Near Fault Observatories collaborative framework

National Observatory of Athens

University of Patras

Charles University of Prague

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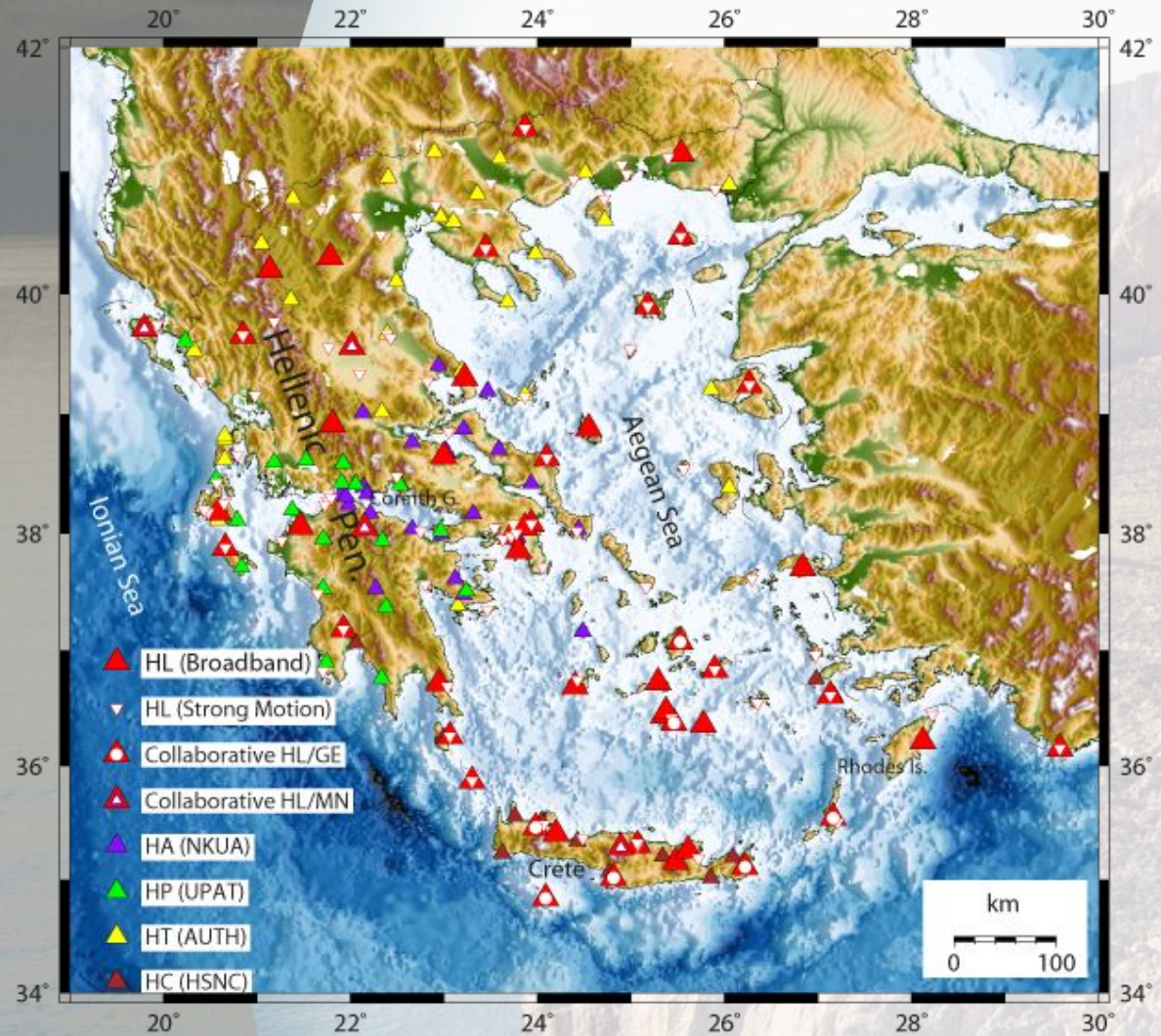
Postojna,

12 November 2019

Team Experience

Operate/Coordinate the Seismic and GNSS networks nationally



Team Experience

Operate data centers that distribute National data archives

INSTITUTE OF GEODYNAMICS
NATIONAL OBSERVATORY OF ATHENS

Access to EIDA Data Archives

EIDA
European Integrated Data Archive

NOA EIDA node

The European Integrated Data Archive (EIDA), is a federated European data center that archives and provides access to seismic waveforms and their related metadata from the European research infrastructures. The distributed EIDA nodes contribute data from specific regions and have committed resources for the support, operation and development of EIDA. Waveform data from seismic stations located in Greece and the southeastern Mediterranean are included to the new regional EIDA node (NOA) hosted by the Institute of Geodynamics of the National Observatory of Athens.

