



NEAMWave17

NOA-INGV scenario

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NEAMWave17

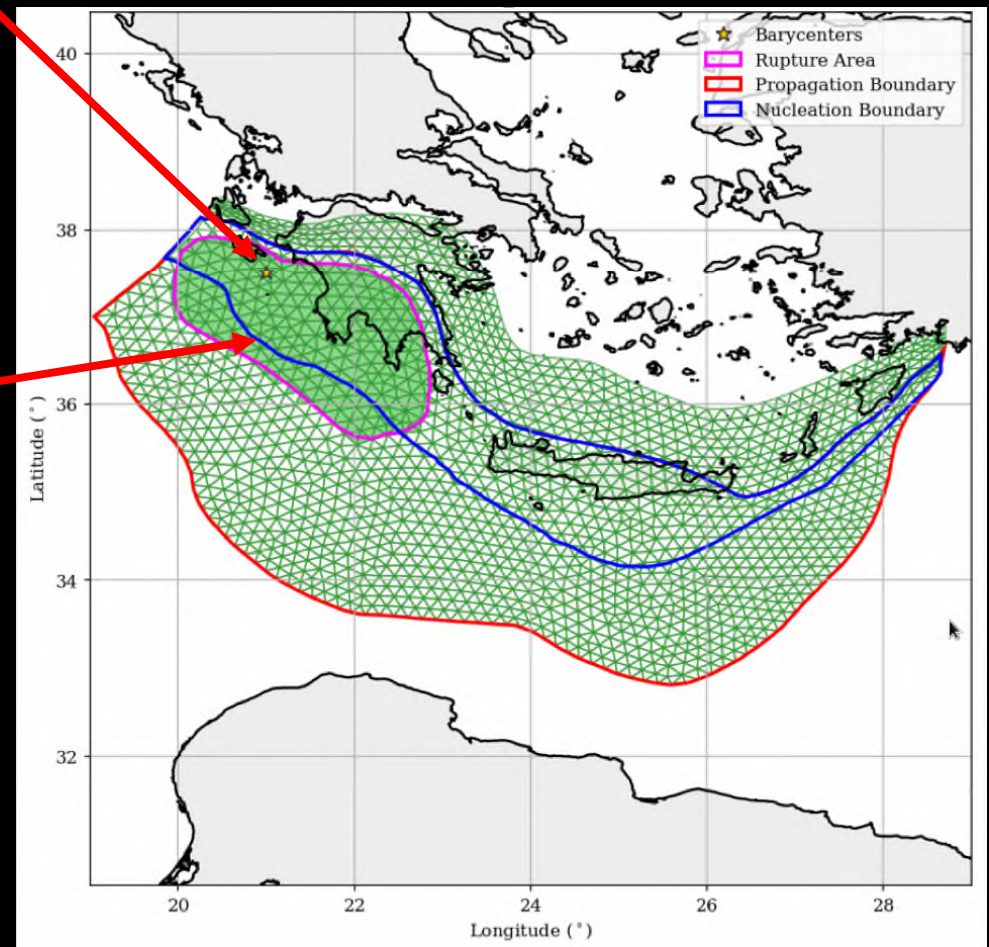
Central Mediterranean Sea scenario

- On 02 November 2017 (Start: 09:00 UTC – End: 13:00 UTC)
- Joint scenario: NOA-HLNTWC, CAT-INGV
- Earthquake Mw8.5 occurring south of Zakynthos Island, in the western segment of the Hellenic Arc
- Historical events ($M \sim 7.5$) in the area: 1953, 1867 1767, and 1638

Earthquake setup

Earthquake parameters	
Mw	8.5
Longitude	21.0 °E
Latitude	37.5 °N
Depth (km)	12.0
Rupture Area (km ²)	~40000
Slip (m)	6.5 (uniform)
Rigidity (GPa)	~26
Rake	90°

