Fault2SHA- A European Working group to link faults and Probabilistic Seismic Hazard Assessment communities in Europe

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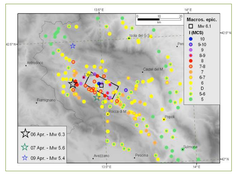
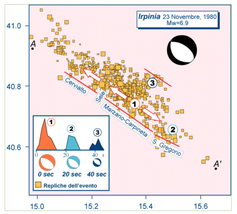
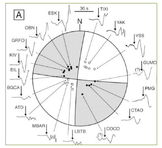
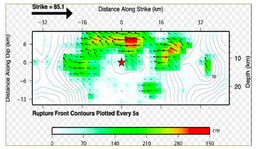
FAULT 2 SEISMOLOGIST









A fault is an earthquake, or a group of earthquakes clustered in space and time. Depending when earthquakes have occurred, a fault2seismologist is:

- ✧ damage/effects reports on inhabited region to derive epicentre and a magnitude proxy;
- ✧ seismograms to obtain hypocentre, origin time and magnitude of the nucleation;
- ✧ additional inversion for focal mechanism (stress style, two equivalent fault planes);
- ✧ as before, for having some patches of slip distribution on a selected rupture plane.

In Space: seismological imaging of faults tends to a thin planar surface with finite dimensions of rupture

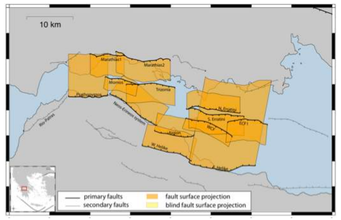
In Time: deformation is measured on a very limited time span, it tends to zero (the precise timing of earthquake)

Pitfalls: the activity rates during an earthquake sequence cannot be considered representative of the seismogenic potential. The analyses of fluctuations of a/b-values based on stress conditions can be biased by detection capabilities and not homogeneous magnitude metric.

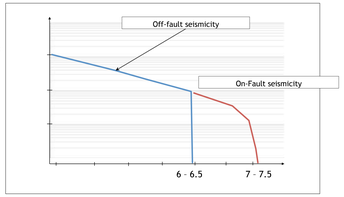
FAULT 2 (P)SHA MODELLER

Single fault rupture scenario

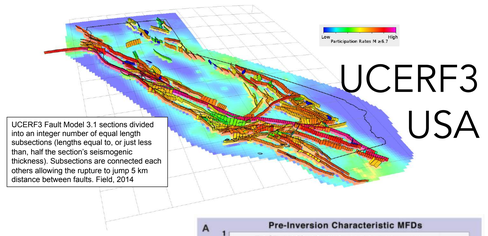
Greece
EU



Mmax off faults =
Mmin on faults
~ 6.0 to 6.5

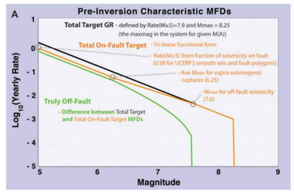


Faults belong to a network: need to allow for multi-fault rupture scenarios



UCERF3
USA

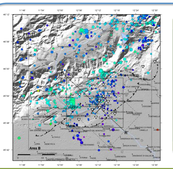
Mmax off fault < 7.6
Mmin on faults > 6.4



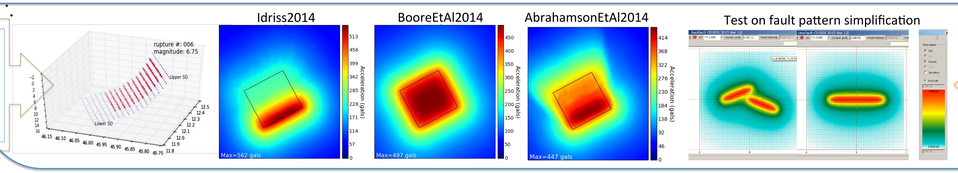
In Space: a PSHA fault-source is a surface (usually rectangular and planar), representing either individual fault or a fault system: ruptures involve portions or the whole surface

In Time: seismogenic potential is given independently from the time span of interest in seismic hazard (usually 1/10-1/100 long with respect to recurrence times of Mmax). Time-dependency usually on theoretical models not experimental data.

