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**Do you want to know more about the SAFER project?
 Then please visit our website:
www.saferproject.net**

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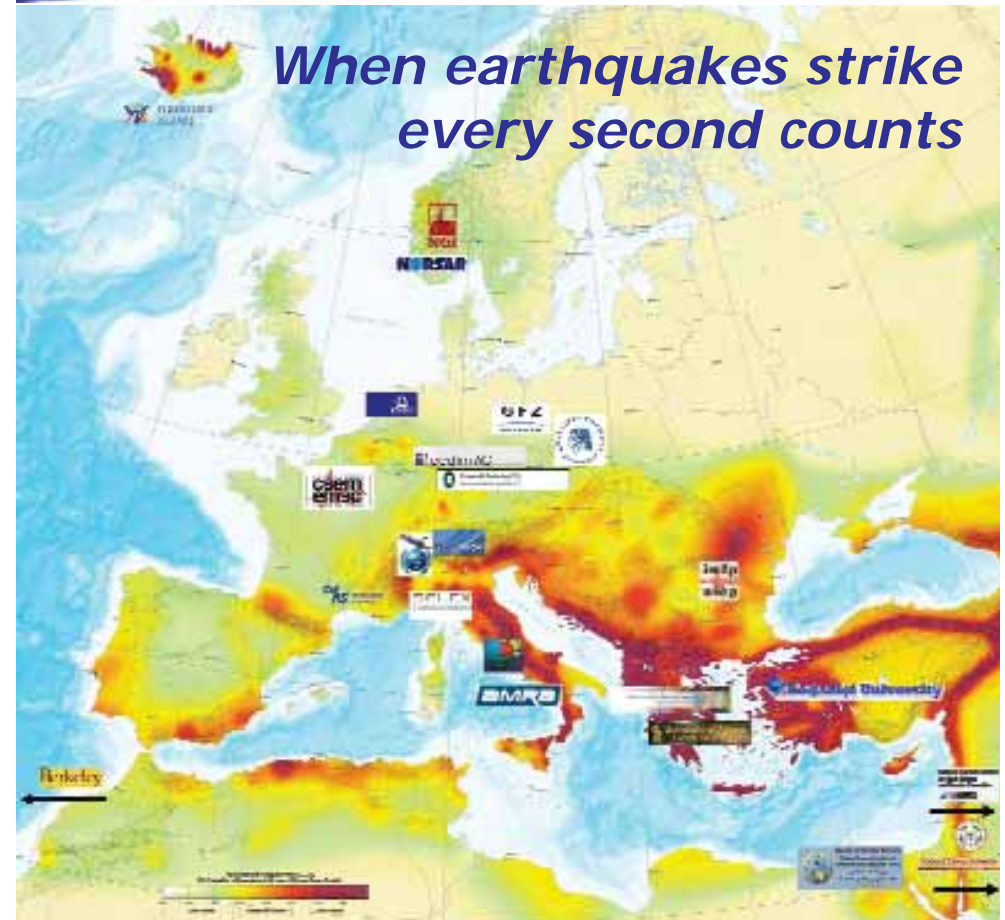
SAFER

Seismic eArly warning For EuRope



Starting Date:
 15 June 2006
 Termination Date:
 14 June 2009

**When earthquakes strike
 every second counts**



SIXTH FRAMEWORK PROGRAMME
 SUSTAINABLE DEVELOPMENT, GLOBAL CHANGE AND ECOSYSTEM



WHY THE SAFER PROJECT?



