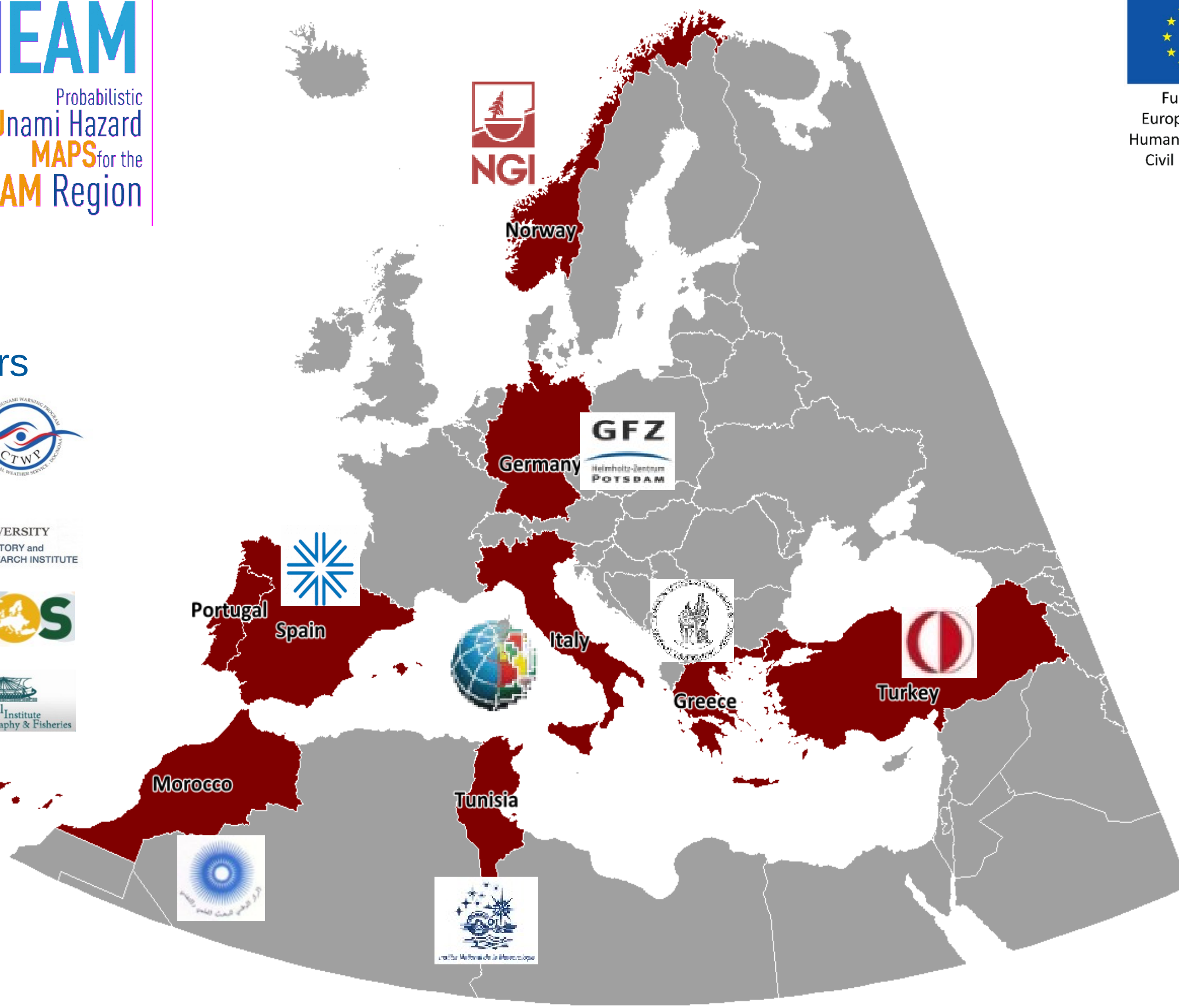
TSUMAPS NEAM

Probabilistic TSUnami Hazard MAPS for the NEAM Region

Funded by European Union Humanitarian Aid & Civil Protection



End Users and Advisers

PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile

UNESCO

CTWP

ipma

BOĞAZİÇİ UNIVERSITY
KANDİLLİ OBSERVATORY and EARTHQUAKE RESEARCH INSTITUTE

USGS science for a changing world

EPOS

EUROPEAN COMMISSION
JOINT RESEARCH CENTRE
Institute for the Protection and Security of the Citizen
The Director

National Institute of Oceanography & Fisheries http://www.globaltsunamimodel.org

GTM: некоторые факты

- ✓ Старт инициативы - IUGG митинг июнь 2015, продолжение дискуссий на последующих конференциях AGU, EGU…
- ✓ **Партнеры вступают в консорциум** путем подписания Соглашения о намерениях (Letter of Interest)
- ✓ К настоящему времени 34 партнера подписали LoI’s
- ✓ Организационной работой занимаются **NGI** и **INGV**

*Координаторы проекта: **Finn Lovholt** (NGI) и **Stefano Lorito** (INGV)* http://www.globaltsunamimodel.org

GTM: Видение и цели

Совместными усилиями достигнуть детального понимания факторов, определяющих степень риска связанного с цунами включая процессы-драйверы риска. GTM-консорциум нацелен на:

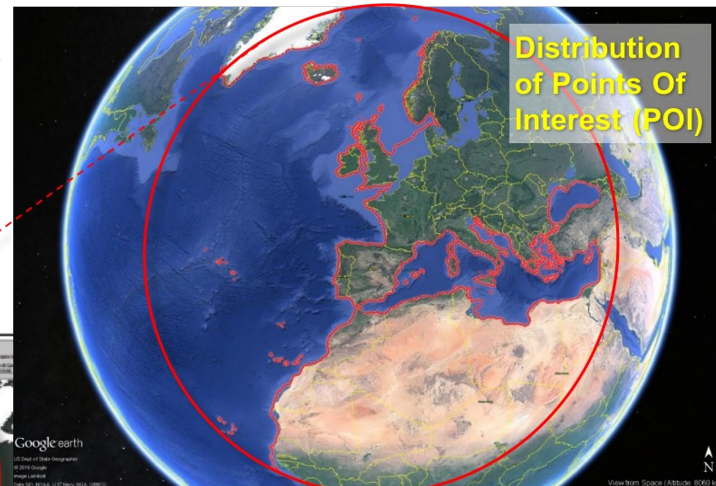
- Разработку и популяризацию согласованных стандартов, “хороших практик” и руководств для проведения вероятностного анализа угрозы цунами и рисков связанных с цунами (Probabilistic Tsunami Hazard and Risk Analysis: PTHA иPTRA)
- Разработку и предоставление модельного портфолио для проведения PTHA и PTRA анализа
- Разработку глобальных и региональных референтных вероятностных карт угрозы и рисков цунами, а также стандартизирования процесса локального анализа
- Формирование панели экспертов для проведения и ревизий анализов
- Взаимодействие со стэйкхолдерами для обеспечения качества и надлежайшего представления результатов анализа включая разъяснения относительно неопределенностей.

