The SIMIT-THARSY project: Upgrading the real-time monitoring system and risk assessment for earthquakes and tsunami on the Maltese islands

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Malta's seismic hazard

- **Most of Malta's earthquake hazard originates in other countries. Malta depends strongly on the exchange of data from other countries.**

- Malta does not have a 24-hour earthquake office.

- Reliance on automated systems

Red curves: potential seismogenic source contributing to the seismic hazard for Malta
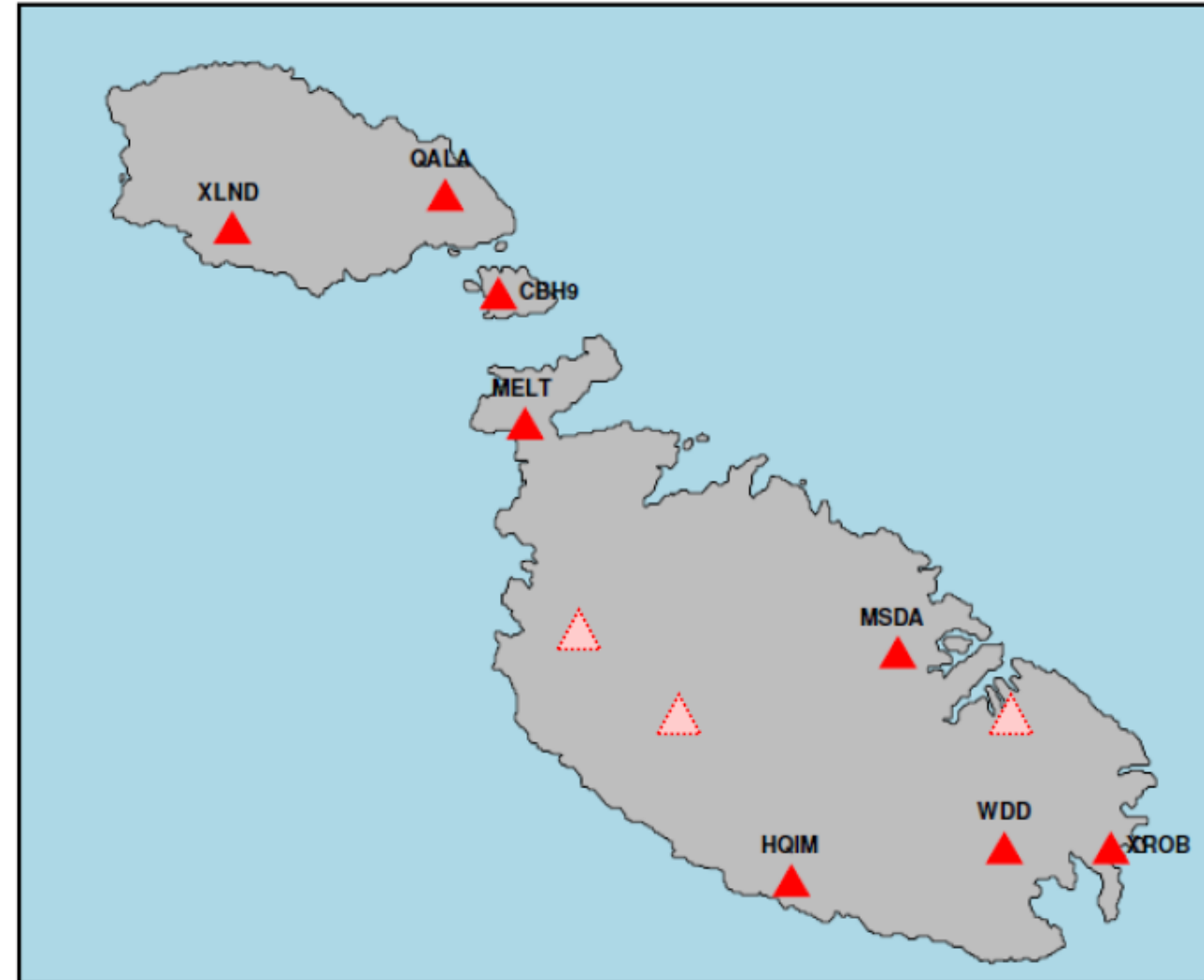
Interreg Italia-Malta SIMIT-THARSY

