Supplementary Figures and Tables for:

Reappraisal and analysis of macroseismic data for seismotectonic purposes: the Southern Calabria strong earthquakes (Italy)

Carlo Andrenacci[1,2], Simone Bello[1,2*], Maria Serafina Barbano[2,3,4], Rita de Nardis[1,2], Claudia Pirrotta[2,3], Federico Pietrolungo[1,2] and Giusy Lavecchia[1,2]

[1]DiSPuTer, University G. d'Annunzio, via dei Vestini 31, Chieti 66100, Italy;
[2]CRUST - Interuniversity Center for 3D Seismotectonics with Territorial Applications 66100, Chieti, Italy;
[3]Dipartimento di Scienze Biologiche, Geologiche e Ambientali, Università di Catania, 95129 Catania, Italy;
[4]Istituto Nazionale di Geofisica e Vulcanologia, (INGV) Catania, Italy
*****Correspondence: simone.bello@unich.it

This Supporting Figures and Tables file contains the following information:

WORKFLOW OF DATA COLLECTION AND ANALYSIS METHODOLOGY (Figure S1) 2
MACROSEISMIC FIELD OF THE 05 FEBRUARY 1783 (Figure S2) 3
MACROSEISMIC FIELD OF THE 06 FEBRUARY 1783 (Figure S3) 4
MACROSEISMIC FIELD OF THE 07 FEBRUARY 1783 (Figure S4) 5
MACROSEISMIC FIELD OF THE 01 MARCH 1783 (Figure S5) 6
MACROSEISMIC FIELD OF THE 28 MARCH 1783 (Figure S6) 7
MACROSEISMIC FIELD OF THE 13 OCTOBER 1791 (Figure S7) 8
MACROSEISMIC FIELD OF THE 16 NOVEMBER 1894 (Figure S8) 9
MACROSEISMIC FIELD OF THE 28 DECEMBER 1908 (Figure S9) 10
METHODOLOGICAL TEST TO THE L'AQUILA 2009 EARTHQUAKE (Figure S10) 11
MACROSEISMIC SUB-FIELDS OF THE 1783 SEISMIC SEQUENCE (Figure S11) 12
MACROSEISMIC SUB-FIELDS OF THE 28 DECEMBER 1908 EARTHQUAKE (Figure S12) 13
MACROSEISMIC ELONGATION FIELDS OF THE 1783 SEISMIC SEQUENCE (Figure S13) 14
MACROSEISMIC ELONGATION FIELDS OF THE 1791, 1894 AND 1908 EARTQUAKES (Figure S14) 15
FIGURE FROM BARATTA 1910 (Figure S15) 16
TIME-SPACE EVOLUTION OF HISTORICAL-PARAMETRICAL EARTHQUAKES 17
List of historical and parametrical earthquakes from CPTI-15 in the area (**Table S13**) 17
Map view of the historical and parametrical earthquakes from CPTI-15 in the area (**Figure S16**) 18
Time-completeness graph for the earthquake catalogue presents in Table S13 (**Figure S17**) 19
Map of historical earthquakes used for the Space-time diagram (**Figure S18**) 20
List of elliptical source parameters of the historical earthquakes (**Table S14**) 21

