

# Le banche dati di faglie sismogenetiche dell'INGV: DISS e EDSF

<http://diss.rm.ingv.it/diss/>

<http://diss.rm.ingv.it/share-edsf/>

# Le banche dati di faglie sismogenetiche dell'INGV: DISS e EDSF

## Indice della presentazione

motivazione e contesto scientifico

concetti fondamentali

tipi di faglie

tipi di pericolosità

caratteristiche delle faglie sismogenetiche

faglie sismogenetiche e faglie capaci a confronto

esplorare la terza dimensione delle faglie: esempi

come si usano le faglie sismogenetiche nella stime di pericolosità

importanza della terza dimensione

struttura generale del DISS

esempio di navigazione del DISS

struttura generale dell'EDSF

esempio di navigazione dell'EDSF

## Ringraziamenti

*ai componenti del DISS Working Group: Salvatore Barba, Pierfrancesco Burrato, Umberto Fracassi, Vanja Kastelic, Gabriele Tarabusi, Mara M. Tiberti, Gianluca Valensise, Paola Vannoli*

*e inoltre a*

*Michele M. C. Carafa, Patrizio Petricca*



# Motivazione e contesto scientifico

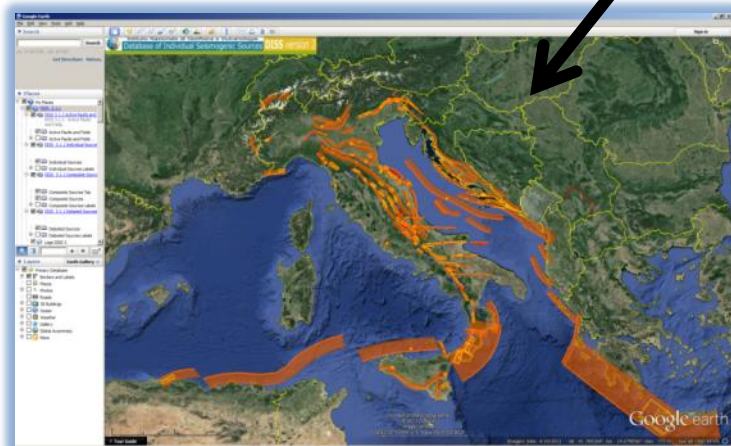
ITALIA



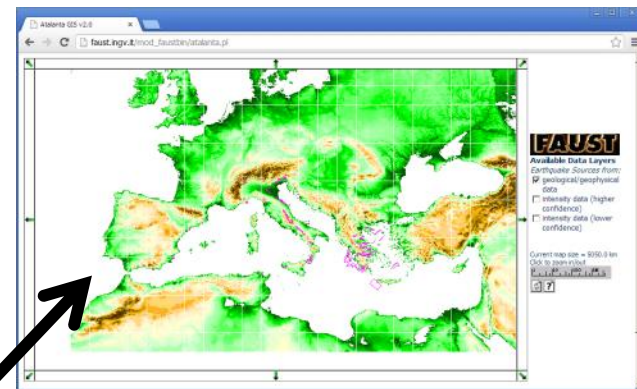
DISS 1.0 2000

DISS 2.0 2001

DISS 3.x.y 2005

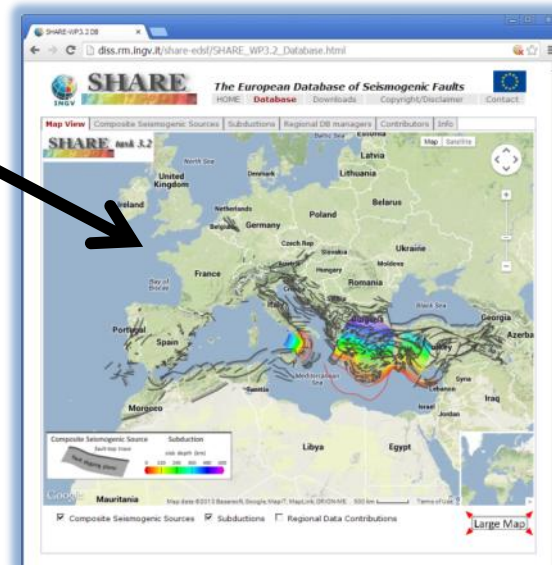


EUROPA



2002 FAUST

2013 EDSF



# Motivazione e contesto scientifico



## Accordo quadro INGV-DPC 2012-2021

<http://www.ingv.it/>

*[DISS è una delle banche dati prioritarie citate nell'accordo quadro decennale tra INGV e Dipartimento della Protezione Civile]*



## EU Project SHARE: WP3

<http://www.share-eu.org/>

*[... expand DISS to the Euro-Mediterranean area and establish common standards for the definition and characterization of seismogenic sources...]*



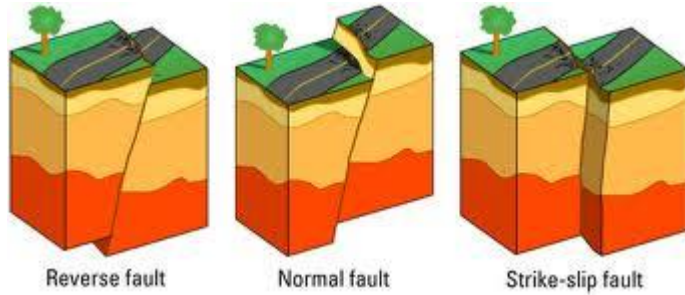
## GEM: The Faulted-Earth Project

<http://www.globalquakemodel.org/>

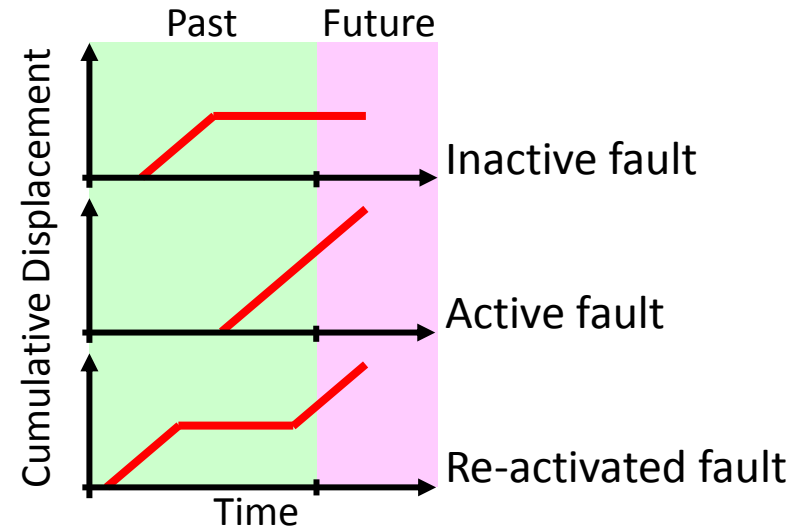
*[... build a global active fault and seismic source database with a common set of strategies, standards and formats...]*

# Concetti fondamentali: tipi di faglie

## faglia



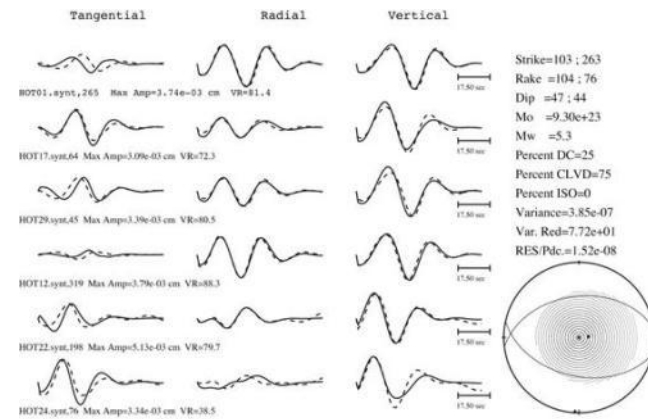
## faglia attiva



## faglia capace



## faglia sismogenetica



# Concetti fondamentali: tipi di pericolosità

## Hazards Associated with Active Faults

### ground shaking

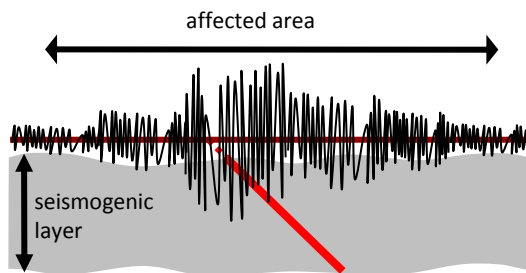
occurs always but is transient

affects the widest area

is responsible for most of the damage

may trigger other geological effects (*liquefactions, landslides, secondary ruptures*)

requires mapping at 1:200k-1M



### surface deformation

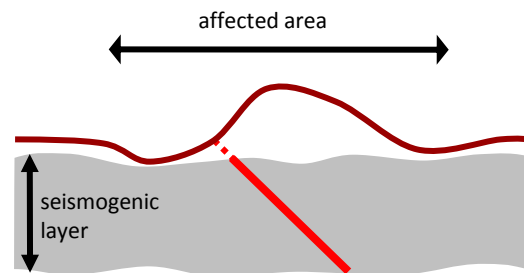
occurs always and is permanent

affects a wide area (*fault size x2*)

produce limited damage (*critical facilities*)

may trigger other geological effects (*stream avulsions, slope instabilities, secondary ruptures, tsunamis*)

requires mapping at 1:200k-1M



### surface rupture

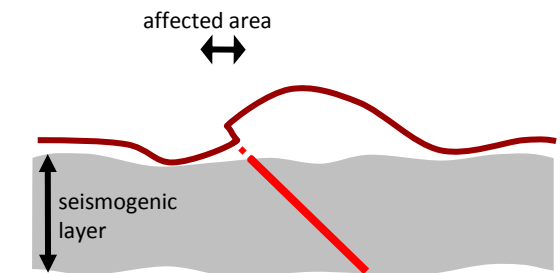
occurs when faults "daylight" and is permanent

affects a limited area (*smaller than fault length*)

may produce significant damage

may trigger other geological effects (*water ponding, damming*)

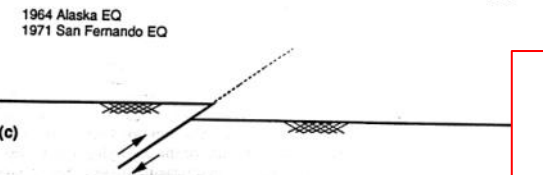
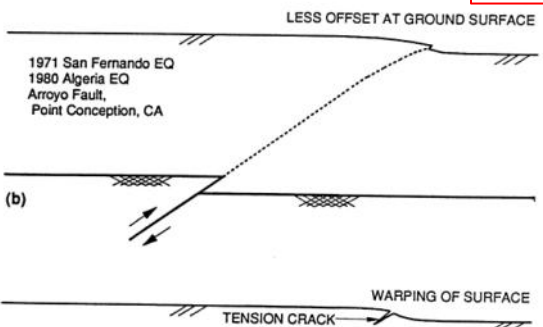
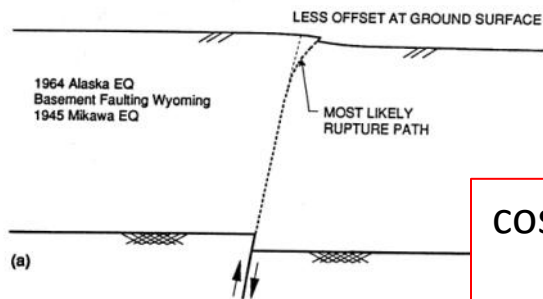
requires mapping at 1:1k-10k



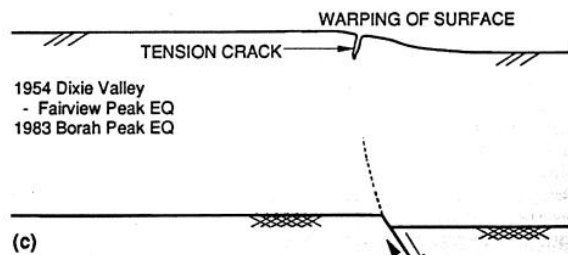
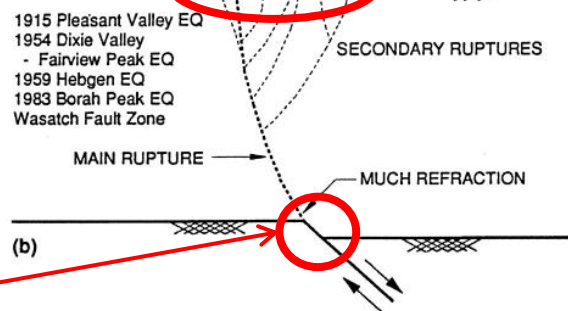
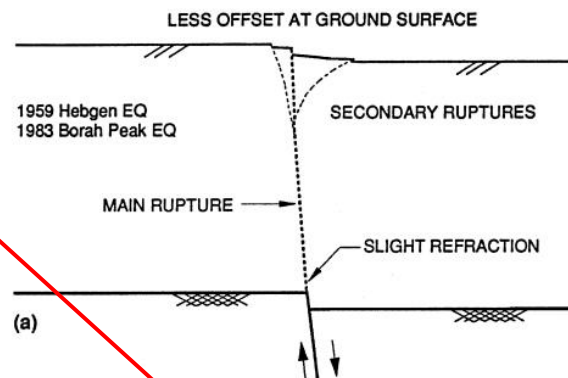
These three processes are the primary cause for damage to buildings and infrastructures. A survey of 50 major earthquakes occurred between 1989 and 2003 (Bird and Bommer, 2004) shows that the primary cause for building collapse is ground shaking in 98% of the cases, followed by liquefaction (32%), slope failure (28%), tsunami (10%), and fault rupture (10%).

# Concetti fondamentali: rottura e propagazione in faglie sismogenetiche

Reverse



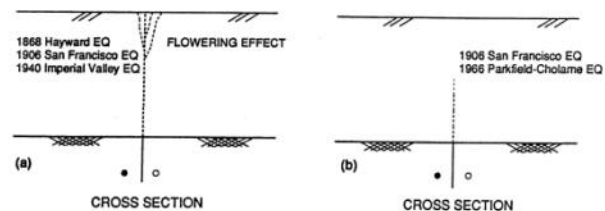
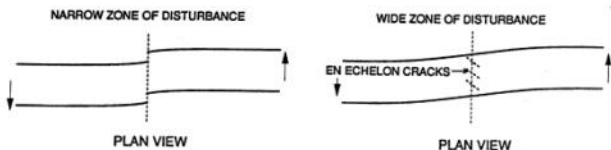
Normal