Node contributors

- National Observatory of Athens
- Aristotle University of Thessaloniki
- University of Patras
- National and Kapodistrian University of Athens
- Institute of Engineering Seismology and Earthquake Engineering
- T.E.I. of Crete
- Cyprus Geological Survey
- CSnet International, Inc.
- Institute for Hydrometeorology and Seismology, Montenegro Seismological Observatory

Regional Node for the SouthEastern Mediterranean

EIDA
European Integrated Data Archives

Team Experience

Synergies with Plate Observing communities

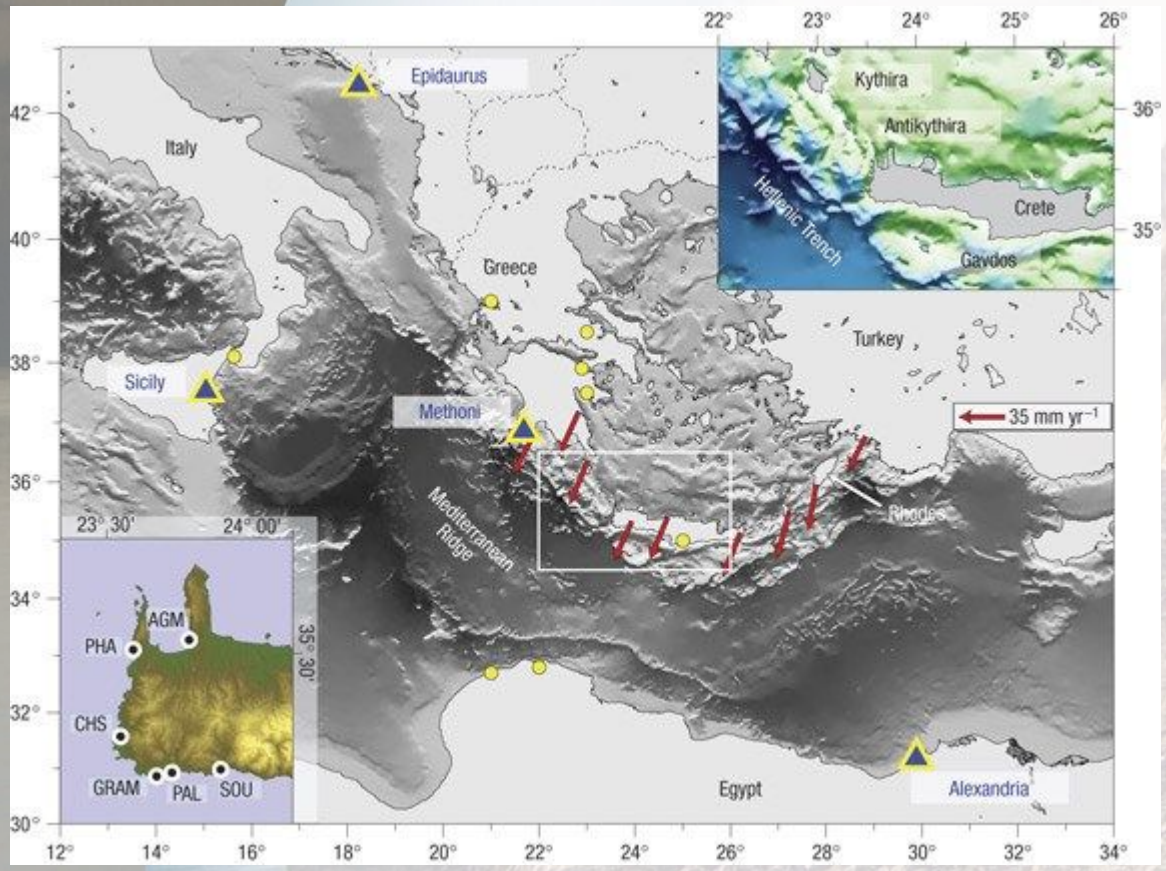
Hellenic Unified Seismic Network:
All data from seismic stations are available in near-realtime for earthquake monitoring and services through HELPOS that NOA coordinates.