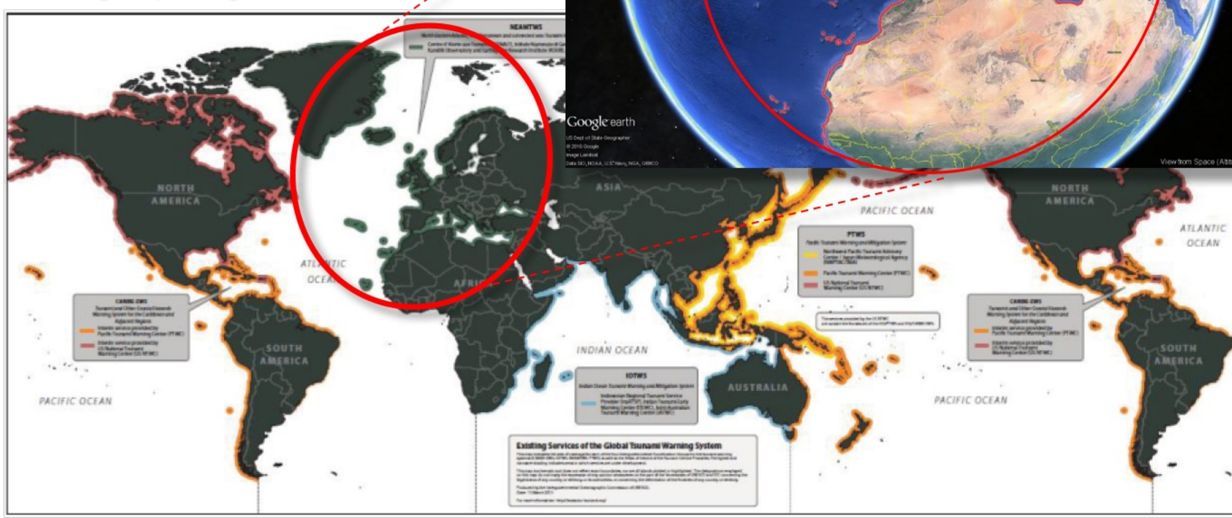
Geographical Scope

Target coastlines (NEAMTWS)

TSUMAPS-NEAM target coastlines are those of the NEAMTWS in Area of Coverage Map of ICGS, IOC-UNESCO

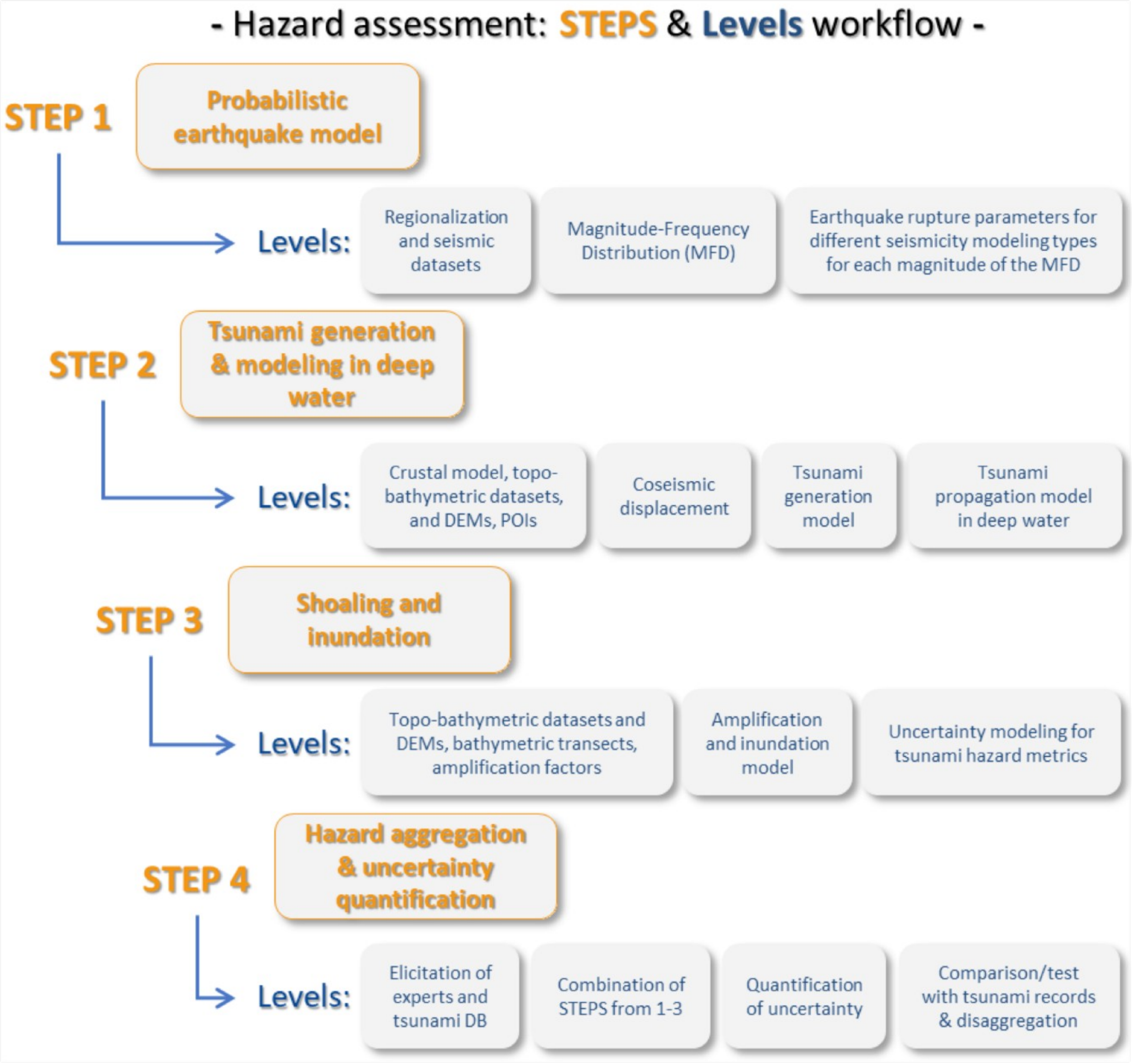
Distribution of POIs
North-East Atlantic: 1076
Mediterranean Sea: 1130
Black Sea: 137
Average spacing ~ 20 km





Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG)
Eighth Meeting Morioka, Japan 12–13 March 2015

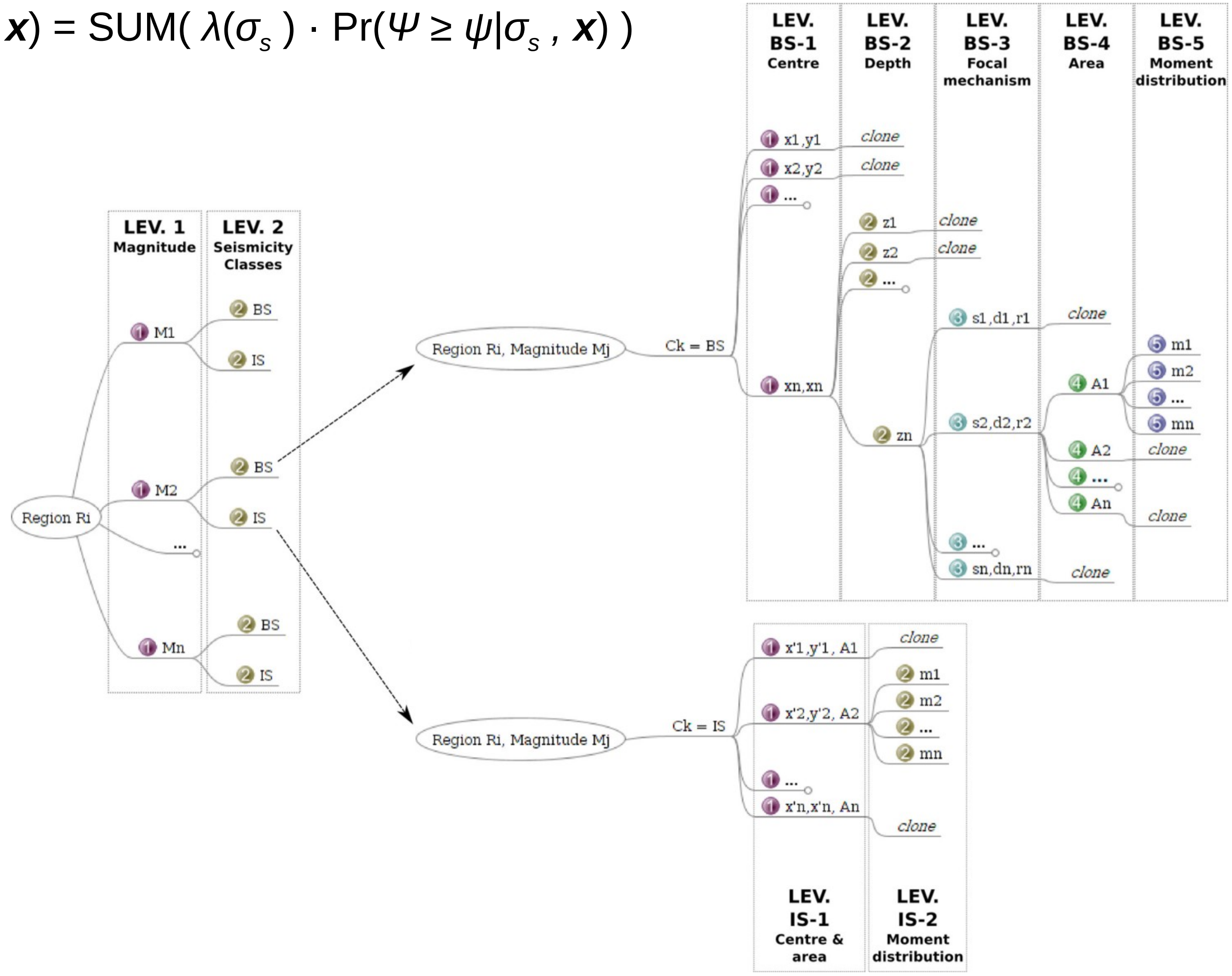
Hazard assessment workflow



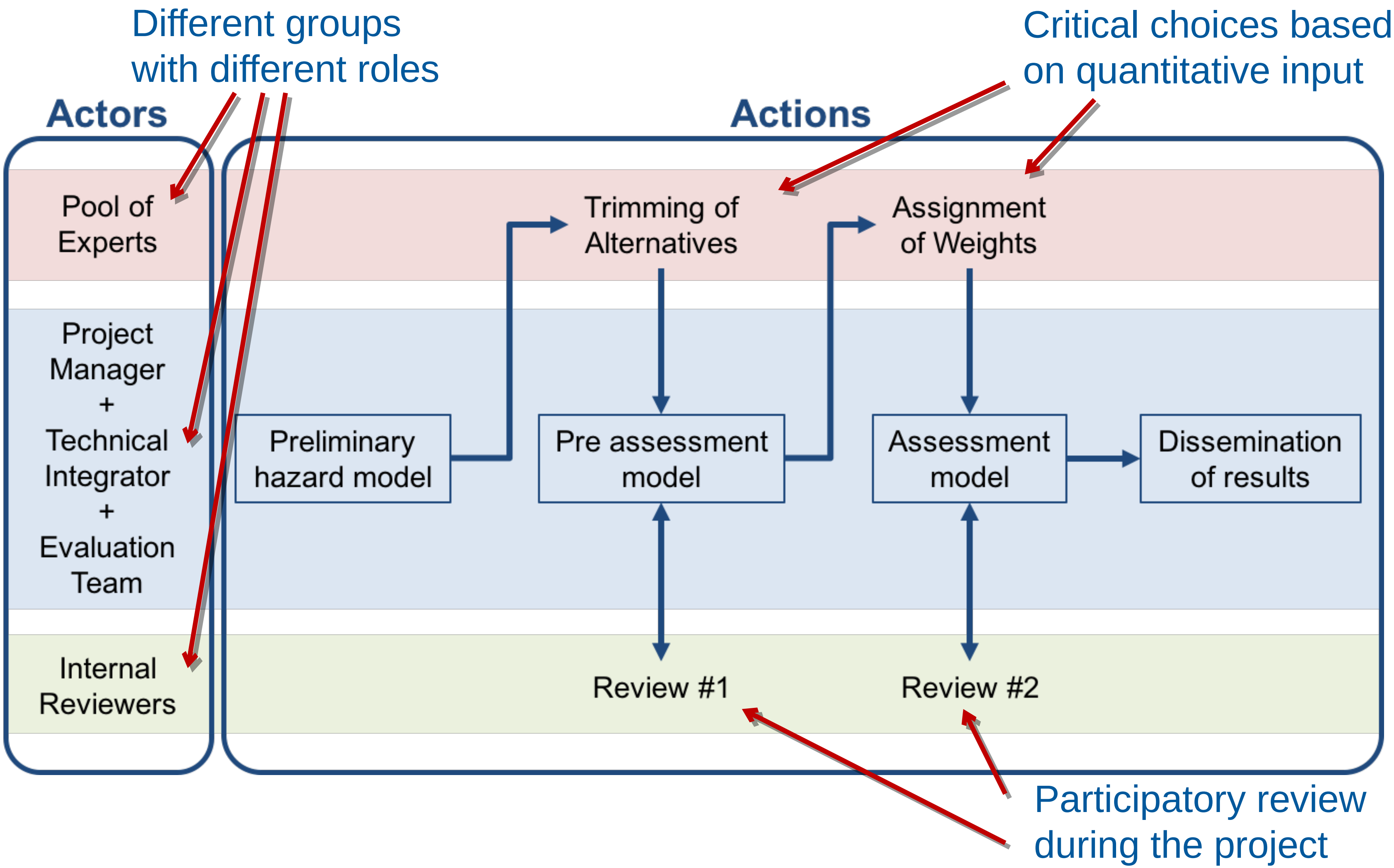
Probability integration and Event Tree

$$\Pr(\boldsymbol{\Psi} \geq \psi, \boldsymbol{x}, T) = 1 - \exp(-\lambda^{Tot}(\Psi \geq \psi, \boldsymbol{x}) \cdot T)$$

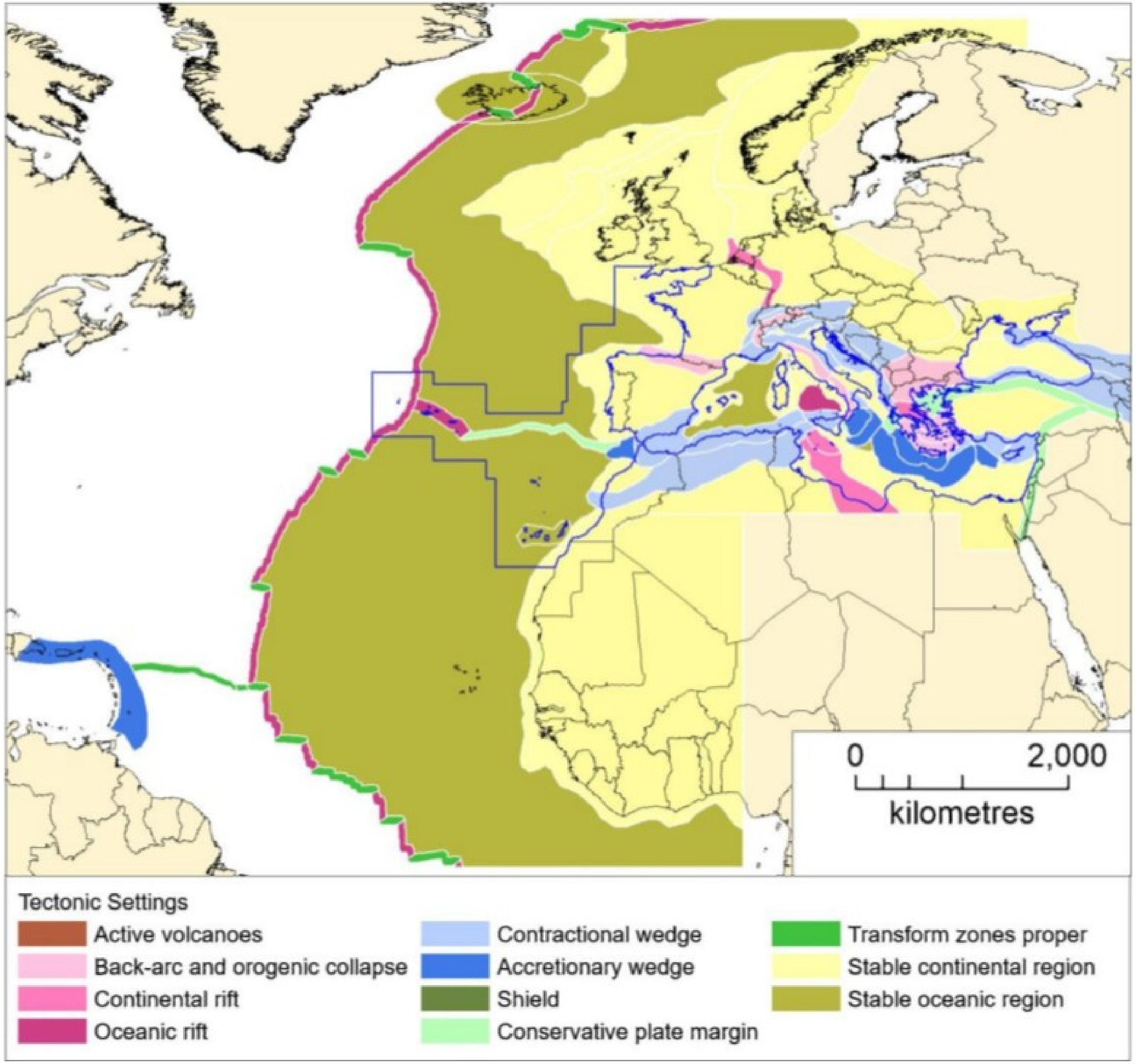
$$\lambda^{Tot}(\Psi \geq \psi, \boldsymbol{x}) = \mathrm{SUM}(\lambda(\sigma_s) \cdot \Pr(\Psi \geq \psi | \sigma_s, \boldsymbol{x}))$$



Multiple-Expert Protocol to Manage Epistemic Uncertainty *(after SSHAC guidelines)*