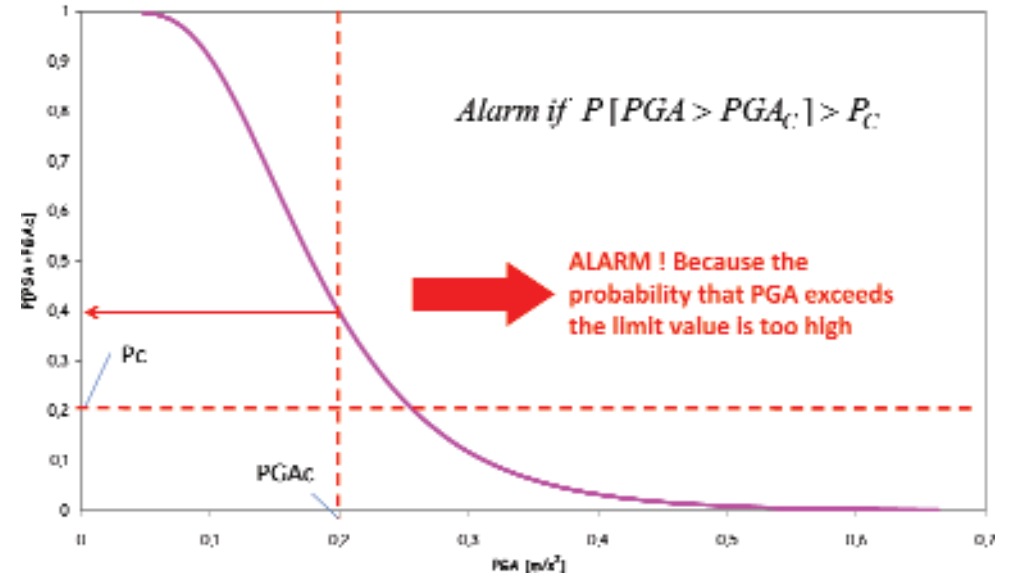
Earthquakes are a serious threat for many countries of Europe, particularly those around the Mediterranean Sea.

Early warning systems, based on the real-time, automated analysis of ground motion measurements, can play an important role in reducing the impact such catastrophic events could have on densely populated areas and,

in particular, in mitigating damage to strategic structures and lifelines. Europe is covered by numerous high quality seismic networks, managed by national and European agencies, including local networks specifically designed for seismic early warning around large cities such as Bucharest, Istanbul and Naples.

SAFER aims at fully exploiting the possibilities offered by the real time analysis of signals from seismic networks for a wide range of protective actions, performed over time intervals of a few seconds to some tens of minutes.

When to activate security measures? Decisional Rules



THE DISASTER REDUCTION CHAIN

Early warning is an important component!



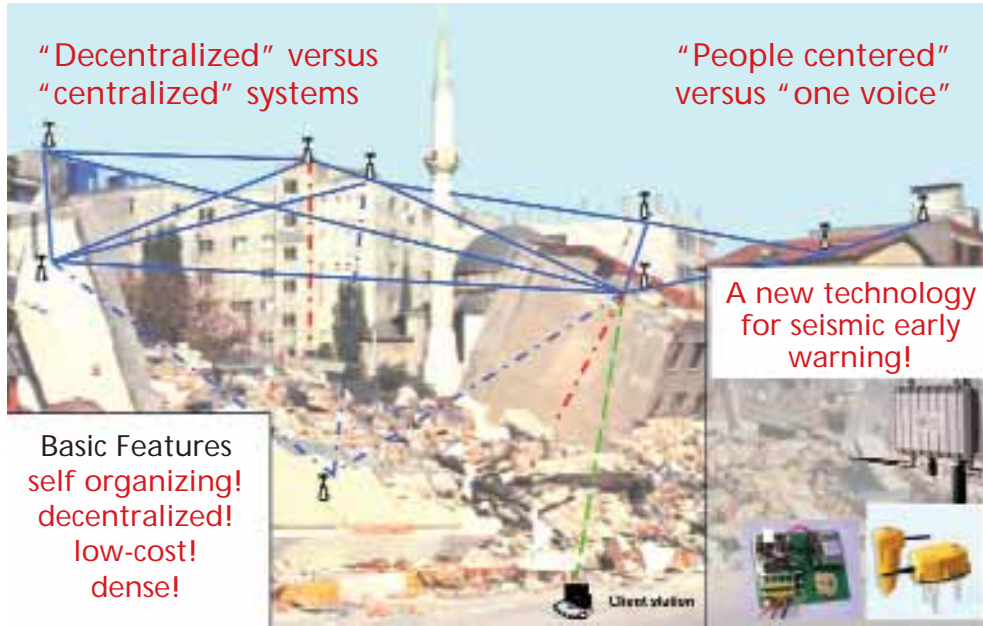
MAIN DISSEMINATION ACTIVITIES

SAFER achievements and scientific advances have been published on several international journals, books and special issues, such as:

- Gasparini P., Manfredi G., Zschau J. (eds.), "Earthquake Early Warning Systems", (Springer), 2007.
- Allen R.M., Gasparini P., Kamigaichi O. (eds.), "New methods and Application of Earthquake Early Warning". Geophys. Res. Letters, 36, L00B007, 2009.
- Iervolino I., Zollo A., (eds.), "Applications and engineering perspectives of earthquake early warning". Soil Dynamics and Earthquake Engineering (SDEE in preparation).