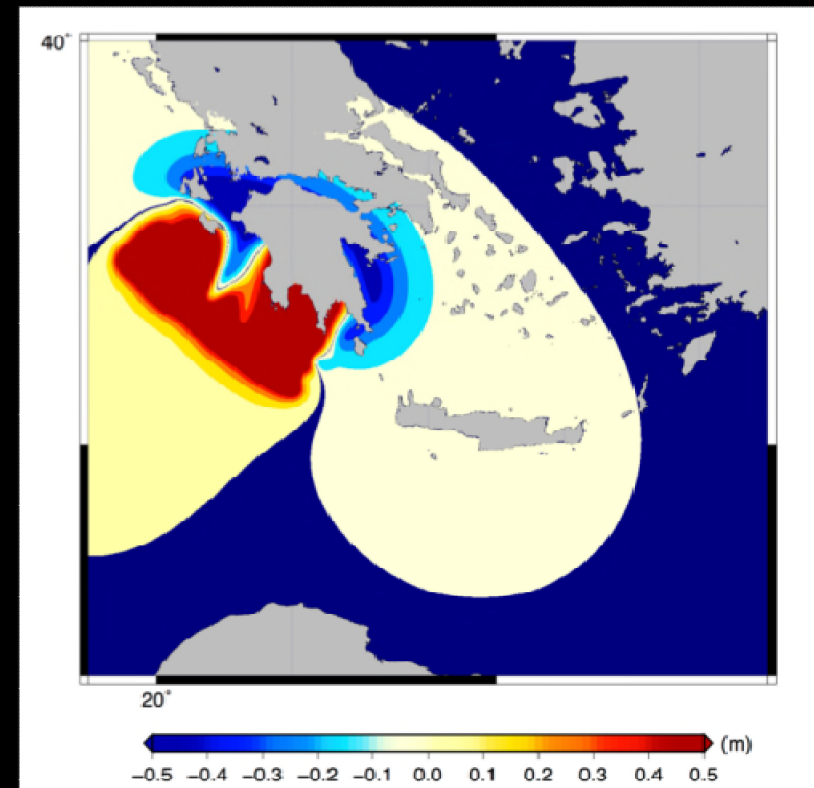
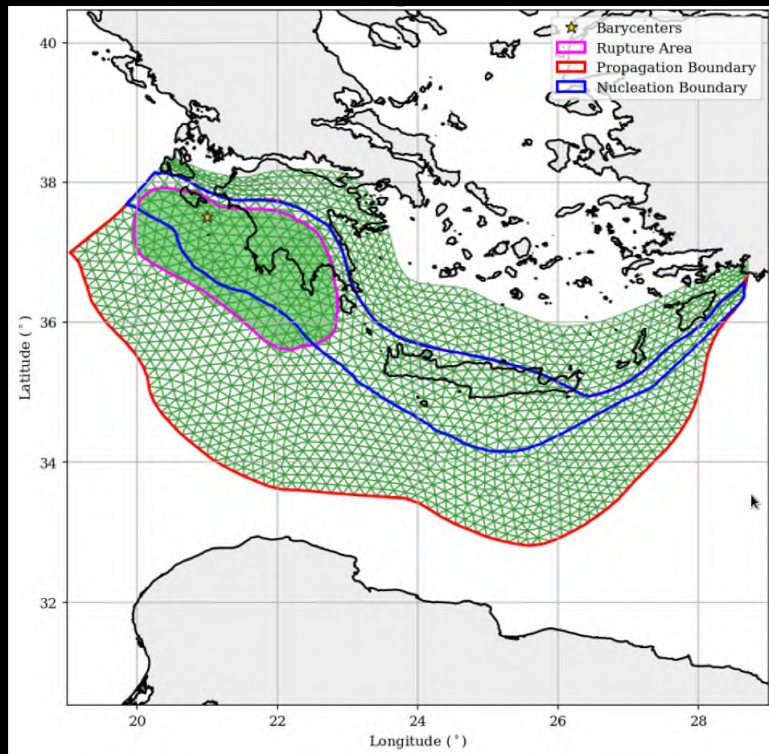
- Rupture area: from empirical scaling law [Strasser et al., 2010]
- Fault model: 3D geometry of Hellenic Arc tasselled with **triangular elements**



Numerical modeling

Initial condition: linear combination of vertical displacement associated to each triangle within the rupture area [analytical formulas by *Meade, 2007*]

