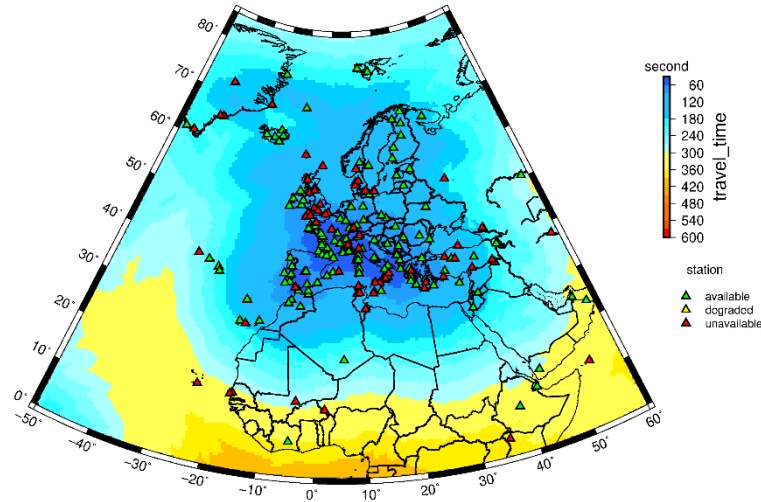


Real time and redundant communication

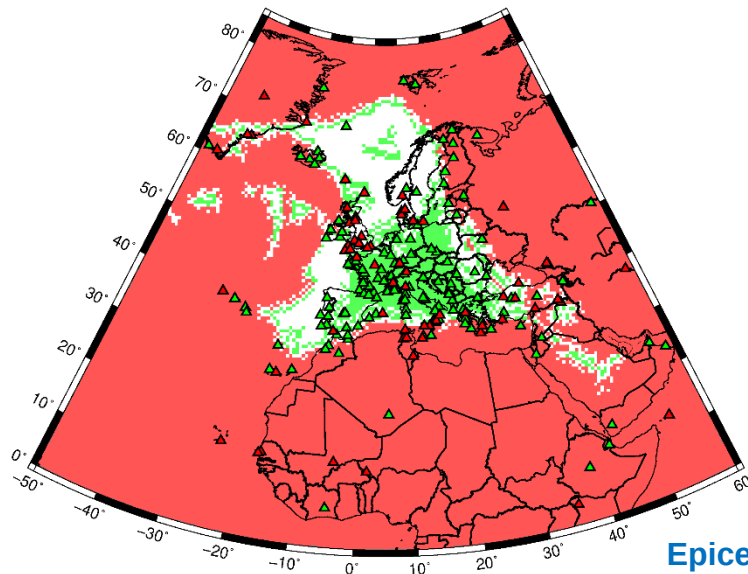
- **RONIM** (Réseau d'Observation du Niveau de la Mer)
 - French national tide gauge network
 - 50 tide gauge stations for numerous applications : hydrography, oceanic tide prediction, extreme events monitoring, tsunami warning, risk prevention, global sea level rise monitoring
 - 41 real time stations available at Cenalt (VPN)
 - Continuous maintenance (9 stations in 2025)
- **Major modernisation** has been completed in 2022
 - Replacement of data-loggers and transmission systems, new sensors, improvement of supervision and network reliability



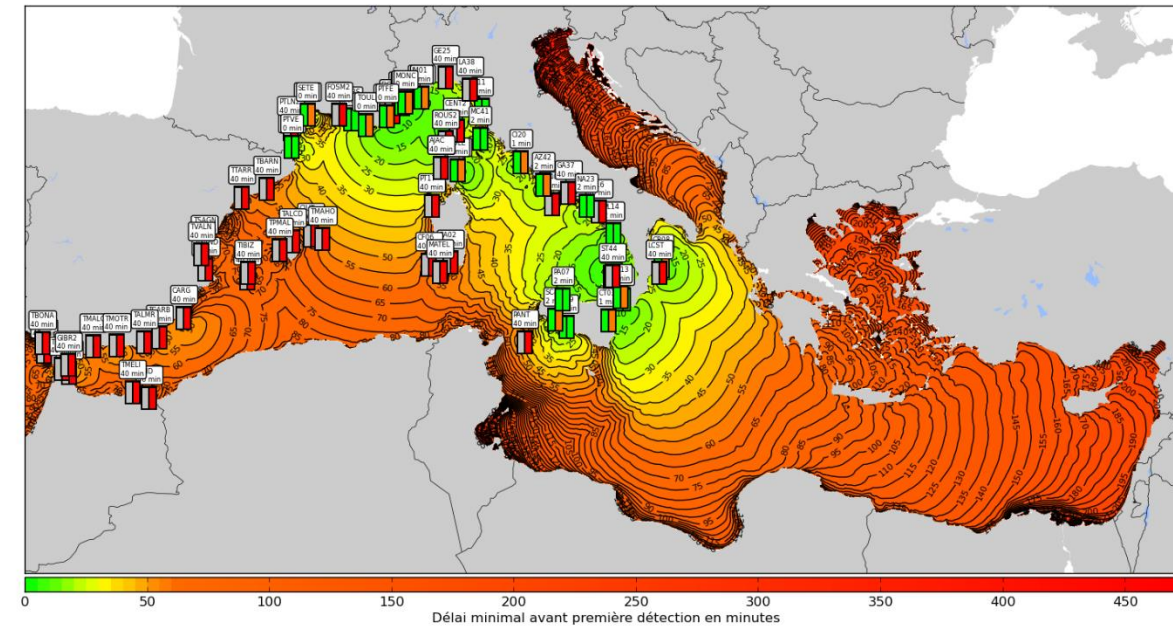
Routine daily operation maps (ex. Feb 10, 2025)