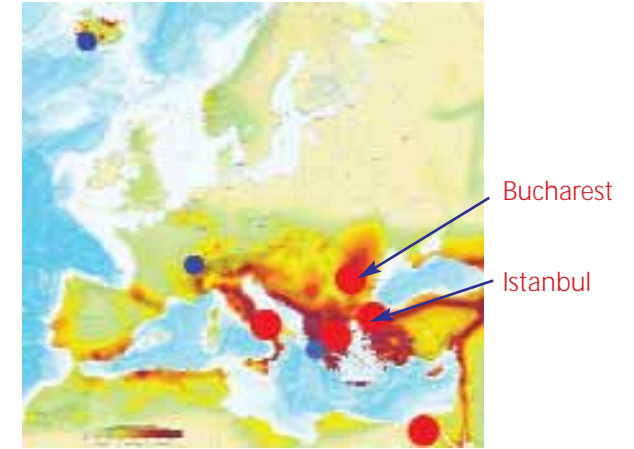
A complete list of Safer publications is available on the Project website:
www.saferproject.net

People Centered Early Warning System
Self Organizing Mesh Networks for Early Warning and Rapid Response

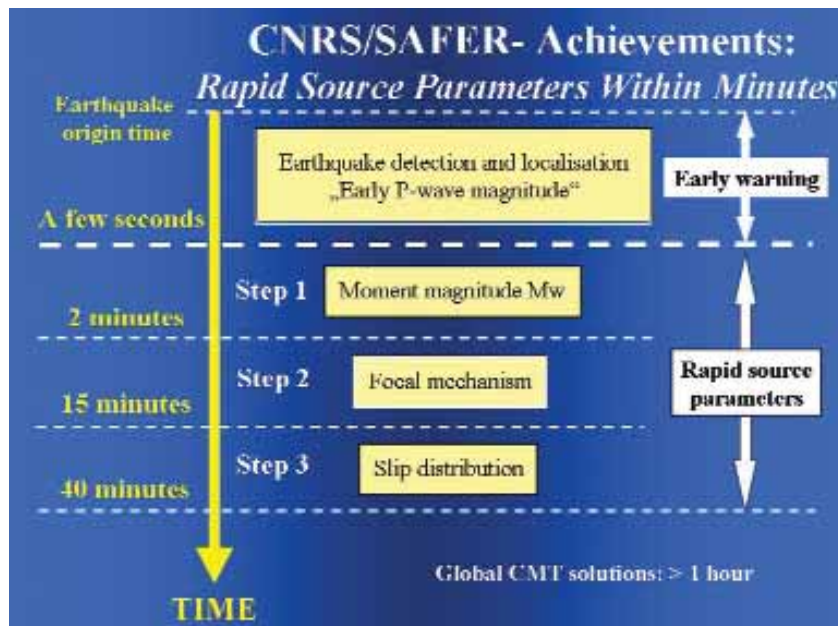


WHERE DID WE START?

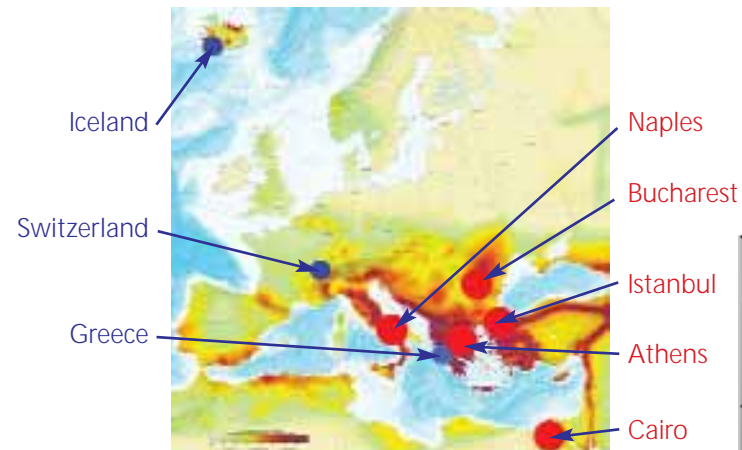
- In seismic early warning Europe was far behind the US, Japan, Taiwan and Mexico!
- Only Istanbul and Bucharest had started to develop EW capabilities for their cities!
- In particular, the shake map technology had not been implemented in Europe!