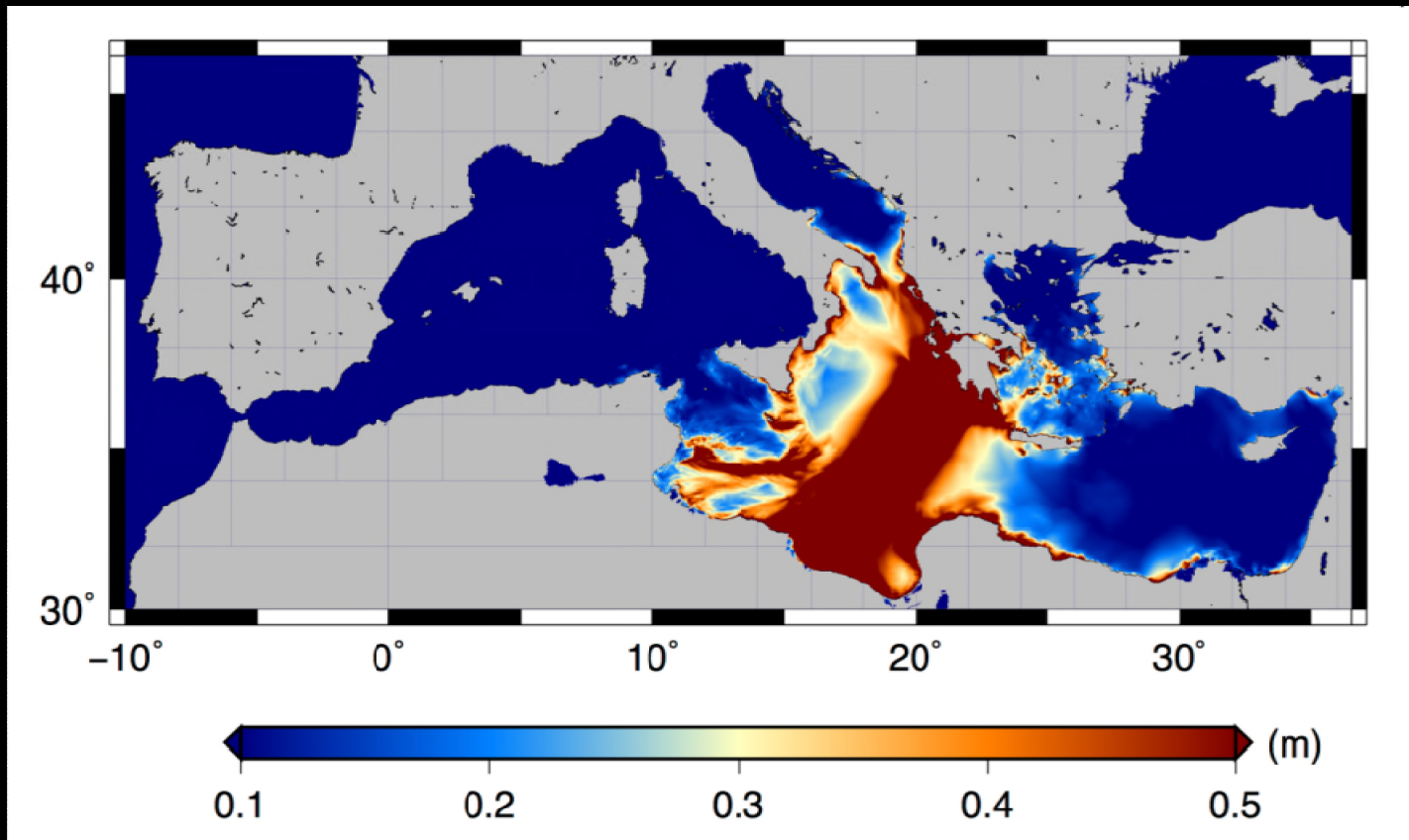
Initial condition



Numerical modeling

- Tsunami propagation: nonlinear shallow water – HySEA, GPU code
- Grid: 30 arc-sec
- Duration: 8 hours

Maximum wave amplitude



Alert Levels

- Alert level estimated at each forecast point is estimated based on earthquake parameters and [Decision Matrix \(DM\)](#)
- Two different DM adopted by NOA-HLNTWC and CAT-INGV