Minimal seismic detection delay



Epicentral location accuracy

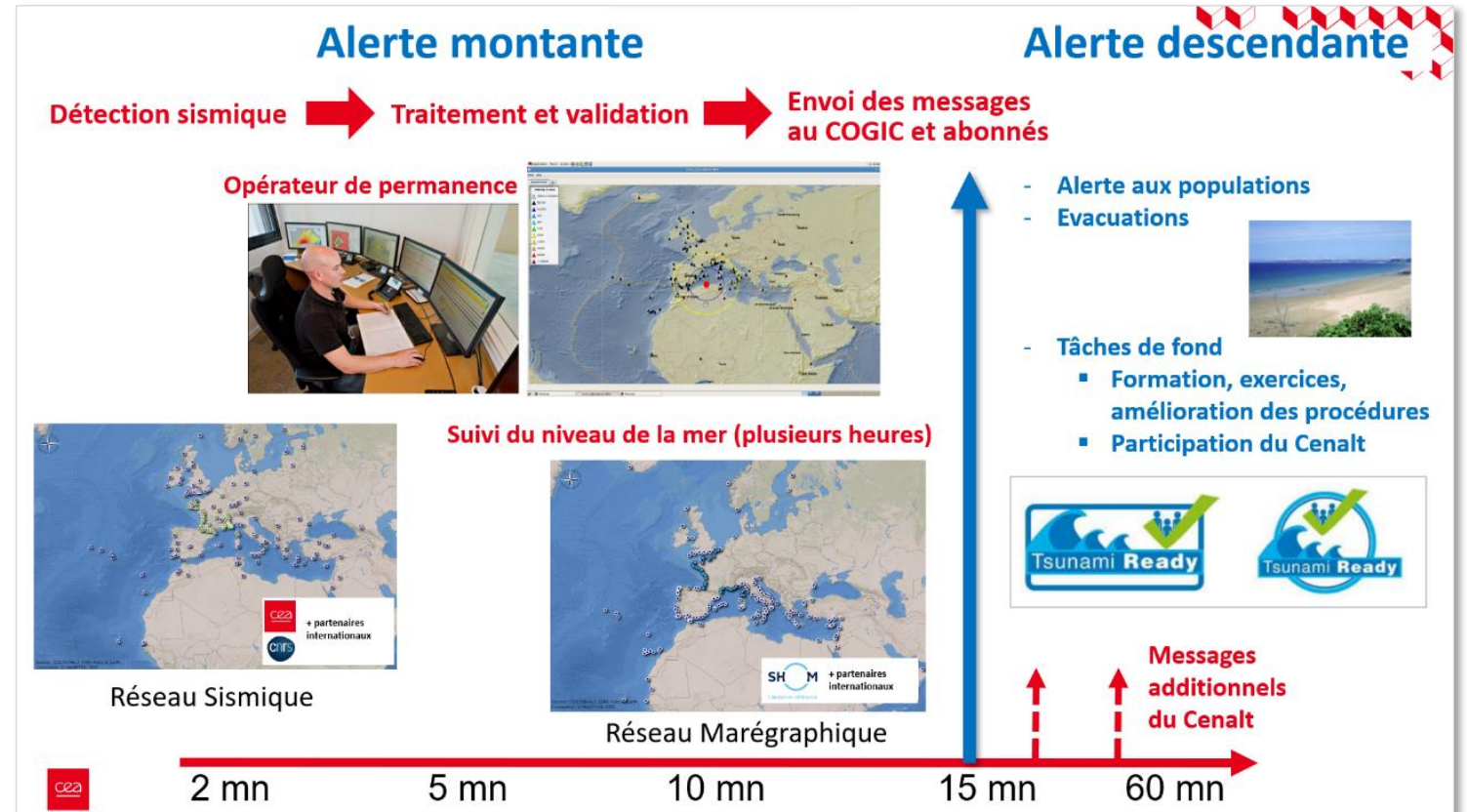


Etats des marégraphes et des données			
Marégraphe HS	Nombre d'échantillons nul	Nombre d'échantillons dégradé (≥ 0 et < 95)	Nombre d'échantillons correcte (≥ 95)
Délai de réception $\geq T2$ (inoperant)			
Délai de réception $> T1$ $\leq T2$ (degrade)			
Délai de réception $\leq T1$ (nominal)			