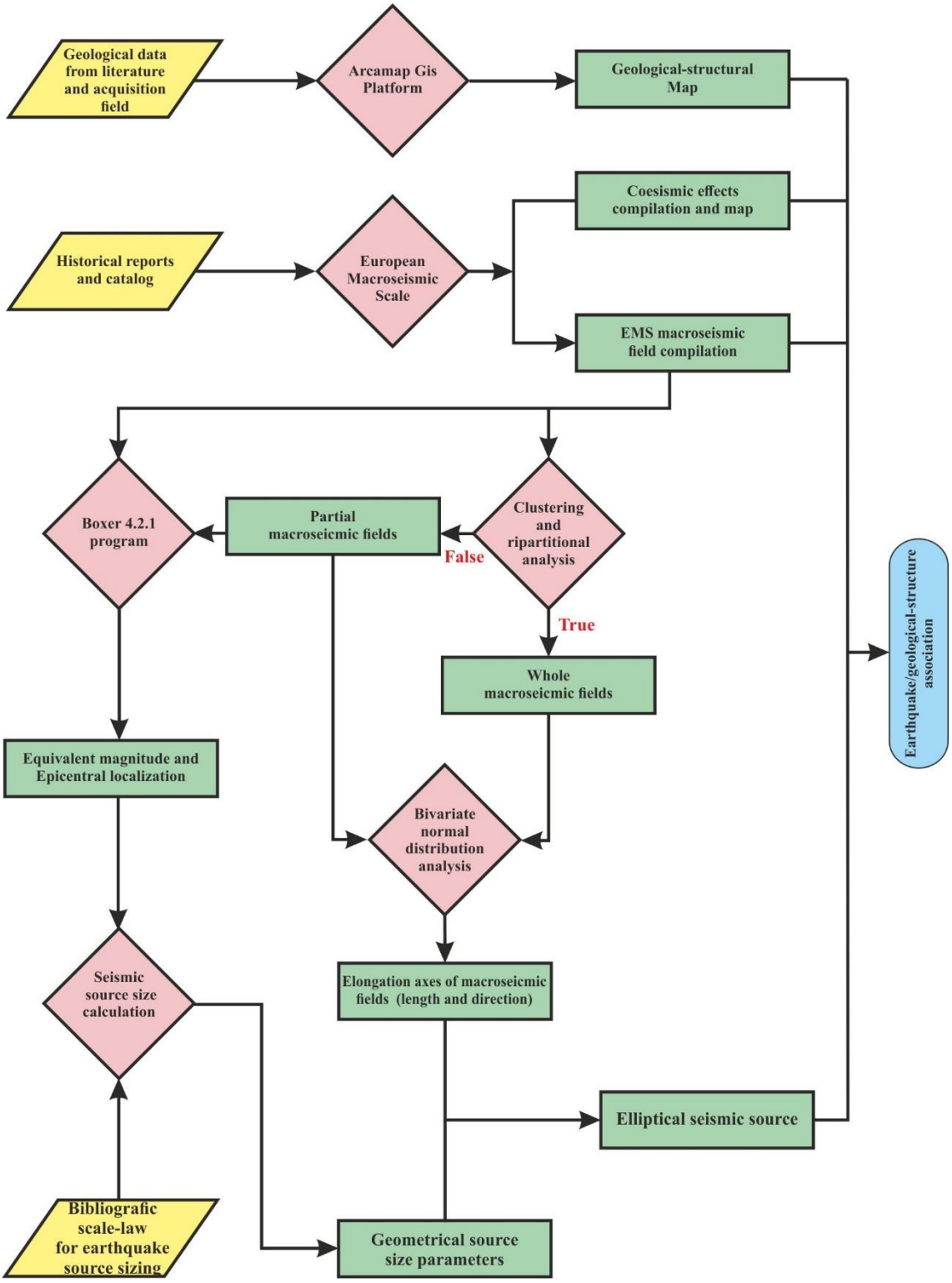

Figure S1. Workflow of data collection and analysis methodology. Key: **Yellow parallelogram**: initial input data; **pink rhomb**: Matlab algorithms and Softwares; **green rectangular:** partial or final results; **blue rounded rectangle:** final work contribution.

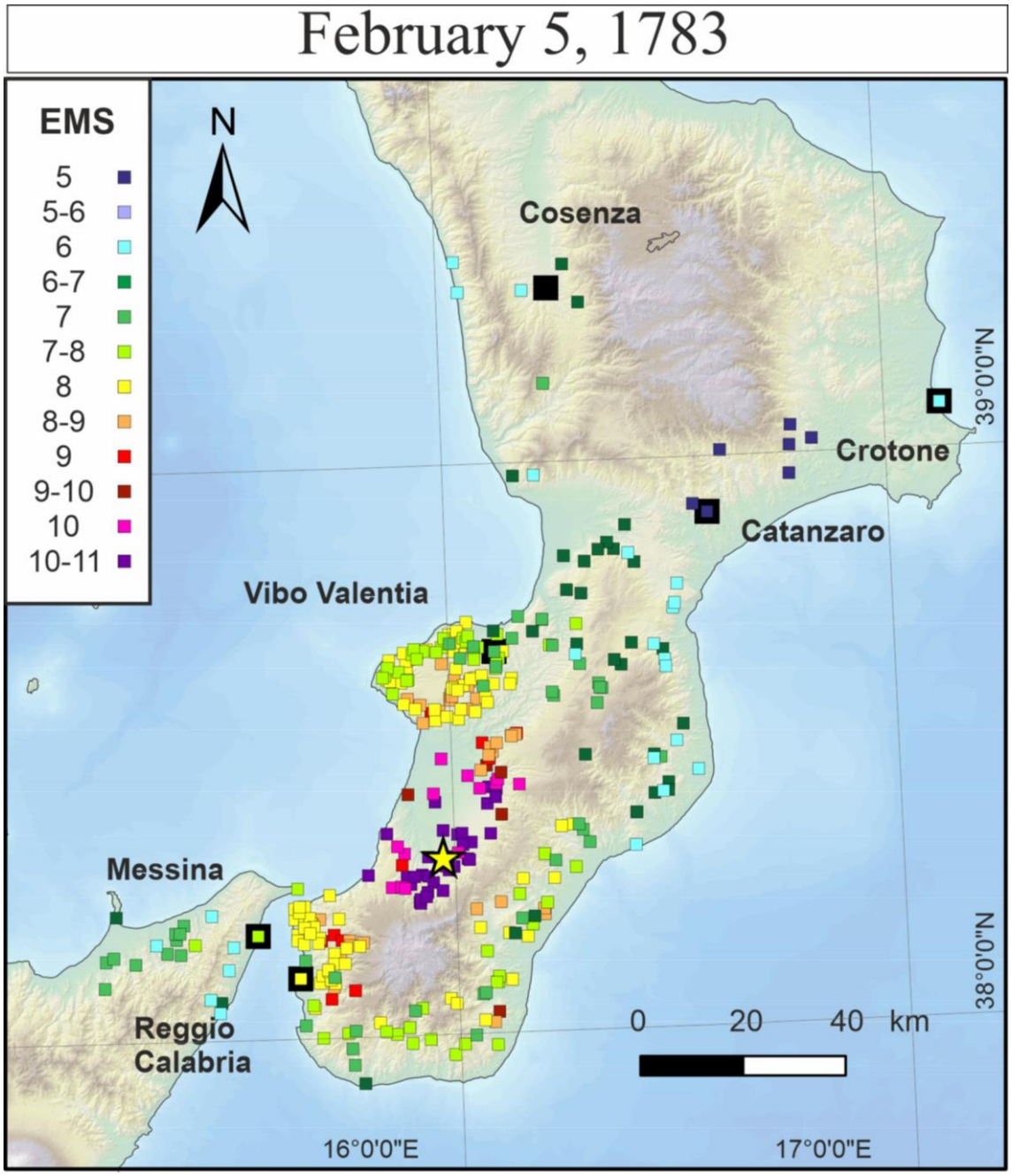

Figure S2. Macroseismic field of 5 February 1783 earthquake (see Table S5 in the Supplementary Data 2).