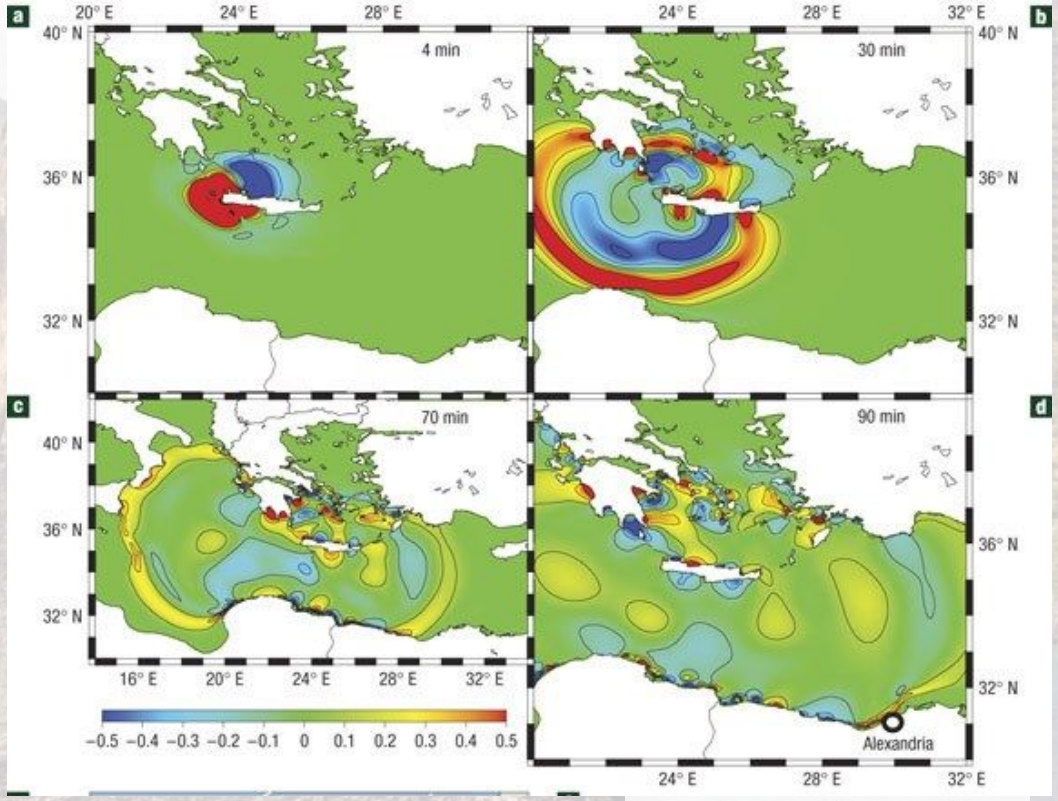
ORFEUS-EIDA: All seismic data are freely distributed to the international research community through the National EIDA node hosted at NOA

EPOS-ERIC: NOA represents the Greek Plate Observing Community. GA members from PGO team. PGO data, services and transnational access will follow and intergrated to EPOS standards.

Pangea Geodynamic Observatory (NOA)

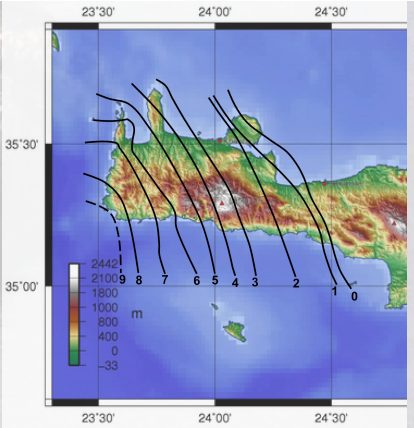
Western segment of Hellenic Subduction Zone
21 July A.D. 365 earthquake (M 8.3)