Rapid Source Parameters Within seconds and Minutes



WHAT DID WE HAVE IN MIND?



- To develop seismic early warning methods and capabilities for Europe.
- To implement and test new methods in European test areas and cities.





THE MEANING OF "EARLY WARNING"

Earthquake early warning is based on the time difference of arrivals at a site of traveling low energy P-waves and the destructive S waves. This delay is of a few seconds close to the epicenter and it increases to tens of seconds and minutes with increasing distance.

This short time-interval can be used to trigger automatic actions to reduce damages and to prevent induced effects (fires, industrial accidents, etc.).

Earthquake early warning systems are able to produce real time shake maps and expected damage scenarios useful for rapid response.



OVERALL ACHIEVEMENTS

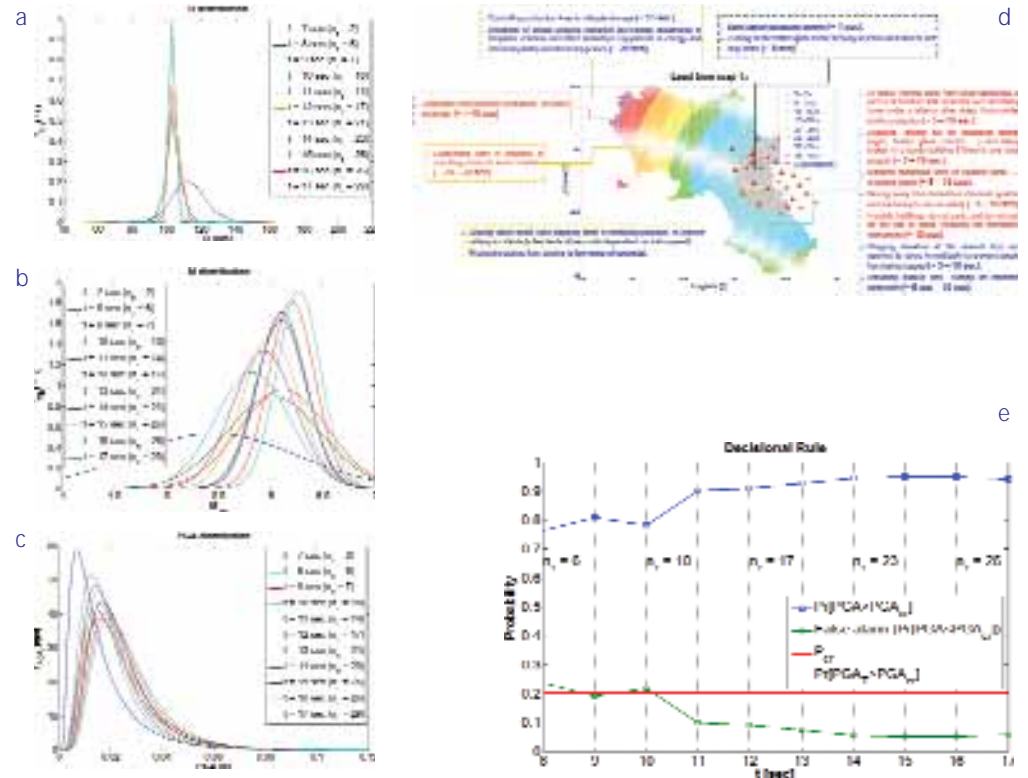
- Improving the understanding of the information contained in the first arriving P-waves.
- Improving the capability of processing seismic data in few seconds.
- Real time production of shake maps.
- Lay-out of a cost-benefit analysis of automatic applications (to stop fast trains, protect lifelines, bridges, etc.).
- Forming an European Science Community in the field of Seismic Early Warning.
- Training many young scientists all over Europe.
- Contributing to the networking between large European projects.



SOME MAIN RESULTS

A New Concept for Regional Early Warning

- a, b, c. Real-Time distributions of source-to-site distance, magnitude, and PGA (at site).
- d. Lead-time map (when 4 stations have triggered) and real-time risk reduction actions.
- e. Decisional rule based on PGA- and false alarm probabilities.



Rapid impact assesment

Achievements (test sites):

Ground Shaking Intensity can be overlaid on infrastructure!

Shake-Maps within a few minutes!

The shake-map-technology has now been implemented through SAFER in many places in Europe! and real-time damage assessment is feasible, but needs more testing