Minimal delay for sea level anomaly detection

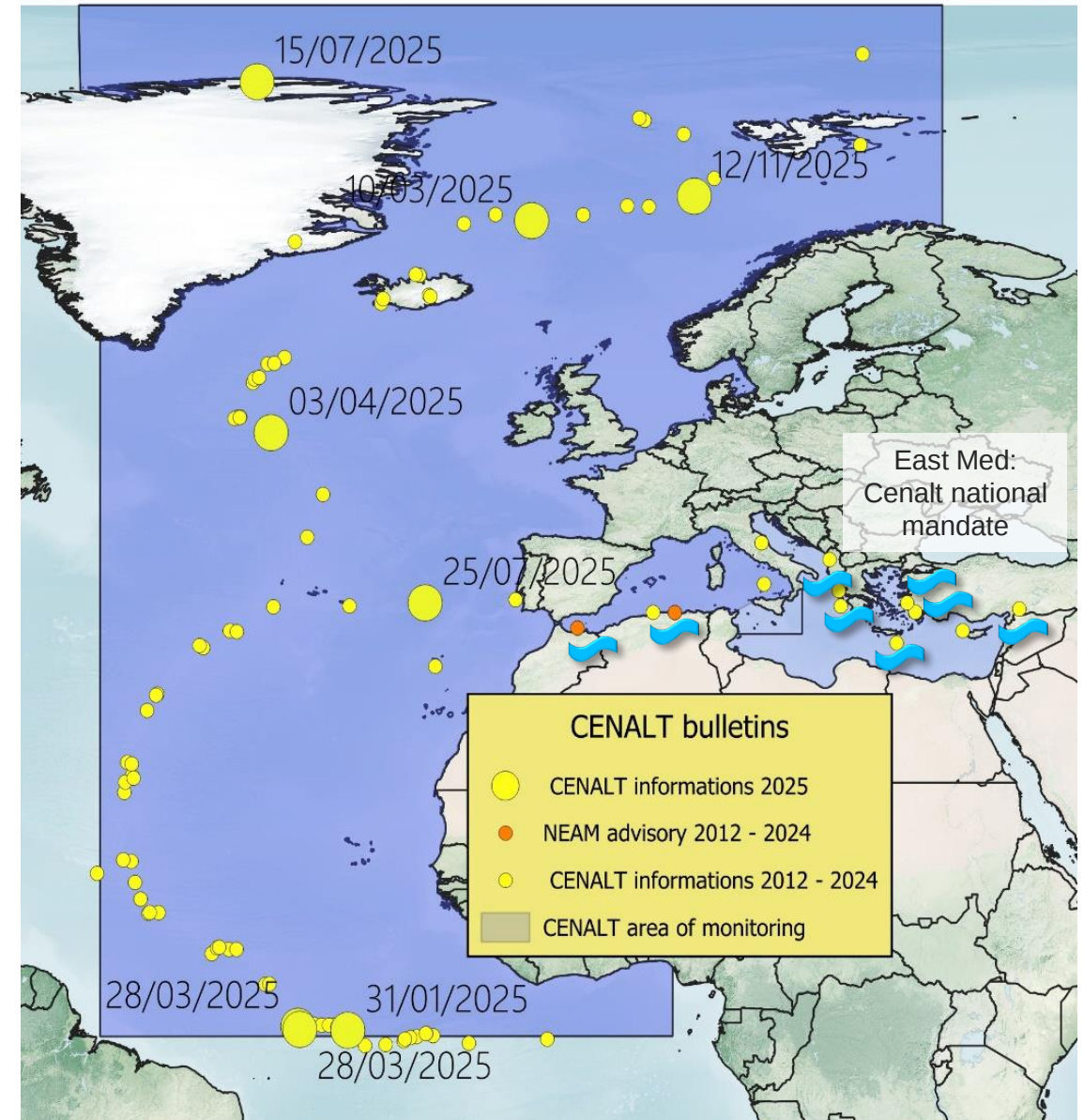
Cenalt operating system

- **Renewal of the Cenalt system is ongoing** (2024-2026), after the first one 2017-2018
 - Servers, communication systems, softwares
- **Major updates**
 - SeisComp and softwares (seismology, maregraphy, tsunami)
 - Fax transmission stop
 - Upate of international data connection if needed