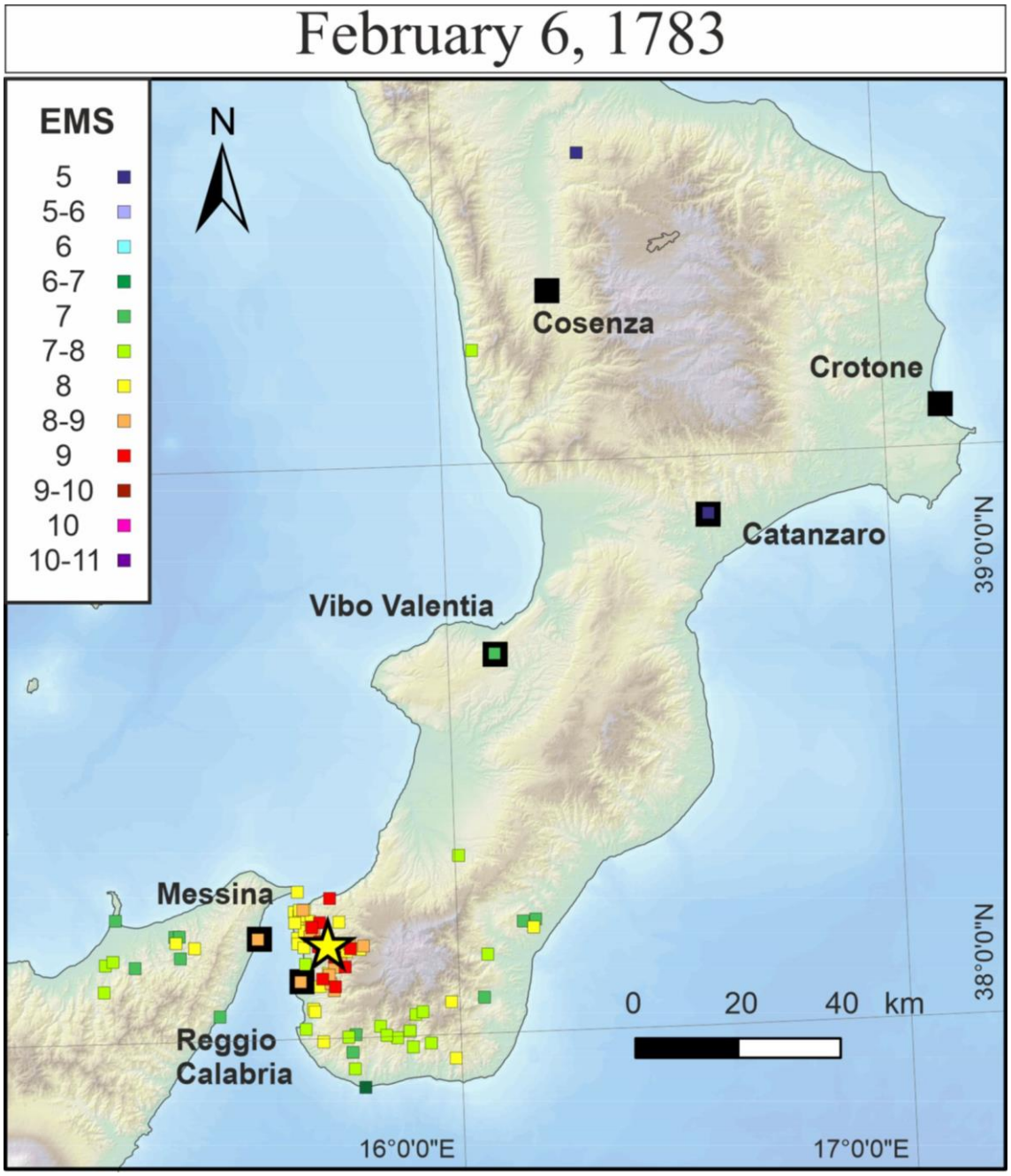

Figure S3. Macroseismic field of 6 February 1783 earthquake (see Table S6 in the Supplementary Data 2).

