7th EUREGEO

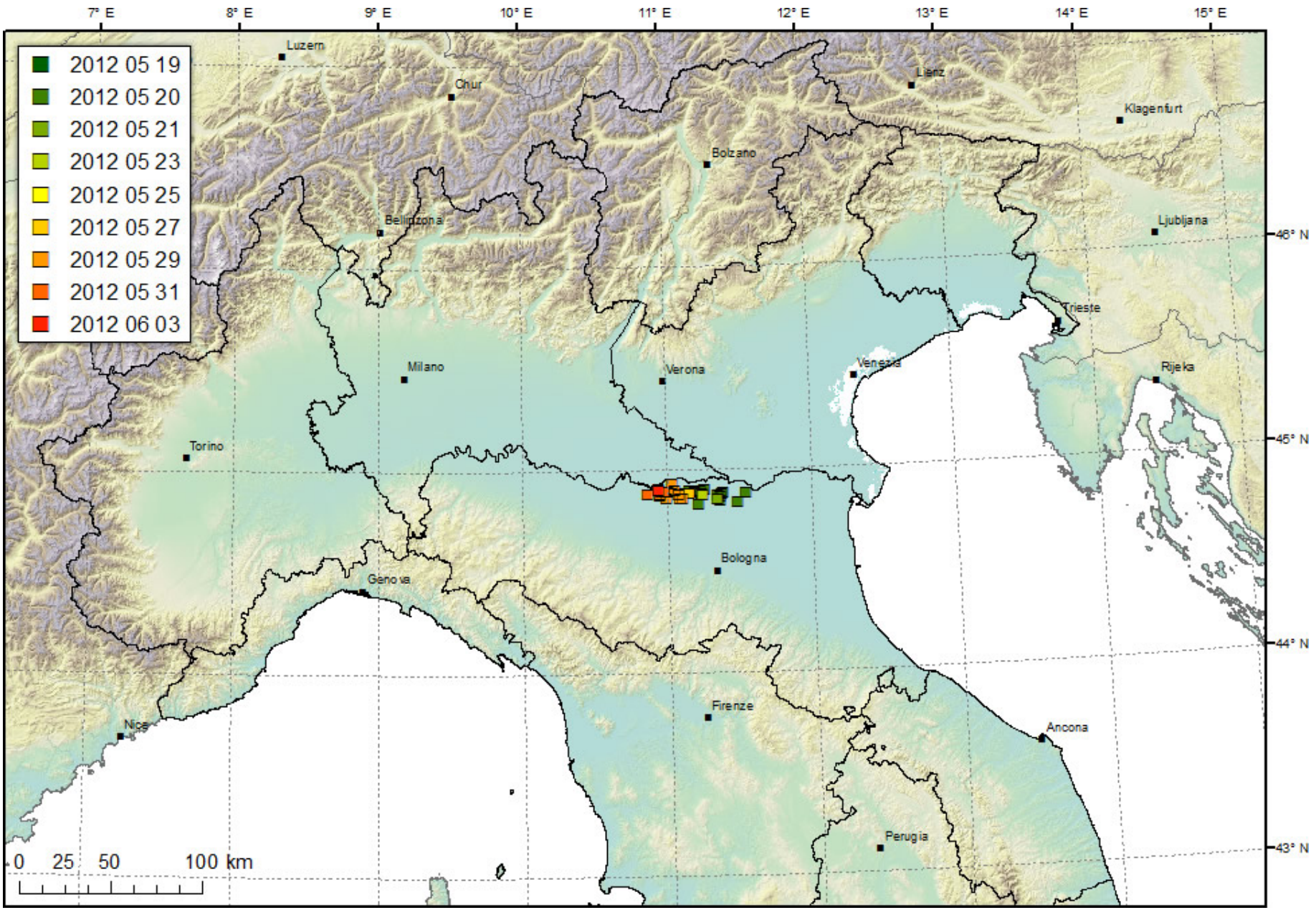
Bologna | Italy | june 12th - 15th 2012

The building up process of a macroseismic intensity database

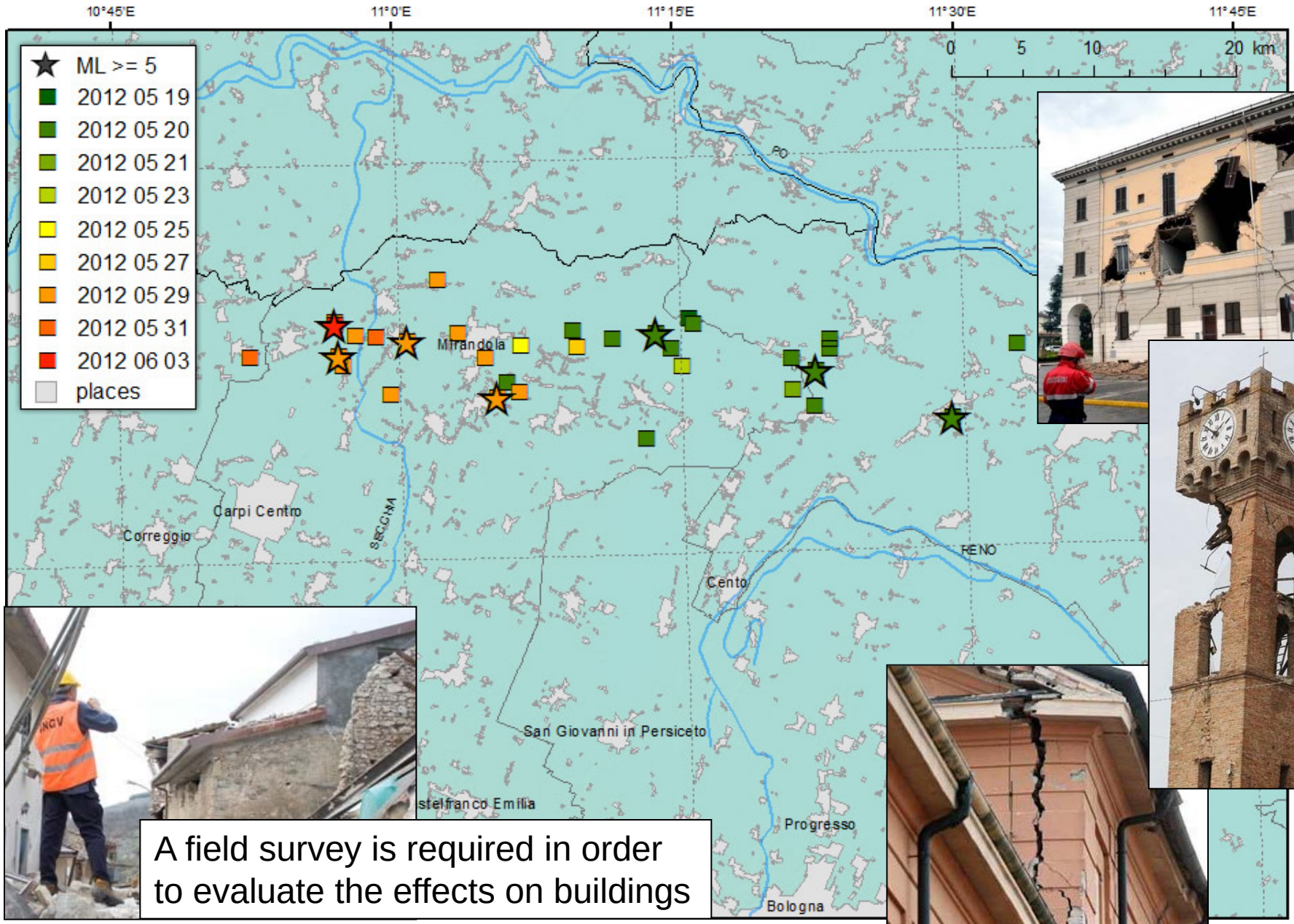
M. Locati and D. Viganò

INGV Milano

When an earthquake occurs we usually see the map of epicentres

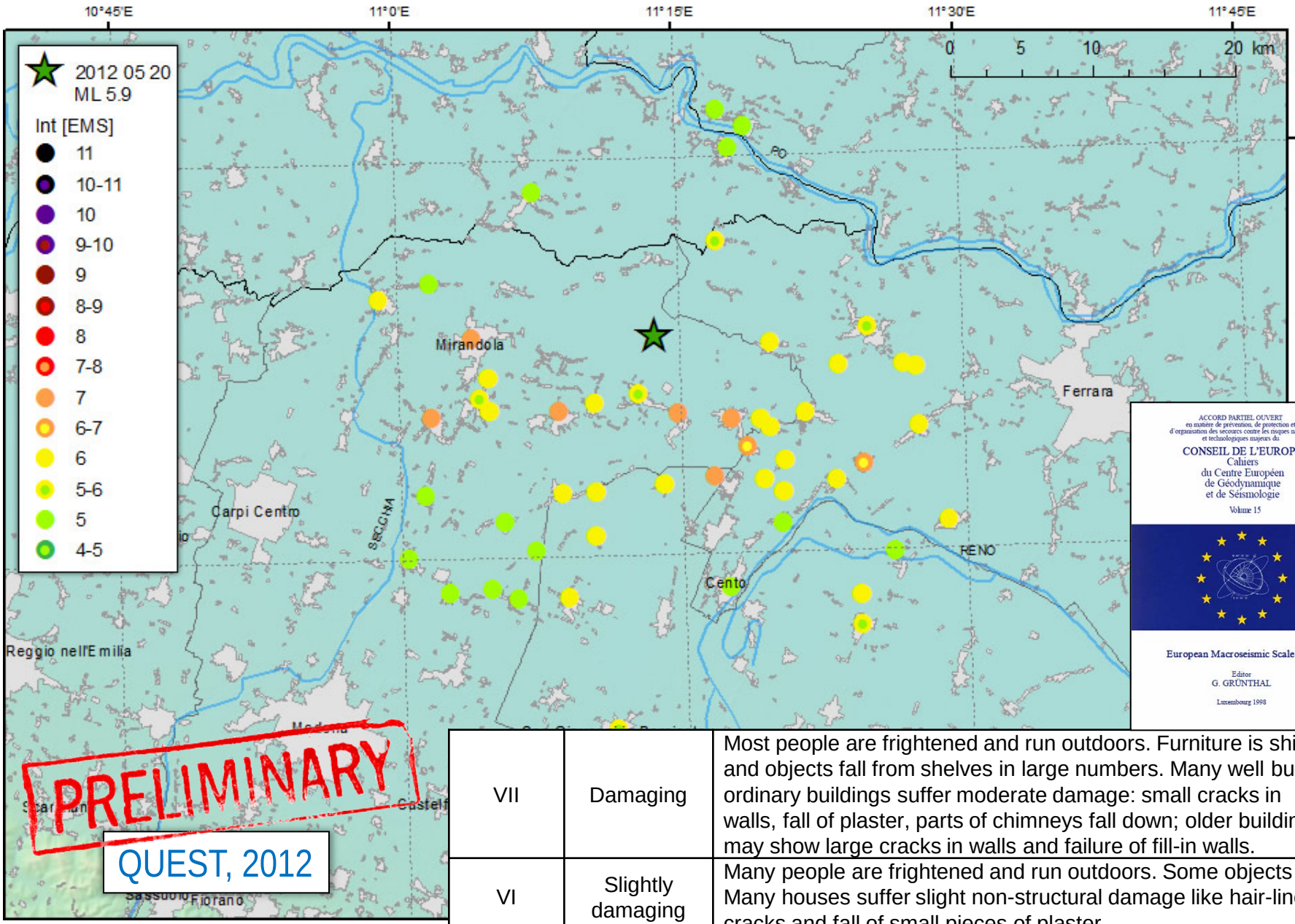


How do we assess the macroseismic intensity?



A field survey is required in order to evaluate the effects on buildings

Macroseismic Data Point (MDP) map of the 20th May 2012



VII	Damaging	Most people are frightened and run outdoors. Furniture is shifted and objects fall from shelves in large numbers. Many well built ordinary buildings suffer moderate damage: small cracks in walls, fall of plaster, parts of chimneys fall down; older buildings may show large cracks in walls and failure of fill-in walls.
VI	Slightly damaging	Many people are frightened and run outdoors. Some objects fall. Many houses suffer slight non-structural damage like hair-line cracks and fall of small pieces of plaster.

Macroseismic Data Point (MDP) map of the 15th October 1996

DBMI11 homepage | Presentazione | Consultazione per località | **Mappa dei terremoti**

Seleziona il terremoto facendo click sulla data.