2025 Summary

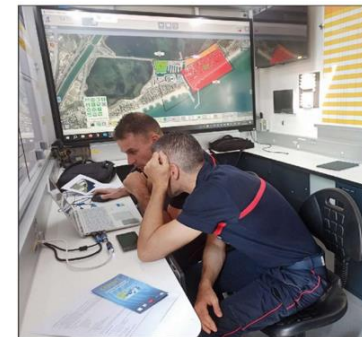
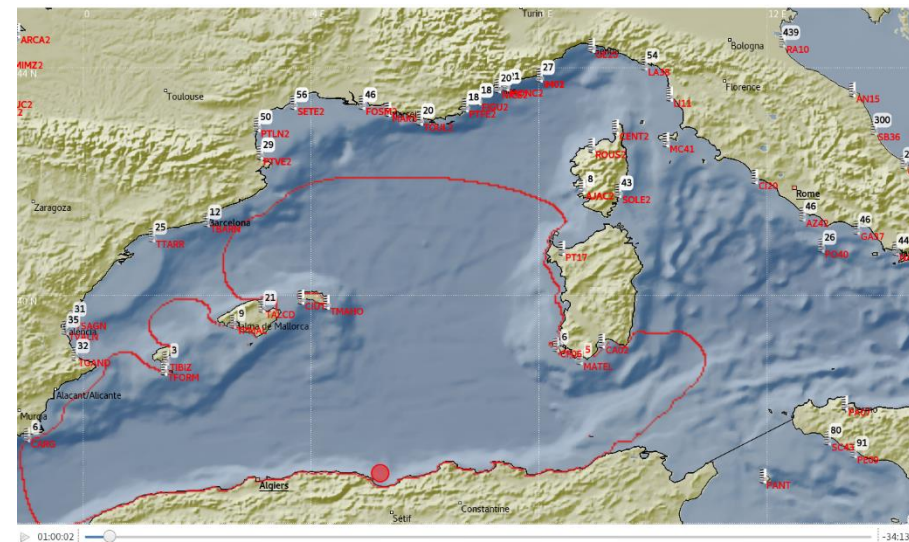
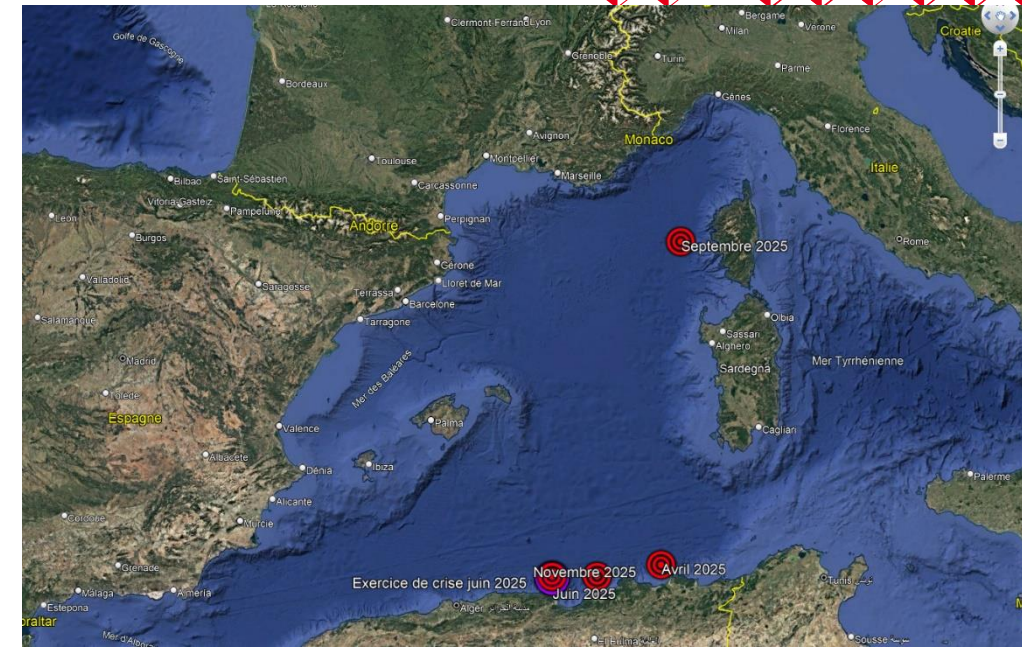
- 8 Information messages in 2025 (Atlantic Ocean)
- Messages issued since 2012
 - 94 Information messages in NE Atlantic
 - 4 Information messages in western Mediterranean
 - 6 Advisory
 - 3 for Alboran Sea, Jan 25, 2016
 - 3 for Algeria, March 18, 2021
- 8 tsunamis monitored