cosa si può osservare in superficie

cosa serve per la pericolosità

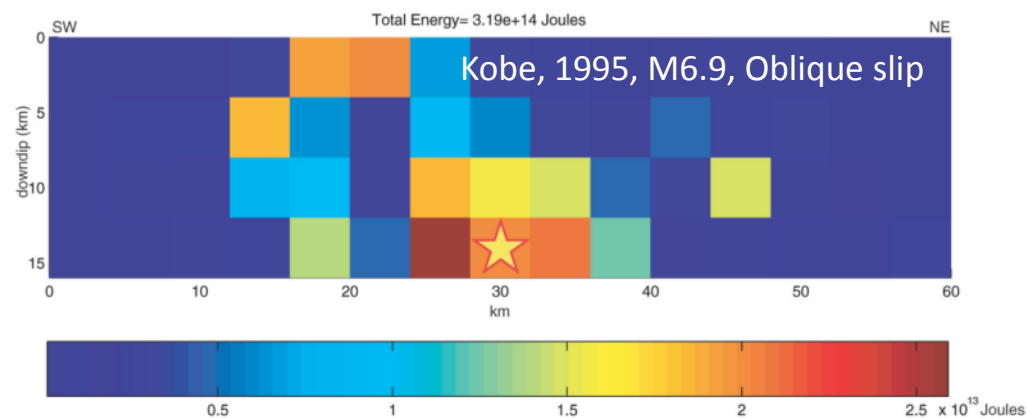
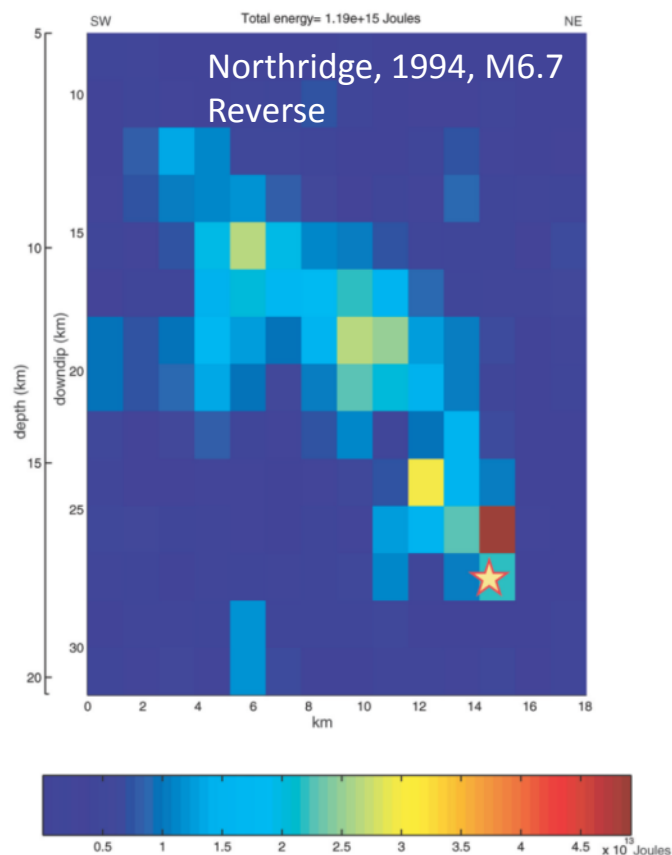
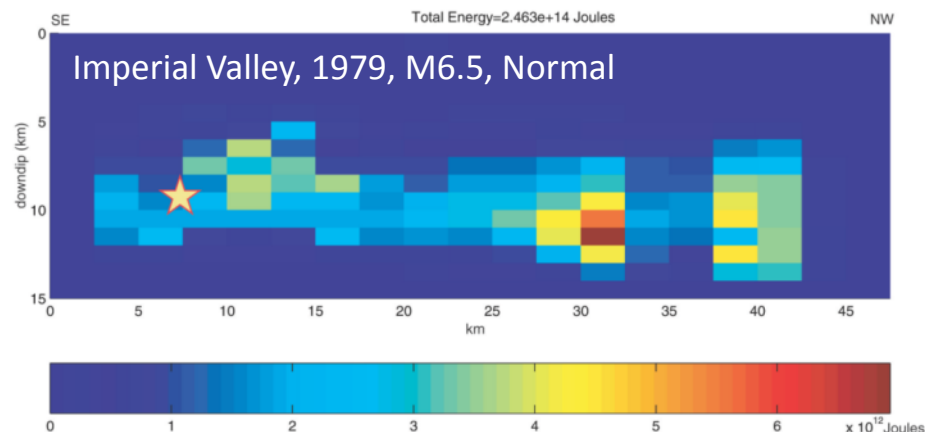
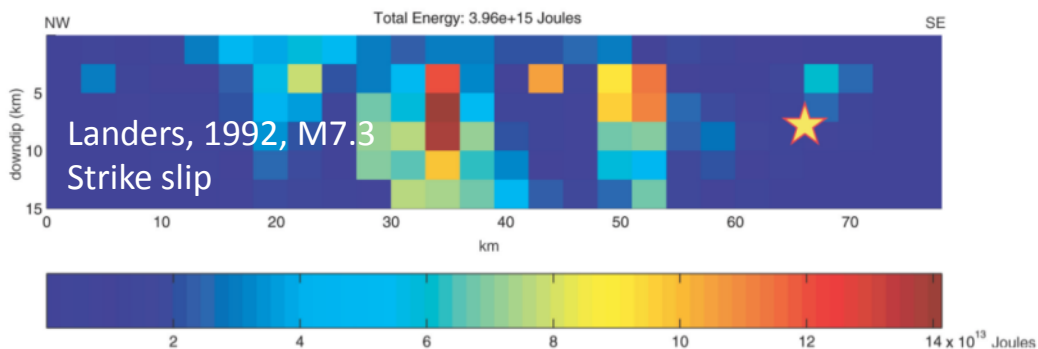
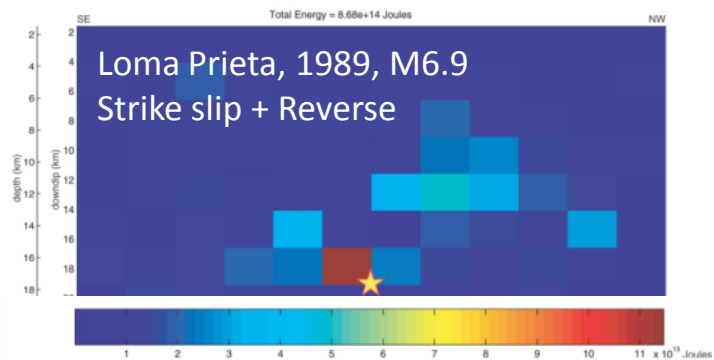
Strike slip



Bray et al., 1994, J. Geotech, Eng.



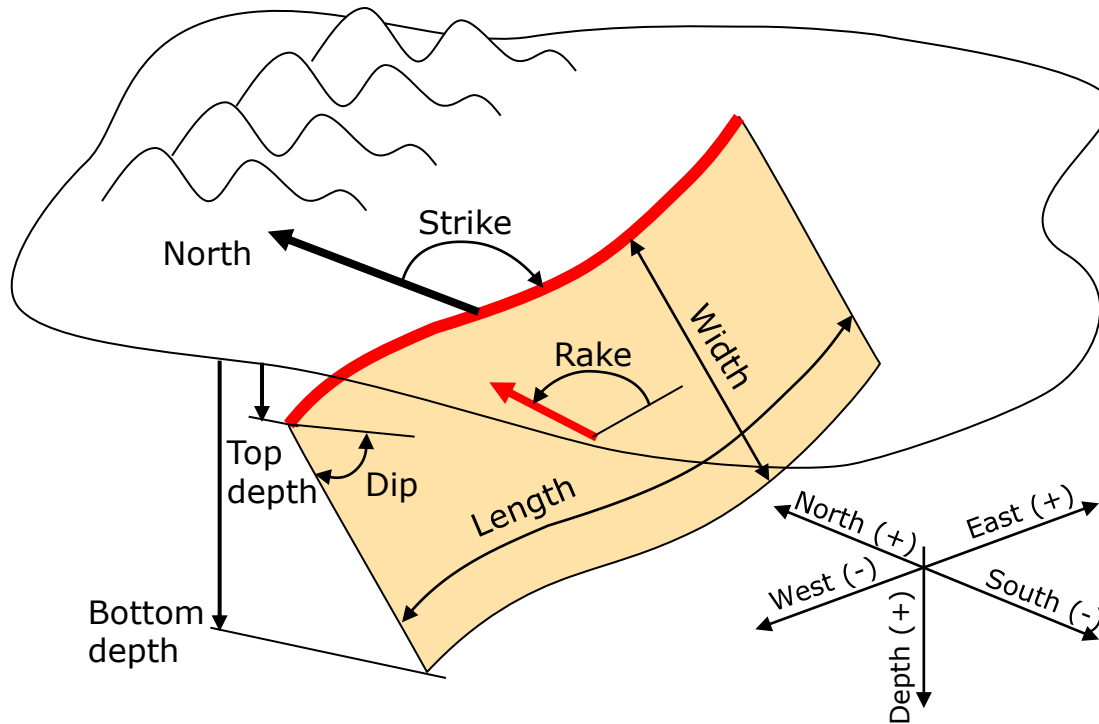
# Concetti fondamentali: radiazione di energia sismica





# Concetti fondamentali: parametri di una faglia sismogenetica

Modello di faglia sismogenetica generalmente usato negli studi di pericolosità sismica



## Geometry

Location: Lat, Lon, Depth

Size: Length, Width

Orientation: Strike, Dip

## Behavior

Rake

Slip Rate

Earthquake Magnitude

Activity Rate

# Concetti fondamentali: definizioni di faglie sismogenetiche

## Variety of fault-source models used in PSHA

Fault source name	Definition	Recurrence model	Hazard model
Hazard fault	Mmax ruptures total length Smaller events allowed on fault	GR	USGS, US
Fault section	Ruptures of any size result from combination of 1+ sections	GR	SCEC, California
Behavioral segment	Earthquake rupture spans 1+ segments	SP	AIST, Japan
Fault segment	Max rupture = total length No smaller events allowed on fault	SP	GNS, New Zealand
Composite seismogenic source	Unspecified number of ruptures of any size up to Mmax	GR	SHARE, Europe

GR: Gutenberg-Richter; SP: strictly periodic

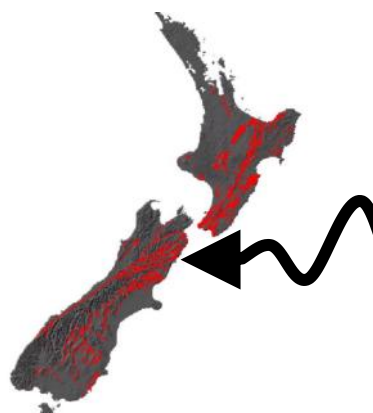


# Concetti fondamentali: faglie sismogenetiche e faglie capaci a confronto

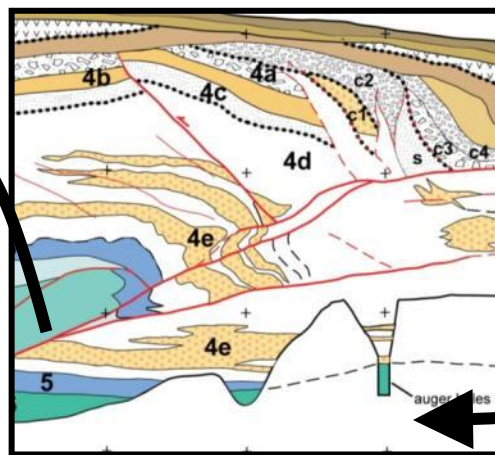
## Mappatura di faglie attive: idea comunemente accettata



Ricerca di affioramenti



Immagazzinamento nella banca dati



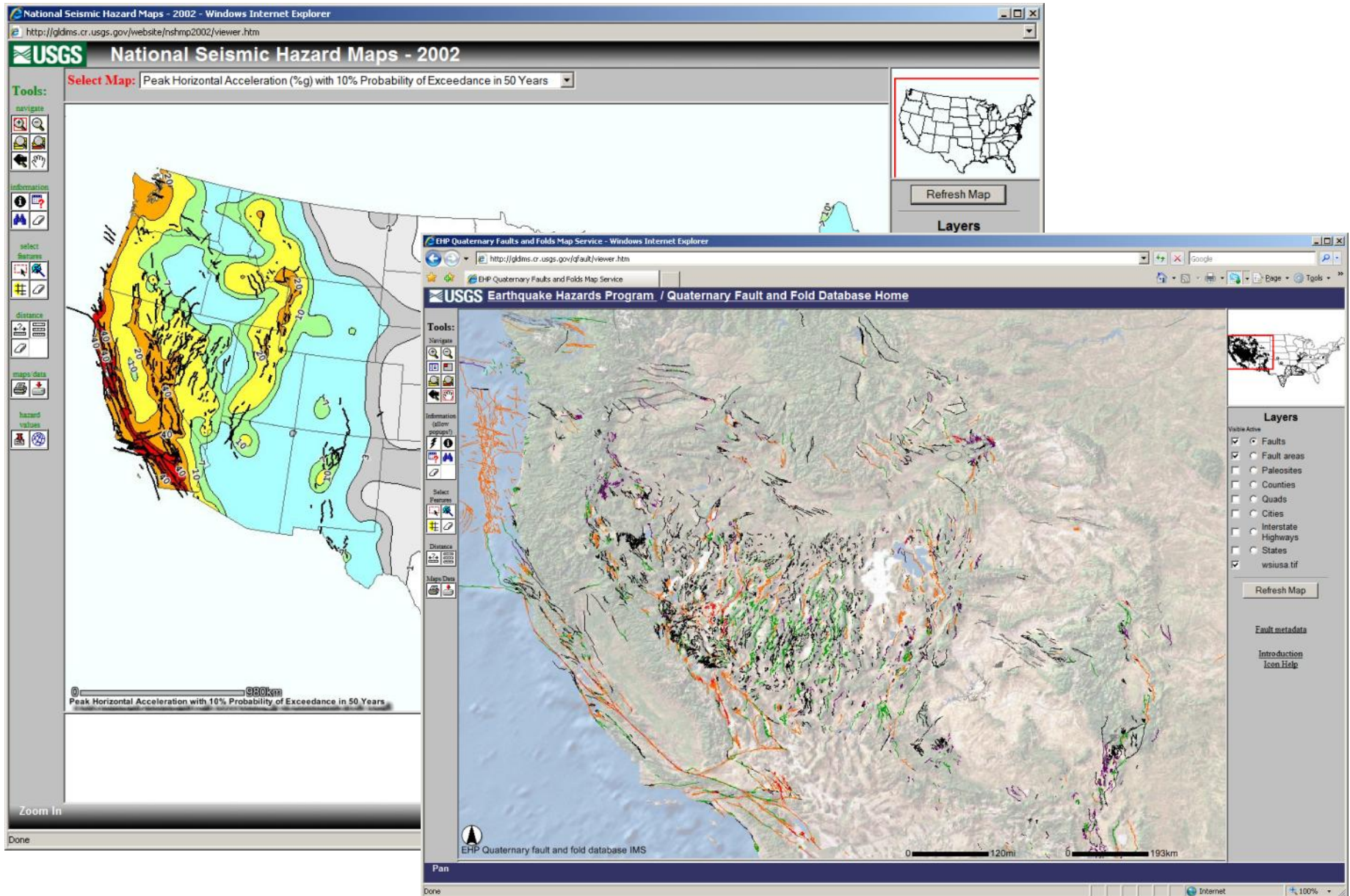
Ricostruzione geometrica/cinematica



Analisi dell'affioramento

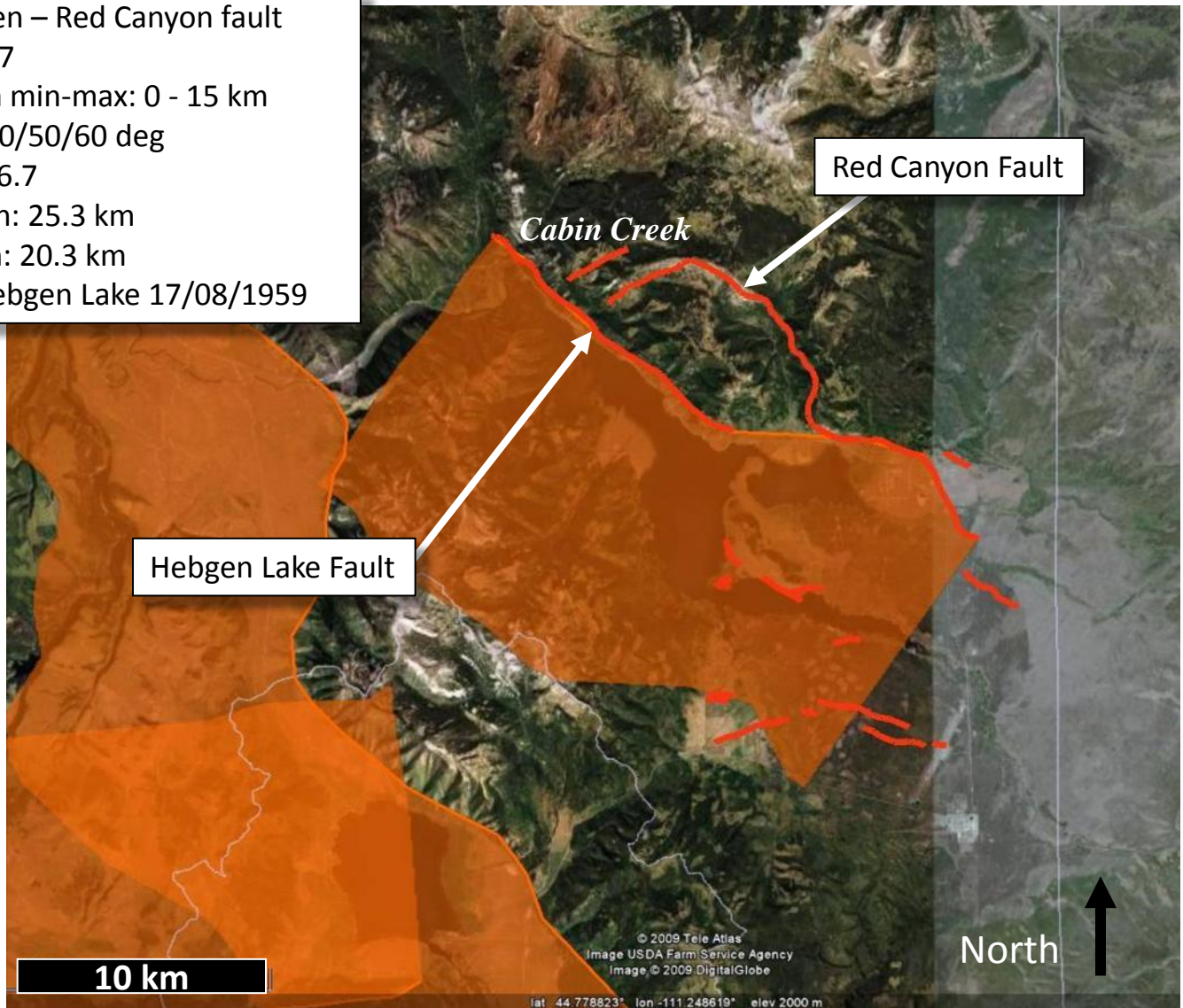
Esiste una corrispondenza diretta tra mappe di faglie attive e modelli di faglie sismogenetiche per le analisi di pericolosità?