Data	Ax	Np	Io	Mw
1995 11 21 04:04	Torinese	64	5-6	4.46 ±0.15
1996 02 27 11:13	Barcis	150	5	4.48 ±0.11
1996 04 03 13:04	Irpinia	557	6	4.93 ±0.09
1996 04 13 13:00	CLAUT-BARCIS	164	5-6	4.62 ±0.10
1996 04 27 00:38	Cosentino	123	6-7	4.86 ±0.11
1996 10 15 09:56	Correggio	135	7	5.41 ±0.09
1996 12 02 13:01	C.DA LUMINARIA	42	6	3.71 ±0.26
1997 03 19 23:10	Matese	284	6	4.55 ±0.09
1997 05 12 13:50	MASSA MARTANA	57	6	4.79 ±0.17
1997 05 12 22:13	Reggiano	56	4-5	4.22 ±0.27
1997 06 09 14:10	Vibonese	69	6	4.47 ±0.14
1997 07 08 08:13	Cosentino	52	5	4.31 ±0.18
1997 07 15 08:51	Appennino umbro-marchigiano	22	4-5	3.69 ±0.21

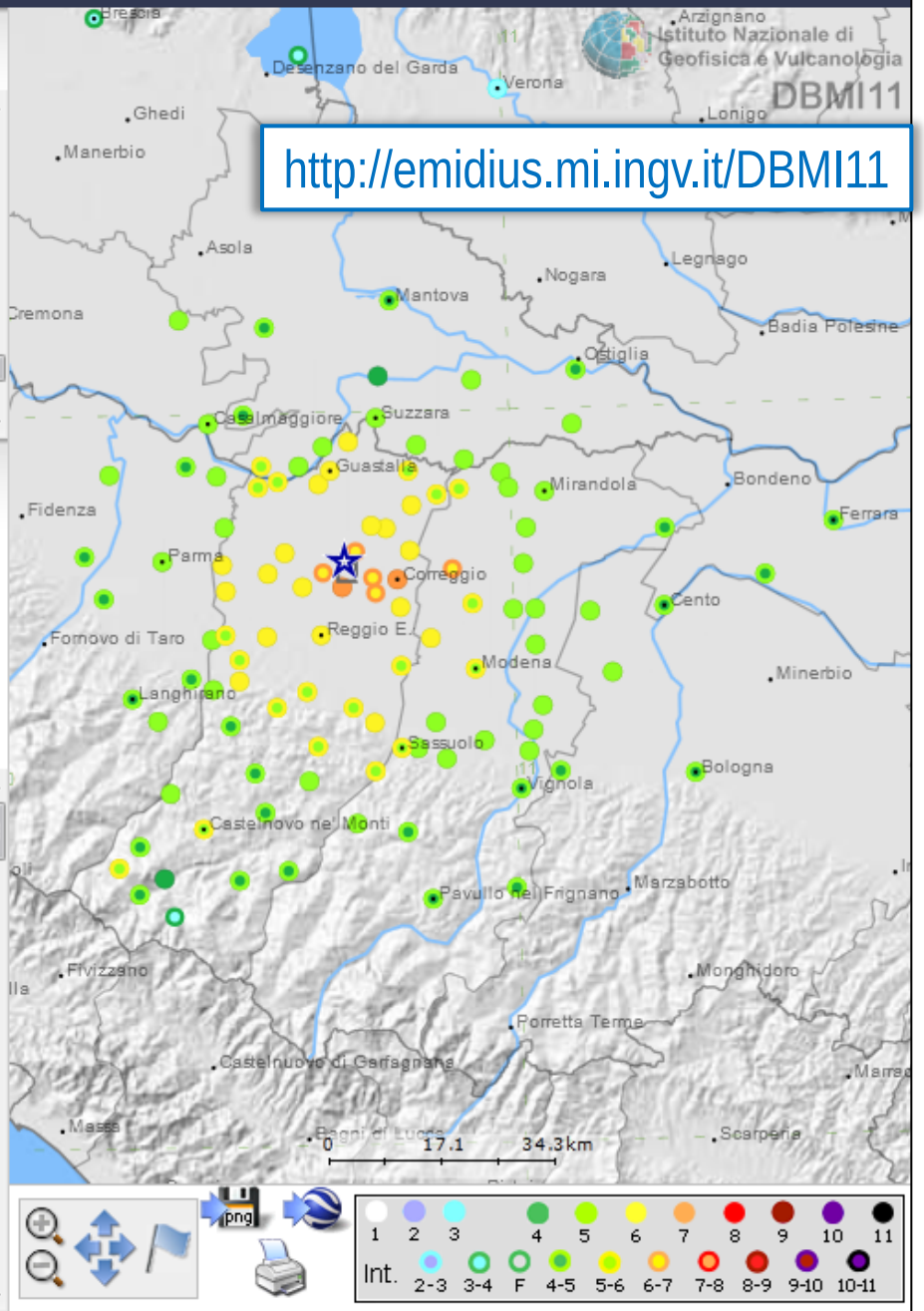
Terremoto **1996 10 15 09:56:02 Correggio**

Studio macros. **Camassi et al., 1996** [Np 135, Imax 7]

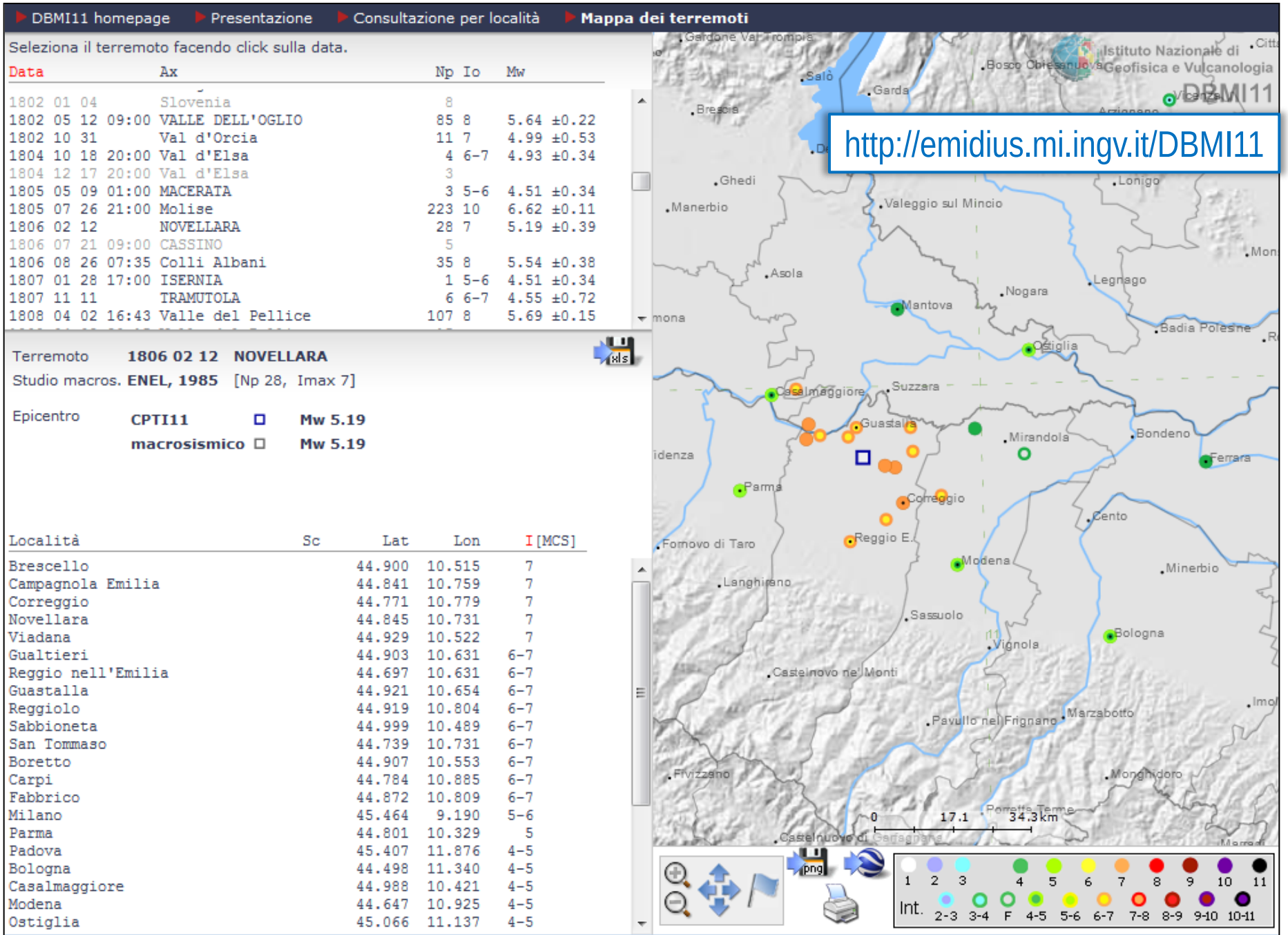
Epicentro

CPTI11	☆	**Mw 5.41**
macrosismico	□	**Mw 5.18**
strumentale	☆	**Mw 5.41**

Località	Sc	Lat	Lon	I[MCS]
Bagnolo in Piano		44.762	10.673	7
Correggio		44.771	10.779	7
Argine		44.782	10.637	6-7
Budrio		44.753	10.737	6-7
Carpi		44.784	10.885	6-7
Fosdondo		44.774	10.732	6-7
Santa Maria della Fossa		44.810	10.700	6-7
Campagnola Emilia		44.841	10.759	6
Quattro Castella		44.636	10.473	6
Campogalliano		44.690	10.841	6
Campegine		44.782	10.531	6
Casalgrande		44.576	10.730	6
Reggio nell'Emilia		44.697	10.631	6
Rio Saliceto		44.810	10.804	6
Castelnovo di Sotto		44.810	10.564	6
Cavriago		44.696	10.527	6
San Martino in Rio		44.733	10.784	6
Sant'Ilario d'Enza		44.759	10.450	6
Fabbrico		44.872	10.809	6
Gattatico		44.795	10.444	6
Gualtieri		44.903	10.631	6



Macroseismic Data Point (MDP) map of the 12th February 1806



Macroseismic Data Point (MDP) map of the 19th March 1624

DBMI11 homepage | Presentazione | Consultazione per località | **Mappa dei terremoti**

Seleziona il terremoto facendo click sulla data.

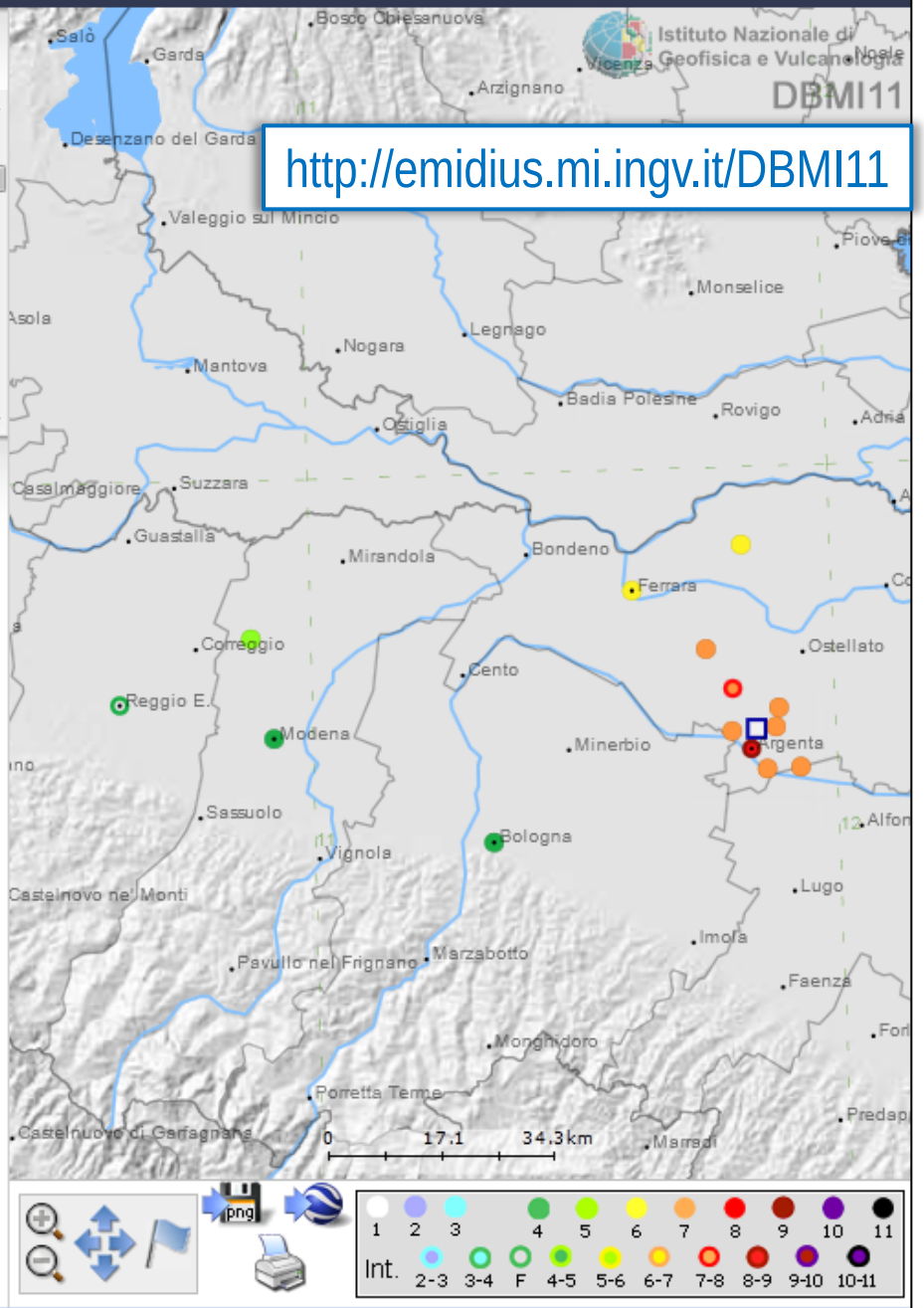
Data	Ax	Np	Io	Mw
1612 10 14	FOSSATO DI VICO	7	7	5.06 ±1.02
1613 08 25 05:00	Naso	2	8	5.57 ±0.34
1614 08	PERUGIA	1	6-7	4.93 ±0.34
1621 08 09	CALABRIA	1		
1622 05 05 11:00	Slovenia	3	7-8	5.35 ±0.34
1624 03 19 19:45	Argenta	18	7-8	5.47 ±0.49
1624 10 03 17:00	Mineo	4	8	5.57 ±0.34
1625 09	Venosa	1	8-9	5.78 ±0.34
1625 12 05	RIMINI	1	6	4.72 ±0.34
1626 04 04 12:45	Girifalco	7	9	6.03 ±0.82
1627 07	ACCUMOLI	1	7-8	5.35 ±0.34
1627 07 30 10:50	Gargano	65	10	6.66 ±0.20
1627 07 30 11:05	San Severo	1		
1627 08 07 16:40	Gargano	5		