Exercises and preparedness

National communication tests

- Monthly communication test
- Quaterly exercise with local procedure testing
 - Lessons and expectations from national and local level authorities (understanding of messages,...)
 - Training
- Internal crisis exercise (June 2025)



Lessons learned from exercises



EXERCICE D'ALERTE TSUNAMI 01/07/2013
Origine : CENALT
Message du 01/07/2013 à 16:03:47

Fin d'alerte

Levée des mesures de surveillance

Plus d'autre message

Initial end off national message

End of alert

End of surveillance measures

No more message

EXERCICE D'ALERTE TSUNAMI 23/06/2025
Origine : CENALT
Message n°4 du 23/06/2025 à 11:29:54 (heure de Paris)

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.

Evolution of end off national message

End of CENALT monitoring

Please note that effects may persist in ports and some bays.
The prefecture will issue the end of alert and safety measures

No more message

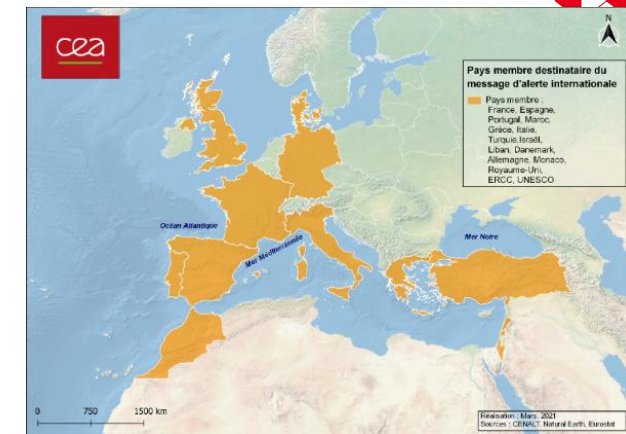
Exercises and preparedness

International communication tests

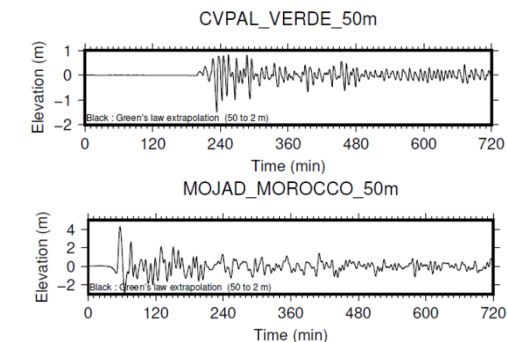
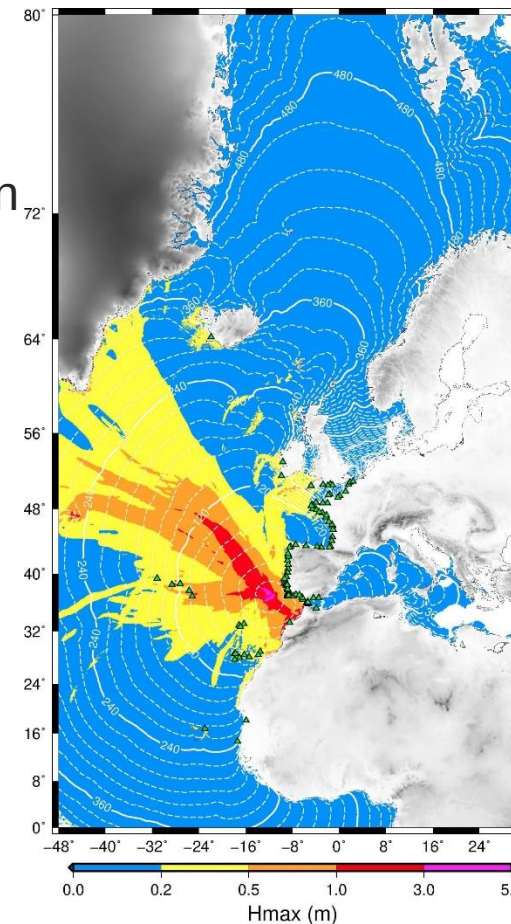
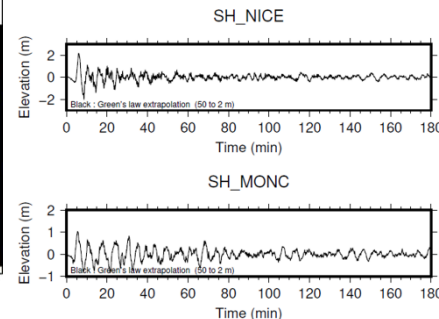
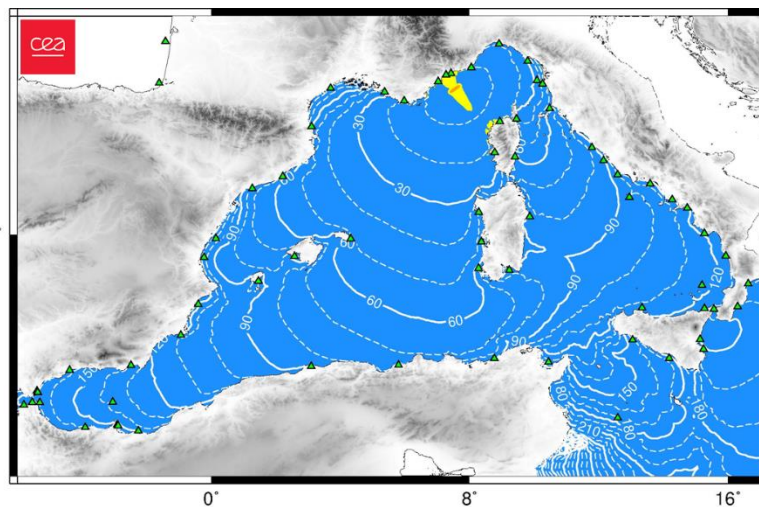
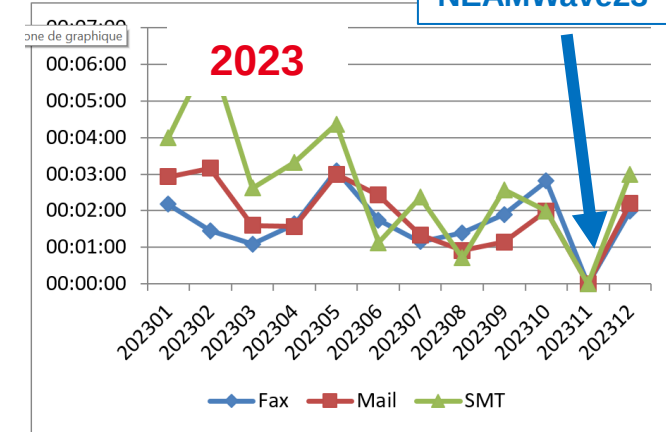
- Monthly tests

NEAMWave exercise

- NEAMWave26: 2 scenarios
 - NE Atlantic (24 March) with Portugal and Spain
 - Ligurian Sea (12 March) with Italy



Test replaced by
NEAMWave23



Tsunami Ready activities

Cannes Tsunami Awareness Day (Nov 5)

- TR Recognition 2024
- Continuous preparedness activities

Exchanges with Cenalt

- Side event to OOSC (June 2025, with Costa Rica)
- Visit to Cenalt of Cannes elected member (Nov 2025)



Questionnaire – Perception du risque tsunami
Mercredi 5 novembre 2025 – Cannes – Quai Saint Pierre

1- Etiez-vous au courant que la ville de Cannes, et globalement le littoral méditerranéen français, est exposé au risque tsunami ?
☐ Oui ☐ Non

2- Avant de passer sur le stand, aviez-vous déjà vu la signalétique tsunami ?
☐ Oui ☐ Non

3- Est-ce que la mise en place d'une signalétique sur le risque tsunami vous semble utile ?
☐ Oui ☐ Non

Pourquoi ? _____

4- Que ressentez-vous en voyant cette signalétique ?
☐ De la peur ☐ Un sentiment de sécurité
☐ du stress ☐ Un sentiment qui rassure
☐ de l'appréhension ☐ Rien

Autre : _____

5- Savez-vous comment vous serez informé en cas d'alerte tsunami ?
☐ Oui ☐ Non

Si oui, pouvez-vous citer les moyens d'alerte : _____

6- Vous êtes :
☐ Résident à l'année
☐ Résident saisonnier
☐ Travailleur sur Cannes
☐ Touriste
☐ Autre : _____
☐ Une femme ☐ Un homme

Age :
☐ 0 - 17 ans
☐ 18 - 39 ans
☐ 40 - 64 ans
☐ 65 ans et plus
☐ Ne souhaite pas communiquer son âge