DM adopted by NOA-HLNTWC

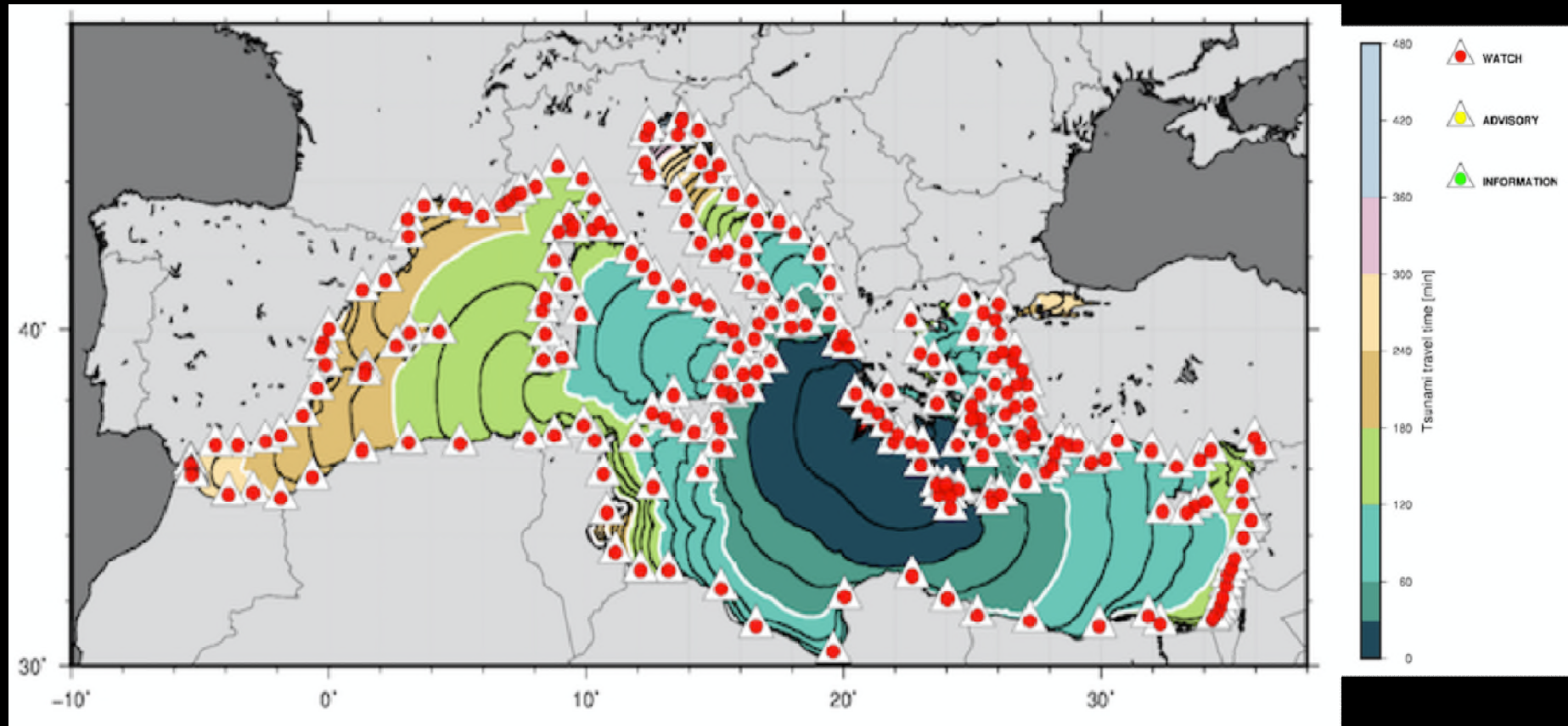
Depth	Epicenter Location	M	Tsunami Potential	Type of Bulletin		
< 100 km	Offshore or close the coast (≤ 40 km inland)	$5.5 \leq M \leq 6.0$	Weak potential of local tsunami	Local Tsunami Advisory	Information Bulletin	Information Bulletin
		$6.0 < M \leq 6.5$	Potential of destructive local tsunami (≤ 100 km)	Local Tsunami Watch	Regional Tsunami Advisory	Information Bulletin
	Inland (> 40 km and ≤ 100 km)	$5.5 \leq M \leq 6.5$	Nil	Information Bulletin	Information Bulletin	Information Bulletin
	Offshore or close the coast (≤ 100 km inland)	$6.5 < M \leq 7.0$	Potential of destructive regional tsunami (≤ 400 km)	Local Tsunami Watch	Regional Tsunami Watch	Basin-wide Tsunami Advisory
		$M > 7.0$	Potential of destructive tsunami in the whole basin (> 400 km)	Local Tsunami Watch	Regional Tsunami Watch	Basin-wide Tsunami Watch
≥ 100 km	Offshore or inland (≤ 100 km)	$M \geq 5.5$	Nil	Information Bulletin	Information Bulletin	Information Bulletin