Terremoto **1624 03 19 19:45 Argenta**

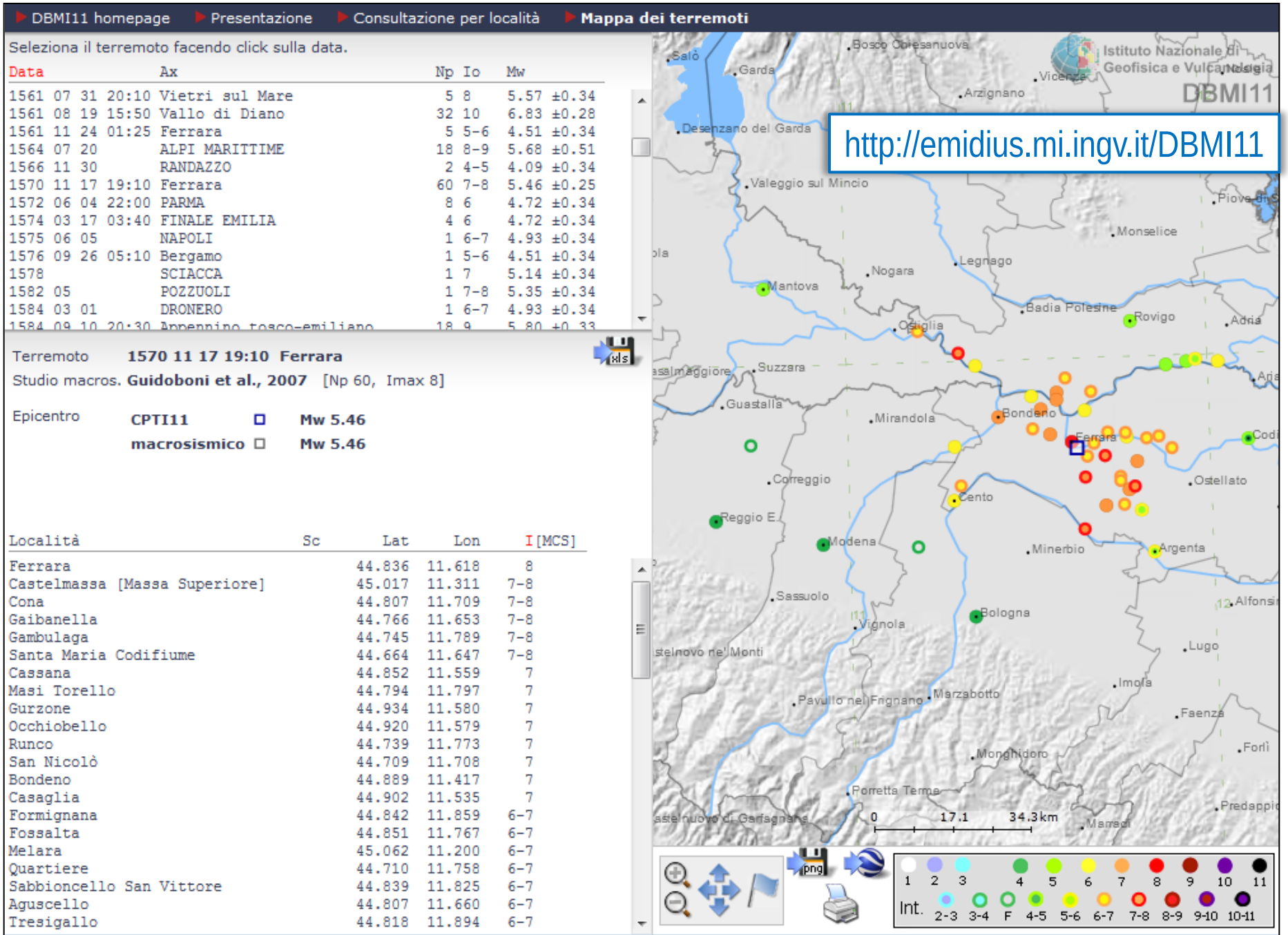
Studio macros. **Guidoboni et al., 2007** [Np 18, Imax 8-9]

Epicentro
- **CPTI11** ☐ **Mw 5.47**
- **macrosismico** ☐ **Mw 5.47**

Località	Sc	Lat	Lon	I [MCS]
Argenta		44.615	11.837	8-9
Portomaggiore		44.698	11.805	7-8
Bando		44.644	11.885	7
Belriguardo		44.753	11.756	7
Boccaleone		44.640	11.801	7
Filo		44.588	11.930	7
San Biagio		44.587	11.866	7
Trava		44.670	11.892	7
Copparo		44.894	11.830	6
Ferrara		44.836	11.618	6
Carpi		44.784	10.885	5
Ravenna		44.417	12.198	5
Venezia		45.438	12.335	5
Bologna		44.498	11.340	4
Modena		44.647	10.925	4
Padova		45.407	11.876	F
Reggio nell'Emilia		44.697	10.631	F
Cento		44.727	11.289	NC



Macroseismic Data Point (MDP) map of the 17th November 1570

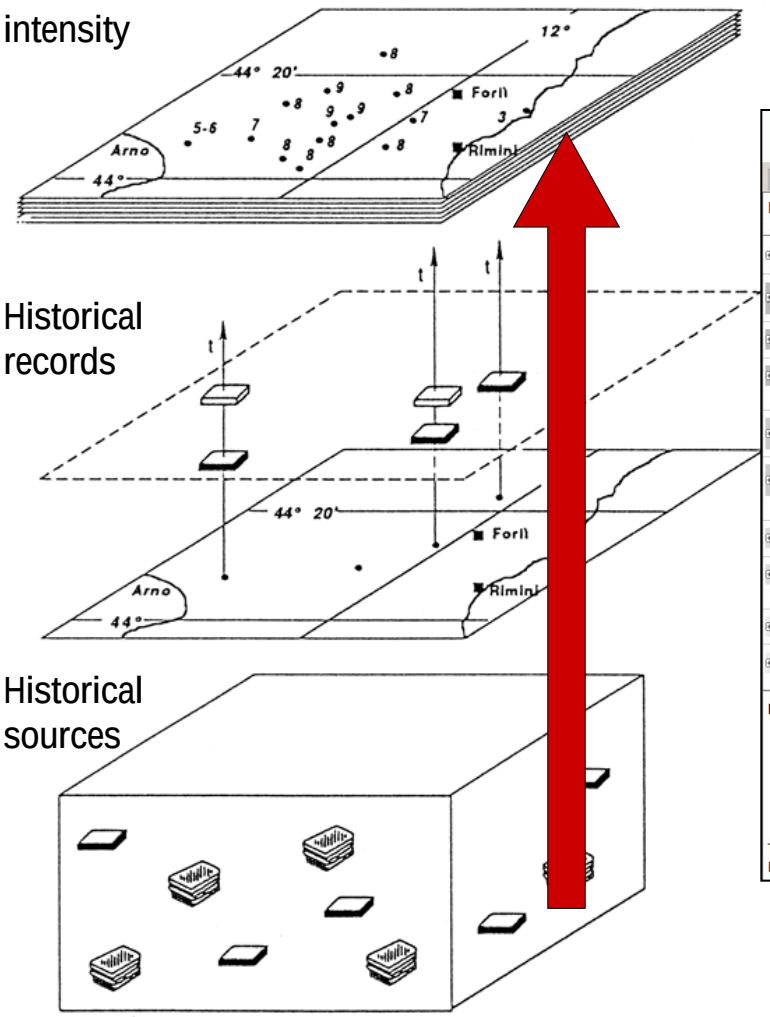


Historical earthquake studies: obtaining MDPs from the past

Macroseismic intensity

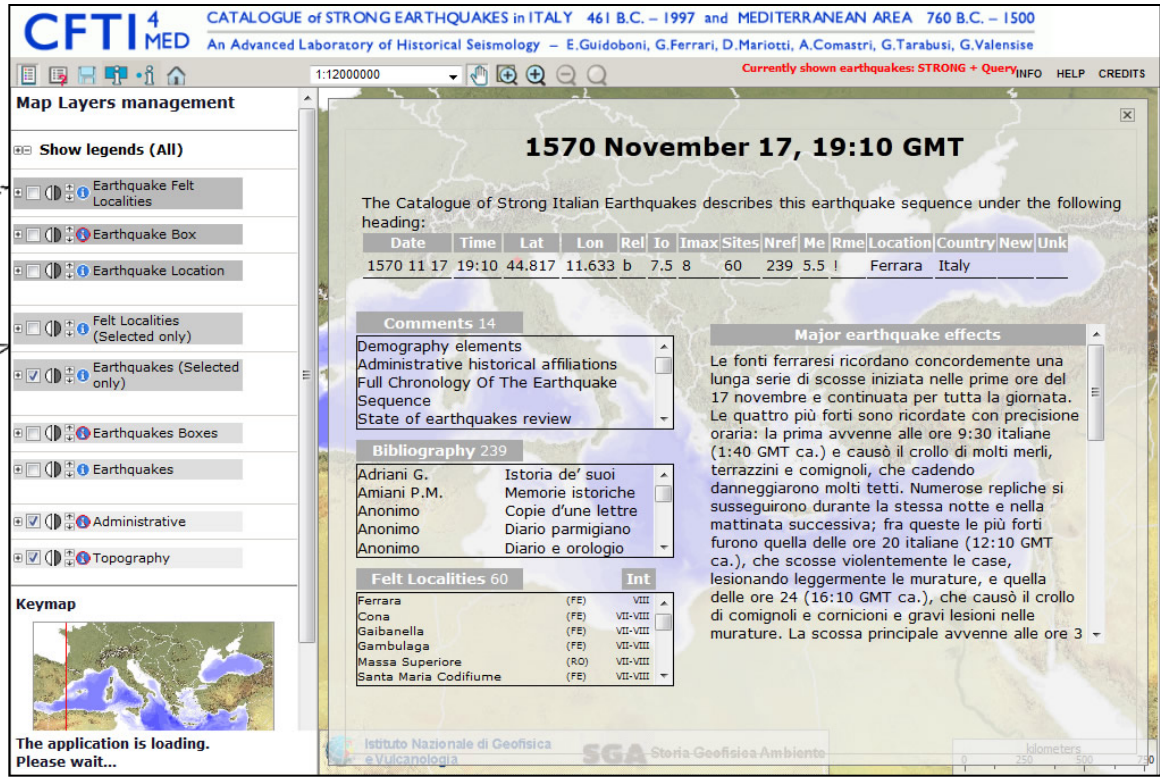
Historical records

Historical sources



Stucchi & Albini, 1992

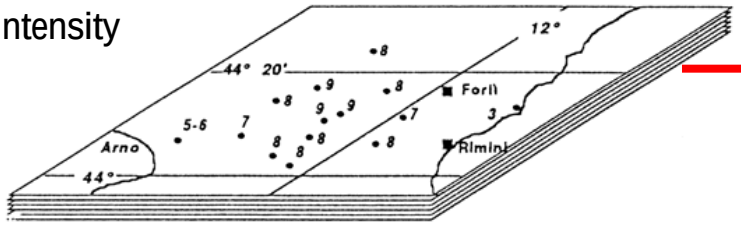
Historical earthquake study “Guidoboni et al., 2007”