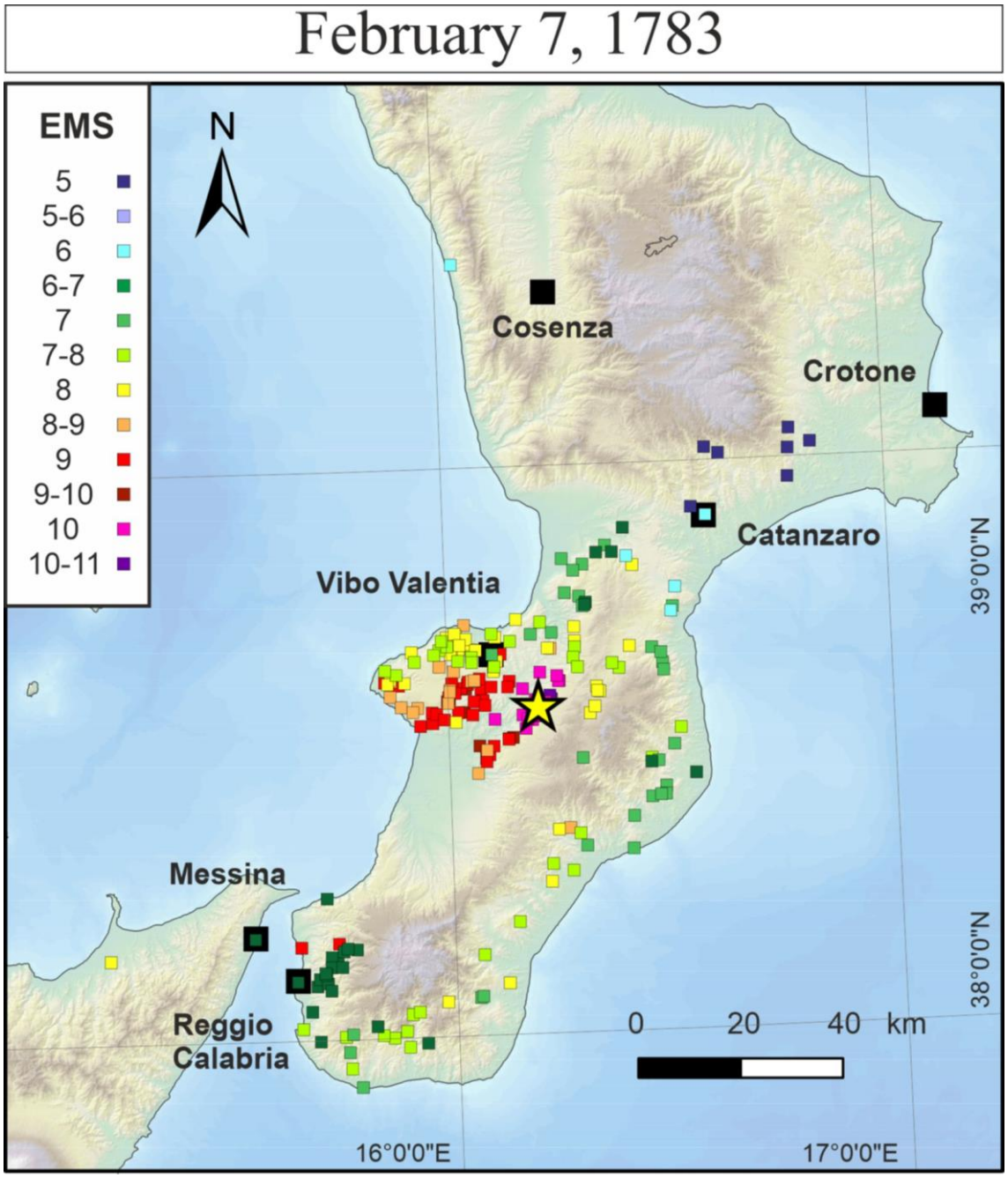

Figure S4. Macroseismic field of 7 February 1783 earthquake (see Table S7 in the Supplementary Data 2).