# Concetti fondamentali: faglie sismogenetiche e faglie capaci a confronto

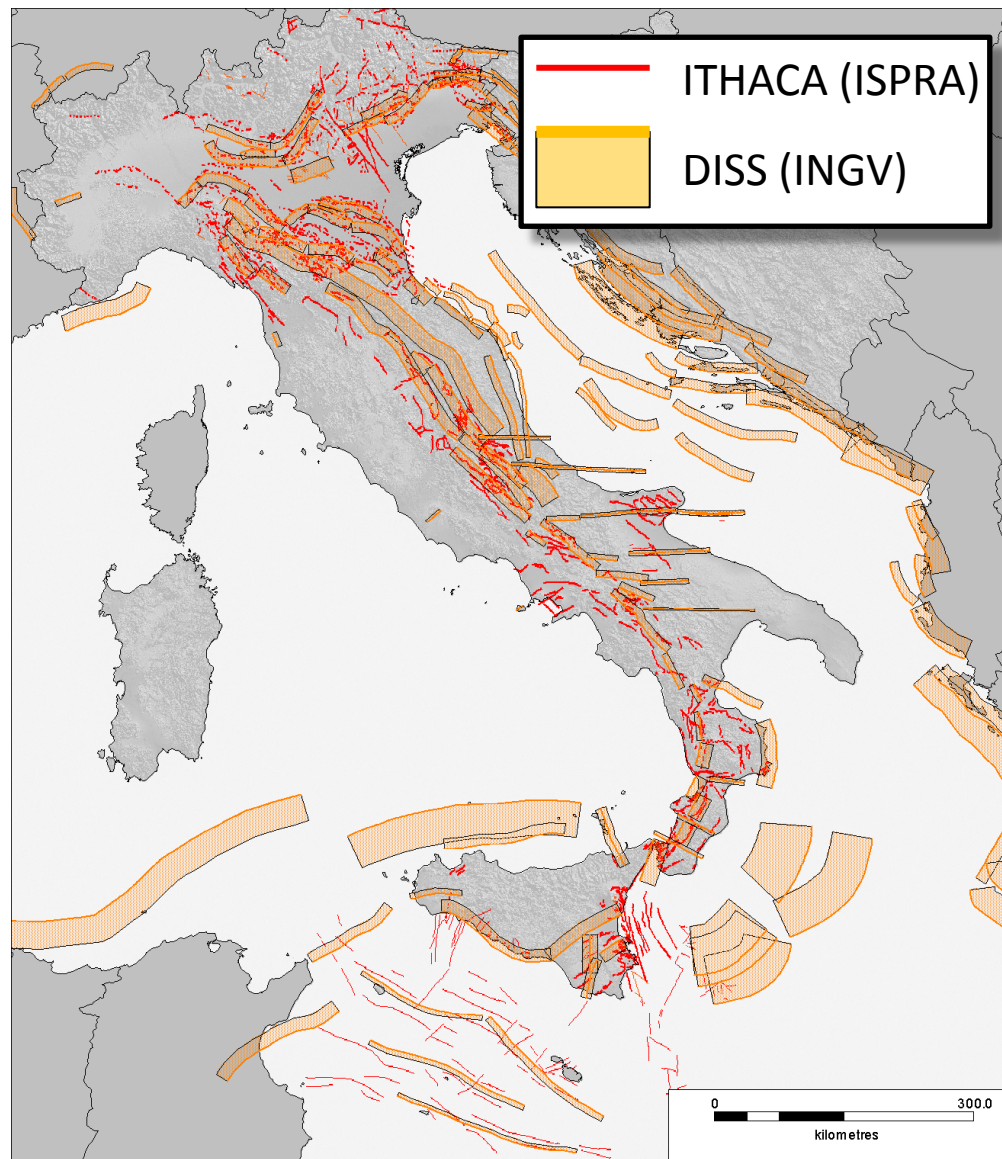


# Concetti fondamentali: faglie sismogenetiche e faglie capaci a confronto

Hebgen – Red Canyon fault  
 ID: 277  
 Depth min-max: 0 - 15 km  
 Dip: 40/50/60 deg  
 Mag: 6.7  
 Length: 25.3 km  
 Width: 20.3 km  
 Eq: Hebgen Lake 17/08/1959



# Concetti fondamentali: faglie sismogenetiche e faglie capaci a confronto



# Concetti fondamentali: faglie sismogenetiche e faglie capaci a confronto

ITCS034: Irpinia - Agri Valley

Depth: 1-14 km

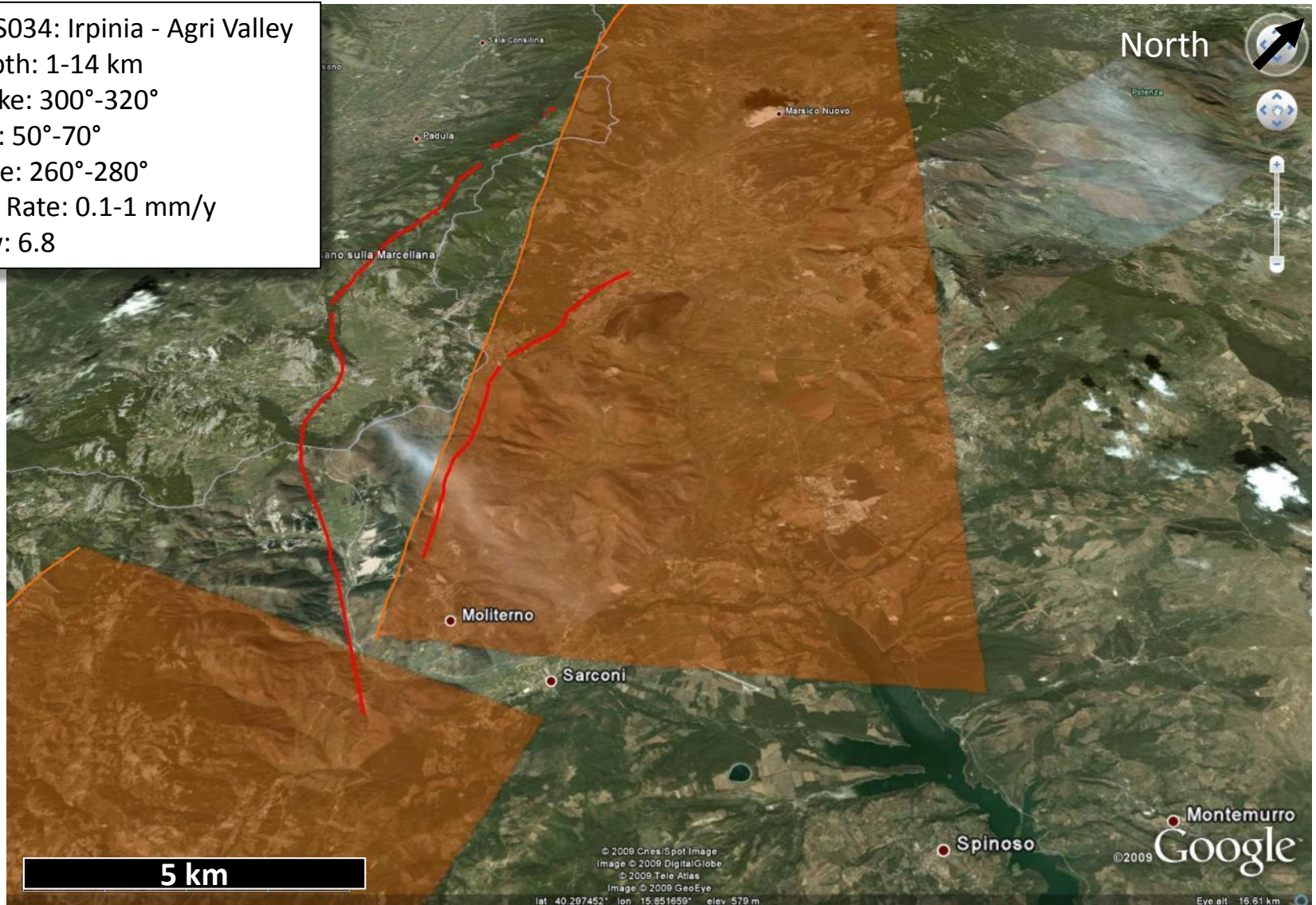
Strike:  $300^{\circ}$ - $320^{\circ}$

Dip:  $50^{\circ}$ - $70^{\circ}$

Rake:  $260^{\circ}$ - $280^{\circ}$

Slip Rate: 0.1-1 mm/y

Mw: 6.8



# Concetti fondamentali: esplorare la terza dimensione delle faglie

## La faglia alto-tiberina

Grant agreement no.: 259256

Principal Investigator: Cristiano Collettini

Host Institution: Istituto Nazionale di Geofisica e Vulcanologia, Roma

Budget: 1.514.400 Euro

Starting date October 2010, duration 5 years.

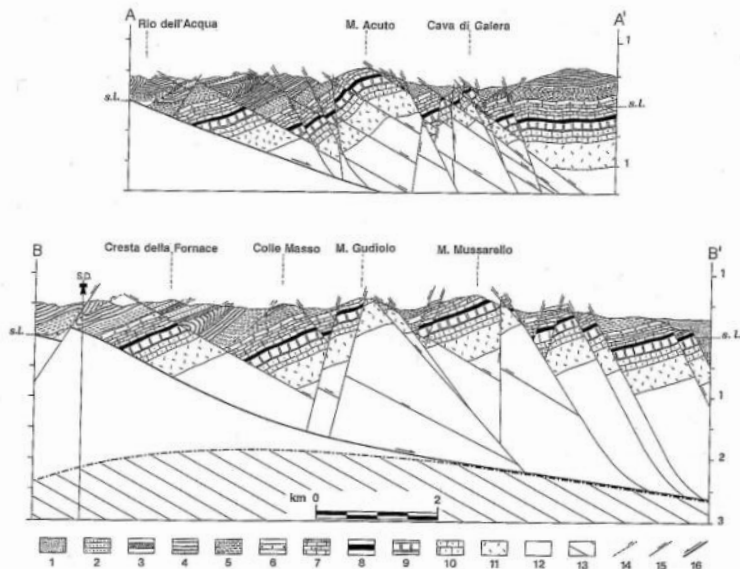


Fig. 7 - Sezioni geologiche attraverso l'area in studio (tracce in Tav. 1). 1: depositi continentali plio-quaternari della Valle del Tevere; 2: Arenarie del Falterona - Cervarola; 3: Argille Varicolori; 4: Marnoso-Arenacea; 5: Marnosa Umbra; 6: Scaglia cinerea e Bisciaro; 7: Scaglia (bianca, rossa e variegata); 8: Marne a Fucoidi; 9: Maiolica; 10: successione giurassica dal tetto del Calcare Massiccio alla base della Maiolica; 11: Calcare Massiccio; 12: Anidriti di Burano; 13: Verrucano; 14: sovrascorrianti; 15: faglie dirette; 16: traccia dello scollamento basale delle faglie distensive.

Brozzetti, 1995

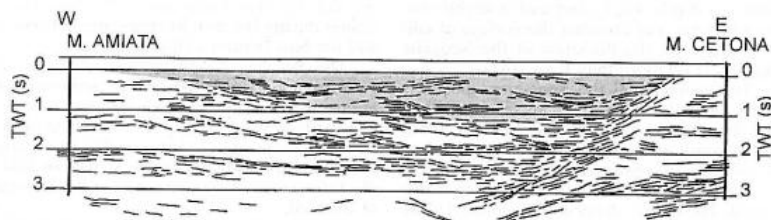
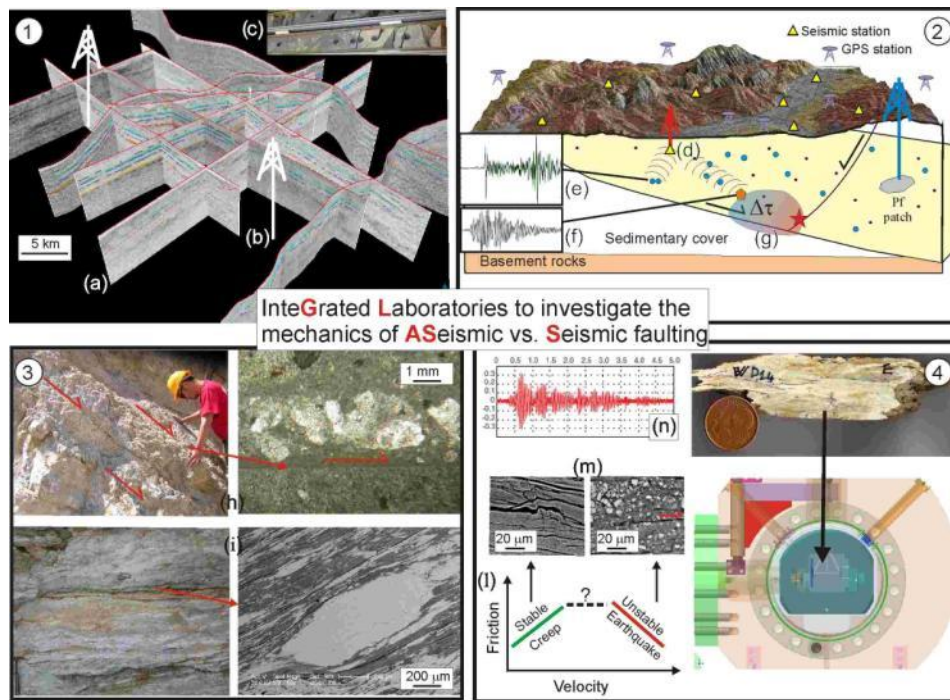


Fig. 2 - Seismic reflection line crossing in a SW-NE direction the Southernmost sector of the Radicofani basin (In gray are the Neogene sediments).