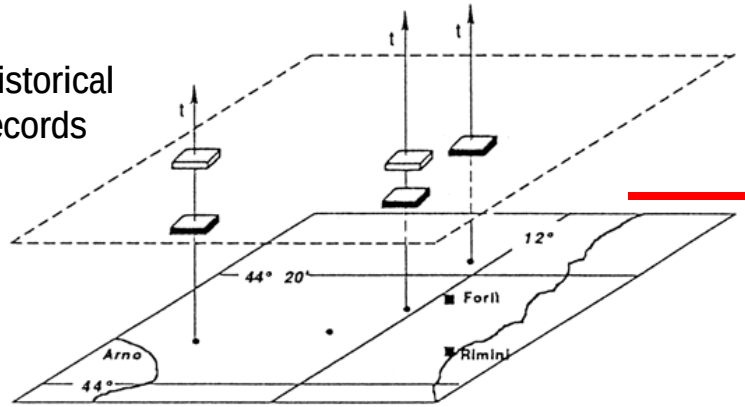
http://storing.ingv.it/cfti4med/

Historical earthquake studies: obtaining MDPs from the past

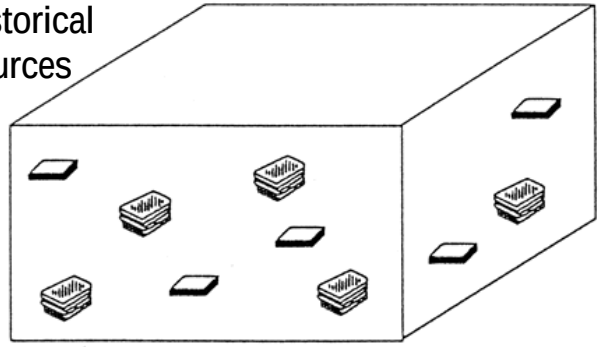
Macroseismic intensity



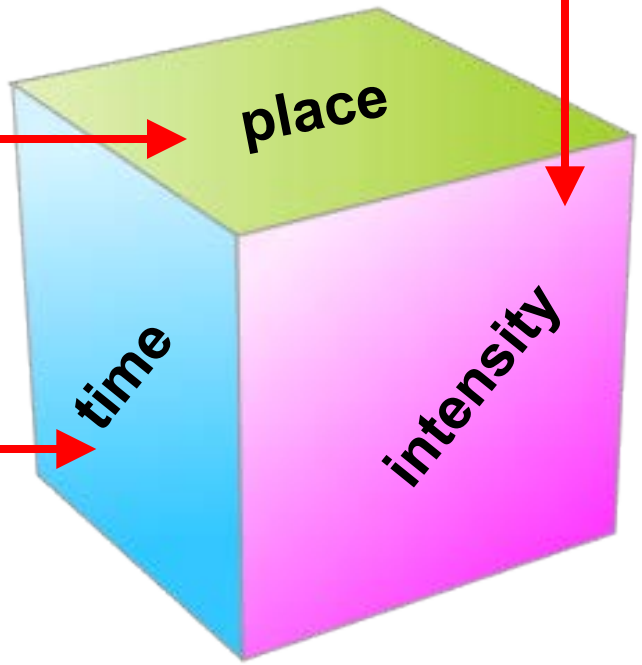
Historical records



Historical sources

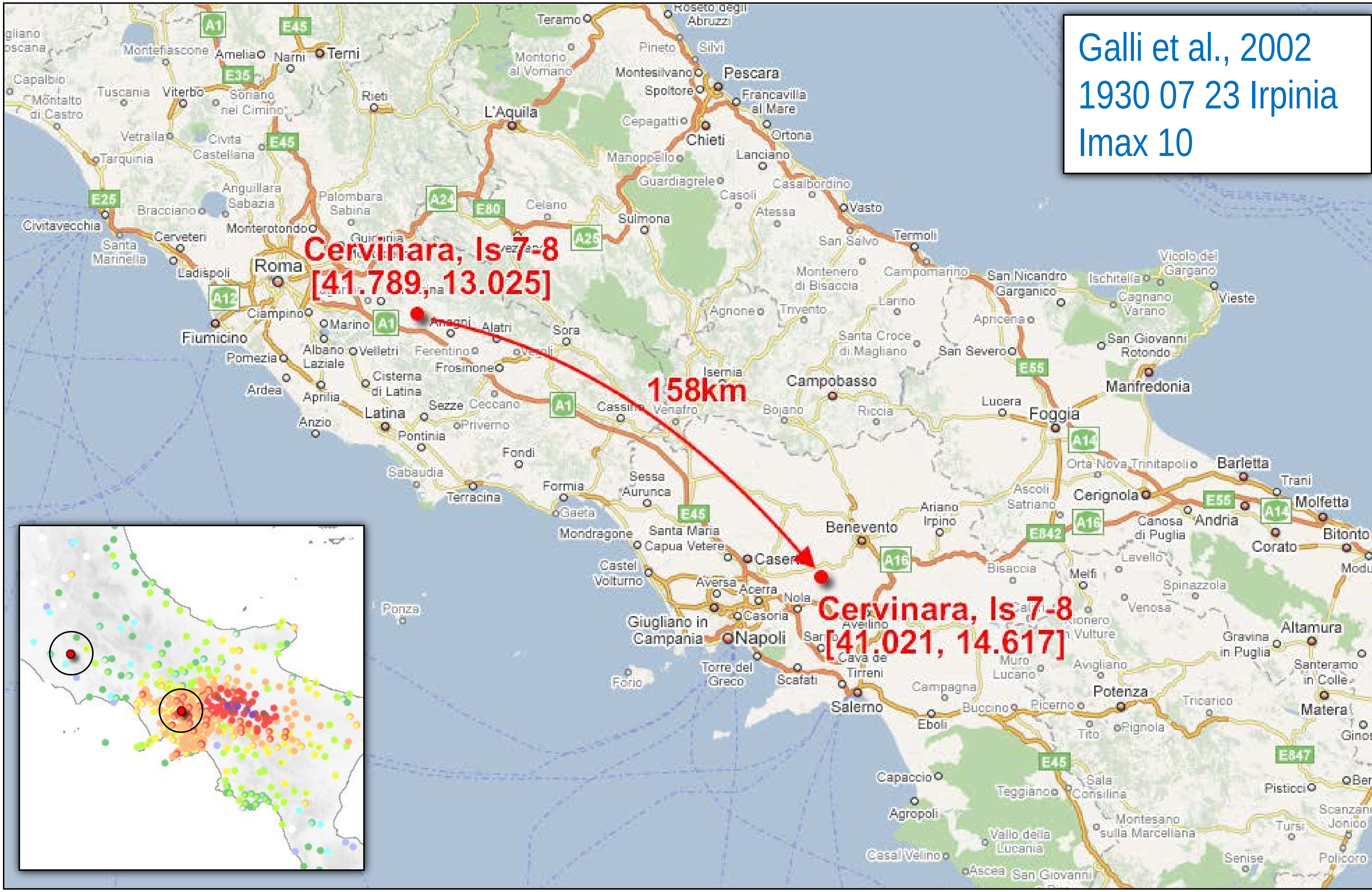


Stucchi & Albini, 1992

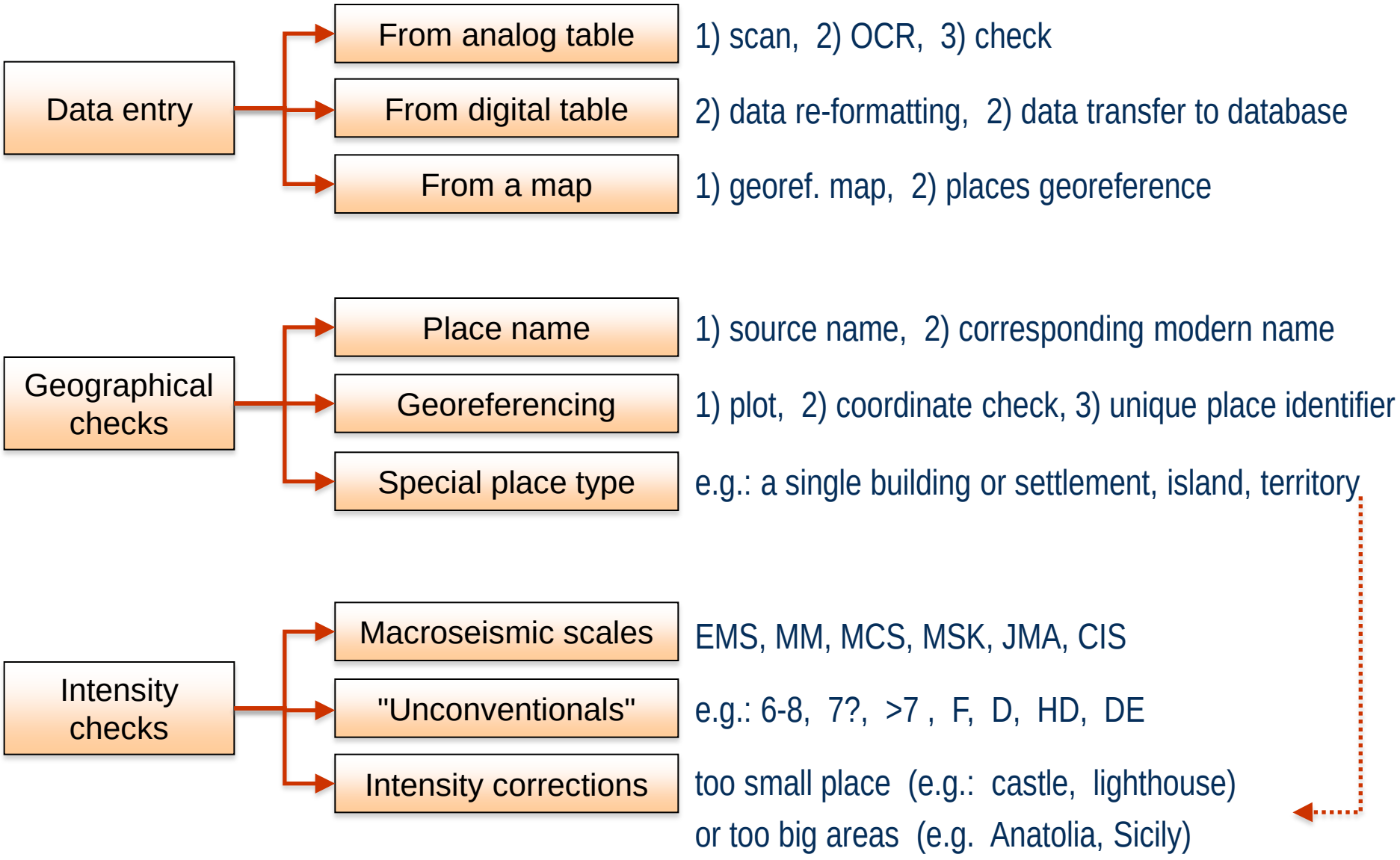


Macroseismic Data Point (**MDP**)

Already georeferenced places must be checked



Summary


Data entry
From analog table
From digital table
From a map
1) scan, 2) OCR, 3) check
2) data re-formatting, 2) data transfer to database
1) georef. map, 2) places georeference
Geographical checks
Place name
Georeferencing
Special place type
1) source name, 2) corresponding modern name
1) plot, 2) coordinate check, 3) unique place identifier
e.g.: a single building or settlement, island, territory
Intensity checks
Macroseismic scales
"Unconventionals"
Intensity corrections
EMS, MM, MCS, MSK, JMA, CIS
e.g.: 6-8, 7?, >7 , F, D, HD, DE
too small place (e.g.: castle, lighthouse)
or too big areas (e.g. Anatolia, Sicily)

How to publish MDP datasets on the Web

midop

Macroseismic Intensity Data Online Publisher

A tool created and developed by INGV since 2006
for easily publish MDP data on the Internet.

It generates a website with:

- epicentres overview map
- single earthquake MDP map
- seismic histories
- maximum intensity map
- references information
- downloadable tables
- export to Google Earth & QuakeML

Advantages:

- safe from web attacks
  (only html with JavaScript pages)
- standard web server
  (no database server required)
- internal geographical maps
  (no need of external web resources)
- websites can be browsed offline