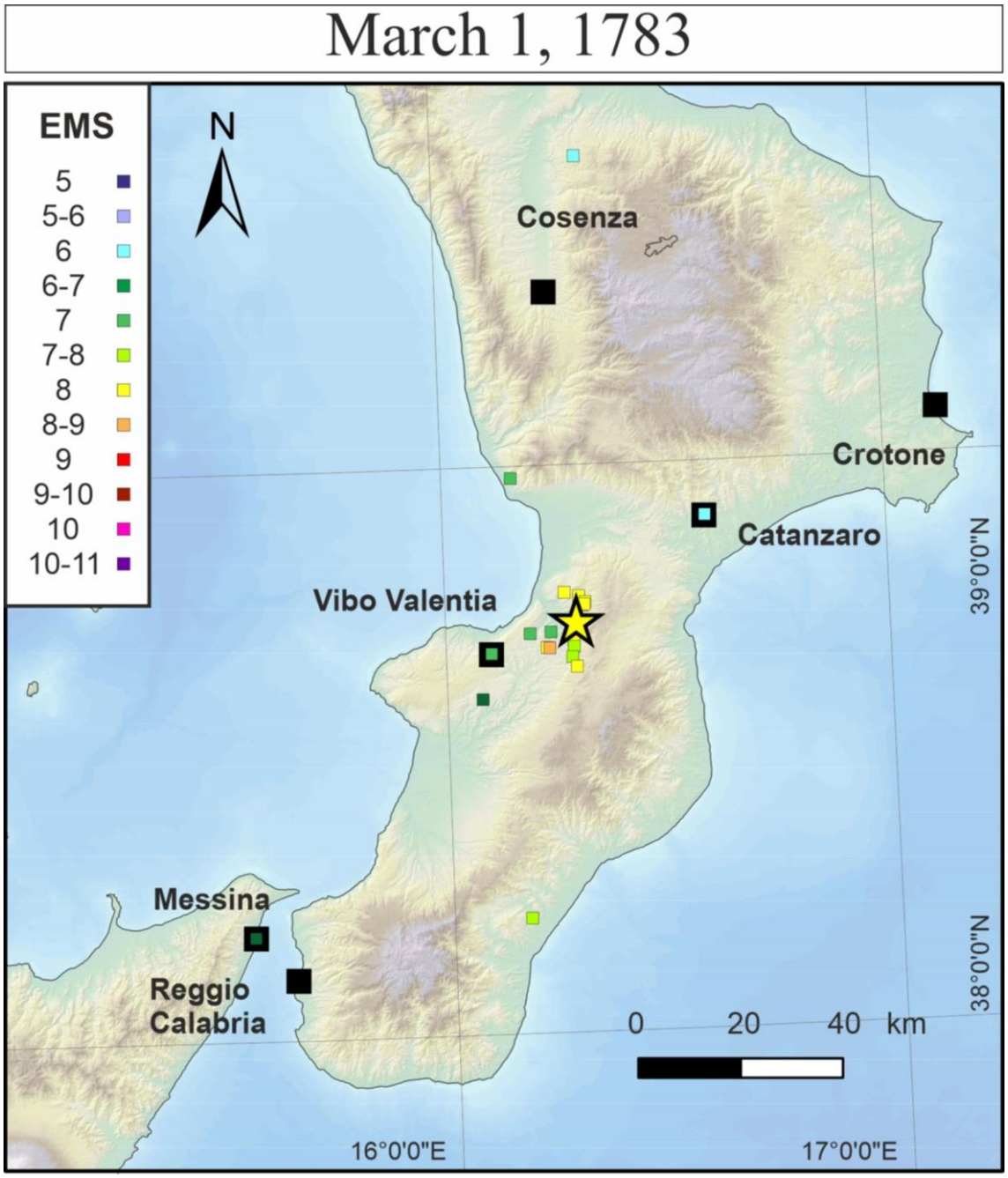

Figure S5. Macroseismic field of 1 March 1783 earthquake (see Table S8 in the Supplementary Data 2).

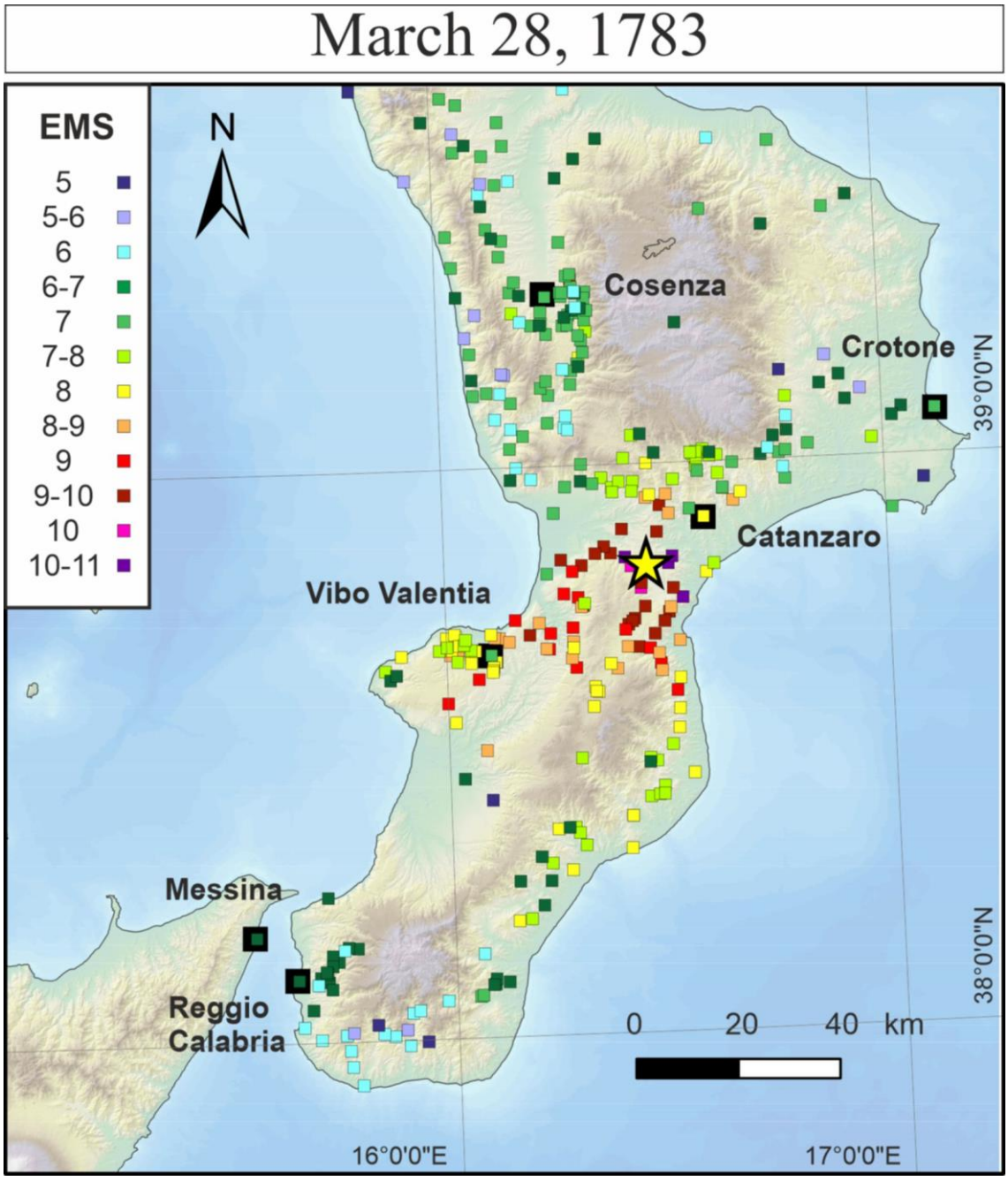

Figure S6. Macroseismic field of 28 March 1783 earthquake (see Table S9 in the Supplementary Data 2).