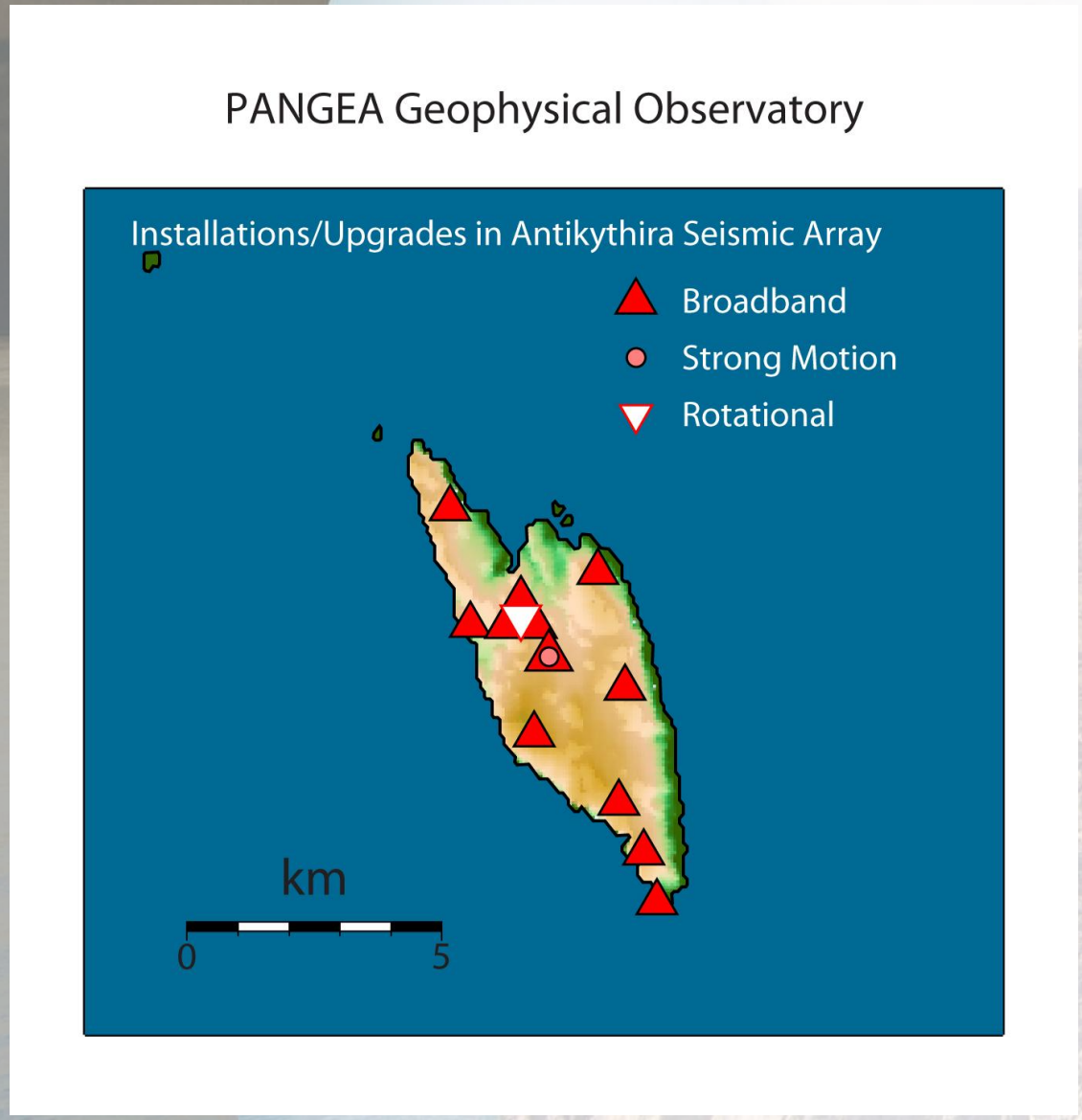


Cities destroyed and thousands of people drowned in coastal regions from the Nile Delta to modern-day Dubrovnik

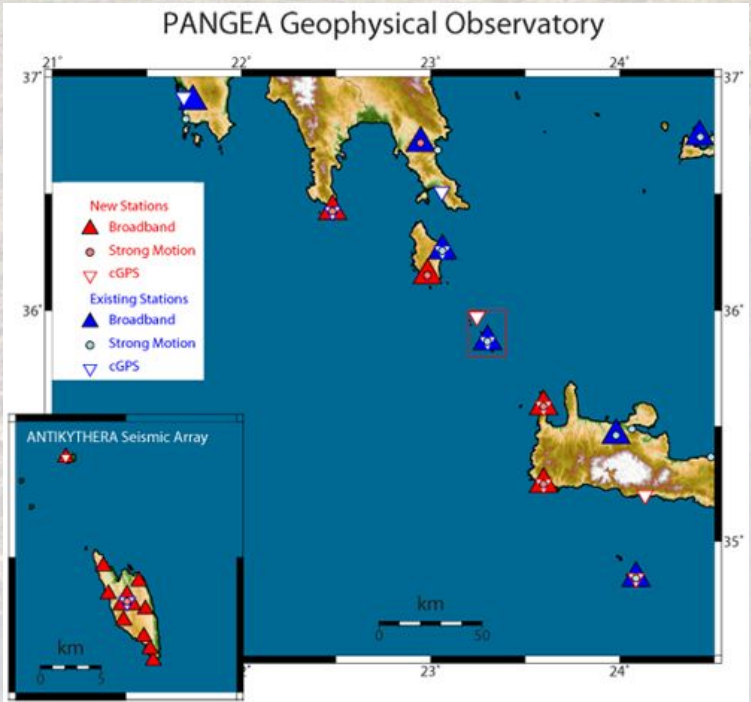
Megathrust earthquake (M>8) in WHSZ may strike the Mediterranean roughly every 800 years