http://www.emidius.eu/MIDOP/

Publishing MDP data on the Web: the MIDOP tool

Development PC

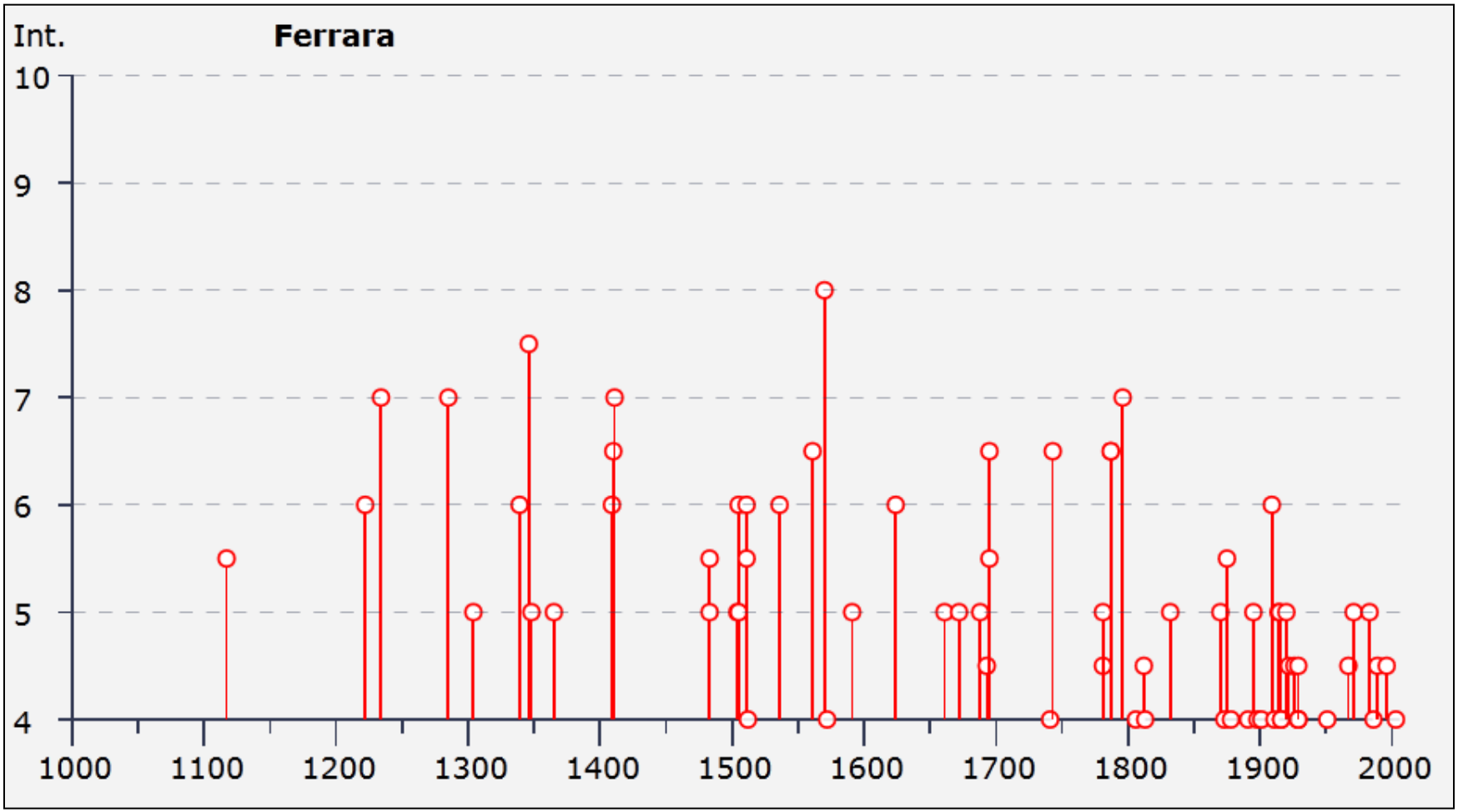
Public Webserver

Client browser

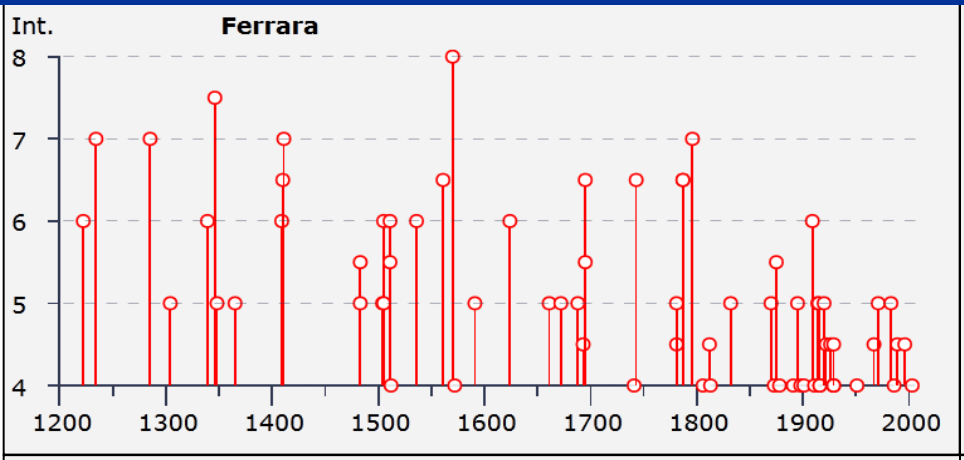
1. List of earthquakes
2. List of MDPs

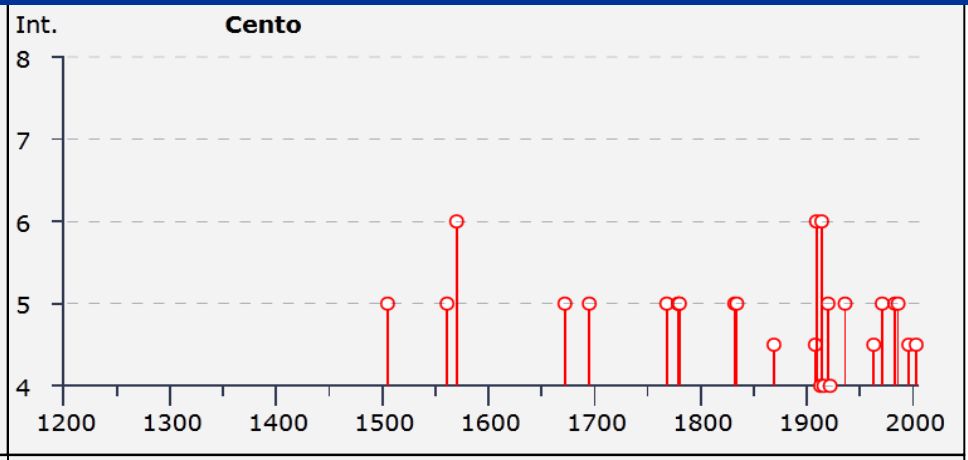
http://www.emidius.eu/MIDOP/

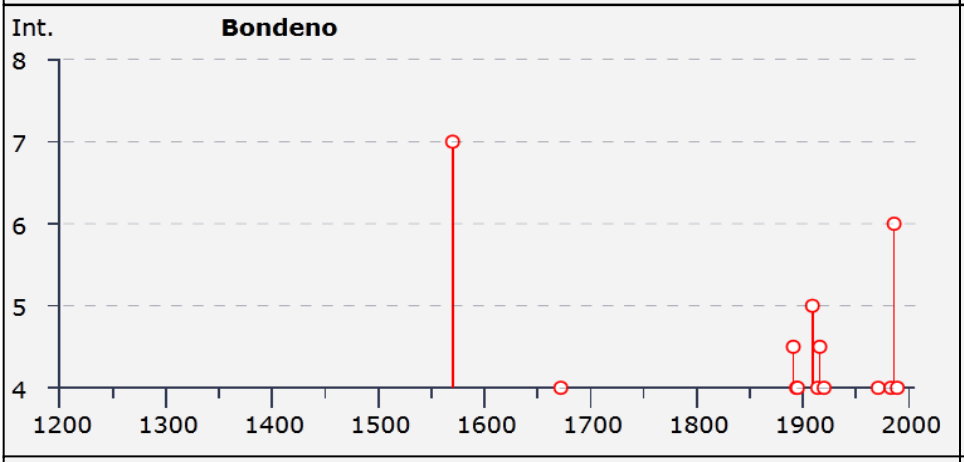
Output example: place seismic histories

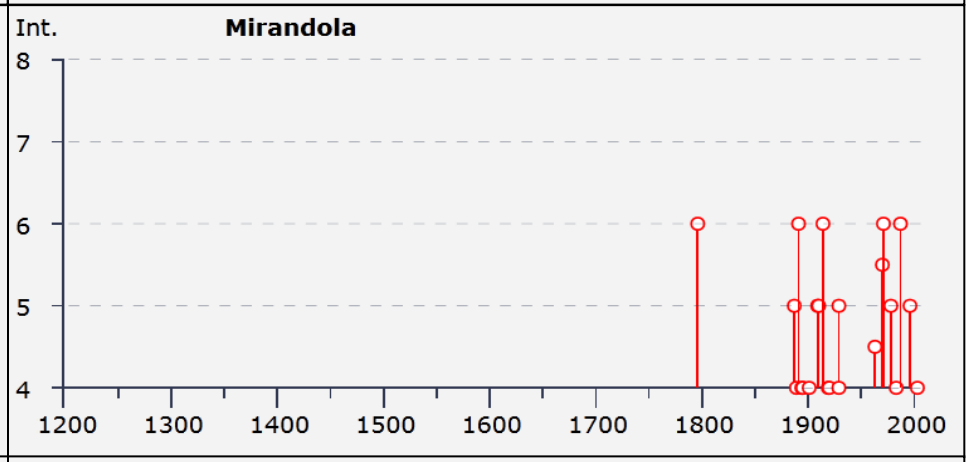


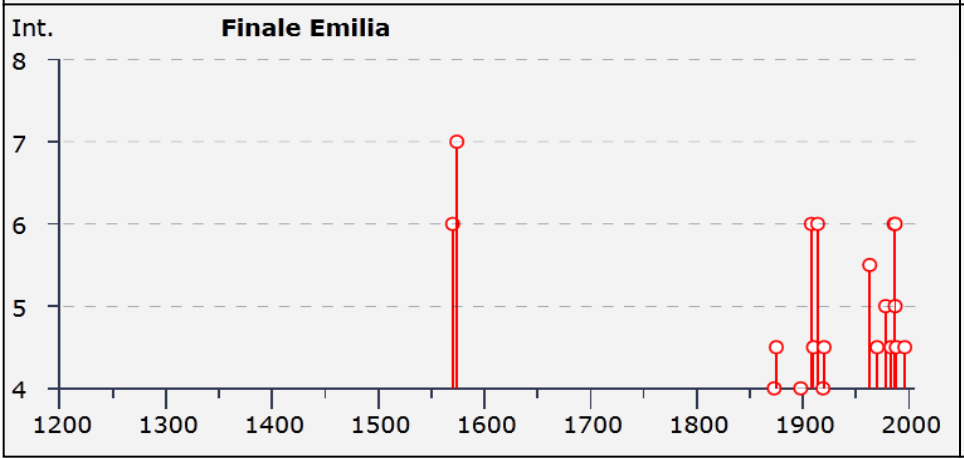
Output example: place seismic histories

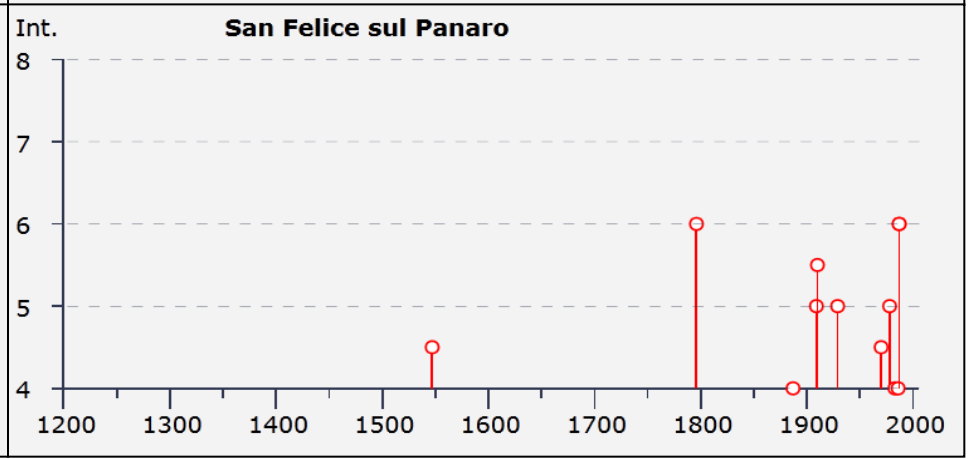




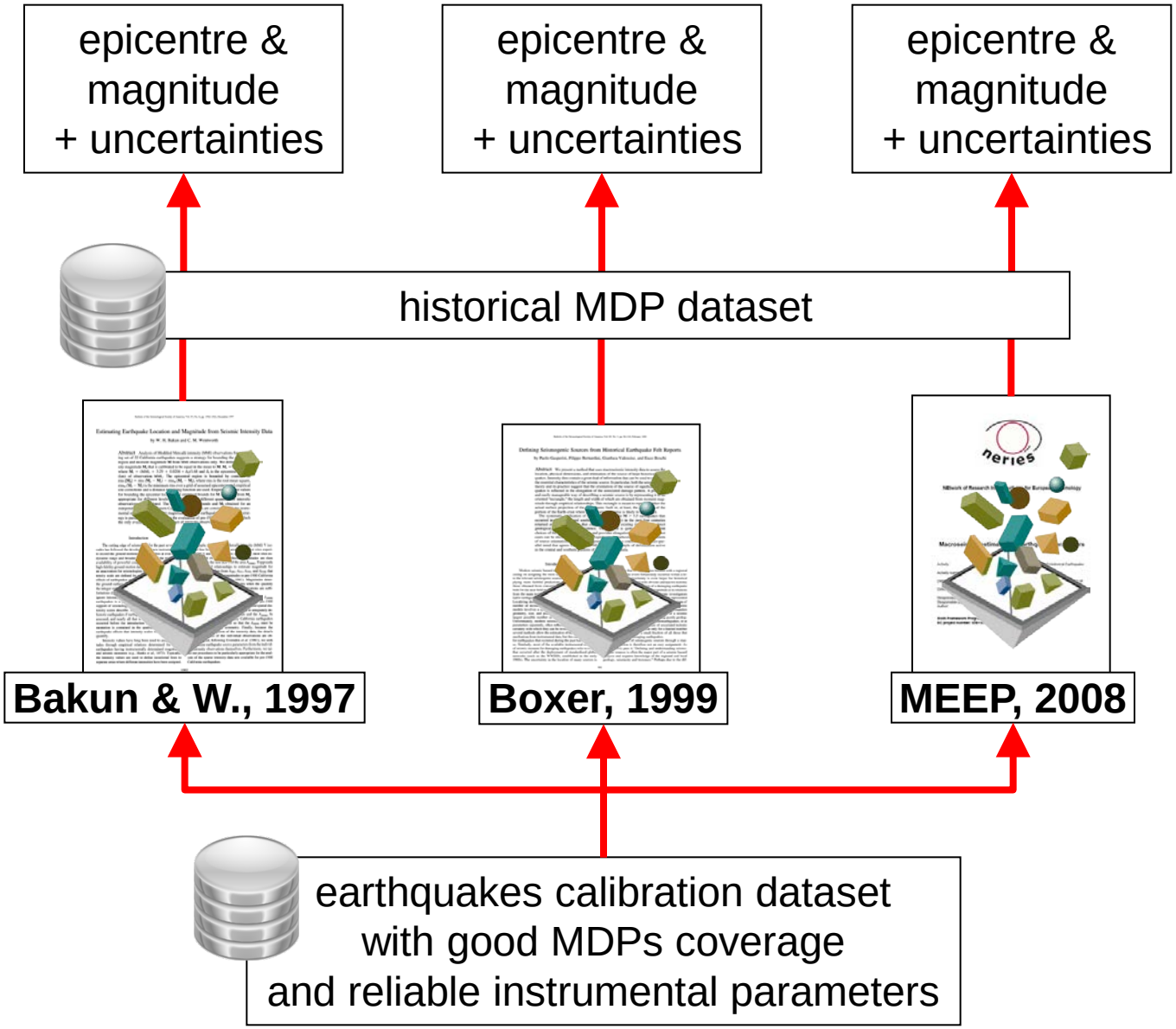








Example of use: earthquakes parameters assessment



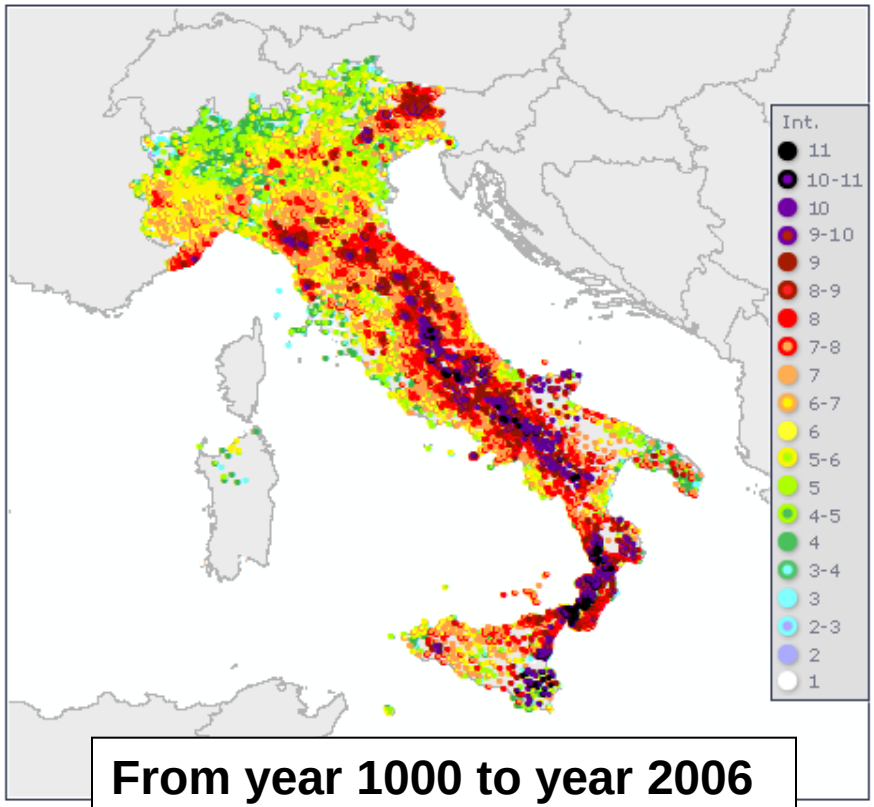
DBMI11, the 2011 release of the Italian Macroseismic Database