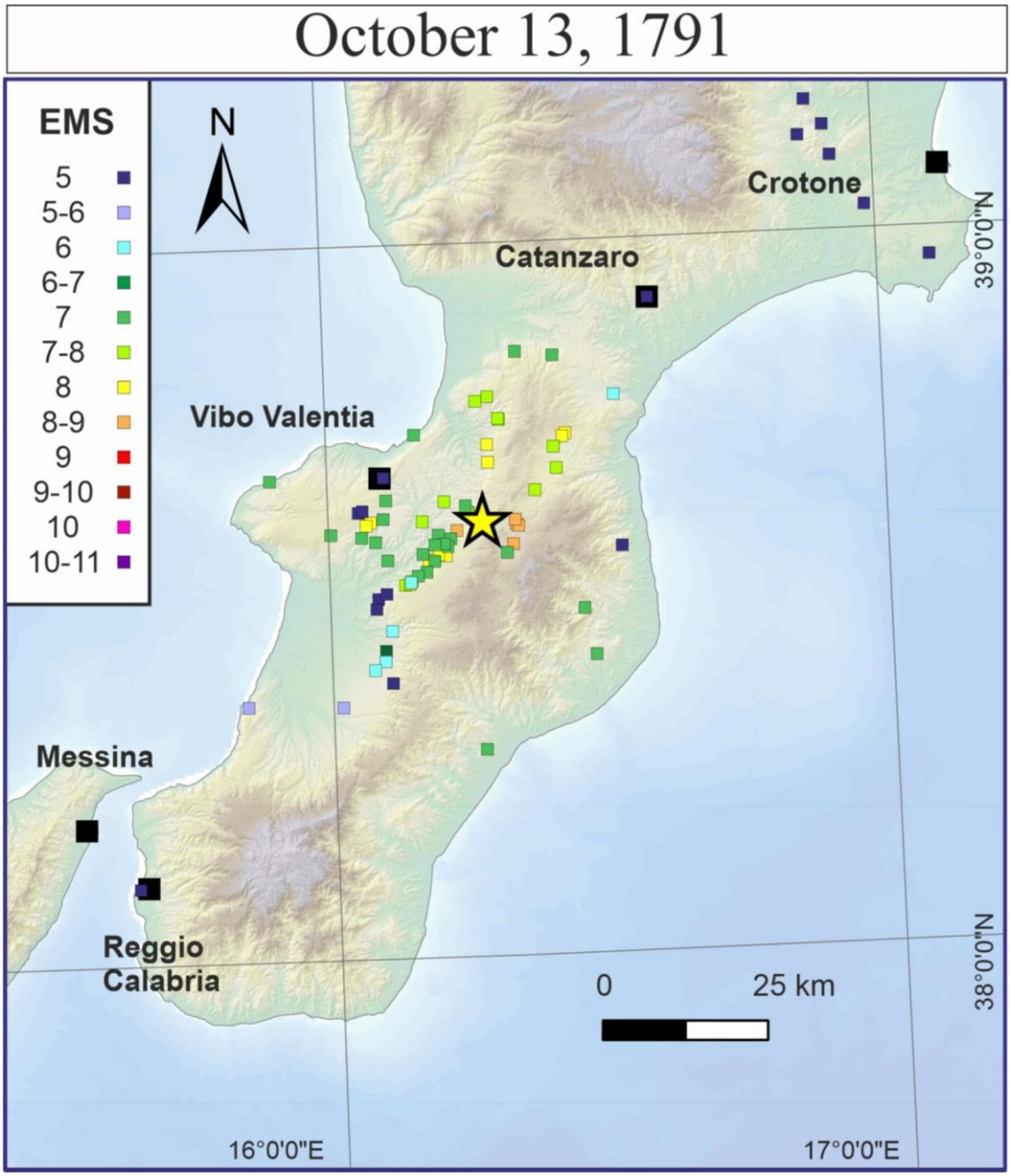

Figure S7. Macroseismic field of 13 October 1791 earthquake (see Table S10 in the Supplementary Data 2).