SIMIT-THARSY: Tsunami Hazard Reduction System

- **Programme:** INTERREG V-A ITALIA -MALTA 2014-2020

- **Duration:** 36 months

- **Total cost:** € 2.5 million

- **Participants:**
  - Regional Civil Protection Department, Sicily
  - University of Palermo
  - University of Catania
  - University of Malta
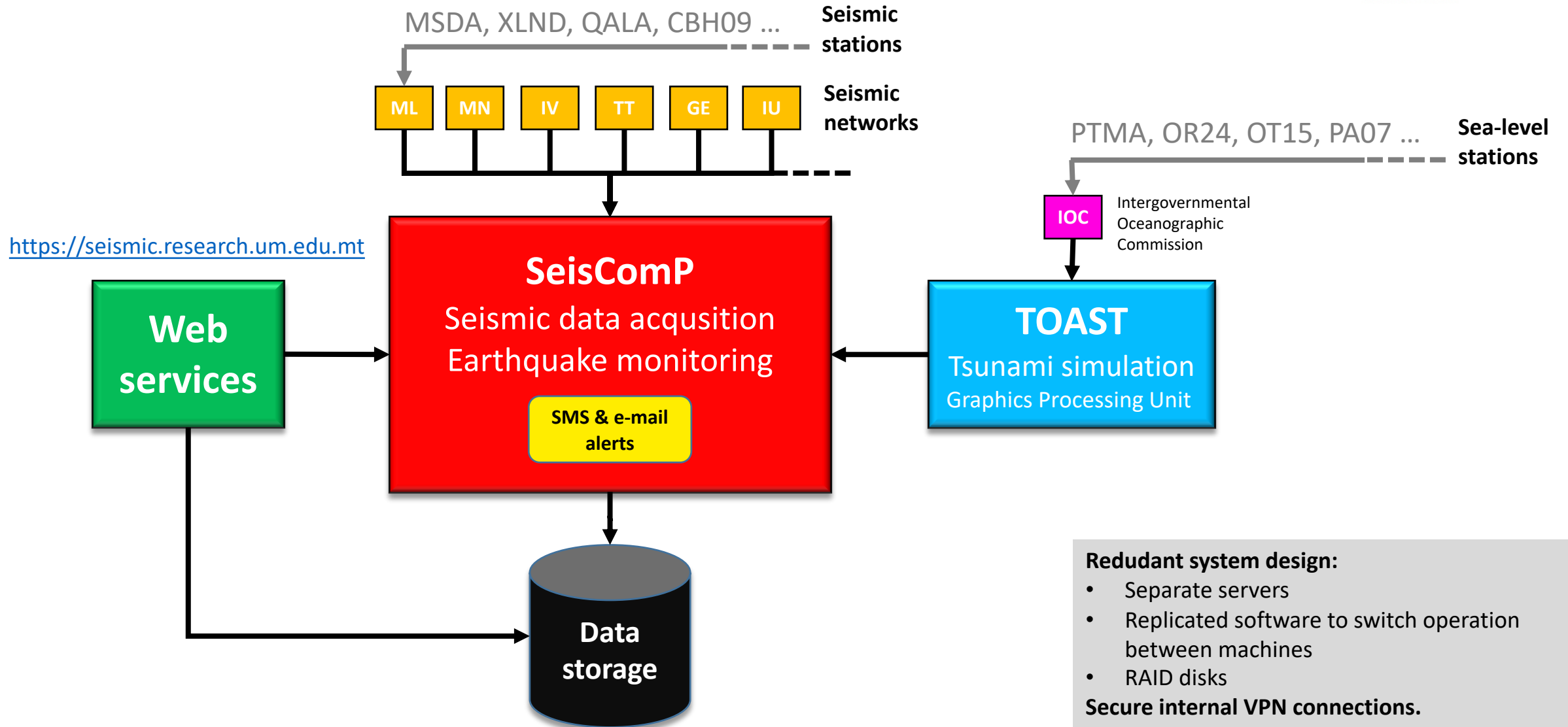 - Civil Protection Department, Malta

Malta Seismic Network

- Set up of international code ML with the international Federation of Digital Seismograph Networks (FDSN).