DM adopted by CAT-INGV

Depth	Epicenter Location	M	Tsunami Potential	Type of Bulletin		
< 100 km	Offshore or close the coast (≤ 40 km inland)	$5.5 \leq M \leq 6.0$	Nil	Information Bulletin	Information Bulletin	Information Bulletin
		$6.0 < M \leq 6.5$	Weak potential of local tsunami	Local Tsunami Advisory	Information Bulletin	Information Bulletin
	Inland (> 40 km and ≤ 100 km)	$5.5 \leq M \leq 6.5$	Nil	Information Bulletin	Information Bulletin	Information Bulletin
	Offshore or close the coast (≤ 100 km inland)	$6.5 < M \leq 7.0$	Potential of destructive local tsunami < 100 km	Local Tsunami Watch	Regional Tsunami Advisory	Information Bulletin
		$7.0 < M \leq 7.5$	Potential of destructive regional tsunami < 400 km	Local Tsunami Watch	Regional Tsunami Watch	Basin-wide Tsunami Advisory
		$M > 7.5$	Potential of destructive tsunami in the whole basin > 400 km	Local Tsunami Watch	Regional Tsunami Watch	Basin-wide Tsunami Watch
≥ 100 km	Offshore or inland (≤ 100 km)	$M \geq 5.5$	Nil	Information Bulletin	Information Bulletin	Information Bulletin

Local ≤ 100 km
Regional ≤ 400 km
Basin-wide ≥ 400 km

Alert Levels



Due to the large magnitude ($M > 7.5$) the alert level at the forecast points is the same for both NOA-HLNTWC and CAT-INGV

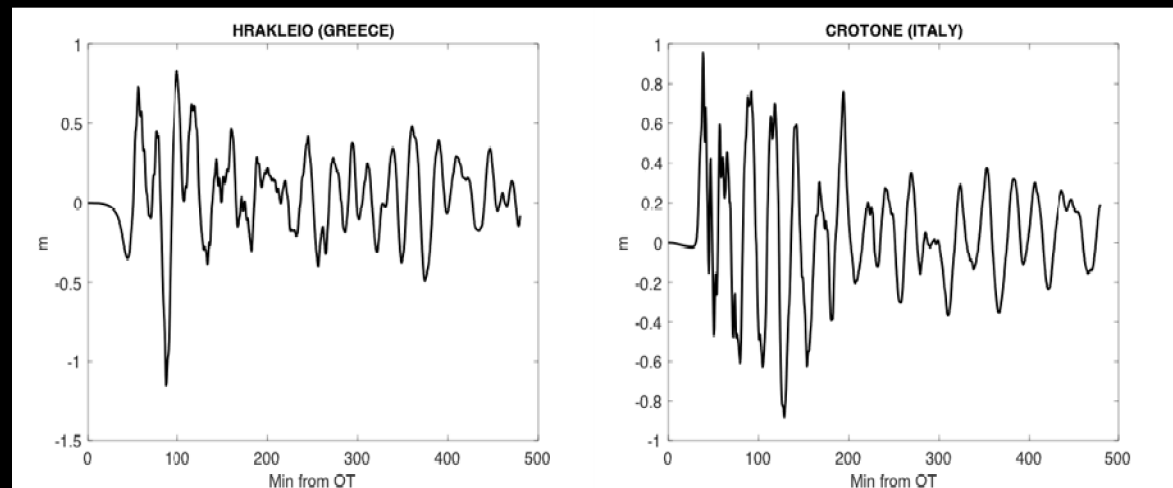
Alert Messages

- NOA-HLNTWC: 4 messages will be issued [INITIAL, 2 ONGOING, END]
- CAT-INGV: 5 messages will be issued [INITIAL, 3 ONGOING, END]