Other ongoing activities

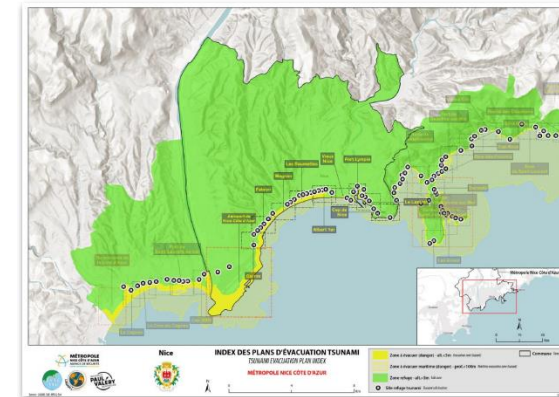
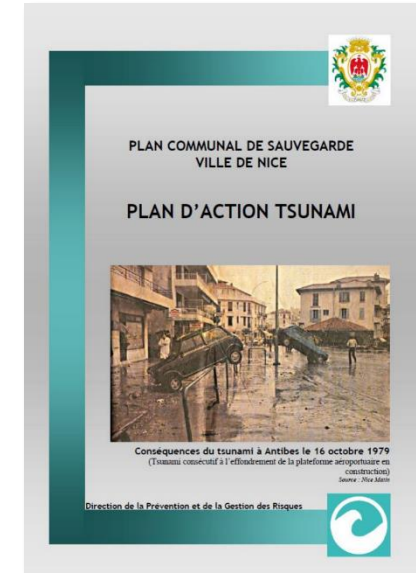
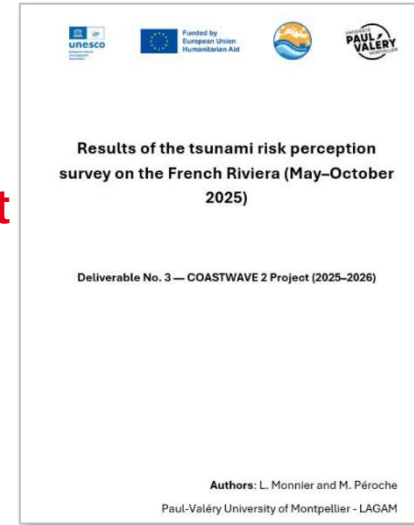
Applications to come in Nice and Marseille, with support of Univ Montpellier

■ Nice Métropole

- 7 candidate communities to be recognized TR
- Two information/awareness events held in Nice for National Resilience Day (October 2024 and 2025)
- Implementation of roadsigs, evacuations routes..

■ Marseille

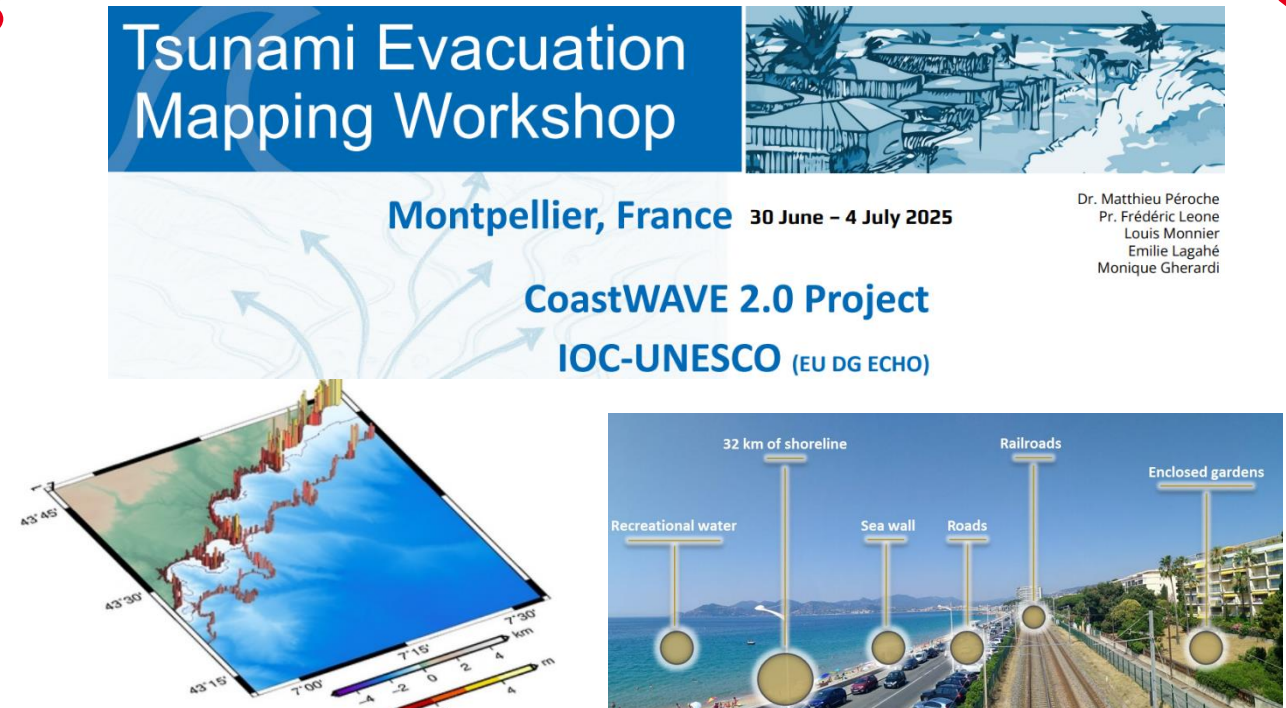
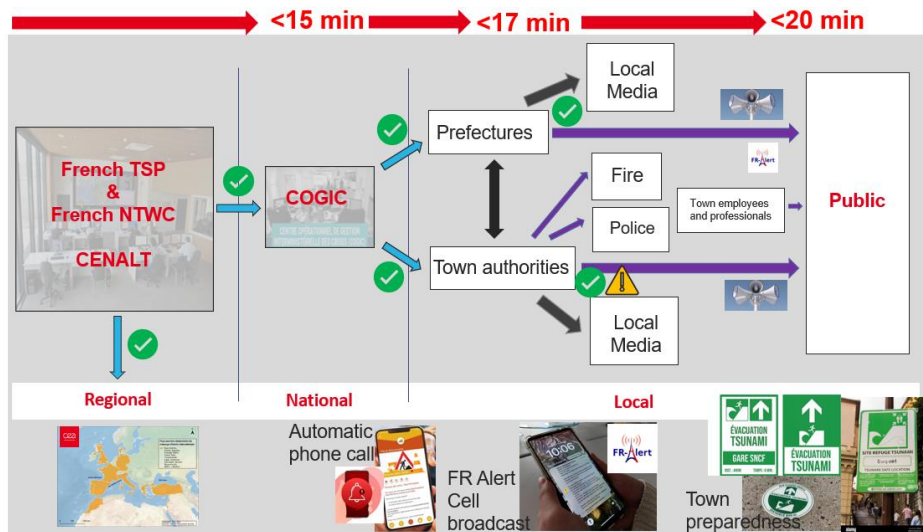
- Ongoing identification of suitable evacuation routes and assembly points
- HR scenario-based modeling to come