Barchi et al, 1998



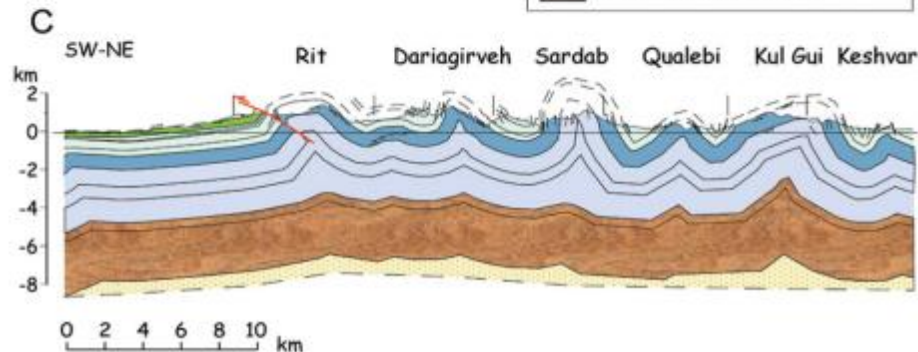
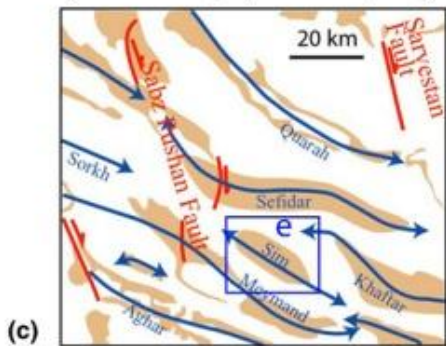
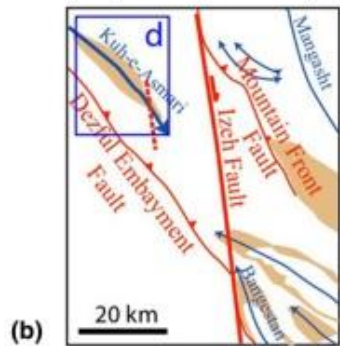
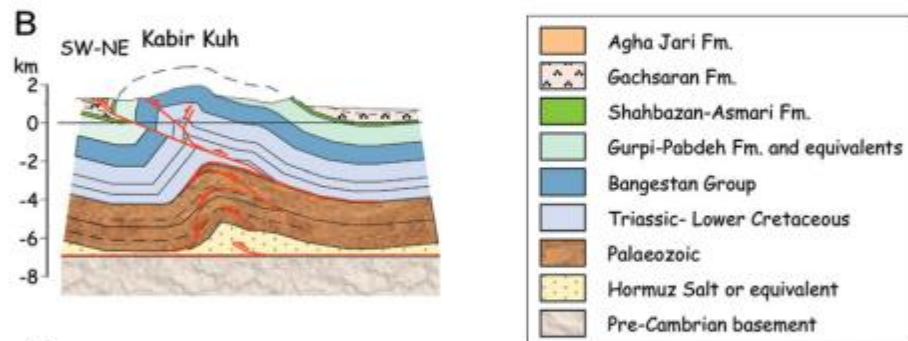
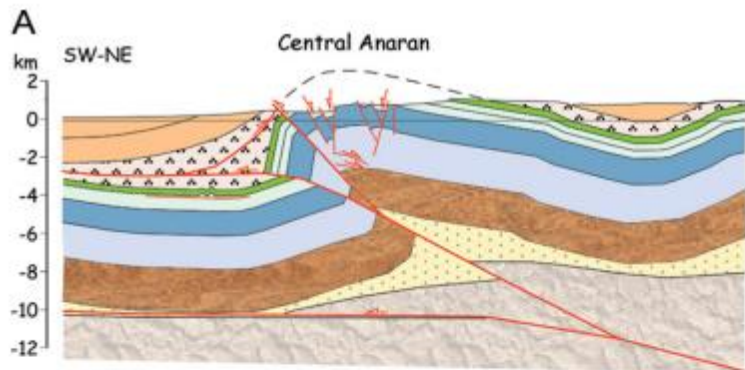
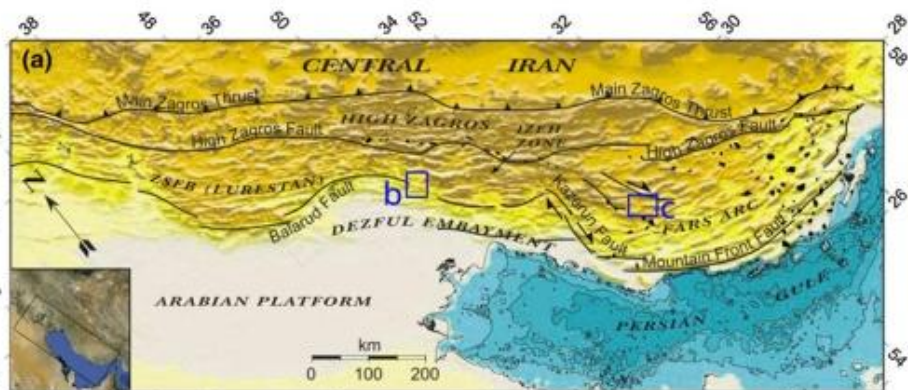
InteGrated Laboratories to investigate the mechanics of ASeismic vs. Seismic faulting





# Concetti fondamentali: esplorare la terza dimensione delle faglie

## Faglie inverse in Iran



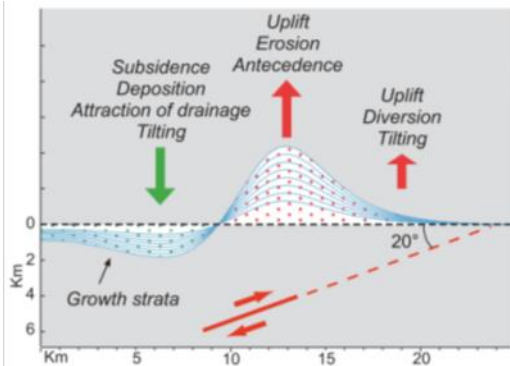
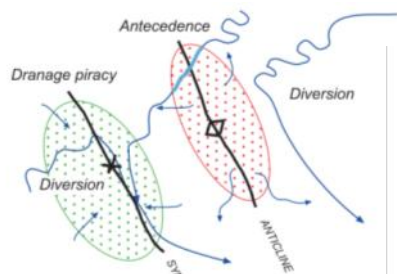
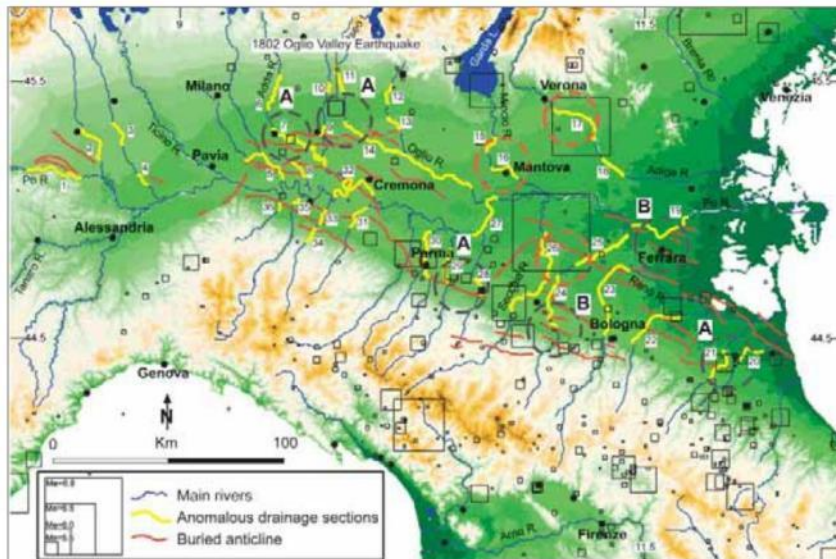
Carminati et al., 2013, Int. J. Earth Sc.

Verges et al., 2011, Geol. Mag.

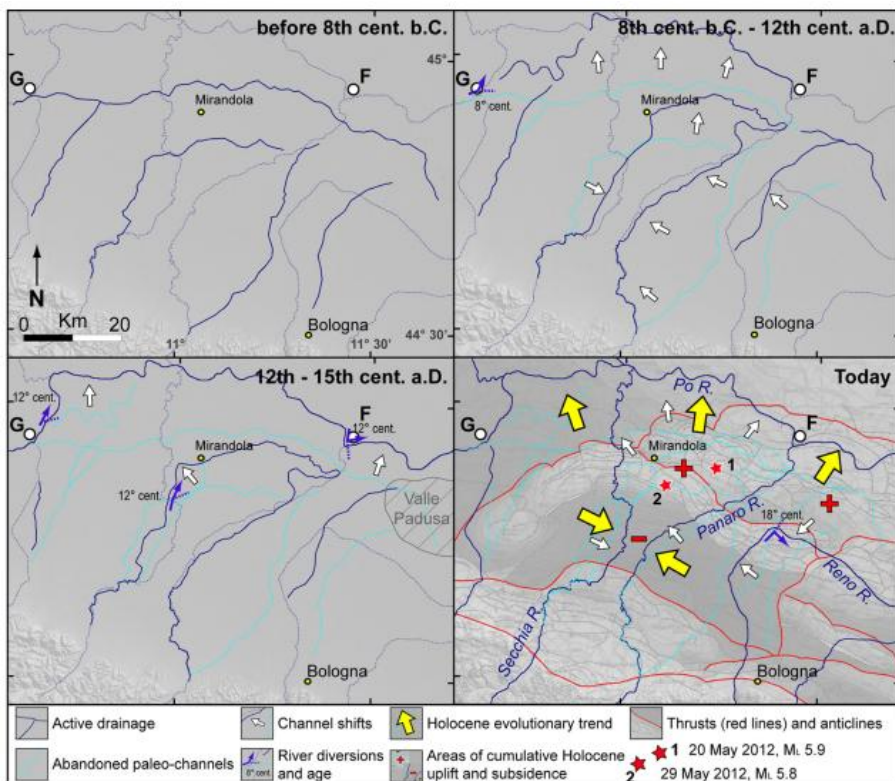
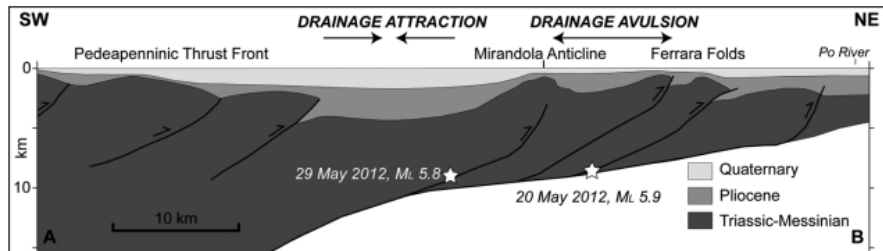