INGV - Database Macrosismico Italiano 2011

homepage

DBMI11
il database macrosismico utilizzato per la compilazione di CPTI11

- Presentazione
- Consultazione per terremoto
- Consultazione per località
- CPTI11



- DBMI08aq
- DBMI04
- 25 ottobre 1972, Passo Cisa
- 6 aprile 2009, Aquilano
- Invia un commento

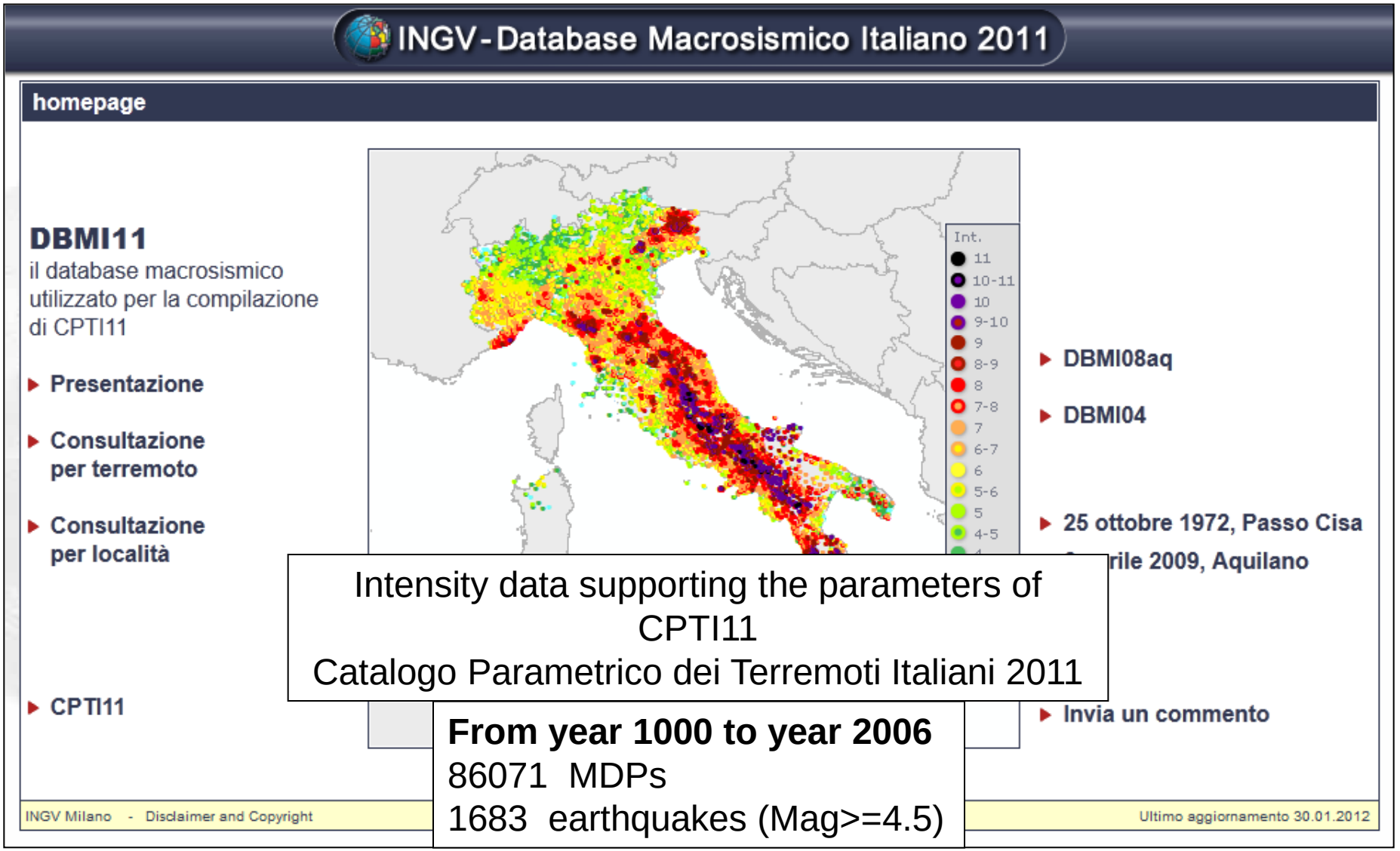
From year 1000 to year 2006
86071 MDPs
1683 earthquakes (Mag>=4.5)

INGV Milano - Disclaimer and Copyright

Ultimo aggiornamento 30.01.2012

http://emidius.mi.ingv.it/DBMI11

DBMI11, the 2011 release of the Italian Macroseismic Database

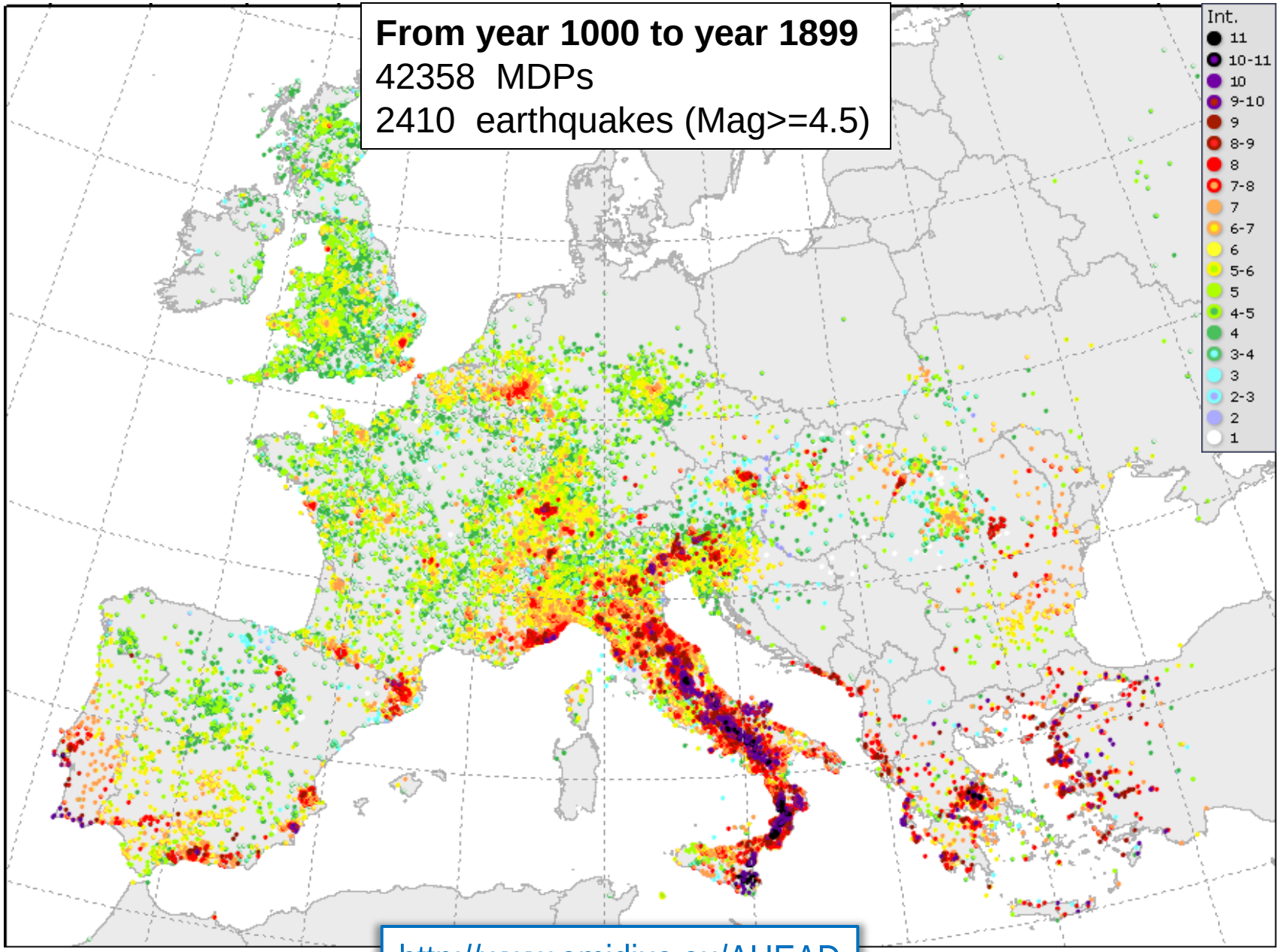


Intensity data supporting the parameters of CPTI11
Catalogo Parametrico dei Terremoti Italiani 2011

From year 1000 to year 2006
86071 MDPs
1683 earthquakes (Mag>=4.5)

