THE EUROPEAN PROJECT UPSTRAT-MAFA

"**U**rban Disaster **P**revention **Strat**egies Using **MA**croseismic Fields and **FA**ult Sources"

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Abstract

In the framework of EU research project *"Urban Disaster Prevention Strategies Using MAcroseismic Fields and FAult Sources" (Grant Agreement n. 230301/2011/613486/SUB/A5)* innovative approaches are proposed to improve critical points in the procedures for assessing probabilistic hazard and seismic risk; they are tested in particular locations – Mt. Etna, Vesuvius and Campi Flegrei areas (Italy), Azores Islands and areas hit by offshore activity (Portugal), Alicante-Murcia area (Spain) and South Iceland including Reykjavik surrounding urban area (Iceland).

A unique probabilistic procedure has been used for seismic hazard evaluation processing both macroseismic fields and characteristics of fault sources. The direct application of probabilistic methodologies to observed and/or synthetic macroseismic fields allows us to carry out a more complete treatment of the uncertainties in the case of both point-wise and linear properties of a fault. An improvement of the urban scale vulnerability information on building and network systems (typologies, schools, strategic buildings, lifelines, and so on) has been introduced to use the new concept of global Disruption Index, with the objective to provide a systematic way to measure the earthquake impact in urbanized areas considered as a complex network. These measures have been then used to identify which nodes are likely to introduce major disruption in the whole urban system, and also which one of them suggests greater risk reduction if intervention takes place.

Besides the disaster prevention strategies based on the level of risk, another effective component of disaster-risk reduction is given by long-term activities using educational information systems. To reduce the absence of risk perception in the community some actions have been performed, such as the development of educational materials and the design of a mobile earthquake interactive experience with interactive panels for children and adults, and a central platform for the simulation of an earthquake.

UPStrat-MAFA: the 5 main activities with 10 related tasks

Forecast of damage scenarios
Task A : Data collection (instrumental, macroseismic fields … ect.)
Task B : Probabilistic Analysis of Macroseismic Data

Evaluation of the seismic hazard at site
Task C : Calibration of the input source parameters for simulation
Task D : Probability Hazard Assessment

Evaluation of the Risk
Task E : Assessment of vulnerability of buildings, infrastructures and system
Task F : Quantitative risk evaluation and mapping (i.e. Disruption Index)

Definition of prevention strategies
Task G : Disaster prevention strategies based on the level of risk
Task H : Disaster prevention strategies based on education information system

Activity of publicity & management
Task I : Publicity
Task J : Management of the project and report of the requirements to EC

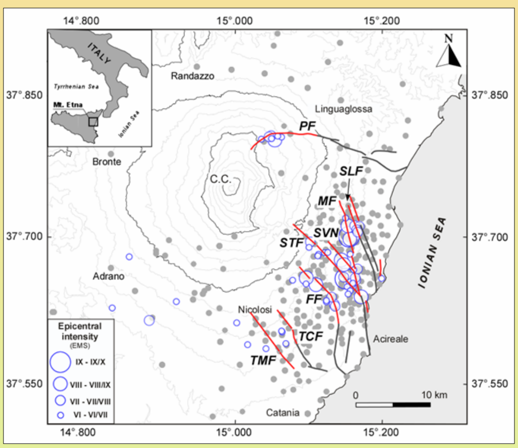
Web site of the European project **UPStrat-MAFA**
http://upstrat-mafa.ov.ingv.it/UPStrat/

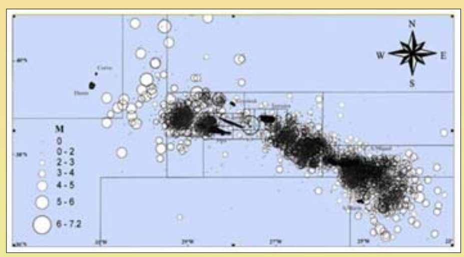
The main points of the project

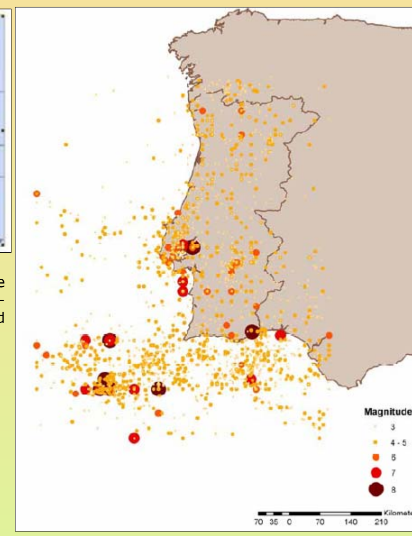
1. **an innovative approach is performed in which a unique probabilistic procedure processes macroseismic fields (historical information) and characteristics of fault sources**
2. **the new concept of global disruption measures (Disruption Index) is introduced with the objective to provide a systematic way to measure earthquake impact in urban areas**
3. **disaster prevention strategies based on an education information system is developed with comparative study of how the education information system is addressed in the different EU-countries participating in the project**