# Concetti fondamentali: esplorare la terza dimensione delle faglie

## La faglia di Mirandola e il terremoto del 2012



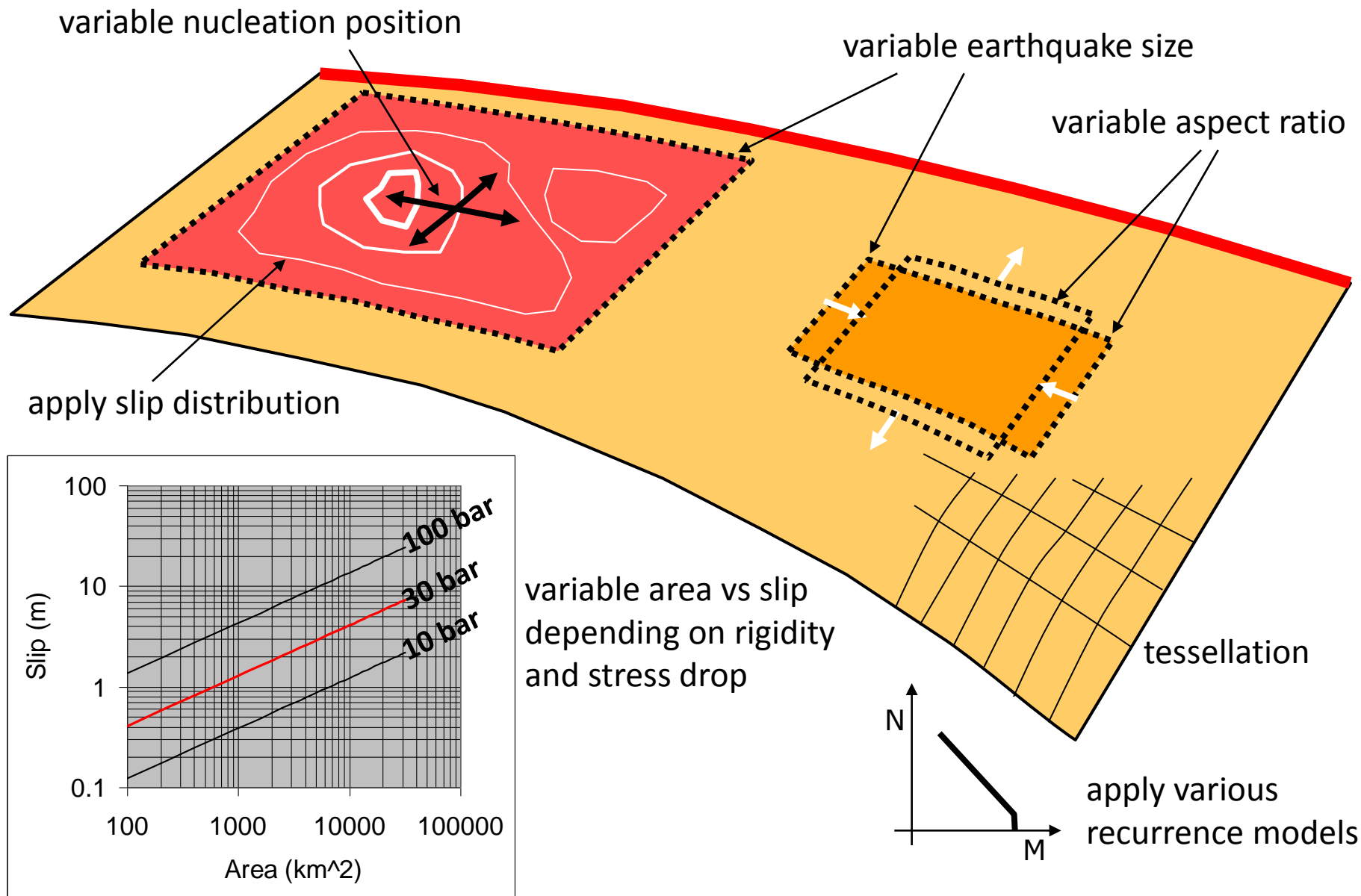
Burrato et al., 2003, AoG



Burrato et al., 2012, AoG

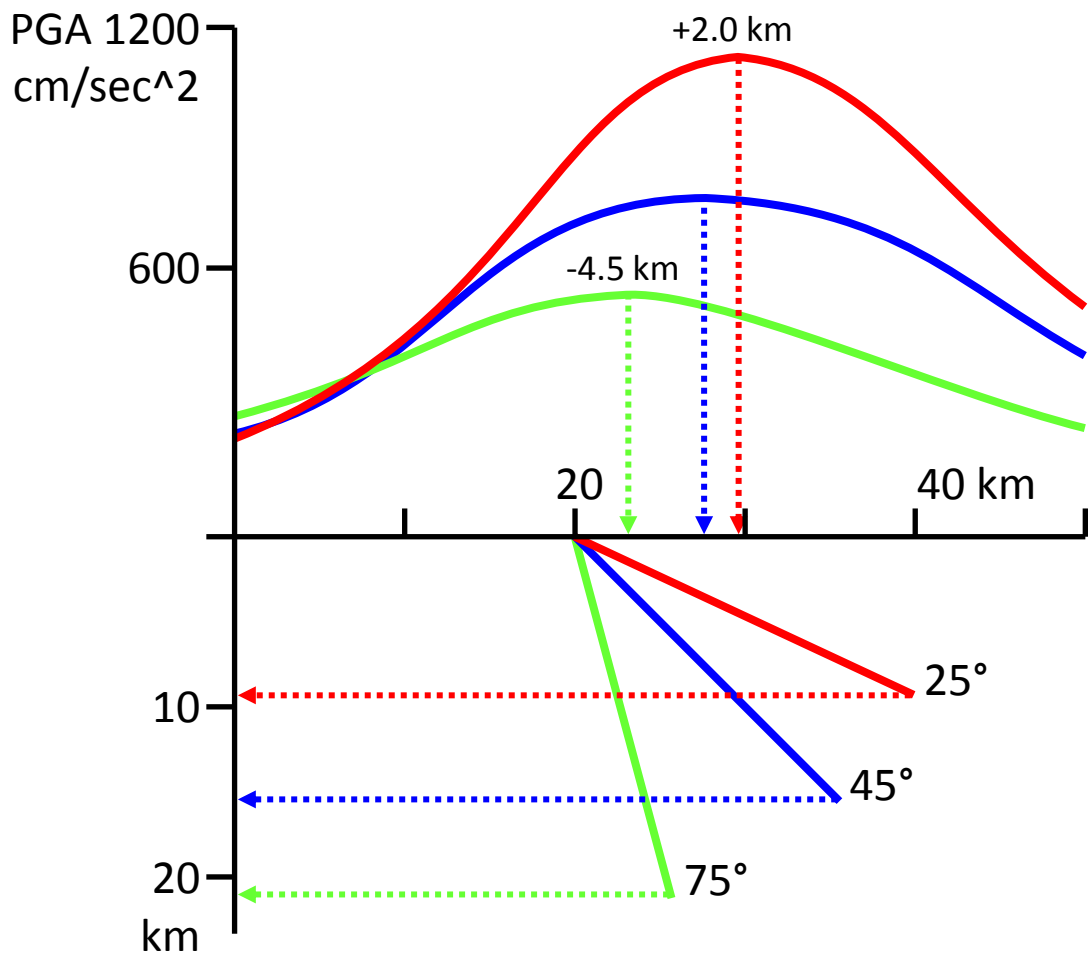


# Concetti fondamentali: come si usano le faglie sismogenetiche



# Concetti fondamentali: importanza della terza dimensione

## Effect of dip angle uncertainty: Ground Motion



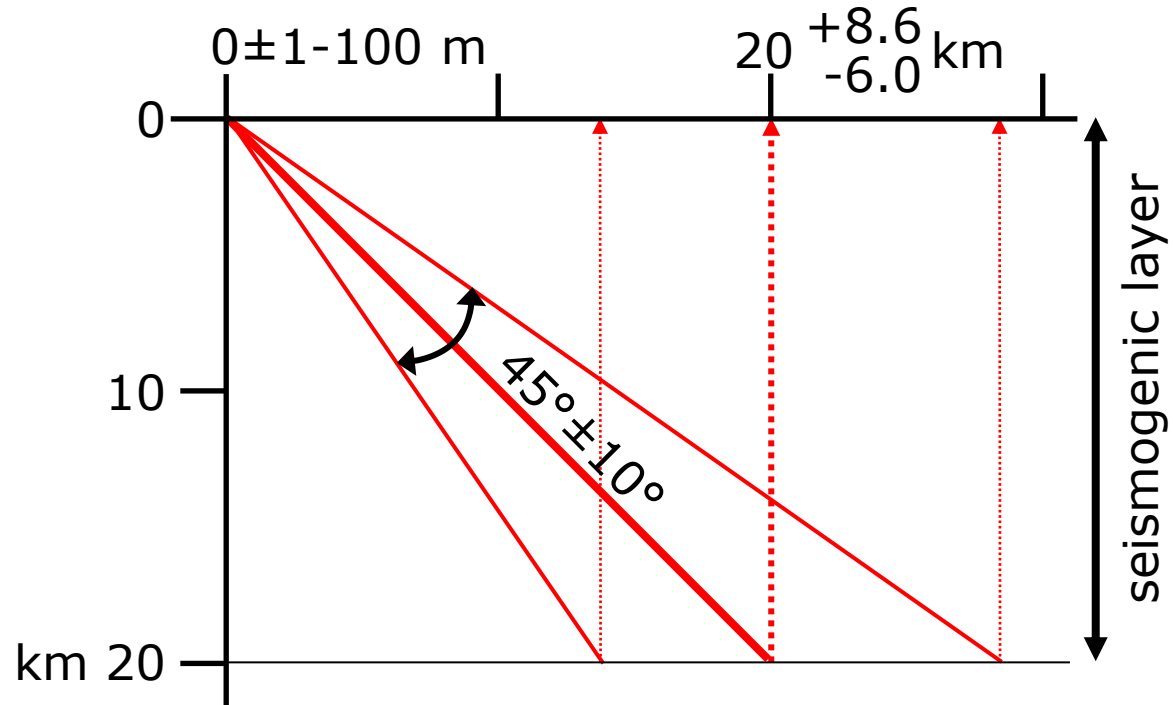
Fault: L=47 km; W=22 km; Mw 7.1



# Concetti fondamentali: importanza della terza dimensione

## Effect of dip angle uncertainty: Geometry

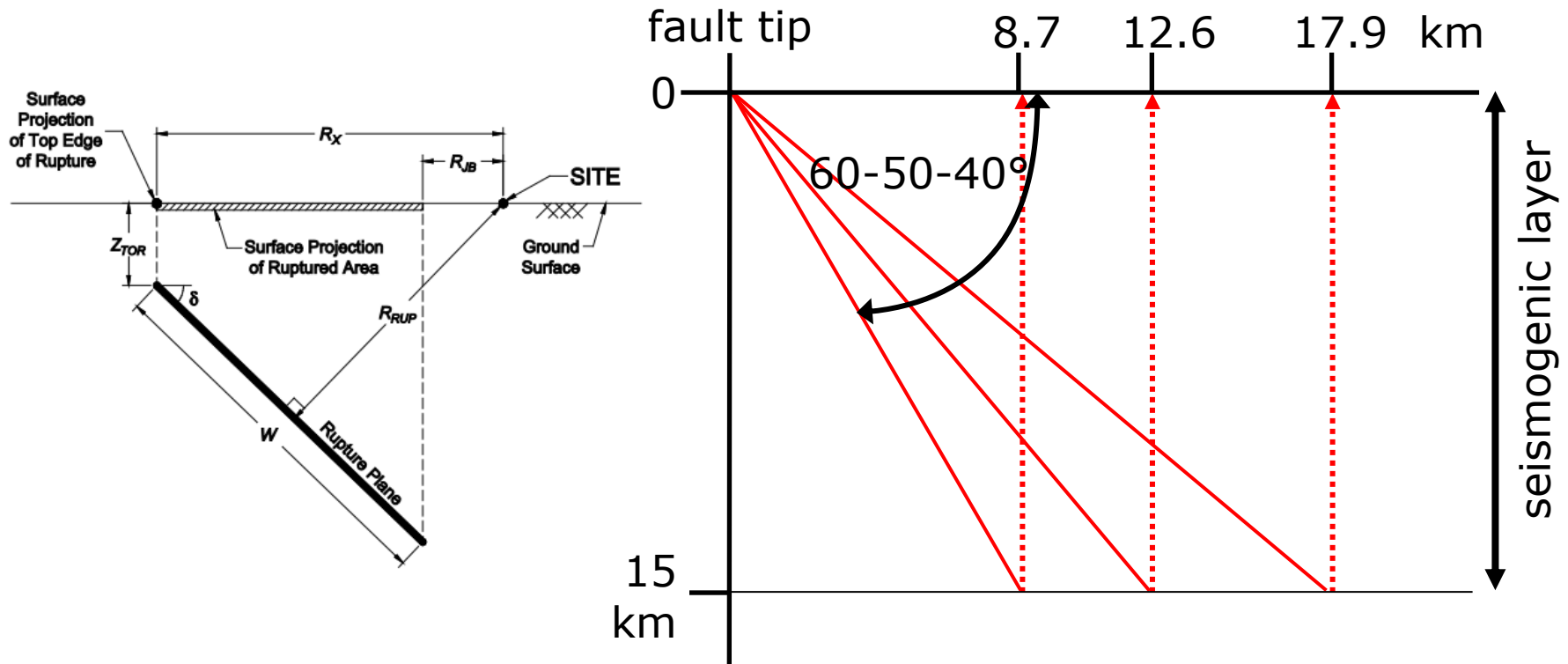
Dip angle uncertainties affect fault-distance metrics in GMPes and activity rates



Dip (deg)	HW (km)	HWErr (km)	DDW (km)	DDWErr (km)	Mw	MwErr
55	14.0	-6.0	24.4	-3.9	7.2	-0.1
45	20.0	0.0	28.3	0.0	7.3	0.0
35	28.6	8.6	34.9	6.6	7.5	0.2

# Concetti fondamentali: importanza della terza dimensione

## Effect of dip angle uncertainty: Fault-site distance



$$Z_{TOR} = 0$$

$$R_{JB} = +5.3 \text{ or } -3.9$$

$$R_{RUP} = +2.5 \text{ or } -2.0$$

Open-File Report 2008-1128

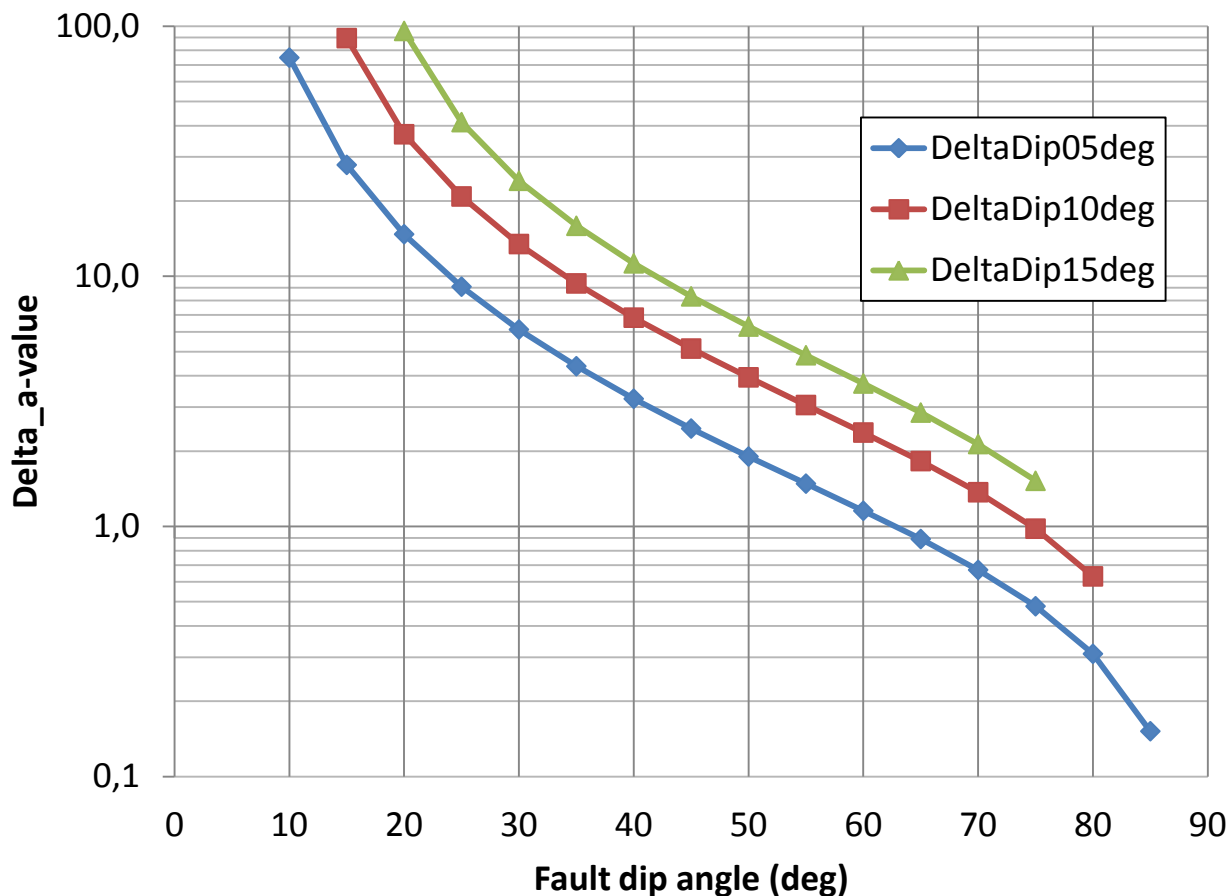
Intermountain West

Allowed for distribution of dips on normal faults (40°, 50°, and 60° with 0.2, 0.6, 0.2 weights, see Appendix G) as recommended by Western States Seismic Policy Council

# Concetti fondamentali: importanza della terza dimensione

*Effect of dip angle uncertainty: Activity Rates*

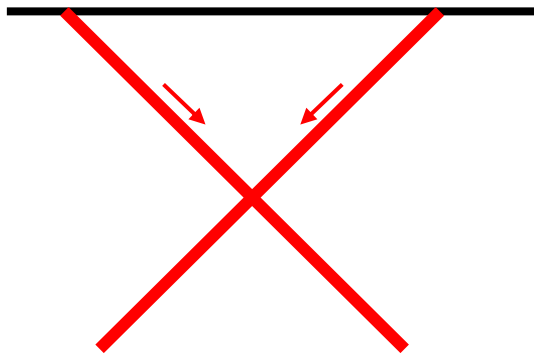
**Z=15km; L=100km; SR=1mm/y;  
Mt=5.5; Mmax=7.5; b-value=1; years=1000**



# Concetti fondamentali: importanza della terza dimensione

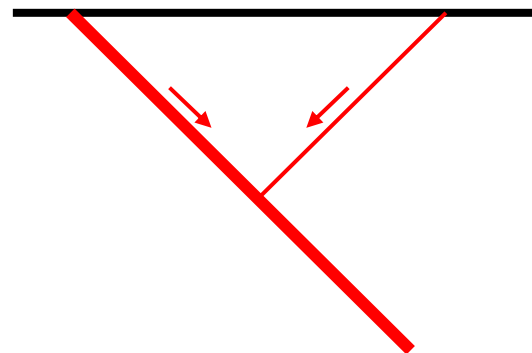
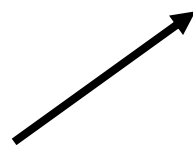
## Effect of dip angle uncertainty: Geometry

cross-cutting faults are mechanically unrealistic

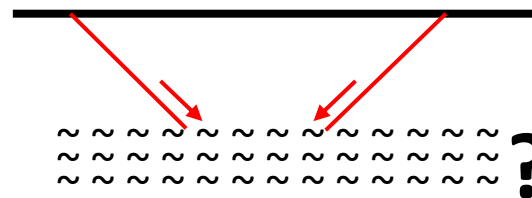


if the case is not treated this may lead to double the activity rates thereby overcooking the hazard

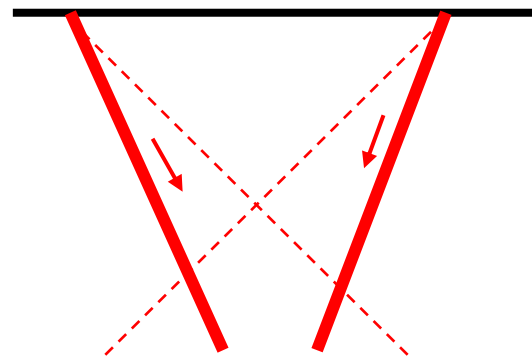
the fault system is partly a secondary structure



the fault system is shallower than thought



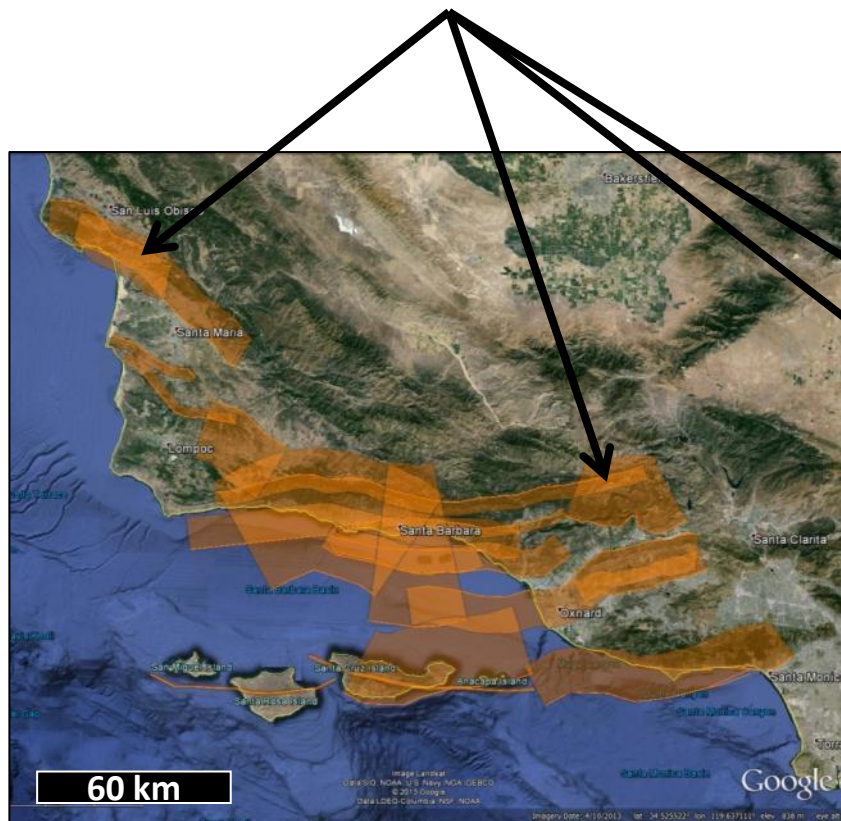
the fault system dip angles are steeper than thought