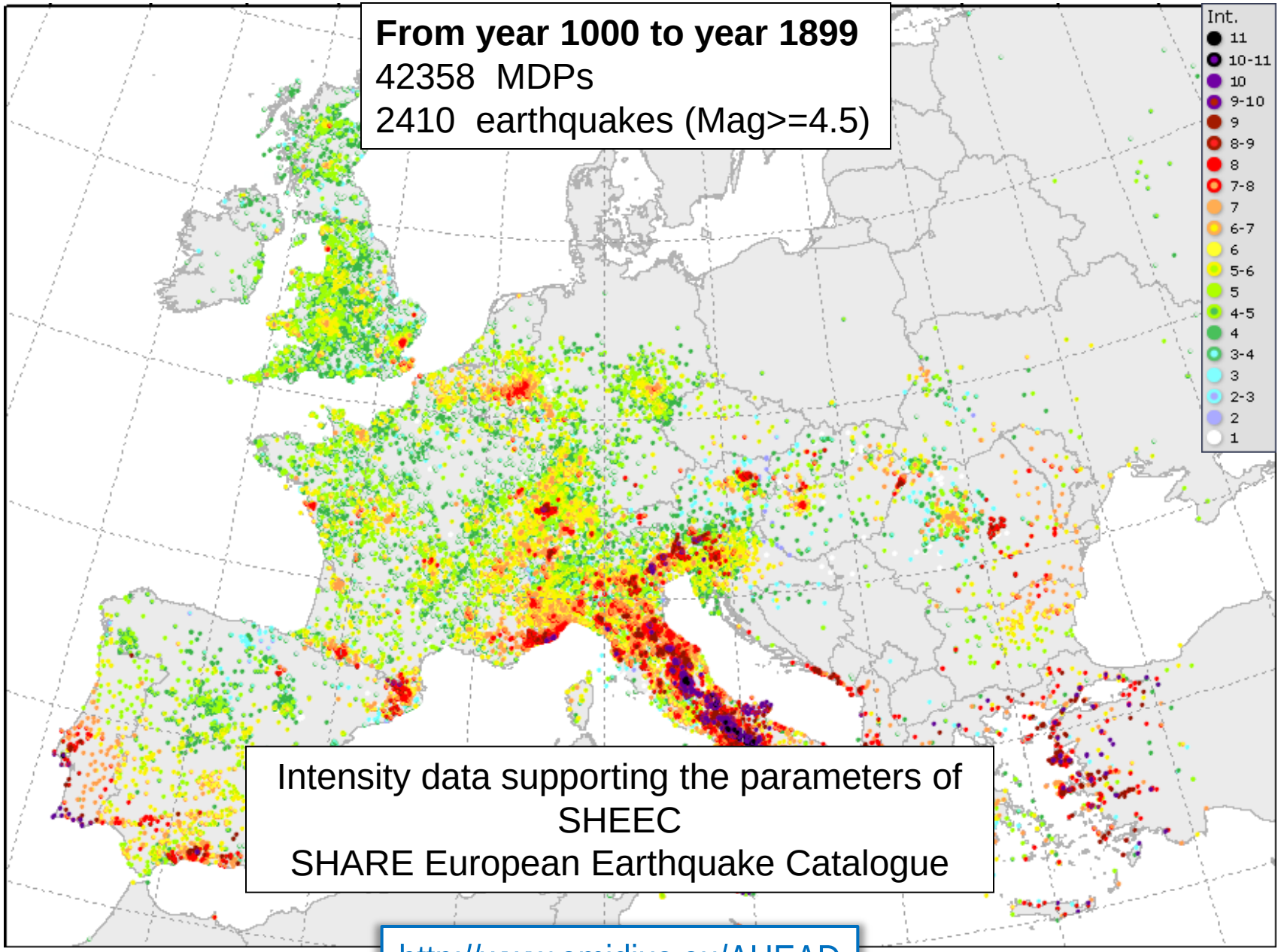
http://emidius.mi.ingv.it/DBMI11

AHEAD, the European Archive of Historical Earthquake Data



http://www.emidius.eu/AHEAD

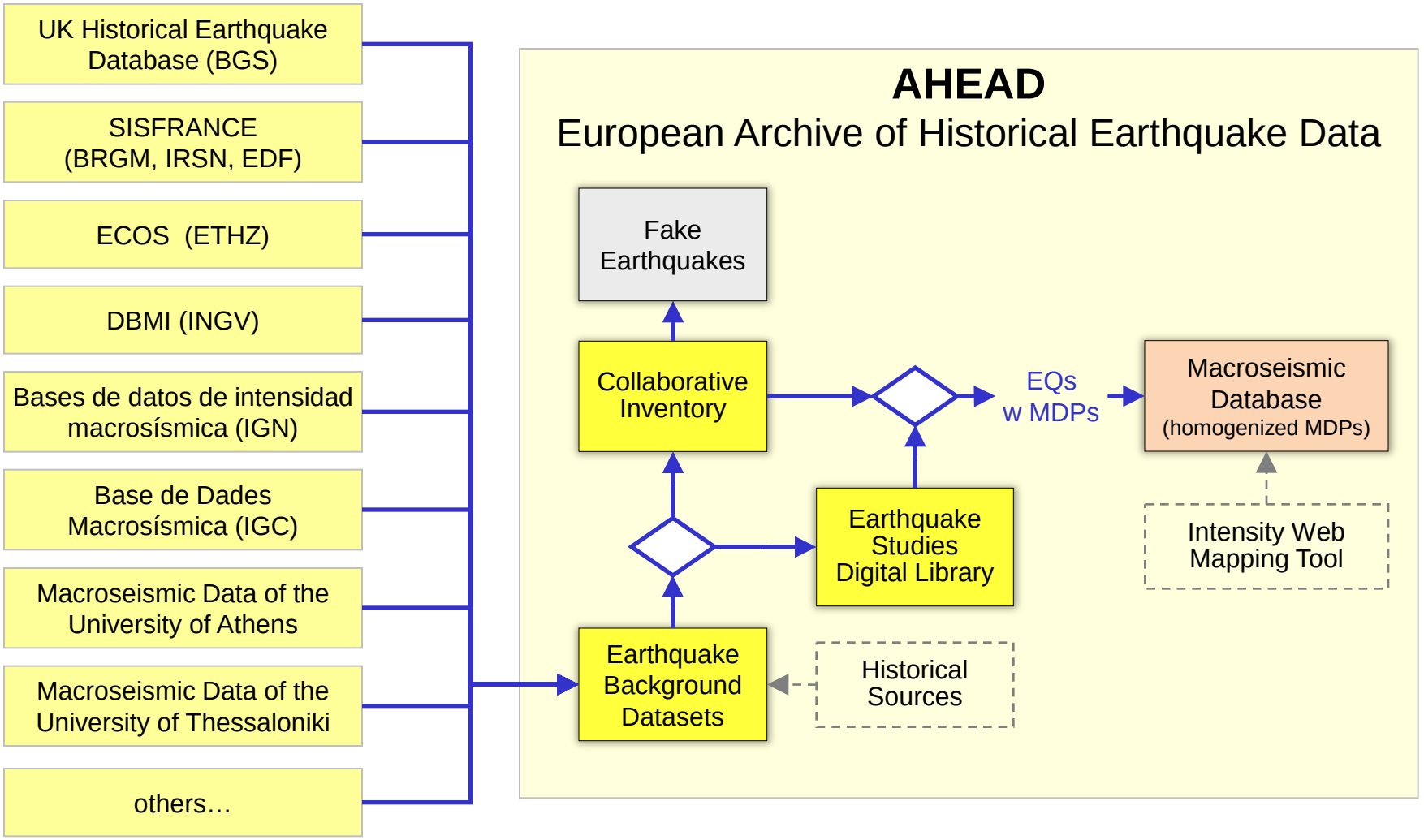
AHEAD, the European Archive of Historical Earthquake Data



AHEAD, the European Archive of Historical Earthquake Data

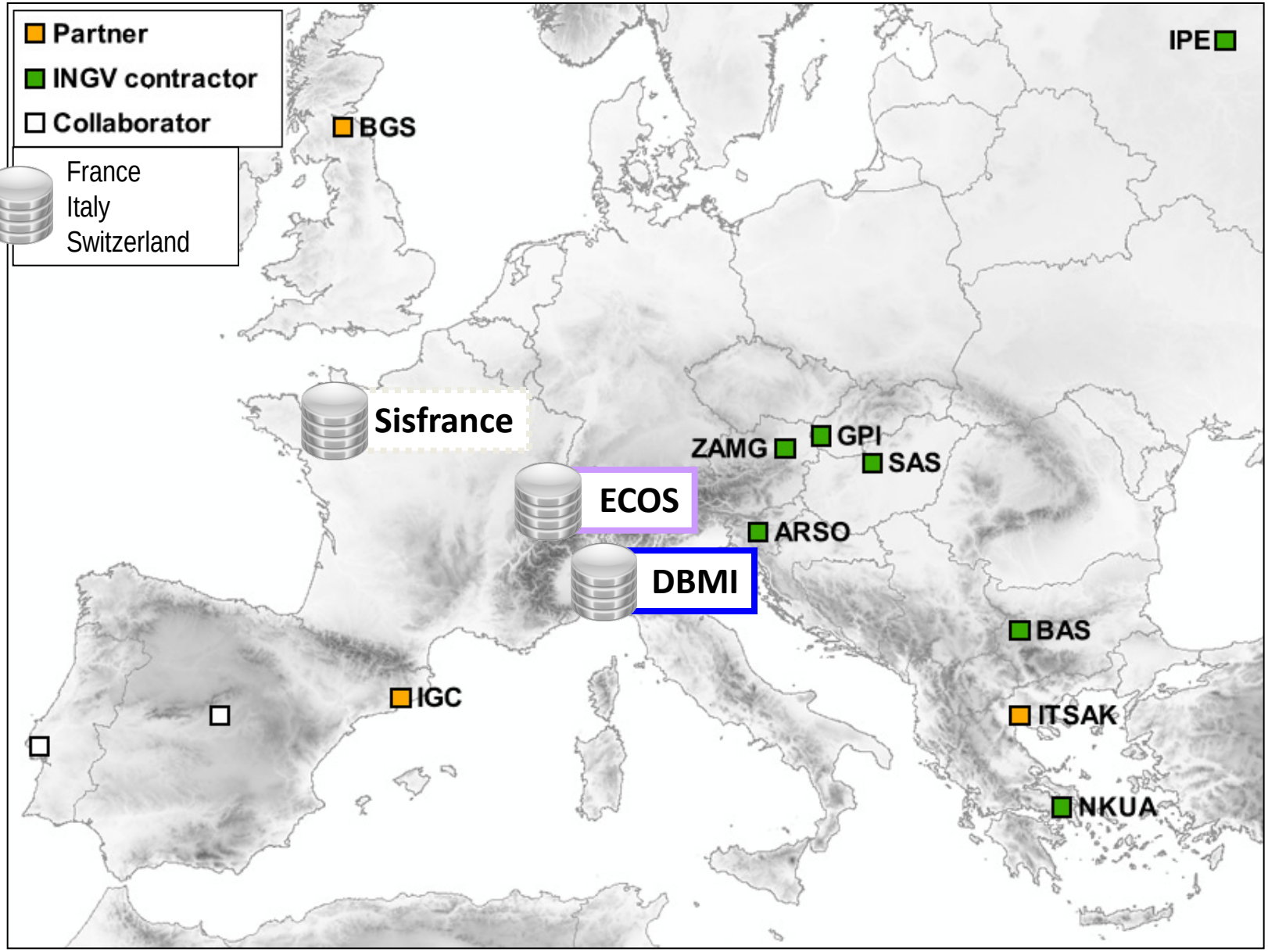
EC Projects NERIES (2006-2010) and SHARE (2009-2012)

NERIES Module NA4, "Distributed Archive of Historical Earthquake Data"
SHARE WP3, Task 3.1, "European earthquake database"



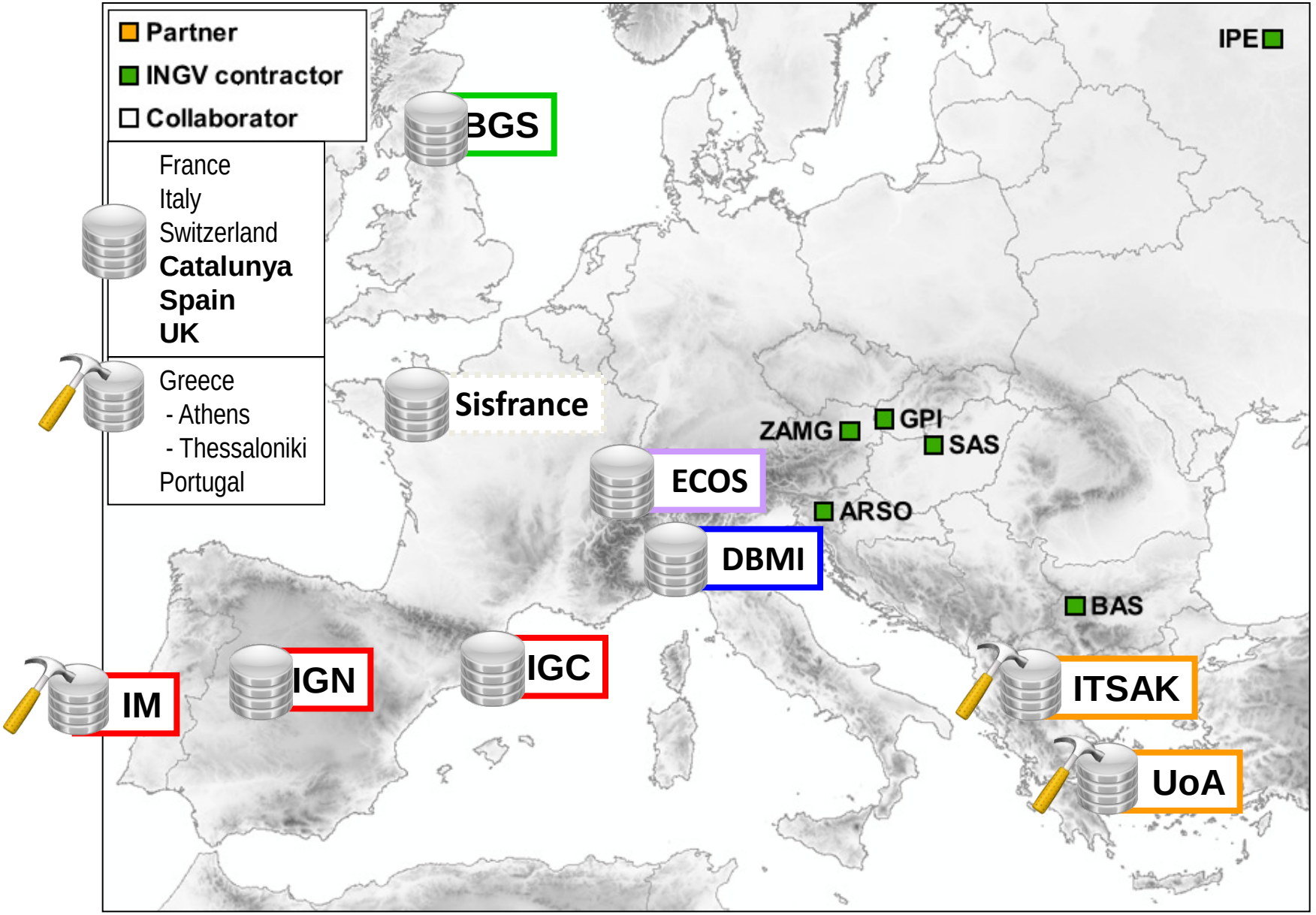
AHEAD, the European Archive of Historical Earthquake Data

Online databases before 2006



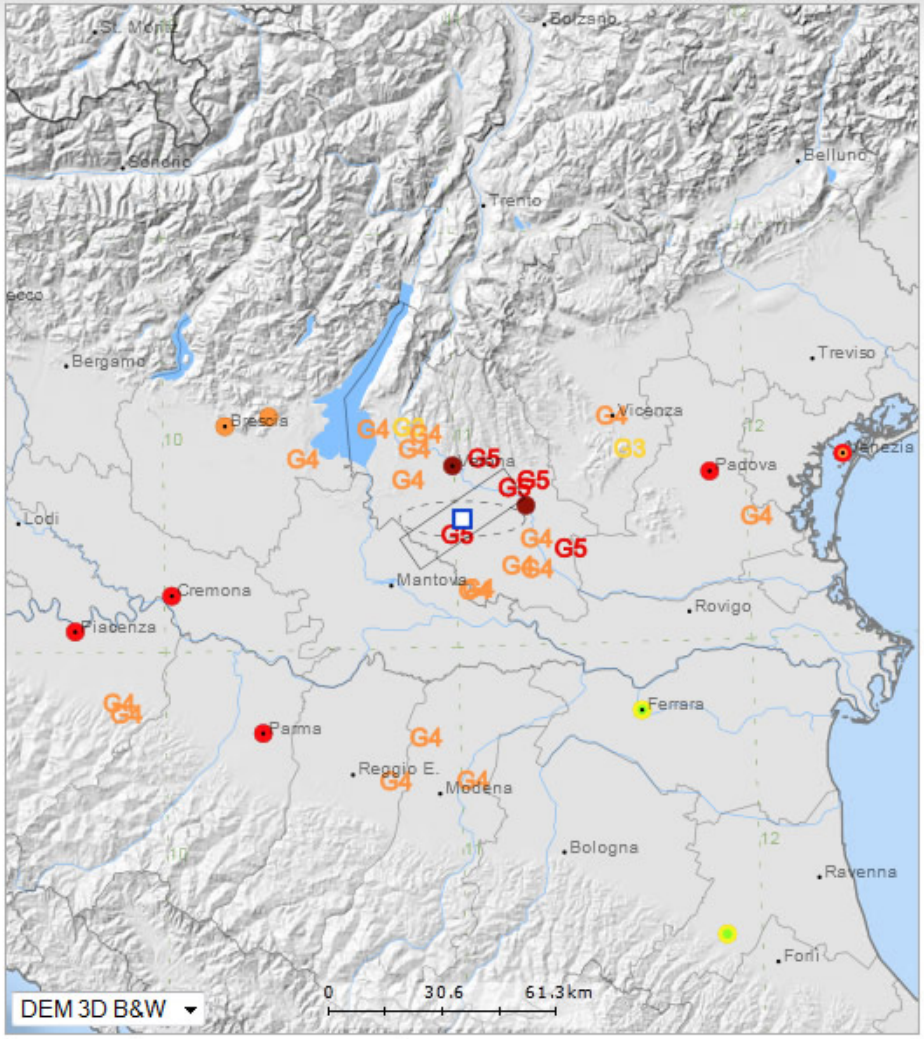
AHEAD, the European Archive of Historical Earthquake Data