Coastwave2 activities

French partner: Université of Montpellier

- Cooperation with Cenalt
- Workshop in Montpellier (July 2025)
 - Cenalt : tsunami modeling, operational challenges and uncertainties (A. Gailler)



- Workshop in Lisbon (Oct 2025)
 - Cenalt : national TW and SOPs (P. Roudil)

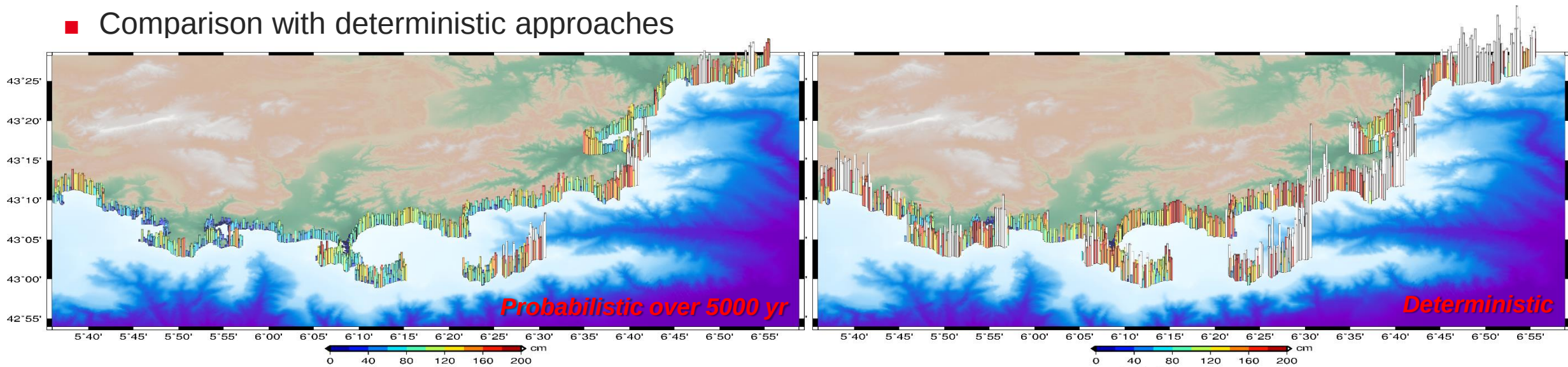
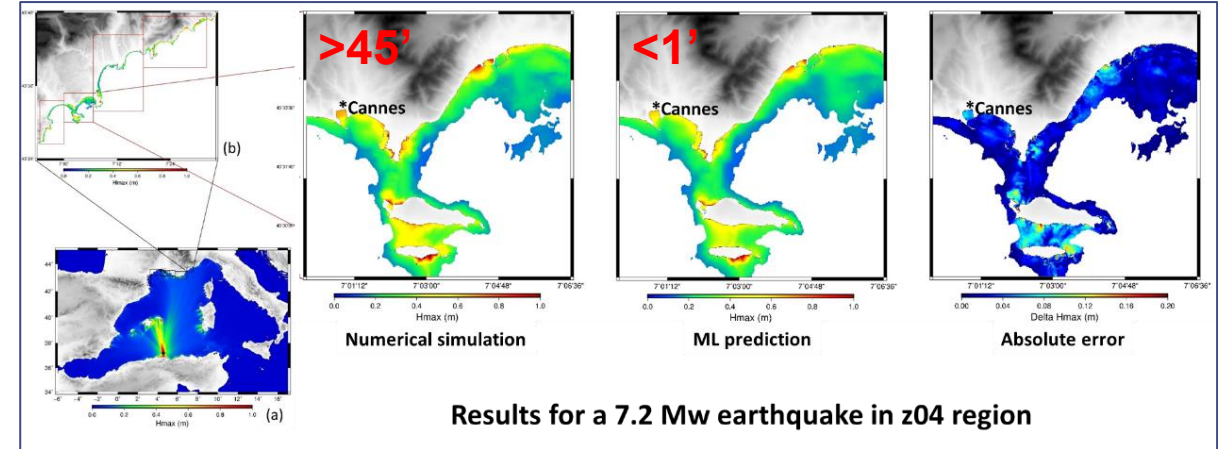
Scientific activities

Forecasting methodology using AI approach

- PhD Pierre Andraud (2025)
- Real-Time high resolution Tsunami impact forecasting using machine learning

Studies regarding hazard assessment

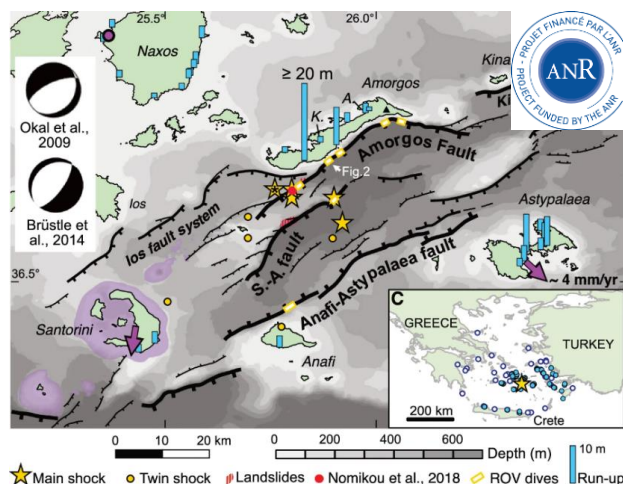
- PTHA application (Souty et al., 2021) based on Taitoko software (Heinrich et al., 2021) and detailed amplification
- Comparison with deterministic approaches