The Disruption Index (DI) is a new tool for the Civil Protection, the authorities and local decision makers that goes beyond the "What happens"; instead, it dips into the "What should we do in order to minimize the consequences of what is expected to happen", so as to prioritize mitigation and response actions. The DI will be evaluated in surrounding Reykjavik (i.e. Hveragerði; Iceland), in Algarve (Portugal) and in Mt. Etna eastern surrounding region (Italy)

Test Area 1: Distribution of the epicentres (blue circles) of the earthquakes with epicentral intensity I0 ≥VI, occurred from 1832-2008. Grey dots represent the localities included in the database of felt macroseismic observations; seismogenic faults are in red.





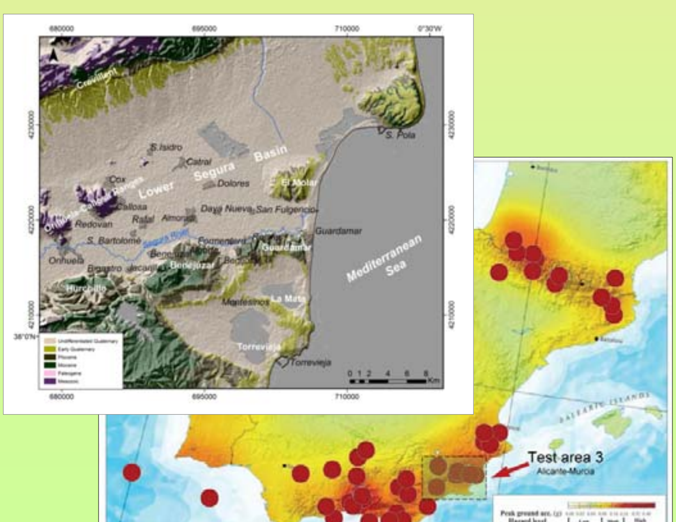


Test Area 2: On the top, Azores Islands with the epicentral map of Azores archipelago for the period 1980-1998 (Nunes et al., 2003) and, on the right, mainland Portugal Lower Tagus Valley and Algarve (Portugal).

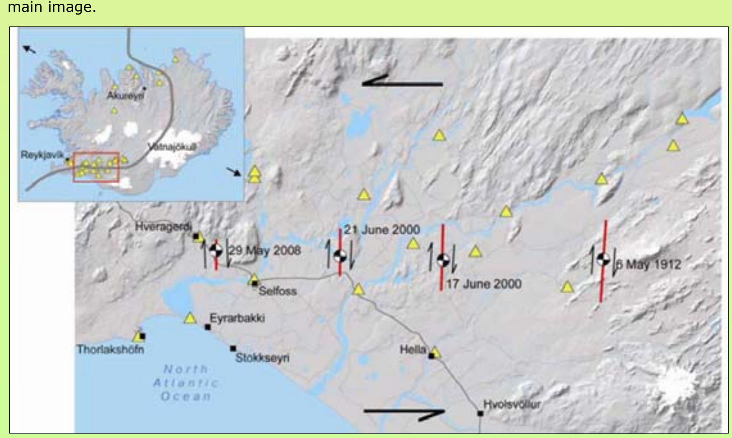
The European project **UPSTRAT-MAFA** involves the following countries: Italy (IT), Portugal (PT), Spain (ES) and Iceland (IS)

Starting date: 01/01/2012 Ending date 31/12/2013 Duration in months:24

Test Area 3: Larger (I-EMS98 ≥ VIII) historical earthquakes in the Iberian Peninsula overlaid on the regional hazard map of pga with 10% probability of exceedance in 50 years (modified from Jimenez et al., 2003). The rectangle identifies test area 3 (Alicante-Murcia region)



Test Area 4: In the main Figure, four major earthquakes are indicated by red fault lines and black arrows showing the right-lateral strike-slip motion. Fault planes are near vertical, as shown by the beach ball plots. The earthquakes had the following moment magnitudes (Mw): 6 May 1912 – Mw 7; 17 June 2000 - Mw 6.5; 21 June 2000 - Mw 6.4; and 29 May 2008 - Mw 6.3. Left-lateral transform motion of the SISZ is indicated by the large black arrows at the top and bottom of the main image.



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