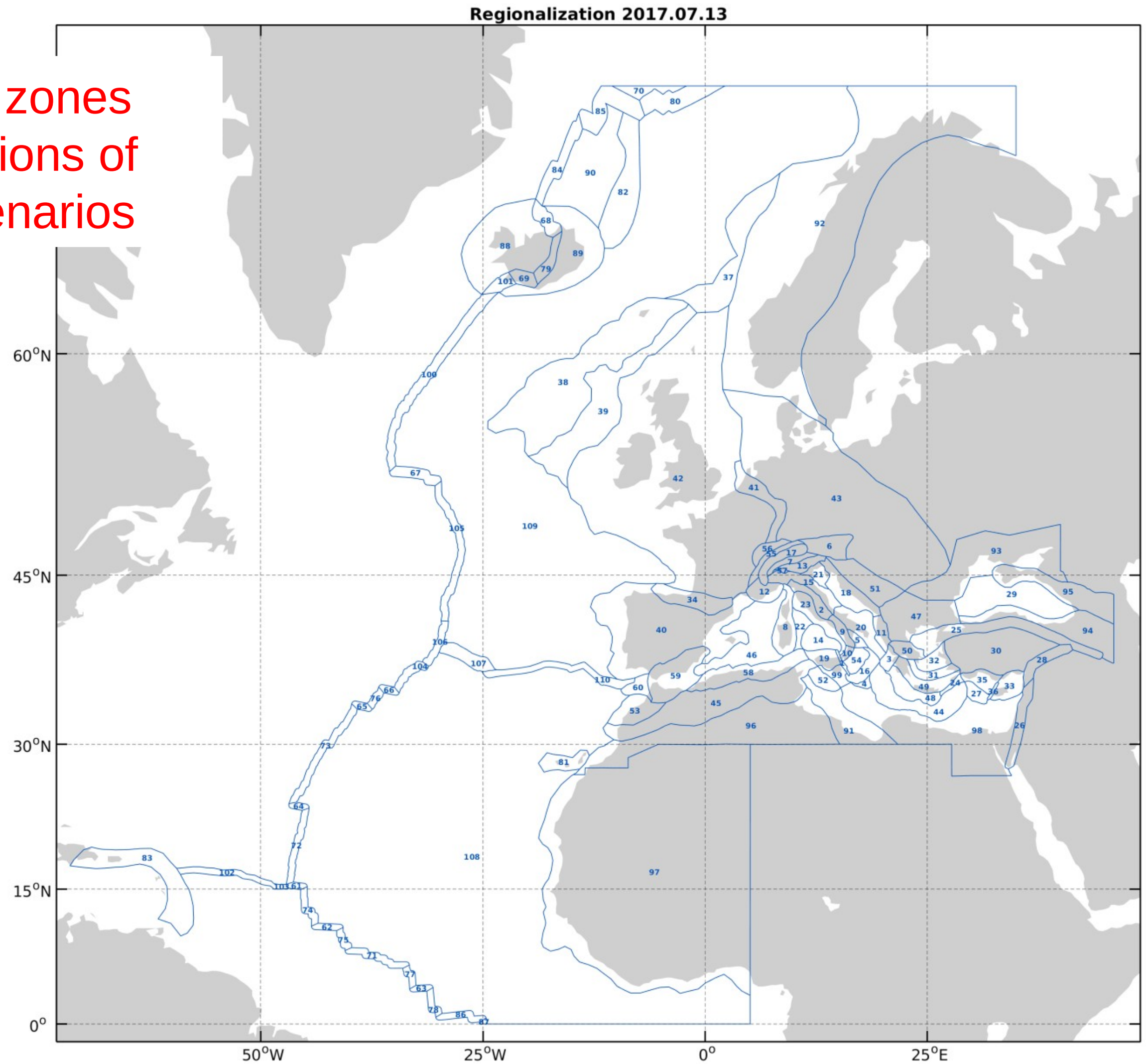


Tectonic zonation

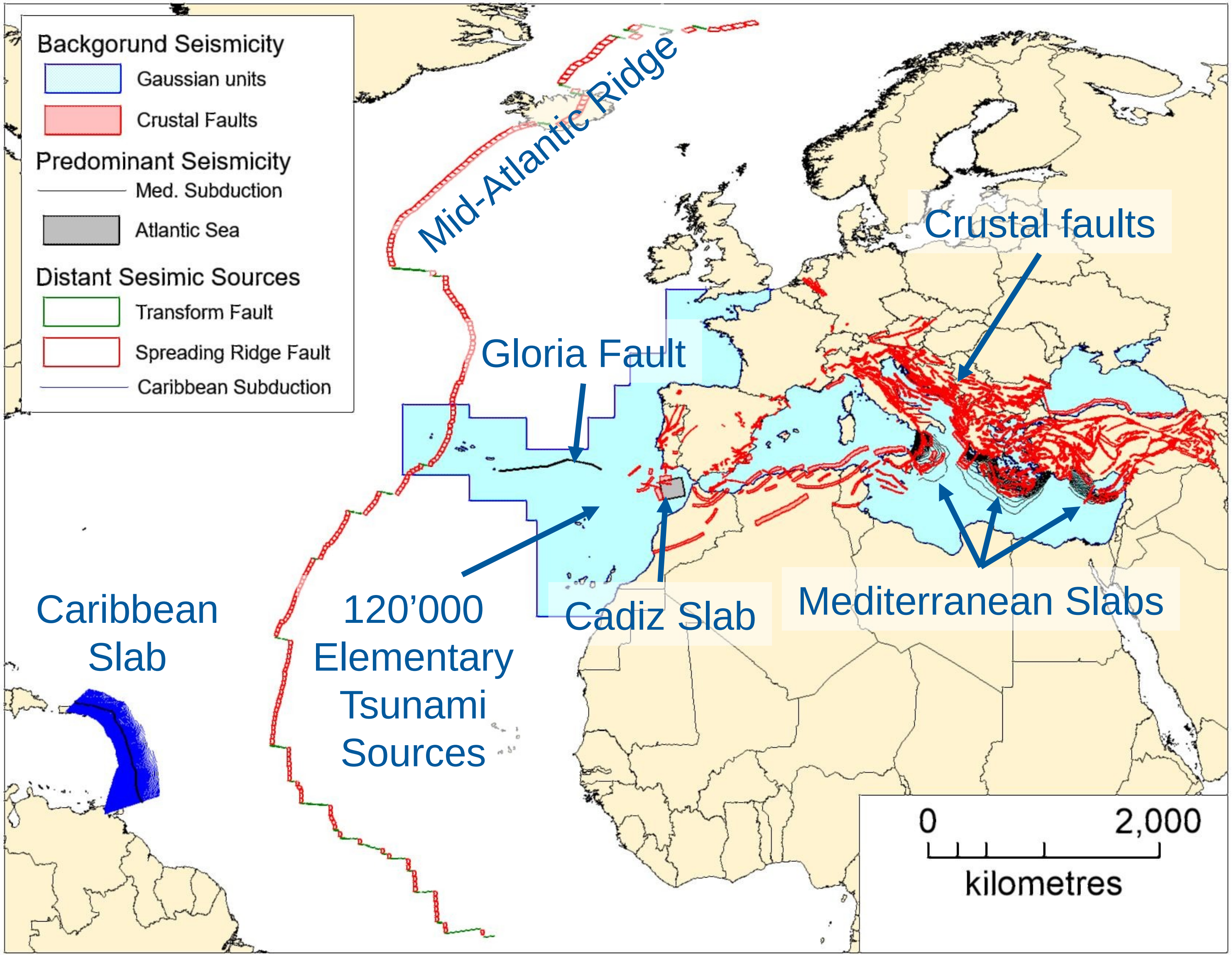


Tectonic zonation

- 110 source zones
- Tens of millions of seismic scenarios

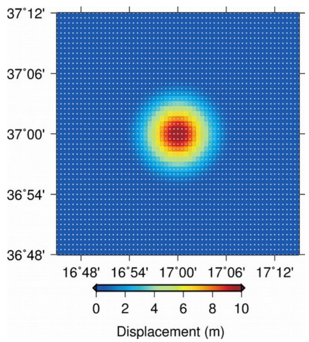


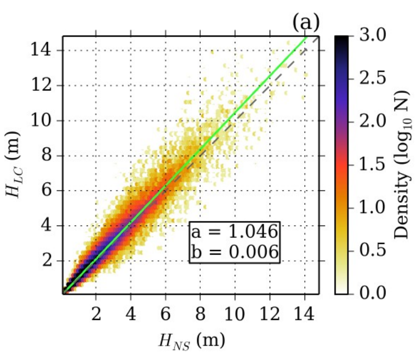
Seismic sources – Tsunami Modeling

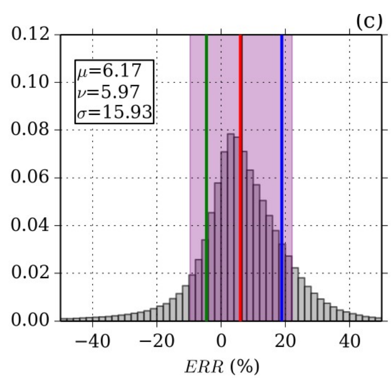