EPOS-FR
EUROPEAN PLATE OBSERVING SYSTEM FRANCE

Epos-France scientific
meeting Sète, Nov. 2025

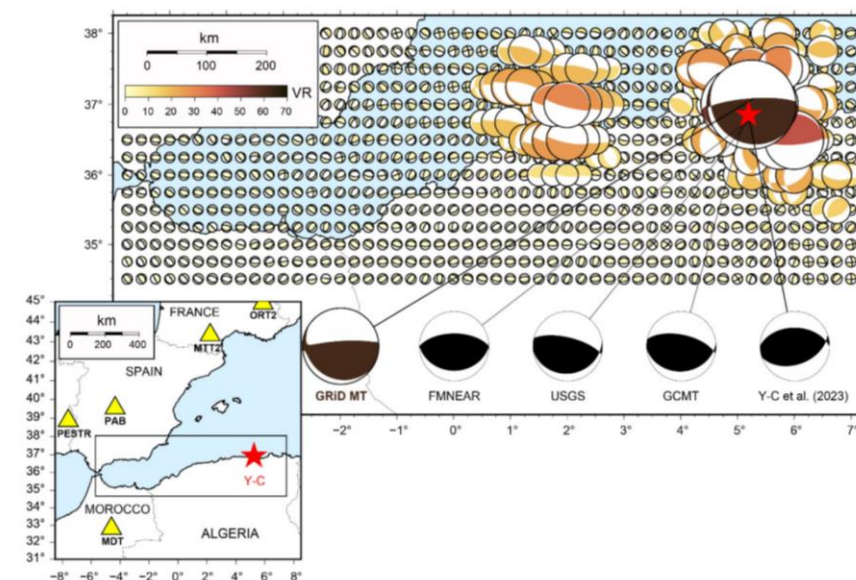
- Opportunity to gather French institutes working on tsunamis
- Recent workshop in Sète (~20 participants)
- Upcoming participation to EPOS



- Amorgos 1956 earthquake and tsunami
- 1 PhD student (Geoazur-CEA)

Real time focal mechanism

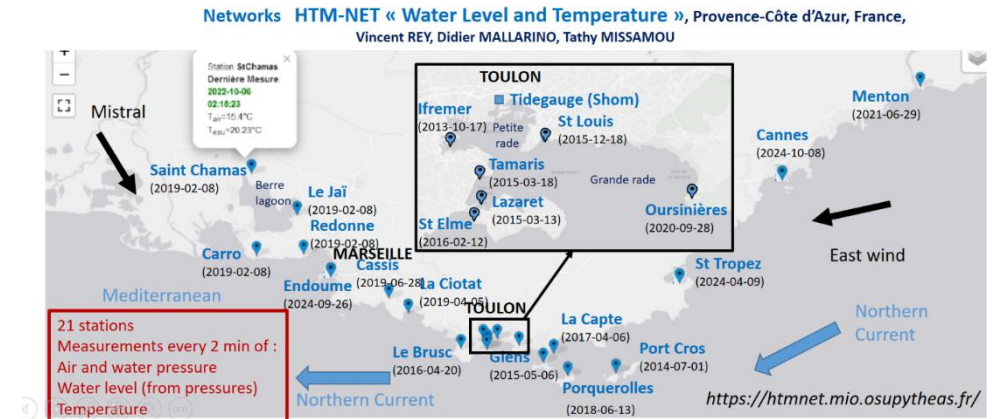
- GriD MT, adapted to the western Med
- Precomputed unit database
- Example Bejaia, 2021 (Heinrich et al., 2024)



Scientific activities

■ HTM NET

- Coordinated by Université de Toulon
- Data available on the French academic sea level measurement network Refmar (coordination Shom)
- <https://htmnet.mio.osupytheas.fr>



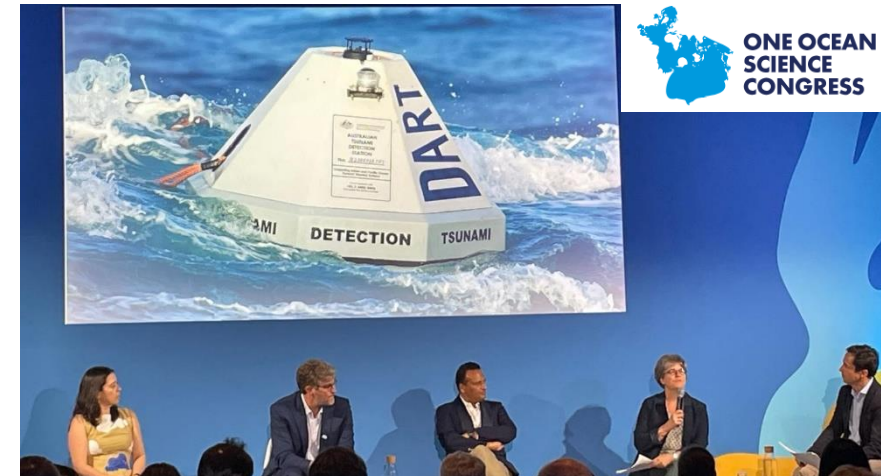
■ SMART cable MISTS project

- Following the CAM project (Portugal), perspective of the MISTS project (EU CEF funding)
 - Presentation to NEAM (March 2025) / Ongoing discussion to define sensor locations



■ Panel discussion during OOSC (Nice, June 2025)

- Including TWS, preparedness, new technologies (SMART cables, DAS..)



ONE OCEAN
SCIENCE
CONGRESS



■ **Thank you for attention**