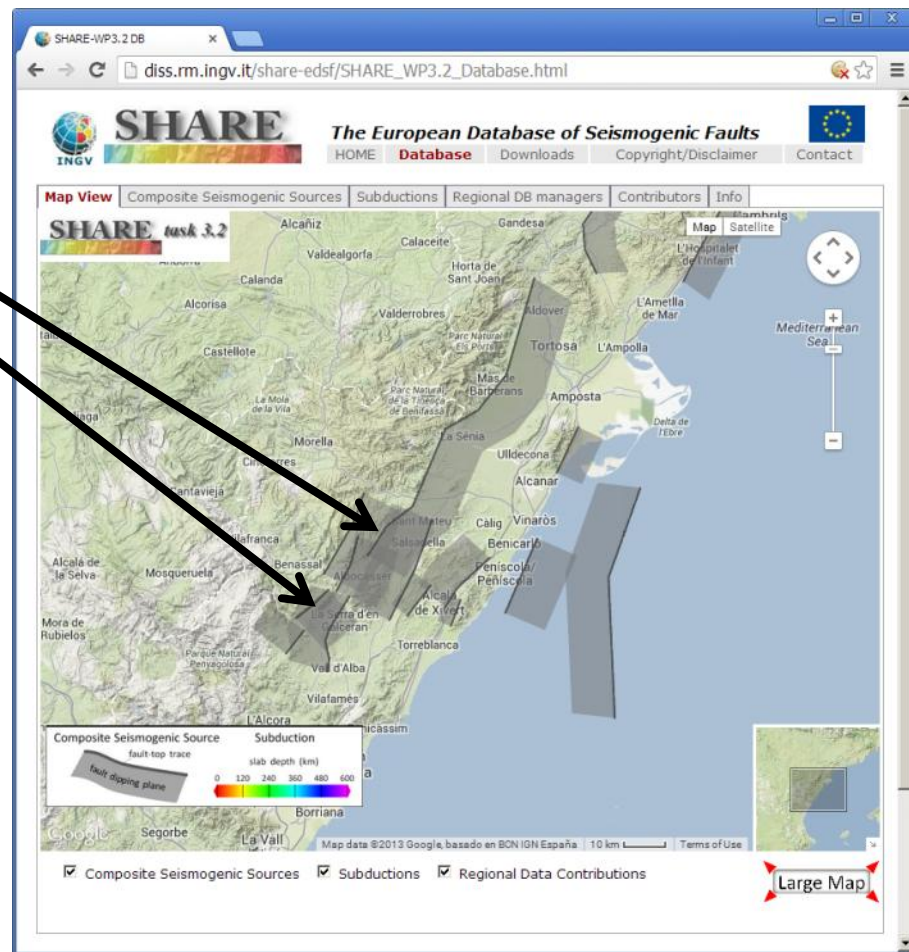


# Concetti fondamentali: importanza della terza dimensione

Zone di sovrastima del tasso di attività



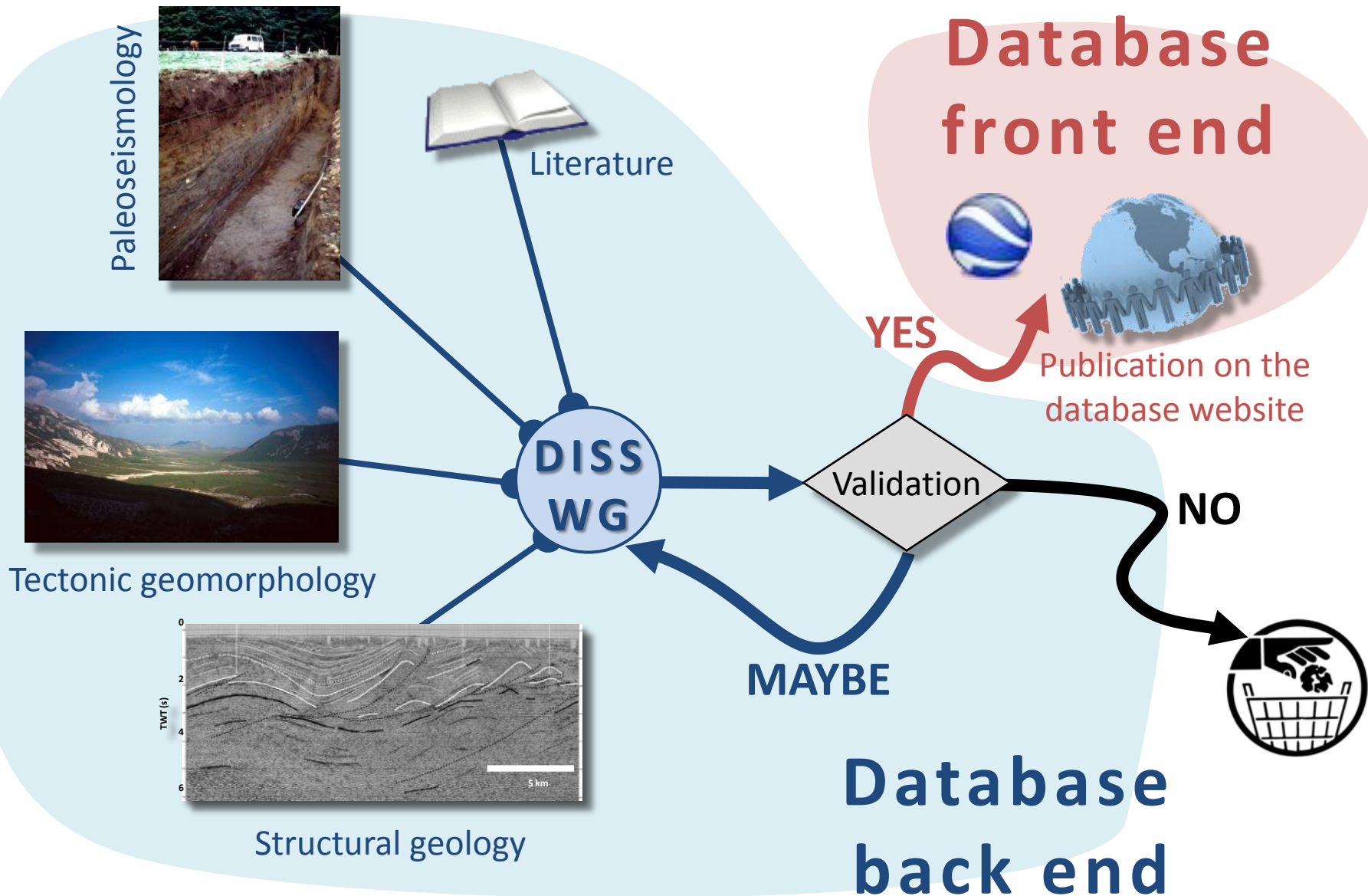
California: fonte UCERF -> USGS



Spagna: fonte QAFI -> SHARE



# DISS: struttura e contenuti <<http://diss.rm.ingv.it/diss/>>



## DISS: struttura e contenuti <<http://diss.rm.ingv.it/diss/>>

The database **FRONT-END** (Web GIS, Google Earth) contains four main layers in common with the BACK-END:

- *Individual Seismogenic Sources*
- *Composite Seismogenic Sources*
- *Debated Seismogenic Sources*
- *Subductions*

Each record of the DATABASE is formed by:

1. a geographic feature;
2. a set of alphanumeric attributes;
3. optional geographic features with attributes (active fault traces and active fold axes);
4. a commentary;
5. a set of pictures, each supplemented by a title and a caption;
6. a list of pertinent references.

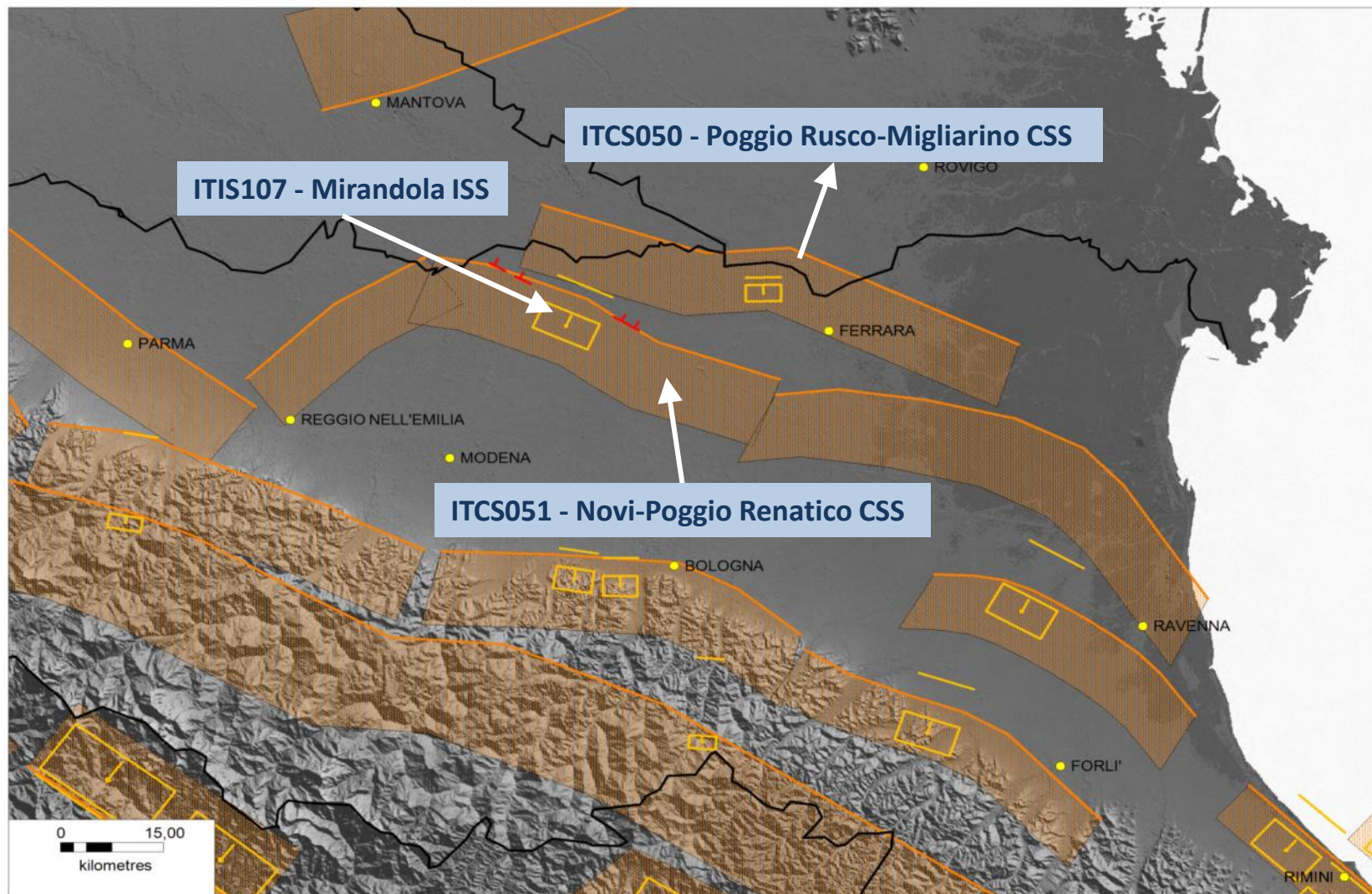
The database **BACK-END** (desktop GIS) contains all support data that are used for constraining the fault sources model:

- *Compilations of active faults traces and tectonic structures*
- *Paleoseismological point data*
- *Borehole breakouts and focal mechanisms*
- *Oil-exploration wells*
- *Geological sections and seismic profiles*
- *Scientific papers, technical reports, theses, original work, georeferenced raster maps and sections, vector data, etc.*



# DISS: esempio di navigazione <<http://diss.rm.ingv.it/diss/>>

*Sorgenti individuali e sorgenti composite in Pianura Padana*



# DISS: esempio di navigazione <http://diss.rm.ingv.it/diss/>

## Esempio di un record completo del database: la sorgente individuale di Mirandola, ITIS107

GENERAL INFORMATION			
DISS-ID	ITIS107	Name	Mirandola
Compiled By	Burrato, P., E. Carminati, C. Dogliani and D. Scrocca	Latest Update	19-Sep-2007
Display map ...			

PARAMETRIC INFORMATION			
Location [Lat/Lon]	44.84 / 11.14	OD	Based on geological and geomorphological observations.
Length [km]	8.7	OD	Based on geological and geomorphological observations.
Width [km]	5.8	OD	Based on geological and geomorphological observations.
Min depth [km]	3.9	LD	Based on geological and seismological data.
Max depth [km]	7.6	LD	Based on geological and seismological data.
Strike [deg]	113	OD	Based on geological and geomorphological observations.
Dip [deg]	40	LD	Based on surface displacement modeling constrained by subsurface data.
Rake [deg]	90	EJ	Inferred from geological data, constrained by orientation of T axes.
Slip [m]	0.45	ER	Calculated from Mo using the relationship from Hanks and Kanamori (1979).
Slip rate [mm/y] min...max	0.25...0.5	OD	Based on growth strata analysis.
Recurrence [y] min...max	900...1800	EJ	Inferred from slip rate and average displacement.
Magnitude [Mw]	5.9	ER	Inferred from slip rate and average displacement.

LD=LITERATURE DATA; OD=ORIGINAL DATA; ER=EMPIRICAL RELATIONSHIP; AR=ANALYTICAL RELATIONSHIP; EJ=EXPERT JUDGEMENT.

INFORMATION ABOUT THE ASSOCIATED EARTHQUAKES		
Latest Earthquake	Unknown	See "Commentary" for information.
Penultimate Earthquake	Unknown	See "Commentary" for information.
Elapsed Time [y]	-9999	See "Commentary" for information.