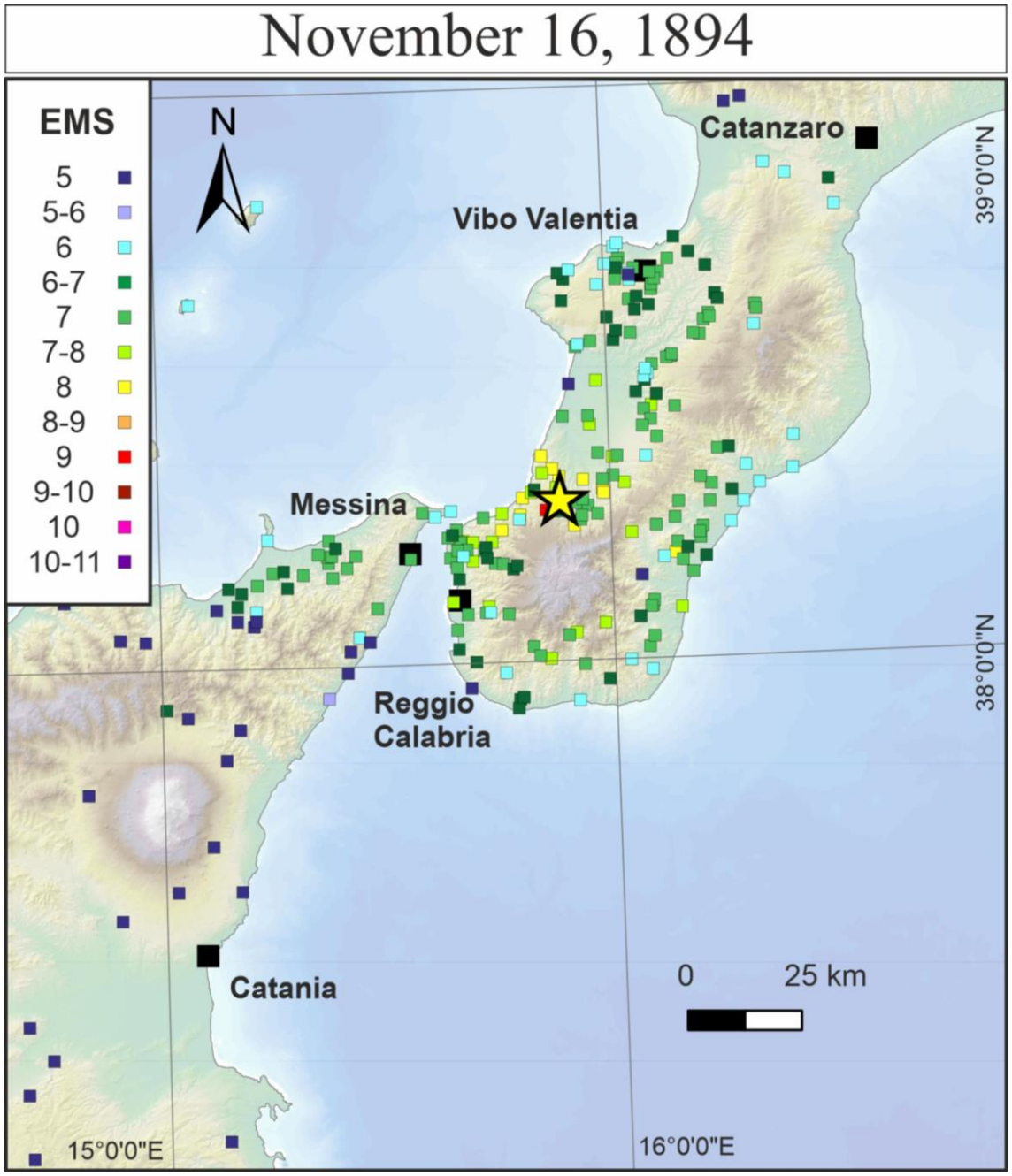

Figure S8. Macroseismic field of 16 November 1894 earthquake (see Table S11 in the Supplementary Data 2).