- 8 broadband seismometers across the Maltese islands.

- Real-time transmission.

- Detect and locate local seismic activity with higher resolution.

- Temporary seismic stations are available to be installed as the need arises.

IT infrastructure

# Real-time seismic data acquisition & earthquake monitoring

- Real-time data acquisition from tens of regional and global seismic networks comprising hundreds of seismic stations.

- Automatic earthquake detection, location and alerts systems are run by SeisComP.

Regional seismic networks.

Real-time traces.

Global seismic networks.

Example of local earthquake

Local earthquakes and strong regional earthquakes are verified manually using dedicated analysis tools.
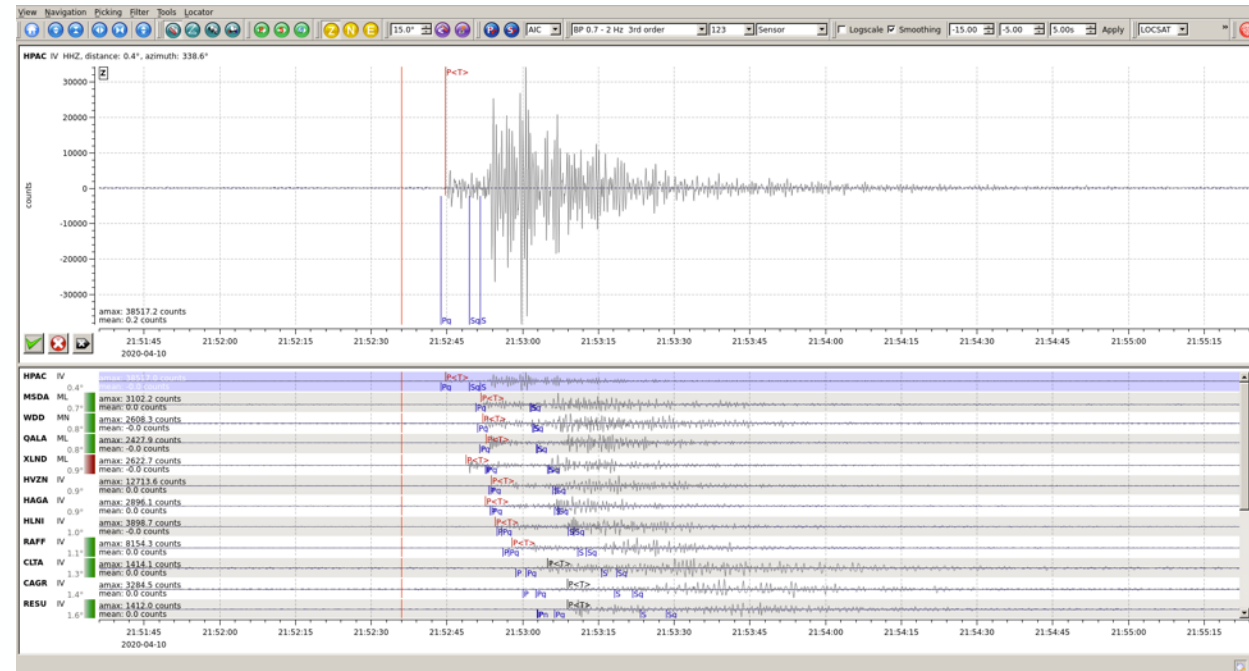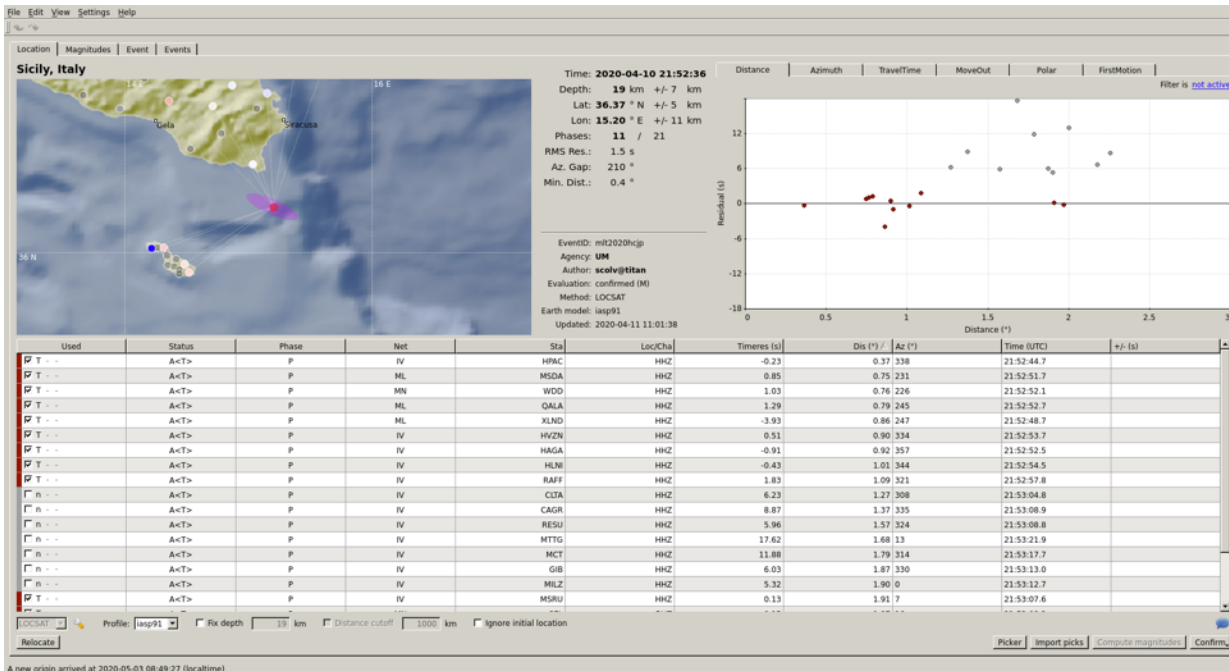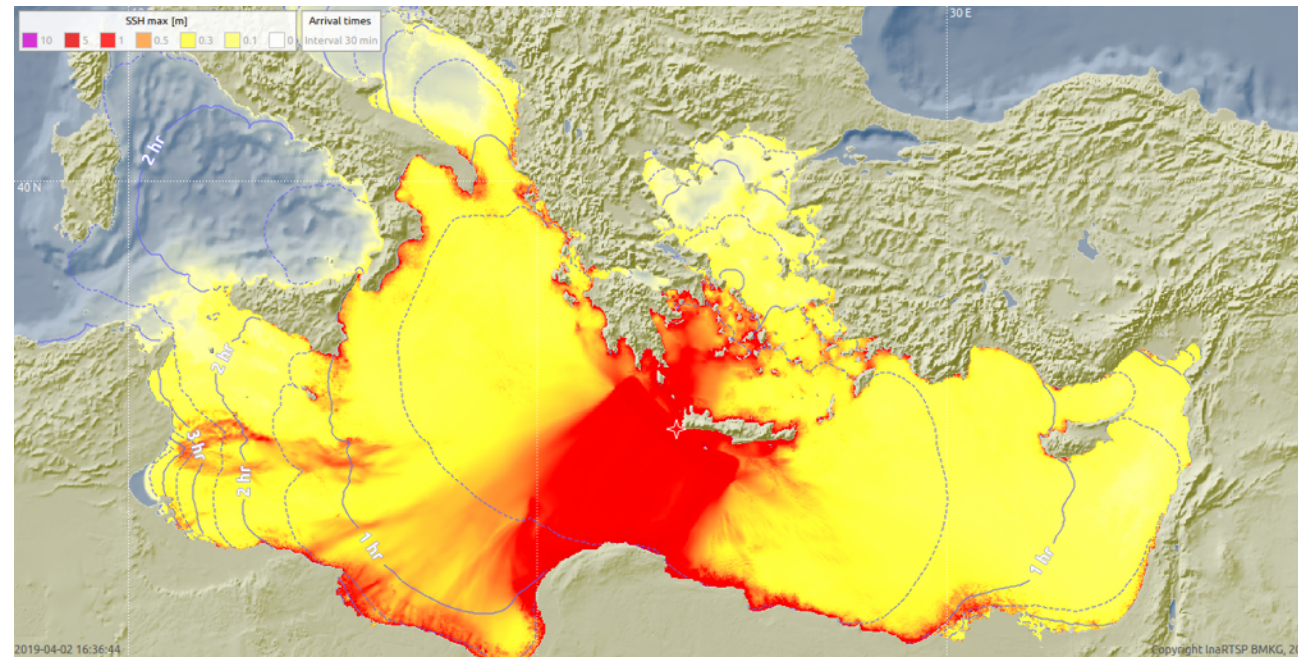
Tsunami simulations