PANGEA Geodynamic Observatory (PGO)
The Plan



- The main element of the PGO on the island of Antikythera. SEISMIC ARRAY
- Extended geodynamic (i.e., seismic and geodetic) network will be also distributed over a wide region, spanning more than 200 km along the active plate-boundary



PGO at Antikythera?

Located at the remote and unexplored part of the WHSZ

Close to the epicenter of the 365 A.D. earthquake. (Its location spans the barrier to earthquake rupture propagation).

Could potentially detect seismic (and aseismic) deformation

No anthropogenic activity - Low levels of high frequency noise

Use seismometers to monitor sea waves

- Proximity and Interaction with other PANGEA entities (ReACT and APCG). Correlation with climatic data/infrastructure
- Surrounded by rough seas with changeable conditions - Source of microseismic noise
- Easier Logistics

Any future action/proposal should:

- Coordination (COST)

A transdisciplinary management open to future European NFOs

- Networking/Training (COST)

Thematic training schools every year inviting experts outside NFOs

- Research (H2020)

1) Explain how/why we are a Starting Community already producing services in EPOS and already working to start a Consortium?

Not all European related NFO infrastructure is there yet. Great potential. Not all DDSS are there yet! Propose new services, software

2) which is the final user and/or community and/or stakeholder and/or industries we are going to feed

- Industry with critical infrastructure near faults: Energy industry (Nuclear, Chemical, Dams etc)
- Cities and Citizens (through EEW)
- Transportation, Networks

Possible contributions to future research projects:

Dense seismic real-time instrumentation close active faults

1) Backprojection of local strong motion records for large events to explore the high frequency part of the rupture (e.g. Evangelidis 2014, Evangelidis & Kao 2013)

Citation:

C. P. Evangelidis, Imaging supershear rupture for the 2014 Mw 6.9 Northern Aegean earthquake by backprojection of strong motion waveforms, Geophys. Res. Lett., 42, doi:10.1002/2014GL062513, 2014

C. P. Evangelidis and H. Kao, High-frequency source imaging of the October 23, 2011 Van (Eastern Turkey) earthquake by back-projection of strong motion waveforms, Geophys.J.Int, doi: 10.1093/gji/ggt437, 2013

2) Seismic Ambient Noise Interferometry techniques (e.g. Parkfield and volcanoes)

Monitoring of spatial and temporal seismic velocity changes. There are already ObsPy and Python based tools that have to be parametrized and calibrated for each NFO case based on the seismic network geometry.

Possible synergy with VOs

3) LargeN applications with low cost sensors (e.g. Mount St Helens)

Low cost dense deployments after strong events or in an experiment based approach. Geophysical techniques from the industry.

Possible contributions to future projects (Patras and Prague):

1) Early warning - in particular testing methodology on synthetic ground motions generated with updated methodologies, similarly to previous work with Franta's involvement (Zollo et al., 2009).

Citation: Zollo, A., Iannaccone, G., Lancieri, M., Cantore, L., Convertito, V., Emolo, A., Festa, G., Gallovič, F., Vassallo, M., Martino, C., Satriano, C., Gasparini, P. (2009). The Earthquake Early Warning System in Southern Italy: Methodologies and Performance Evaluation, Geophys. Res. Lett., 36, special issue on New Methods and Applications of Earthquake Early Warning, L00B07, doi:10.1029/2008GL036689.

2) Early warning - ground motion scenarios for the Rio-Antirio bridge, in particular for possible strong earthquake generated on Psathopyrgos fault.

3) Development and possible application of source inversions including dynamic rupture simulation

[new 'school' of several students and post-docs for dynamic simulation, headed in Prague by F.Gallovic.

4) Ad-hoc analyzing strong earthquakes in Greece, when they occur, using the latest simulation techniques (we all; seismic and GPS data).

6) better techniques for moment tensors of events with lower magnitudes than currently processed, including automation.

7) database of "weak" earthquakes possible used as EGF.