Online databases now, 2012



AHEAD, the European Archive of Historical Earthquake Data

AHEAD Archive of Historical EArthquake Data



3 January 1117, 15:15 Veronese

Catalogues | Studies | Seismicity | Add a comment

Guidoboni et al., 2007
Reported date: 3 January 1117, 15:15
▶ full reference
◉ ▶ 55 MDPs Imax 9

Guidoboni et al., 2005 abstract
Reported date: 3 January 1117, 15h
▶ full reference
○ ▶ 55 MDPs Imax 9

Galli, 2005 abstract
Reported date: 3 January 1117
▶ full reference

Camassi & Stu., 1997
Reported date: 3 January 1117, 13h
▶ full reference

Boschi et al., 1997
Reported date: 3 January 1117, 13h
▶ full reference
○ ▶ 85 MDPs Imax 9

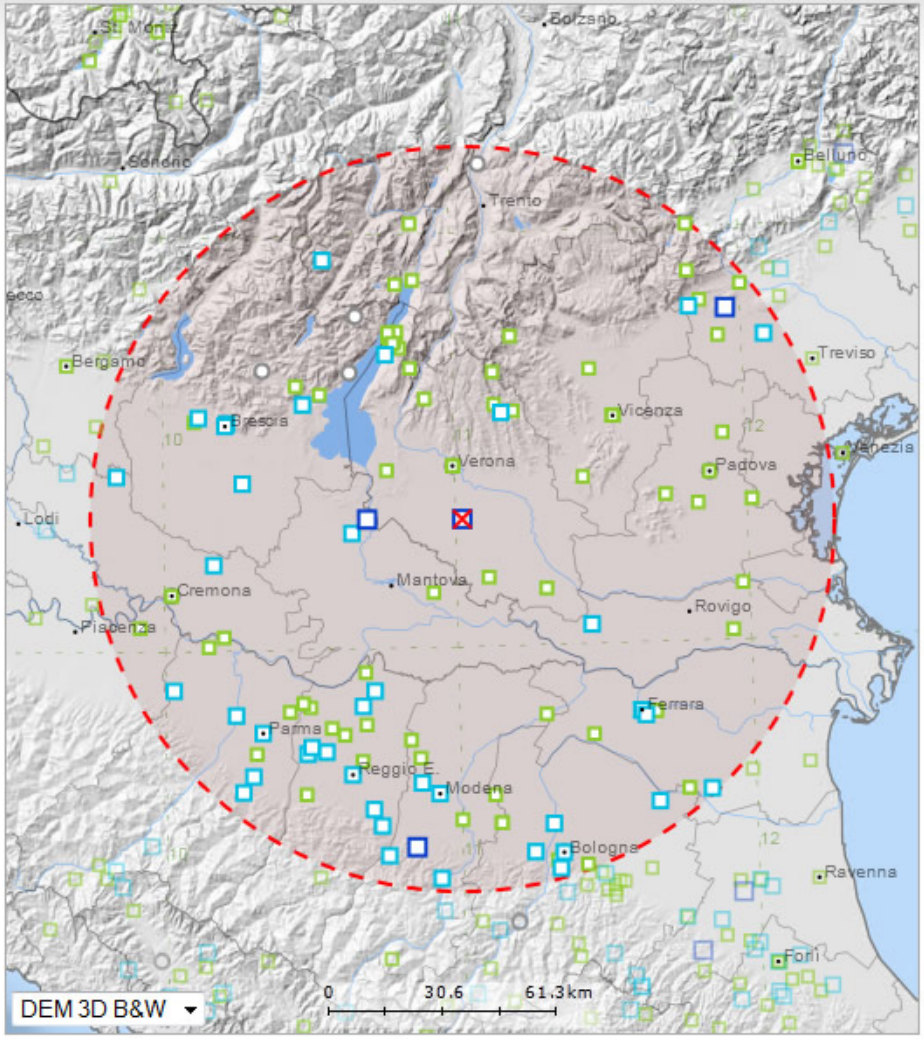
Alexandre, 1990
Reported date: 3 January 1117

http://www.emidius.eu/AHEAD

internal beta version

AHEAD, the European Archive of Historical Earthquake Data

AHEAD Archive of Historical EArthquake Data

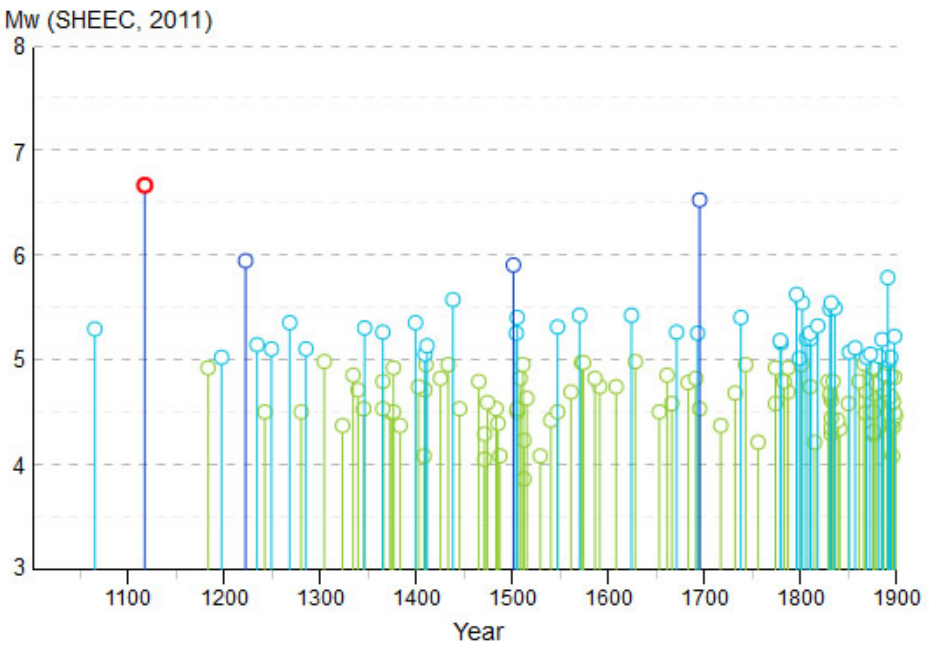


3 January 1117, 15:15 **Veronese**

Catalogues | Studies | Seismicity | Add a comment

Create a seismicity buffer
- by radius (km, max 500) 100
- by drawing a polygon

select ▶ 158 earthquakes selected



- ☑ 1000-1300
- ☑ 1301-1500
- ☑ 1501-1600
- ☑ 1601-1750
- ☑ 1751-1830
- ☑ 1831-1875
- ☑ 1876-1899

- ☑ extra large Mw >= 7.00
- ☑ large 5.80 <= Mw < 7.00
- ☑ medium 5.00 <= Mw < 5.80
- ☑ small Mw < 5.00
- ☑ not determined

http://www.emidius.eu/AHEAD

internal beta version

Global Earthquake Model (GEM), Tools for compiling the Global Earthquake History

a Global Component project that will produce a common set of definitions, strategies, standards, quality criteria and formats

INGV & BGS coordination
Activity: 2010 - ongoing
Time-window: 1000-1903
Magnitude: >=7

Source	Year	Mo	Da	Ho	Mi	Lat	Lon	Dep	M	TM	Int
EMME011	1008	04	27	18		34.600	47.400		7.00	S	
EMME011	1033	12	05			32.500	35.500		7.00	S	
ZHAAL999	1038	01	15			38.400	112.900		7.30	W	10
SHELE997	1052	06	02			36.200	58.000	16	7.00	S	
SBEAL005	106									S	8
SHEEC011	106									W	
EMME011	106									Mf	8
UTSUol	109										
UTSUol	1095	02	10	00		33.000	135.500		8.20		
SHEEC011	1107	02	12	03		45.700	26.600	150	7.10	W	8
SBEAL005	1114	11				37.300	36.500	40	7.70	S	9
SBEAL005	1114	11				37.300	38.500	40	7.40	S	8-9
EMME011	1115					31.870	44.410		7.10	W	9-10
ZHAAL999	1125	09	06			36.100	103.700		7.00	W	9
SHEEC011	1126	08	08			45.700	26.600	150	7.10	W	8

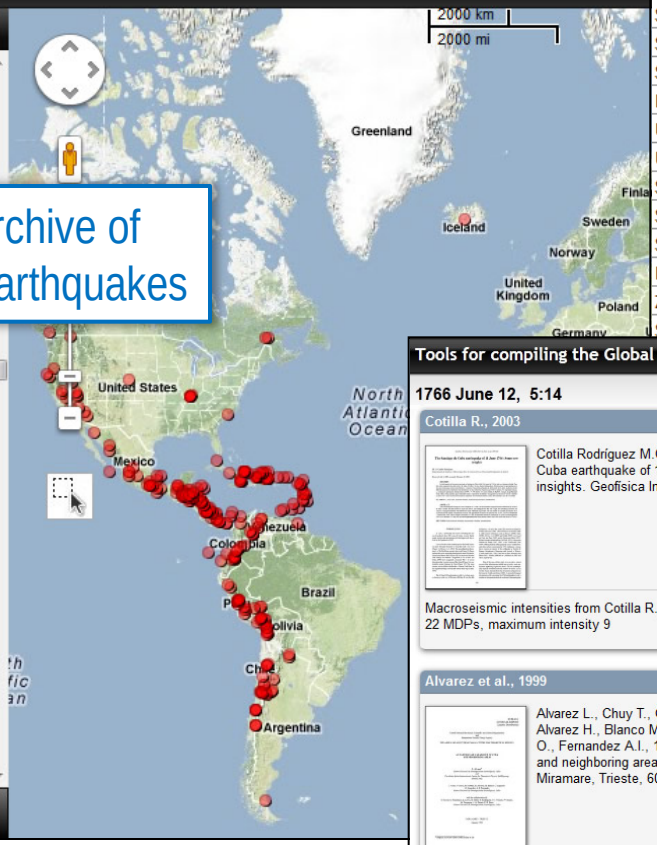
Global Parametric Earthquake Catalog

Tools for compiling the Global Earthquake History

Date	Area	Cou	info
1763 03 11 12	Aomori Pref. (Hachinohe)	JP	
1763 03 15 14	Aomori Pref. (Hachinohe)	JP	
1764 07	Trujillo	HN	
1765 04	San Martin	SV	
1765 10 24			
1766 03 08 18	Aomori, Hirosaki		
1766 05 22	Istanbul		
1766 06 12 05 14			
1766 08 05	Marmara Sea	TR	
1766 10 21 09		VE	
1769 08 29 15	Oita, Miyazaki and Kumamoto Pref.s	JP	
1769 10 24 13	BAIKAL	RU	
1770 06 04 00 15		HT	
1771 04 24 08	Yae-yama mountain, Miyako Islands	JP	
1772 06 15		GT	
1773 07 29		GT	
1773 09 07		GT	
1773 12 13		GT	
1776 03 30		GT	
1776 04 21		MX	
1776 05 30 17 15		SV	
1776 07 06		SV	

listed earthquakes 715
selected 0

Global Archive of Historical Earthquakes



Tools for compiling the Global Earthquake History

1766 June 12, 5:14

Cotilla R., 2003

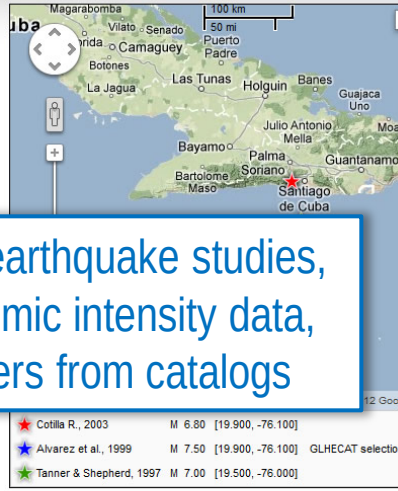
Cotilla Rodríguez M.O, 2003. The Santiago de Cuba earthquake of 11 June 1766: Some new insights. Geofísica Internacional, 42, 4, 589-602. PDF

Macroseismic intensities from Cotilla R., 20
22 MDPs, maximum intensity 9

Alvarez et al., 1999

Alvarez L., Chuy T., Garc
Alvarez H., Blanco M., E
O., Fernandez A.I., 1999
and neighboring areas. IC
Miramare, Trieste, 60 pp.

Tanner & Shepherd, 1997



Historical earthquake studies, macroseismic intensity data, parameters from catalogs

Global Earthquake Model (GEM), Tools for compiling the Global Earthquake History

a Global Component project that will produce a common set of definitions, strategies, standards, quality criteria and formats

INGV & BGS coordination
Activity: 2010 - ongoing
Time-window: 1000-1903
Magnitude: >=7

Thank you!

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