- Tsunami simulations are run by **TOAST** (**T**sunami **O**bservation **A**nd **S**imulation **T**erminal).
- TOAST provides tsunami arrival times, maximum Sea Surface Height, maps and dissemination tools.

Maximum Sea Surface Height (SSH max)
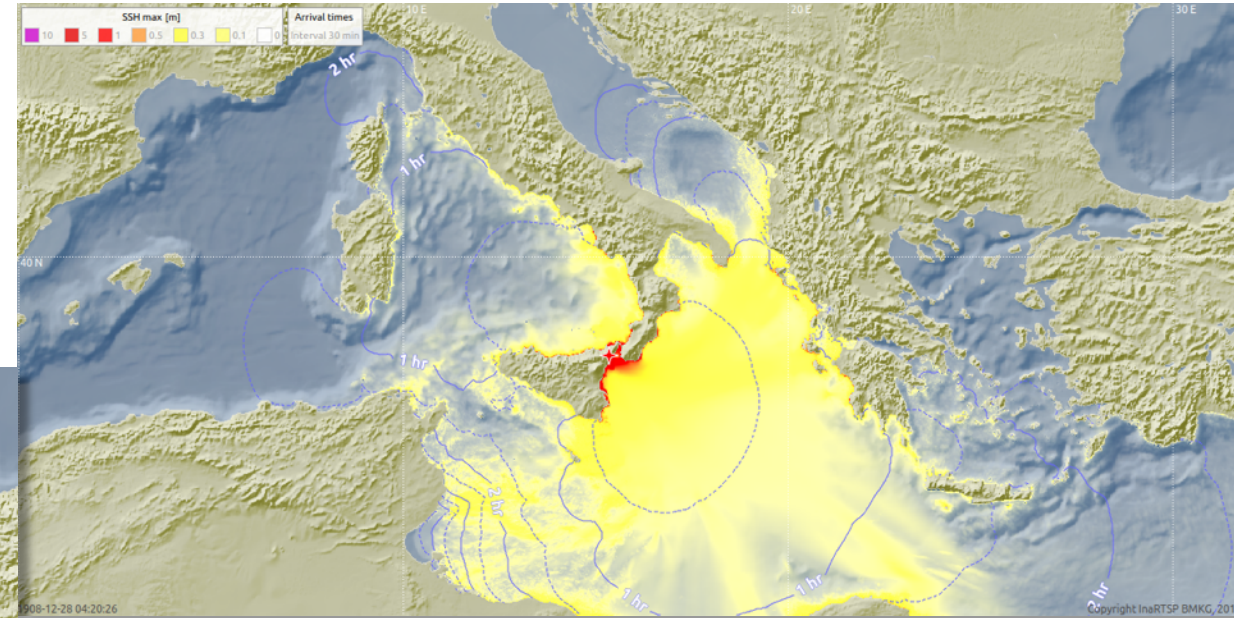
Example Sicily (Messina) tsunami from earthquake magnitude 7.5 in 1908