Tsunami Modeling – Elementary Sources

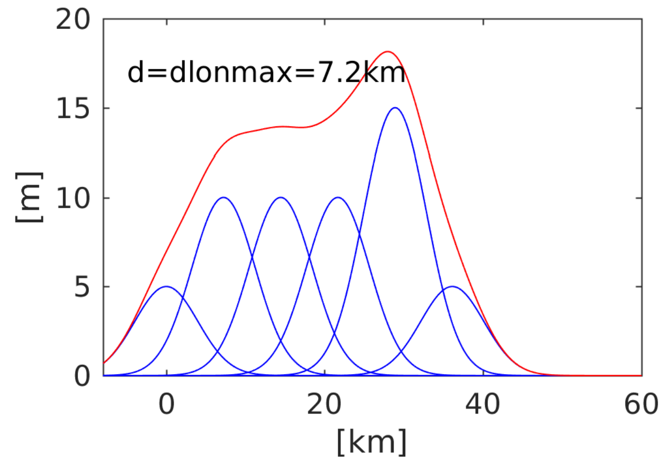
Gaussian elementary sources

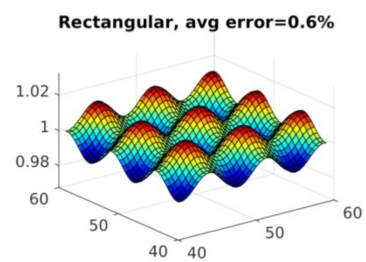


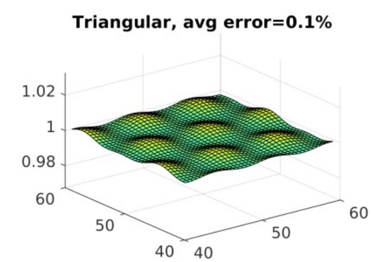




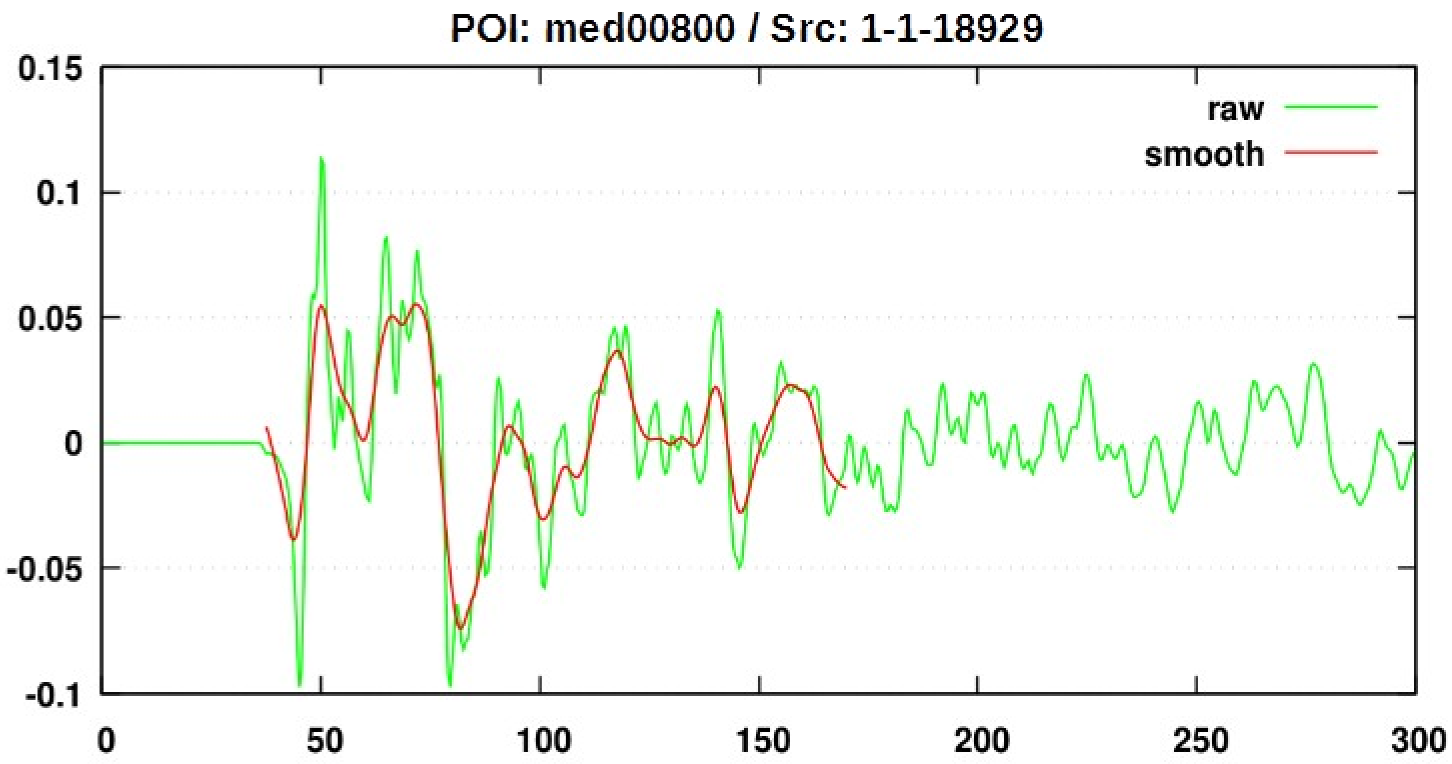
Distribute weights to “fill-up” initial sea surface deformation