TITLE	CONTENT	TIME
NOA EARTHQUAKE ANNOUNCEMENT MESSAGE (only to Greek GCPA)	1. Earthquake Parameters validated by 24/7 personnel	T0 + 03'
NOA TSUNAMI EXERCISE MESSAGE NUMBER 001	1. Earthquake Parameters (M8.2) 2. Wave Arrival Times 3. Level of Alert	T0 + 07'
INGV TSUNAMI EXERCISE MESSAGE NUMBER 001	1. Earthquake Parameters (M8.2) 2. Wave Arrival Times 3. Level of Alert	T0 + 09'
INGV TSUNAMI EXERCISE MESSAGE NUMBER 002	1. Earthquake Parameters update (M8.5) 2. First validated Wave Arrival (TG verification) 3. Level of Alert	T0 + 22'
NOA TSUNAMI EXERCISE MESSAGE NUMBER 002	1. Earthquake Parameters update (M8.5) 2. First validated Wave Arrival (TG verification) 3. Level of Alert	T0 + 25'
INGV TSUNAMI EXERCISE MESSAGE NUMBER 003	1. Earthquake Parameters 2. Second validated Wave Arrival (TG verification) 3. Level of Alert	T0 + 53'
NOA TSUNAMI EXERCISE MESSAGE NUMBER 003	1. Earthquake Parameters updated 2. Second validated Wave Arrival (TG verification) 3. Level of Alert	T0 + 118'
INGV TSUNAMI EXERCISE MESSAGE NUMBER 004	1. Earthquake Parameters 2. Third validated Wave Arrival (TG verification) 3. Level of Alert	T0 + 192'
NOA TSUNAMI EXERCISE MESSAGE NUMBER 004	1. Earthquake Parameters updated 2. End of Tsunami Alert Message	T0 + 200'
INGV TSUNAMI EXERCISE MESSAGE NUMBER 005	1. Earthquake Parameters 2. End of Tsunami Alert Message	T0 + 210'

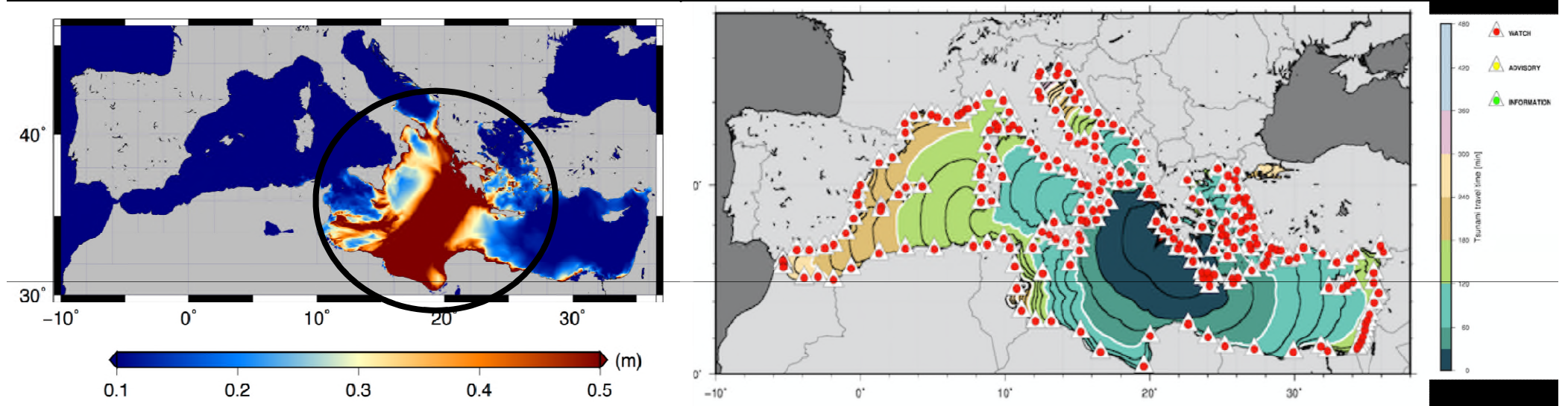
Timetable of the messages

Ongoing messages based on tsunami waveforms simulated at forecast points



Alert Messages

However...



- The area affected by the tsunami in the 'real' event (the scenario) appears relatively more confined with respect the alert levels map (from DM)
- But, we stay on the safe side, possible local amplifications

Conclusion

- This is the first time that a scenario is shared contemporary by different TSPs
- **Due to organisational reasons:**
 - the amount of ONGOING messages is limited; actually, in a real M8+ event the number of ONGOING messages would be definitely greater
 - the END message is issued very early
- However, the joint scenario is a good opportunity to mimic contemporary the operational procedures of different TSP in case of a real tsunamigenic event

Thank you