Example Crete tsunami from earthquake magnitude 8.5 in 365

Real-time, tsunami simulations

- Real-time earthquake monitoring using **SeisComP**.
- For strong earthquakes (M>6) tsunami simulations are triggered automatically.
- Analyst can analyse the seismic data and compare synthetic mareograms with live **tide-gauge data** retrieved from the **Intergovernmental Oceanographic Commission** (IOC).
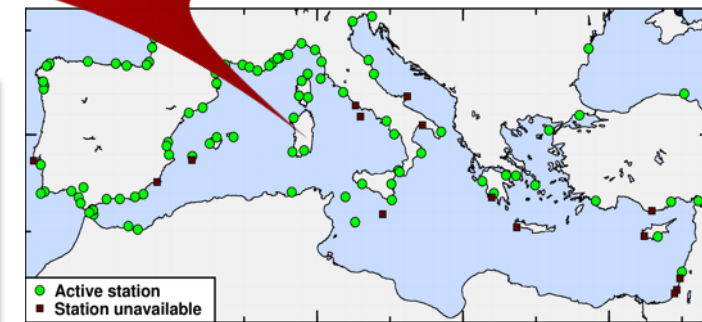
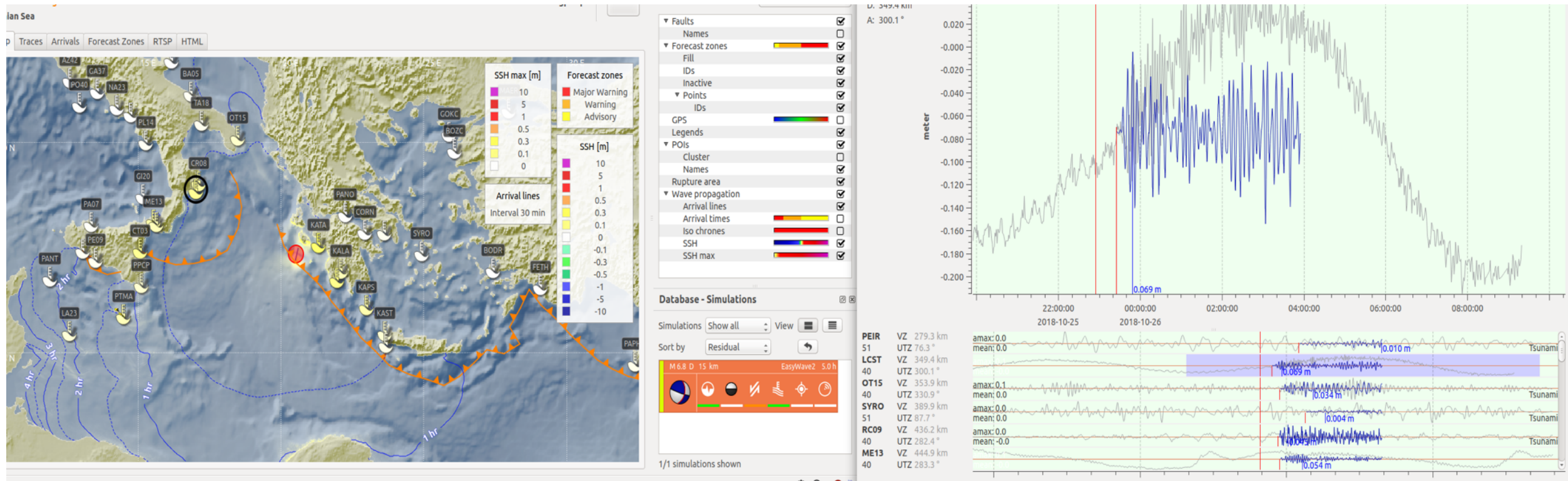**Earthquake monitoring**
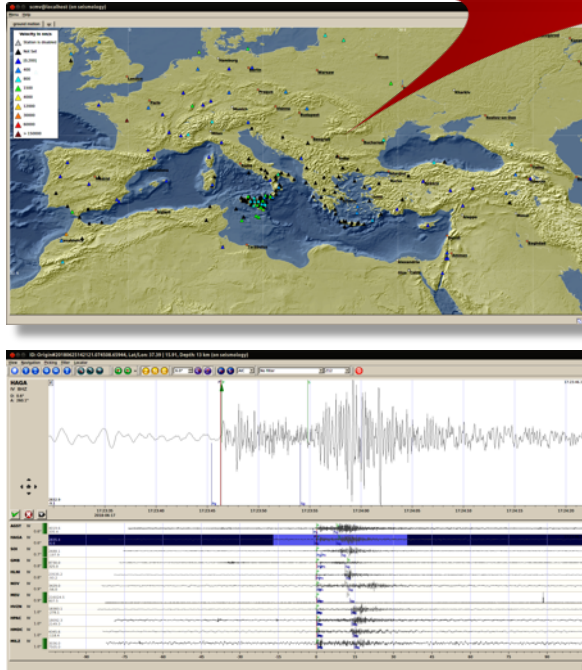
Tsunami simulation
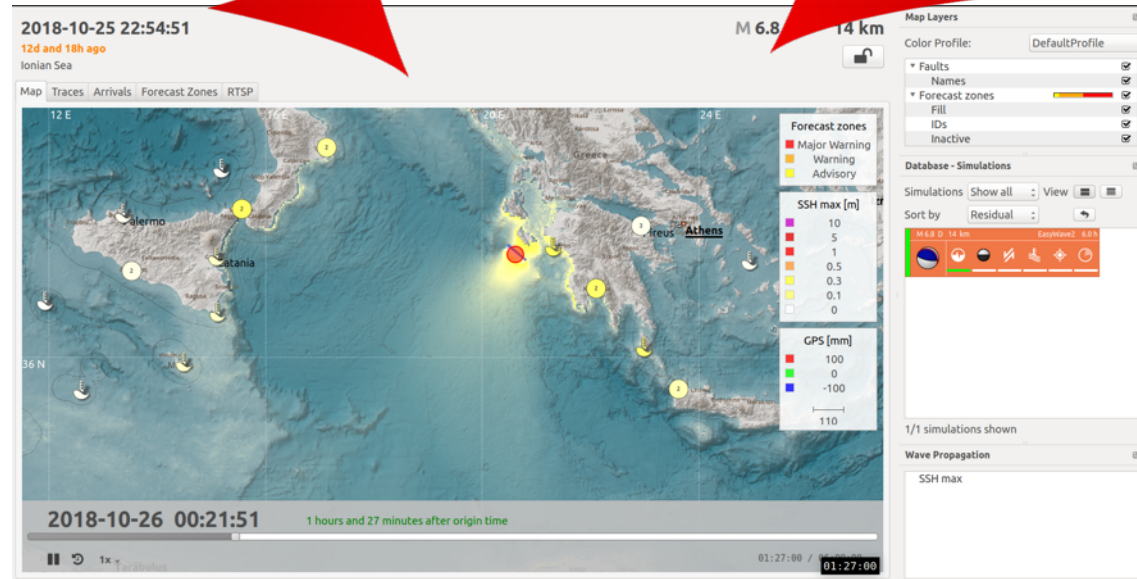
IOC Sea-level monitoring

Tsunami simulation: 25 October 2018, Greece

- Example of a recent tsunami triggered from a magnitude 6.8 earthquake in Greece.
- Graphic user interface showing estimated wave arrival times, SSH max and mareograms (live & synthetic)

Earthquake location, sea-level stations, arrival times and SSH max

Actual (black) and synthetic (blue) memograms at La Castellea sea-level station, southern Italy.

Tsunami simulation: 25 October 2018, Greece

- Alert warning for Malta and comparison with actual tide-gauge data.


```
Origin Time: 22:54:50
-----------------------------------------------------------------------------
Initial arrival        | Arrival max wave height | Runup  | Status   | Place
-----------------------------------------------------------------------------
2018-10-26 00:14:42 (0.01m)| 2018-10-26 00:53:50 (0.09m)| 0.04m | Nothreat | Malta
```

Portomaso station, Malta