ACTIVE FAULTS		
ID	NAME	REFERENCES
78	Mirandola	Castaldini et al. [1979]
79	Canalazzo di Finale Emilia	Castaldini et al. [1979]
80	Concordia	Castaldini et al. [1979]

COMMENTARY	
COMMENTS	SUMMARIES
<p>We propose the existence of the Mirandola Source based on the recent tectonic activity of the buried Ferrara Arc, highlighted by thrusting exerted on the evolution of the drainage network and by the geomorphological growth strata.</p> <p>In the area located between the Pedo-Apenninic Thrust front and fronts of the Northern Apennines an active compressional tectonic structure is documented by borehole breakout data with N-S oriented maximum focal mechanism and GPS data.</p> <p>The Pedo-Apenninic Thrust Front is traditionally considered an active sequence thrust of the Northern Apennines belt, with a continuous Apennines foot-hills defined by geologic and geomorphic evidence (Boccaletti et al., 2004). However, recent papers proposed that the feature of the Pedo-Apennines foot-hills is not the expression of a shallow thrust fault (Picotti and Pazzaglia, 2008). According to this model the regional deformation would be taken by a deep, blind thrust responsible of the large scale geomorphology of the Northern Apennines.</p> <p>The ongoing activity of the more external Northern Apennines thrust in the plain is still a matter of debate, probably due to the unfavorable tectonic activity (expressed as vertical deformation due to anticlines) and the rates of sedimentation. As a consequence, geophysical and geological subsurface data are able to show the existence of the buried structures.</p> <p>Besides, in the Po Plain differential compaction of unconsolidated sediments mimicks the vertical tectonic movements induced by thrust activity and relative sinclinal subsidence and anticlinal uplift.</p> <p>The geometry of the Mirandola Source and its kinematics were determined by a combined study that used the modeling of drainage anomalies and high-resolution stratigraphic data (Ciucci et al., 2002; Burrato et al., 2007).</p> <p>In particular, activity of the Mirandola Source was responsible for the sinclinal and diversion around the anticline of the Secchia and Panaro rivers, whose paleo-courses show consistent evolution with migration areas of relative subsidence. The use of high resolution stratigraphic data highlighted the geometry of growth strata in the sinclinal strata, and calculated the relative uplift rates of the growing anticline during the Quaternary, obtaining 0.16 mm/a of relative uplift rate for the last 10,000 years.</p> <p>We propose the following geometrical parameters for the source: the strike (N113°) is chosen according to the local strike of the Ferrara Arc; the fault dips 40° towards the South, according to subsurface geology; the rake is assumed to be 90° (pure thrusting), based on considerations constrained by modeling of the drainage anomalies; the width is obtained by seismic profiles and is also constrained by the modeling of drainage anomalies; the minimum and maximum depth (3.9 and 7.6 km) are constrained by subsurface geology; the length (8.7 km) is obtained by modeling of the drainage anomalies.</p>	<p>Castaldini et al. (1979)</p> <p>In the framework of a reconstruction of neotectonic events, these workers examine the evolution of the drainage system of this reach of the Po Plain. The analysis considers the full length of the Holocene but special emphasis is given to the past three thousand years of progressive shift and sudden diversions of the main streams of the area. In particular, Castaldini et al. (1979) point out that the Secchia and Panaro rivers are first attracted towards each other and towards the axis of the so-called Bologna-Bomporto-Reggio Emilia syncline, then pushed sideways respectively towards the NW and E as they cross the alignment Carpi-Crevalcore. Castaldini et al. (1979) also describe important diversions that occurred after the VIII century B.C., particularly affecting the Po river turning North at Guastalla ("rotta di Guastalla"), the Secchia river turning East just North of Modena, and again the Secchia river turning northwest a few km South of Mirandola. Finally, Castaldini et al. (1979) describe surface faults in the area Mirandola-Concordia based on correlations of the stratigraphy of water wells, in the area of Canalazzo di Finale Emilia based on observations of open ground cracks aligned along a WNW trend, and near Correggio based on observations of fractures in walls and road pavements. This last fault is also shown in satellite imagery.</p> <p>Veggiani (1985)</p> <p>In the context of a reconstruction of paleo-channels of the Po river and of its main tributaries, this worker proposes a scheme for the evolution of the Secchia, Panaro, Crostolo and Reno rivers during the past 3,000 years. In particular, Veggiani (1985) proposes a dated sequence of progressive shifts of the Secchia and Panaro rivers up to their present position.</p> <p>Cassano et al. (1986)</p> <p>These investigators provide a comprehensive summary of subsurface and surface data along several transects crossing the Po Plain from the Southwest to the Northeast. Their interpretation of Section 9 shows a major anticline driven by a low-angle north-verging blind thrust culminating between Mirandola and Medola.</p> <p>Burrato et al. (2003)</p> <p>These workers analyse in detail the fluvial system of the Po Plain and identify several areas where significant drainage anomalies (e.g., river diversions and shifts in channel patterns) with wave-length comparable to that of tectonic structures of crustal significance are suggestive of the presence of active blind thrust or reverse faults. As second step of their approach the authors compare the position of the drainage anomalies with the location of known buried anticlines, to corroborate the hypothesis of the tectonic nature of the anomalies. Following the observation that some of the anomalies are associated also with historical earthquakes, they propose that these blind thrusts may be potential sources of rather infrequent large earthquakes beneath the Po Plain. Burrato et al show that the Secchio and Panaro rivers exhibit significant anomalies in their trend as they cross an anticline reported in the official geological map. They interpret the fluvial anomaly as having tectonic origin.</p>



# DISS: esempio di navigazione <<http://diss.rm.ingv.it/diss/>>

Esempio di un record completo del database: la sorgente individuale di Mirandola, ITIS107

## PICTURES

TITLE	VIEW
Paleochannels of Panaro and Secchia rivers	
Surface ruptures associated with anticline	
Depth of fresh water-salt water interface	
Cross-section across Mirandola anticline	
Vertical movements in Mirandola region	
Paleochannels of Po River and main tributaries	
Geologic cross-section across Mirandola anticline	

## REFERENCES

Argnani, A., G. Barbacini, M. Bernini, F. Camurri, M. Ghielmi, G. Papani, F. Rizzini, S. Rogledi and L. Torelli 2003 Gravity tectonics driven by Quaternary uplift in the Northern Apennines: insights from the La Spezia-Reggio Emilia geotranssect. *Quatern. Int.*, 101-102, 13-26.

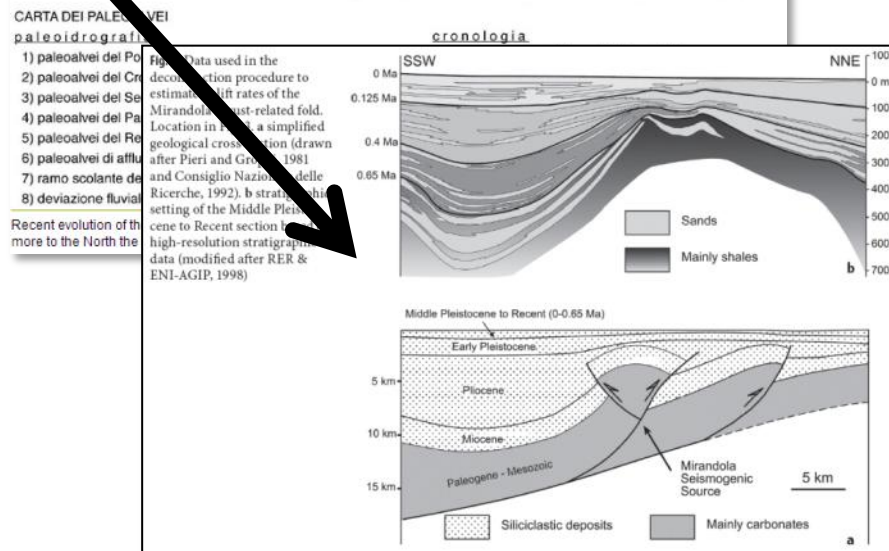
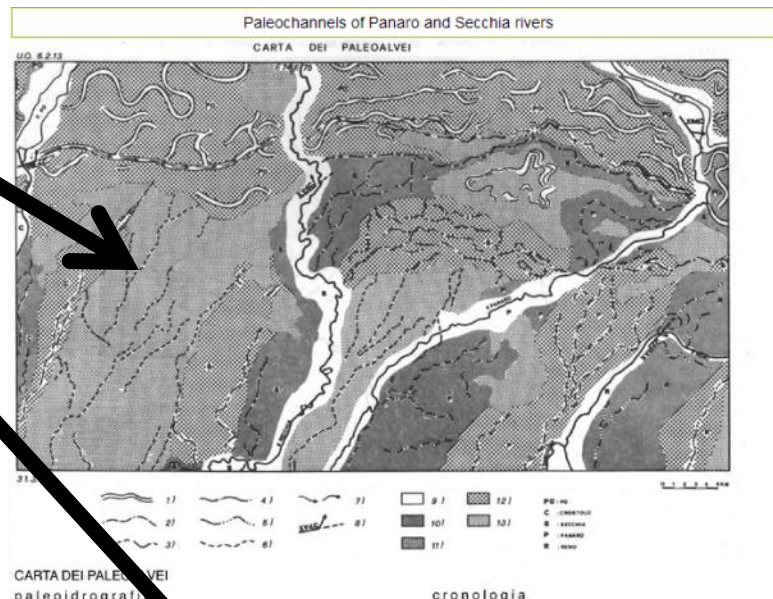
Barozzi, P., and L. Colombi 1992 Profilo CROP-01/01A, sezioni sismiche e geologiche e ipotesi di tracciato del profilo nella Pianura Padana. in: R. Capozzi and A. Castellarin (eds), *Studi preliminari all'acquisizione dati del profilo CROP 1-1A La Spezia-Alpi Orientali*. Studi Geologici Camerti, spec. vol. 92/2, 161-170.

Bonori, O., M. Ciabatti, S. Cremonini, R. Di Giovambattista, G. Martinelli, S. Maurizzi, G. Quadri, E. Rabbi, P. V. Righi, S. Tinti and E. Zantedeschi 2000 Geochemical and geophysical monitoring in tectonically active areas of the Po Valley (Northern Italy). Case histories linked to gas emission structures. *Geogr. Fis. Din. Quat.*, 23, 3-20.

Burrato, P., F. Ciucci and G. Valensise 1999 Un approccio geomorfologico per la prima individuazione di strutture potenzialmente sismogenetiche nella Pianura Padana. Proc. 18<sup>o</sup> Meeting G.N.G.T.S., Rome November 9-11, 1999.

Burrato, P., F. Ciucci and G. Valensise 2002 Is the Po Plain a low seismic hazard region? XXVIII General Assembly of the European Seismological Commission - Genoa, Italy 1-6 September 2002, Book of Abstracts, 45-46.

Burrato, P., F. Ciucci and G. Valensise 2003 An inventory of river anomalies in



# DISS: esempio di navigazione <<http://diss.rm.ingv.it/diss/>>

*Esempi di sorgenti composite: informazioni generali e parametriche, ITCS050 e ITCS051*

## GENERAL INFORMATION

DISS-ID	ITCS050	Name	Poggio Rusco-Migliarino
Compiled By	Burrato, P., and S. Mariano	Latest Update	07-Sep-2007
Display map ...			

## PARAMETRIC INFORMATION

Min depth [Km]	1.0	OD	Based on geological data from various authors.
Max depth [km]	8.0	OD	Based on geological data from various authors.
Strike [deg] min...max	85...115	OD	Based on geological data from various authors.
Dip [deg] min...max	25...55	OD	Based on geological data from various authors.
Rake [deg] min...max	80...100	OD	Based on geological data from various authors.
Slip Rate [mm/y] min...max	0.1...0.5	EJ	Derived from geological data concerning adjacent structures.
Max Magnitude	5.5	OD	Based on the strongest earthquake occurred in the region.

LD=LITERATURE DATA; OD=ORIGINAL DATA; ER=EMPIRICAL RELATIONSHIP; AR=ANALYTICAL RELATIONSHIP; EJ=EXPERT JUDGEMENT;

## GENERAL INFORMATION

DISS-ID	ITCS051	Name	Novi-Poggio Renatico
Compiled By	Burrato, P., and S. Mariano	Latest Update	30-Aug-2007
Display map ...			

## PARAMETRIC INFORMATION

Min depth [Km]	3.0	OD	Based on geological data from various authors.
Max depth [km]	10.0	OD	Based on macroseismic and geological data from various authors.
Strike [deg] min...max	95...125	OD	Based on geological data from various authors.
Dip [deg] min...max	25...45	OD	Based on geological data from various authors.
Rake [deg] min...max	80...100	OD	Based on geological data from various authors.
Slip Rate [mm/y] min...max	0.25...0.5	OD	Based on geological data from Scrocca et al. (2007).
Max Magnitude	5.9	OD	Derived from maximum magnitude of associated individual source(s).

LD=LITERATURE DATA; OD=ORIGINAL DATA; ER=EMPIRICAL RELATIONSHIP; AR=ANALYTICAL RELATIONSHIP; EJ=EXPERT JUDGEMENT;

# EDSF: struttura e contenuti <<http://diss.rm.ingv.it/share-edsf/>>

<http://www.share-eu.org/>

Banca dati delle faglie sismogenetiche

Mappe di pericolosità

**SHARE** The European Database of Seismogenic Faults

The European Database of Seismogenic Faults (EDSF) was compiled in the framework of the EU Project SHARE, Work Package 3, Task 3.2. EDSF includes only faults that are deemed to be capable of generating earthquakes of magnitude equal to or larger than 5.5 and aims at ensuring a homogenous input for use in ground-shaking hazard assessment in the Euro-Mediterranean area. Several research institutions participated in this effort with the contribution of many scientists (see the Database section for a full list). The EDSF database and website are hosted and maintained by INGV.

Database compilation progression - Version 3, May 2012: 1,128 records for ~63,775 km of crustal faults + 3 subductions

**Citation:**  
Basili R., Kastelic V., Demiroglu M. B., Garcia Moreno D., Nemser E. S., Patricca P., Sboras S. P., Besana-Ostman G. M., Cabral J., Carnealbeck T., Caputo R., Dancu L., Domec H., Fomasev J., Garcia-Mayordomo J., Giardini D., Glavacovic B., Gulen L., Ince Y., Pavlidis S., Seeshan K., Tarabusi G., Tiberti M., Utku M., Valensise G., Vanhete K., Vilanova S., Wössner J. (2013). The European Database of Seismogenic Faults (EDSF) compiled in the framework of the Project SHARE. <http://diss.rm.ingv.it/share-edsf/>. doi:10.6092/INGV.IT-SHARE-EDSF.

This project was supported by

European Commission SHARE | Work Package 3 | Task 3.2 Seismic Hazard Harmonization in Europe Seventh Framework Programme (FP7) Grant Agreement No.226749 1 June 2009 - 31 May 2012

Basili et al. (2013; doi:10.6092/INGV.IT-SHARE-EDSF)

**SHARE** SEISMIC HAZARD HARMONIZATION IN EUROPE

**Project Scope**  
SHARE is a Collaborative Project within the Cooperation programme of the Seventh Framework Program of the European Commission. SHARE's main objective is to provide a community-based seismic hazard model for the Euro-Mediterranean region with update mechanisms. The project aims to establish new standards for Probabilistic Seismic Hazard Assessment (PSHA) practice by a close cooperation of leading European geologists, seismologists and engineers.

**Project Status**  
SHARE successfully delivered a Euro-Mediterranean wide probabilistic seismic hazard assessment across multiple disciplines spanning from geology to seismology and earthquake engineering. The project built a framework for integration across national borders, compiled relevant earthquake and fault data, and developed a sustainable high-impact authoritative community-based hazard model assembled by seeking external expert elicitation and participation through multiple community feedback procedures.

**Project Achievements**  
SHARE produced more than sixty time-independent European Seismic Hazard Maps (ESHMs) spanning spectral ordinates from PGA to 10 seconds at from  $10^2$  to  $10^4$  yearly probability. The hazard values vary from 0.01 to 0.1 g. SHARE models earthquakes as finite magnitude  $M_{max}$  4.5 in the computation of hazard value weighting scheme that reflects the importance of the impact horizon, thus emphasizing the geologic knowledge for probabilistic hazard assessment for shorter ones.

The slideshow highlights some key results including Euro-Mediterranean Seismic Hazard Maps.

**Highlights**  
Data and Result release:  
SHARE releases data and results via the Portal of European Facility for Earthquake Hazard and Risk (EFEHR). Access at [www.efehr.org](http://www.efehr.org).

**Final Report:**  
SHARE has successfully delivered its final report. Please find a short summary here.

For questions and comments please contact Project Manager Dr. J. Wössner

**EFEHR** EUROPEAN FACILITY FOR EARTHQUAKE HAZARD AND RISK

**EFEHR - SHARE Portal home**  
SHARE Model Documentation  
Portal Usage Tutorials  
Browse Hazard Results  
Download Data  
Data Licence

**Portal Under Construction**  
Capabilities and functionalities are under construction! Revisiting frequently may serve you with updated information. For questions write to [share@sed.ethz.ch](mailto:share@sed.ethz.ch).

**Euro-Mediterranean Seismic Hazard Mapping**  
The Euro-Mediterranean Seismic Hazard Maps (ESHMs) update previous efforts on the European level and are based on the current information about earthquake rates and active faults incorporating the latest research results. The ESHMs provide basic information to mitigate earthquake risk as engineers can use the updated estimates together with modern seismic design provisions to construct buildings, bridges, and other infrastructures to withstand earthquake shaking, thus saving lives and economic losses. These maps can also make a difference for each individual to better understand the hazard at their homes and work places and to prepare for the unexpected. People may also use these maps to investigate whether earthquake insurance is an option to take, in case this is not required by their government.

**Seismic Hazard Portal Content**  
The Seismic Hazard Portal currently provides access to input data and time-independent hazard results produced within the EU-FP7 project "Seismic Hazard Harmonization in Europe".