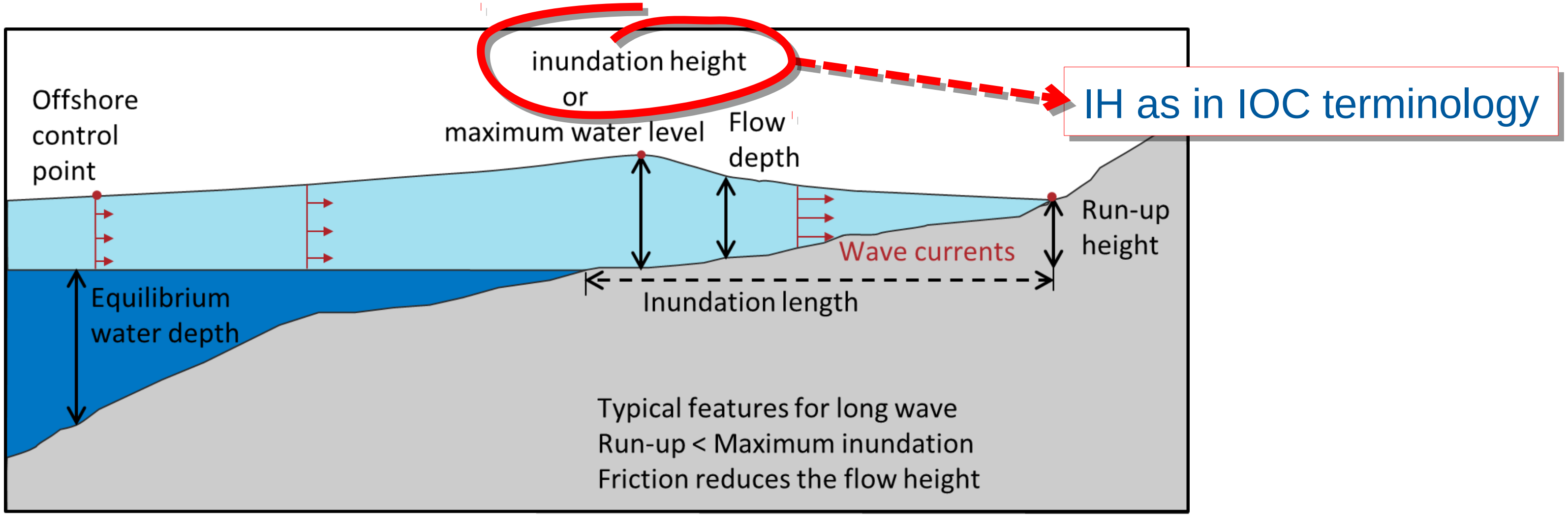
Tsunami Modeling – Combining Mareograms

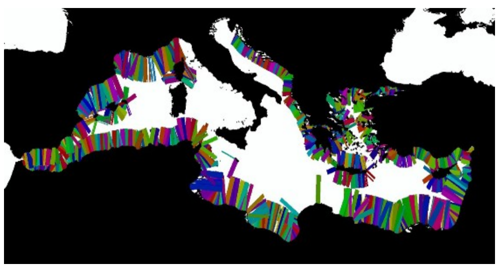


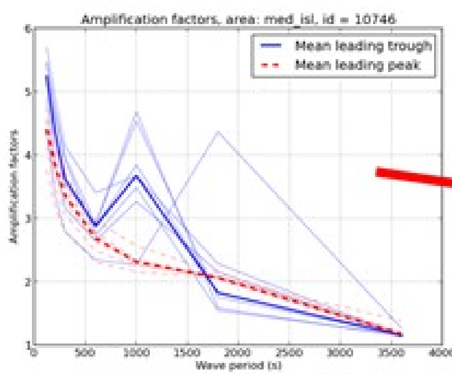
Employing LOWESS filtering with automatic smoothness to derive wave characteristics needed to apply NGI local amplification factors:

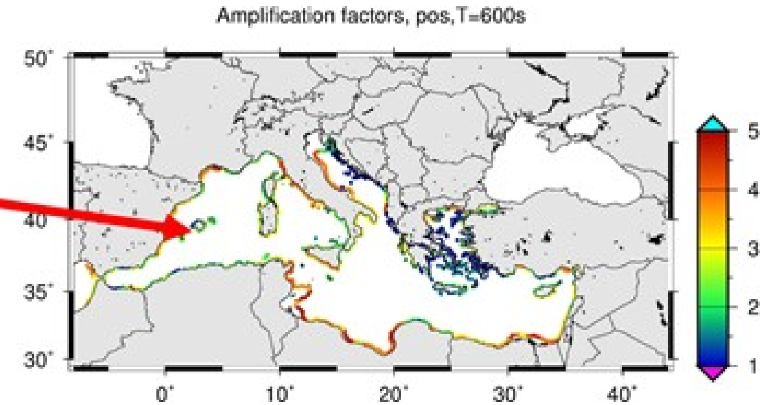
- Polarity
- Period

Tsunami Modeling – from Off- to Onshore







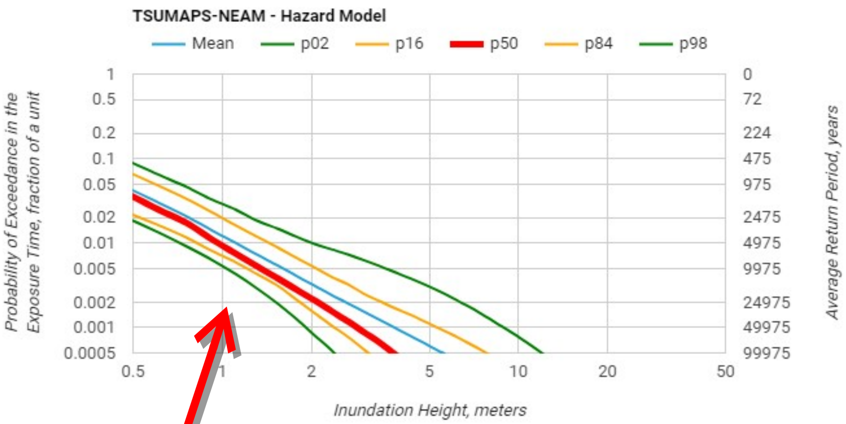


For any given target point

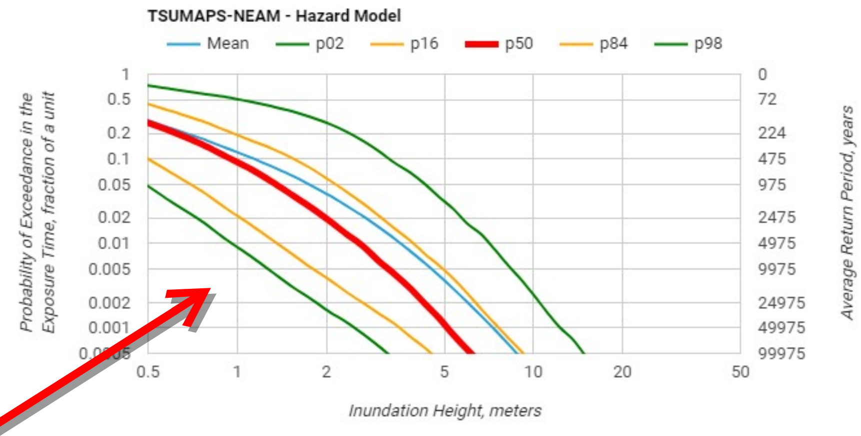
- Extract 40 nearby depth profiles
- Run the 1HD LSW model for all combinations of the wave characteristics (polarity and period) for a selection of profiles
  - **For each run**
    - Measure surface elevation at 50 m depth and shoreline, compute the amplification factors
    - Use the median value of the amplification factor over all the simulated transects for each wave period
    - Store results (median amplification factor values) in a look-up table
    - Multiply factors with 2HD simulations results to compute the IH

Examples of Hazard curves at coastal locations

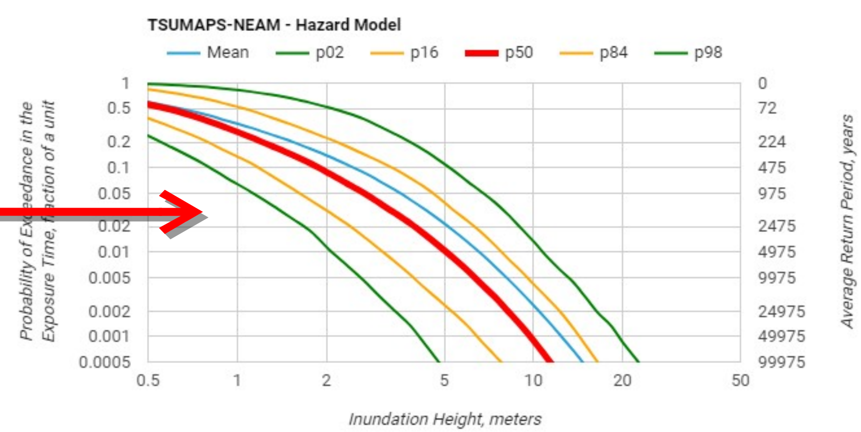
Lisbon, Portugal



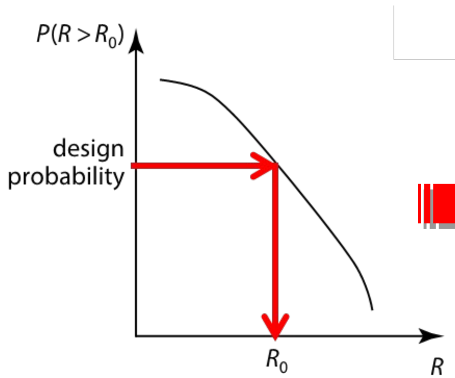
Messina, Italy

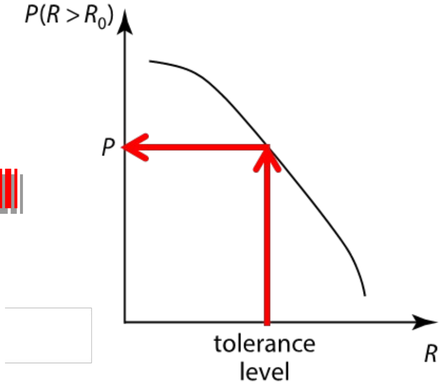


Alexandria, Egypt



Results: Probability and Hazard Maps





http://www.tsumaps-neam.eu

Results: Probability and Hazard Maps

Results Factsheet

Total number of scenarios: ~ 50 Mln

Hazard curves calculated at 2,343 POIs (North-East Atlantic: 1,076; Mediterranean Sea: 1,130; Black Sea: 137) at an average spacing of ~20 km

For each curve, hazard values for mean, 2nd, 16th, 50th, 84th, 98th percentiles

Probability maps for IH 1, 2, 5, 10, 20 meters

Hazard maps for Average Return Periods of 500, 1000, 2500, 5000, 10000 years

Interactive Web-based Hazard Map and Curve Tool
http://www.tsumaps-neam.eu