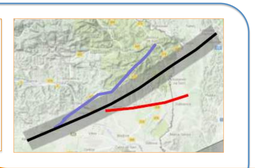
Pitfalls: Distance metrics for modelling ground motion are not always selected consistently with fault geometries (e.g. J-B distance applied to 3D fault, see the examples given in the panel below)



Seismology
Microseismic imaging of TF
Fault model
Complex fault with end-member EQs potential



Geology
two branches (blue/red faults)
Fault model
one single seismogenic source (black)

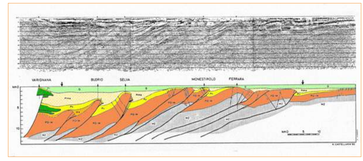


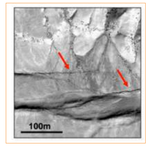
FAULT 2 GEOLOGIST

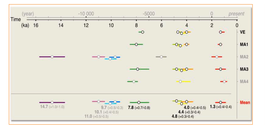
A fault is a crack in the Earth's crust, resulting in the displacement of one side with respect to the other. Based on the methods of investigation, a fault2geologist is:

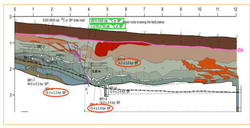
- ✧ surface between geologic units (deformation style, cumulative displacement);
- ✧ satellite images and mapping of active faults and earthquake ruptures
- ✧ space-time reconstruction of displacement's episodes of surface faulting in trenches


Credit: Babak Hejrani (distributed via imaggeo.egu.eu)







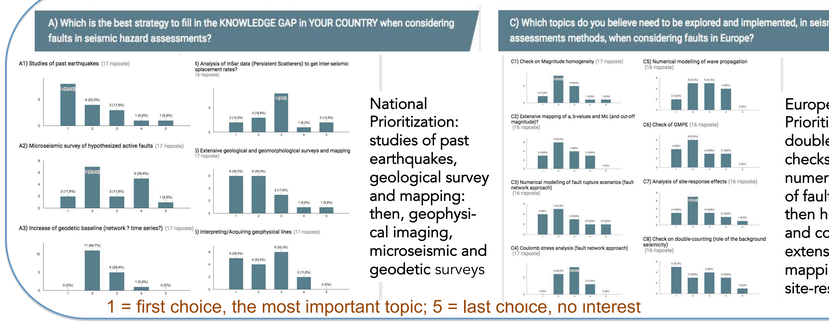


In Space: Active faults belong to complex networks of structures, in a 3D seismogenic volume.

In Time: Faults activity is measured on the cumulative deformation over very long time span (10^3 to 10^6 Myrs)

Pitfalls: geology is poor to resolve the seismic versus aseismic displacement, coseismic vs postseismic components, and rearrangements of motion on inherited discontinuities; timing has huge uncertainties.

SPLINTER SURVEY on an INFORMAL GROUP



National Prioritization: studies of past earthquakes, geological survey and mapping: then, geophysical imaging, microseismic and geodetic surveys

European Prioritization: double-counting checks, GMPE, numerical modelling of fault scenario; then homogeneous and complete M, extensive a-b mapping, Coulomb, site-response

An informal meeting, in Paris, November 2014, hosted by IRSN, was held for motivating exchanges between field geologists, fault modellers and seismic hazard practitioners.
In 2015 the group met again in Chieti (Italy), and shared experiences and ideas with exercises on a test case study. Many problems and some solutions emerged in fault-source characterizations for PSHA in Europe, and in the exploration of key uncertainties affecting fault models. We believe that such a kind of forum should help in reducing the heterogeneities of seismogenic faults representation for PSHA in Europe.
For EGU2016, we launched a splinter survey in order to drive the discussion during a splinter meeting, planned on Wes 20, before the FAULT2SHA session.
Here some of the Questions & Answers given by the interviewed, collected till Apr, 17th
Add your answers if you want to contribute, and follow the updates:
https://sites.google.com/site/linkingfaultpsha

PERSPECTIVES

We hope that by the analysis of common case studies, a Fault2SHA community could converge towards homogeneous and shared approaches to treat the data, for a better representation of the knowledge and the lack of knowledge of faults in European (P)SHA studies.

Apply to the next meeting of the Fault2SHA group, planned at the 35 General Assembly of ESC, session #24.

http://www.35esc2016.eu/
Trieste, 4-10 Sep, 2016
Abstracts deadline: Apr 30th

Credits: the survey is performed by Google tools, the PSHA test cases obtained by OpenQuake and Crisis2015. Many thanks for the materials provided by L. Benedetti, R. Gee, A. Romano