**Seismic Hazard Map**  
10% Exceedance Probability in 50 years

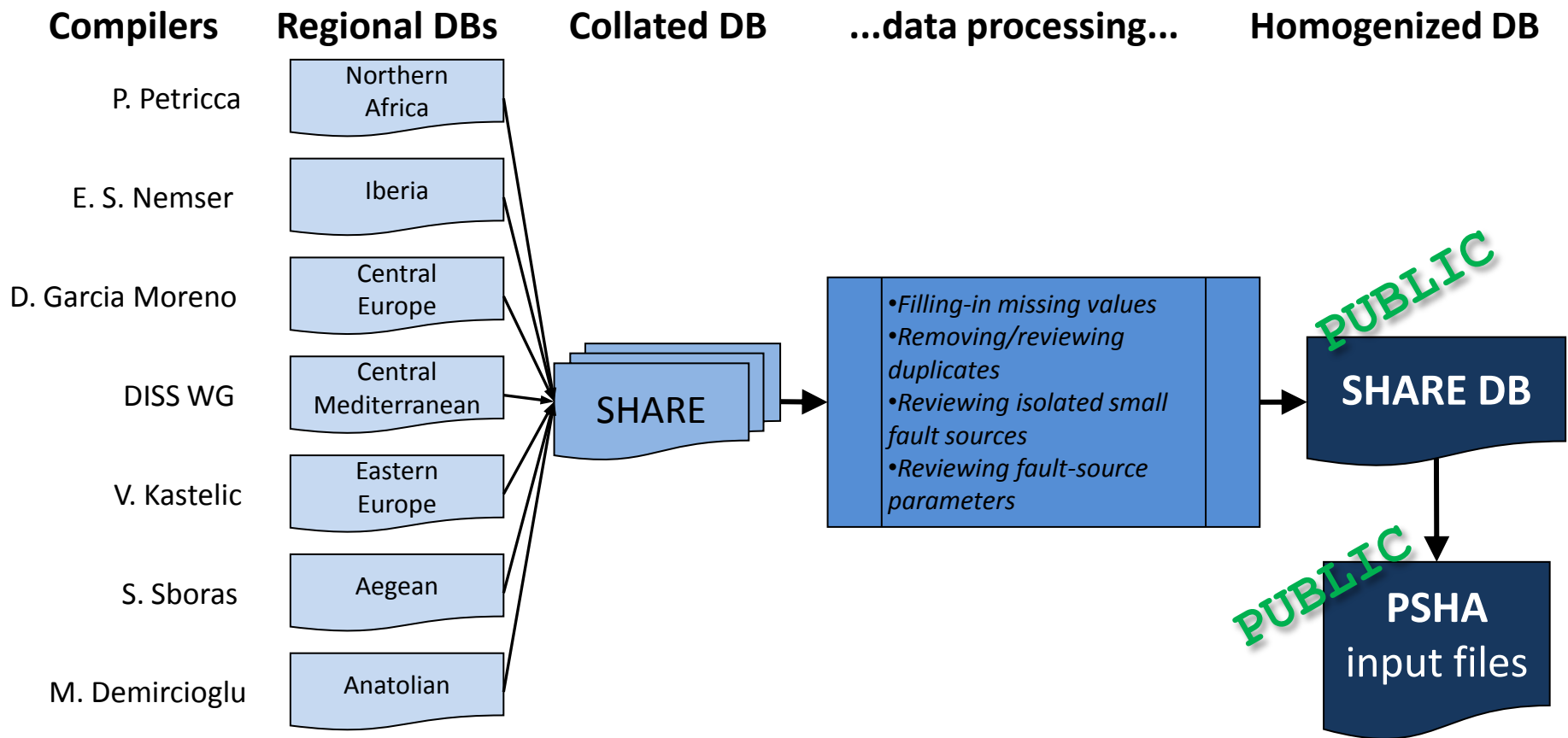
The primary results are the Euro-Mediterranean Seismic Hazard Maps, one example is displayed above. This map depicts the 10% exceedance probability that a peak ground acceleration of a certain fraction of the gravitational acceleration  $g$  is observed within the next 50 years. The color code ranges from 0.0-0.5g and is saturated. In less technical words, the map shows that lower ground motions are

Giardini et al. (2013; doi:10.12686/SED-00000001-SHARE)





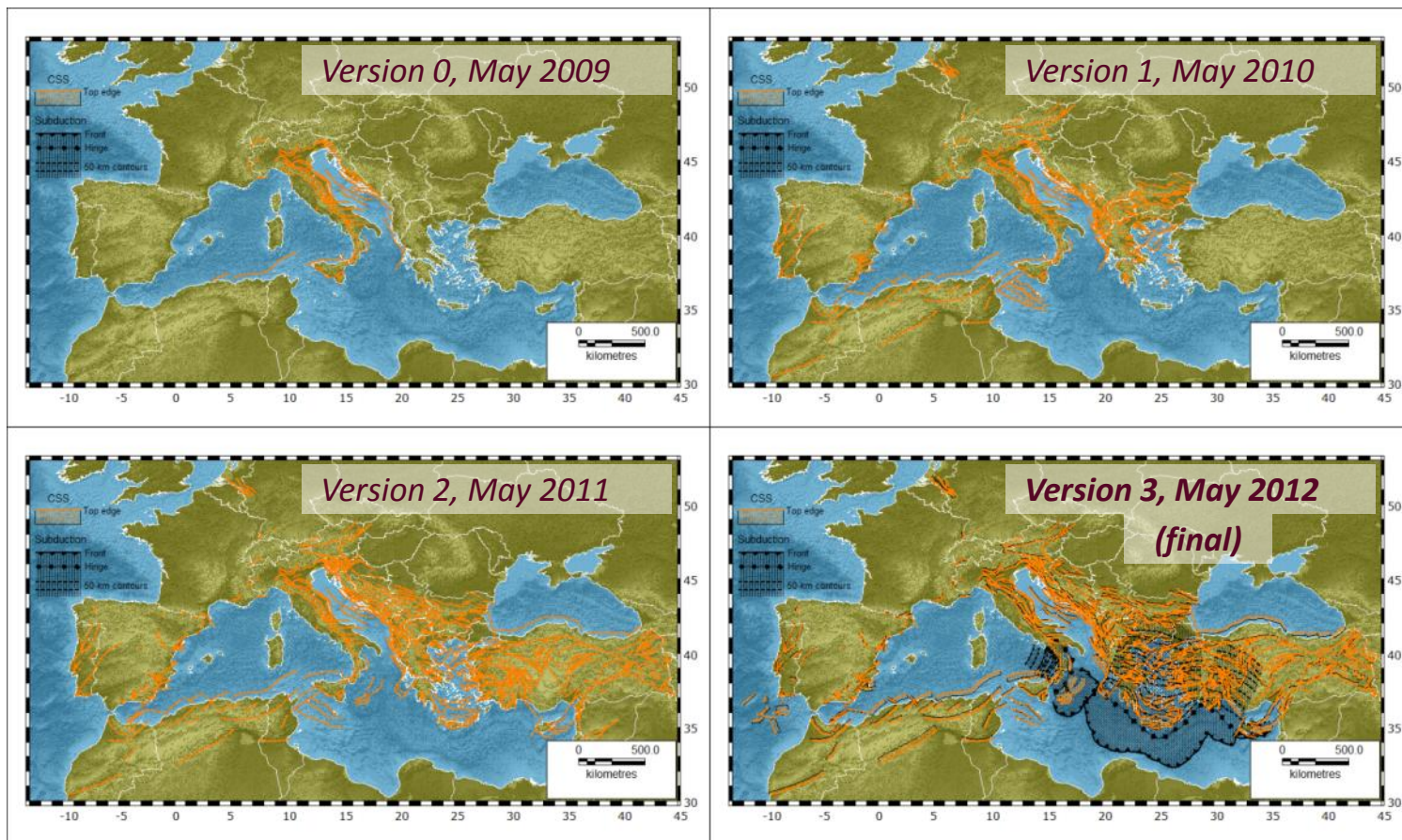
# EDSF: struttura e contenuti <<http://diss.rm.ingv.it/share-edsf/>>



**Contributors:** 109 scientists from 49 different institutions plus a number of regional initiatives from DISS WG (Italy), EMME Project (Turkey), GreDASS (Greece), QAFI (Spain and Portugal)

# EDSF: struttura e contenuti <<http://diss.rm.ingv.it/share-edsf/>>

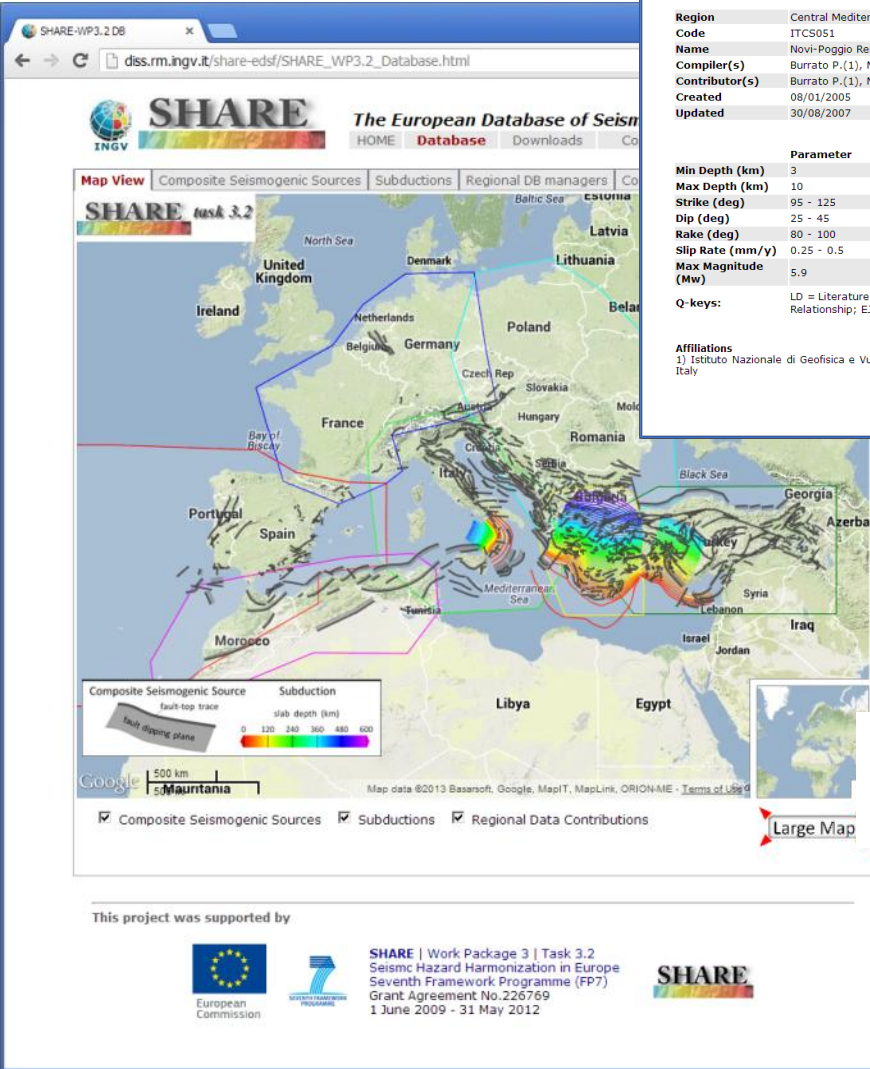
## Database compilation progression



1,128 records for ~63,775 km of crustal faults + 3 subductions

# EDSF: esempio di navigazione <http://diss.rm.ingv.it/share-edsf/>

Composite fault source (crustal)



SHARE The European Database of Seismogenic Faults

Source Info Summary

General information

Region: Central Mediterranean  
Code: ITCS051  
Name: Novi-Poggio Renatico  
Compiler(s): Burrato P.(1), Mariano S.(1)  
Contributor(s): Burrato P.(1), Mariano S.(1)  
Created: 08/01/2005  
Updated: 30/08/2007

Parameter	Qual.	Evidence
Min Depth (km)	3	OD Based on geological data
Max Depth (km)	10	OD Based on macroseismic data
Strike (deg)	95 - 125	OD Based on geological data
Dip (deg)	25 - 45	OD Based on geological data
Rake (deg)	80 - 100	OD Based on geological data
Slip Rate (mm/y)	0.25 - 0.5	LD Based on geological data
Max Magnitude (Mw)	5.9	OD Derived from maximum source(s).

Q-keys: LD = Literature Data; OD = Original Data; ER = Earthquake Relationship; EJ = Expert Judgement

Affiliations  
1) Istituto Nazionale di Geofisica e Vulcanologia; Sismologia e Tettonofisica, Roma, Italy

SHARE The European Database of Seismogenic Faults

Source Info Summary

General information

Region: SHARE  
Code: GRSD001  
Name: Hellenic Arc  
Compiler(s): Tiberti M.M.(1)  
Contributor(s): Tiberti M.M.(1), Kastelic V.(1), Basili R.(1)  
Created: 15/02/2011  
Updated: 13/05/2011

Parameter	Qual.	Evidence
Min Seismogenic Depth (km)	15	LD Based on seismological data from various authors.
Max Seismogenic Depth (km)	45	LD Based on seismological data from various authors.
Dip direction	NNE	LD Based on geophysical data from various authors.
Convergence azimuth (deg CW from North)	20-40	LD Based on geodetic data from various authors.
Convergence Rate (mm/y)	23-35	LD Based on geodetic data from various authors.
Max Magnitude (Mw)	8.4	LD Based on the largest associated earthquake according to various authors.

Q-keys: LD = Literature Data; OD = Original Data; ER = Earthquake Relationship; EJ = Expert Judgement

Affiliations  
1) Istituto Nazionale di Geofisica e Vulcanologia, Roma, Italy

Subduction source

SHARE The European Database of Seismogenic Faults

Source Info Summary

References

Number of references: 144

Author	Year	Title	Reference
Agostini, S., C. Doglioni, F. Innocenti, P. Manetti and S. Tonarini	2008	Neogene volcanism and extension in the Western Anatolian-Aegean area: A new geodynamic model.	IOP Conf. Ser.: Earth Environ. Sci., 2, 1, 012008, 10.1088/1755-1307/2/1/012008.
Agostini, S., C. Doglioni, F. Innocenti, P. Manetti and S. Tonarini	2010	On the geodynamics of the Aegean rift.	Tectonophysics, 488, 1-4, 7-21, 10.1016/j.tecto.2009.07.025.
Aksu, A. E., J. Hall and C. Yaltrak	2008	Miocene-Rrecent evolution of the Anaximander Mountains and Finike Basin at the junction of Hellenic and Cyprus Arcs, eastern Mediterranean.	Mar. Geol., 258, 1-4, 24-47, 10.1016/j.margeo.2008.04.008.
Aksu, A. E., J. Hall and C. Yaltrak	2005	Miocene to Recent tectonic evolution of the eastern Mediterranean: New pieces of the old Mediterranean puzzle.	Mar. Geol., 221, 1-4, 1-13, 10.1016/j.margeo.2005.03.014.
Anastasakis, G., and G. Kelling	1991	Cyprus arcs and related geotectonic elements.	Mar. Geol., 97, 3-4, 261-277, 10.1016/0025-3227(91)90120-S.
Baker, C., D. Hatzfeld, H. Lyon-Caen, E. Papadimitriou and A. Rigo	1997	Earthquake mechanisms of the Adriatic Sea and Western Greece: implications for the oceanic subduction-continent collision transition.	Geophys. J. Int., 131, 3, 559-594, 10.1111/j.1365-246X.1997.tb06600.x.
Becker, D., and T. Meier	2010	Seismic Slip Deficit in the Southwestern Forearc of the Hellenic Subduction Zone.	B. Seismol. Soc. Am., 100, 1, 325-342, 10.1785/0120090156.
Becker, D., T. Meier, M. Bohnhoff and H. P. Harjes	2010	Seismicity at the convergent plate boundary offshore Crete, Greece, observed by an amphibian network.	J. Seismol., 14, 2, 369-392, 10.1007/s10950-009-9170-2.
Benetatos, C., A. Kiratzi, C. Papazachos and G. Karakaisis	2004	Focal mechanisms of shallow and intermediate depth earthquakes along the Hellenic Arc.	J. Geodyn., 37, 253-296, Nature Geoscience, 1, 211-212.