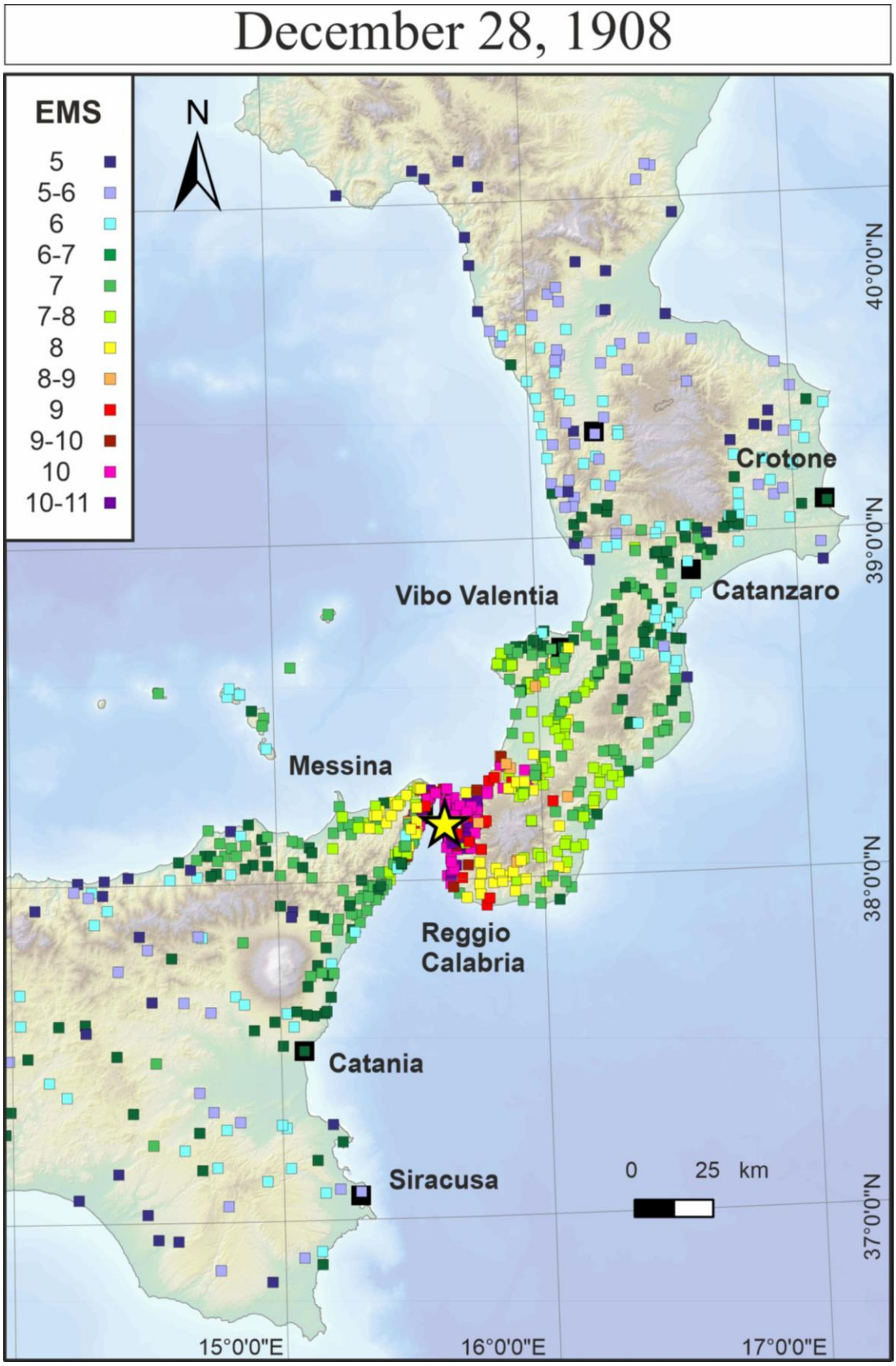

Figure S9. Macroseismic field of 28 December 1908 earthquake (see Table S12 in the Supplementary Data 2).

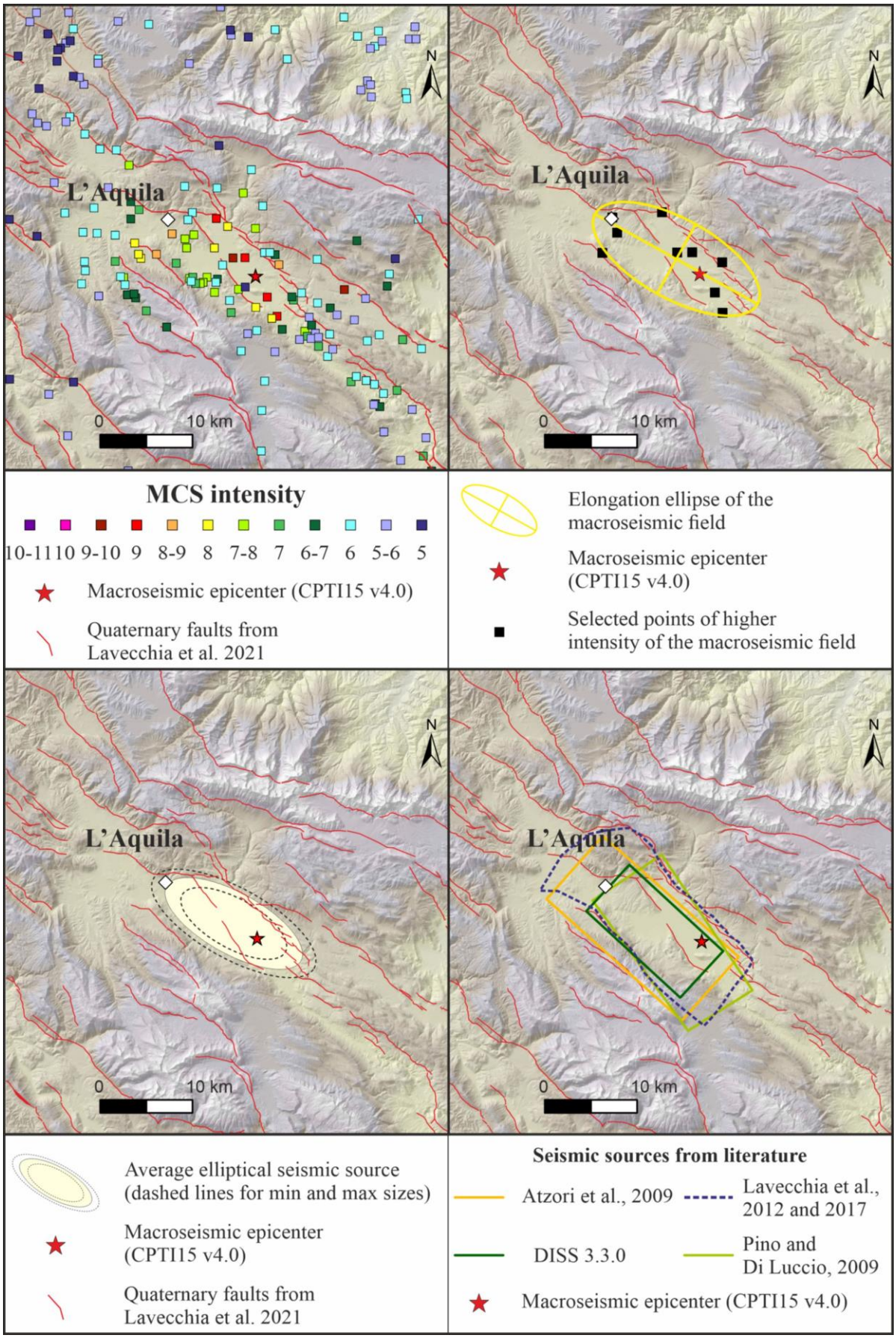

Figure S10. Application of our methodology to the case of the L'Aquila 2009 (Central Italy) earthquake.

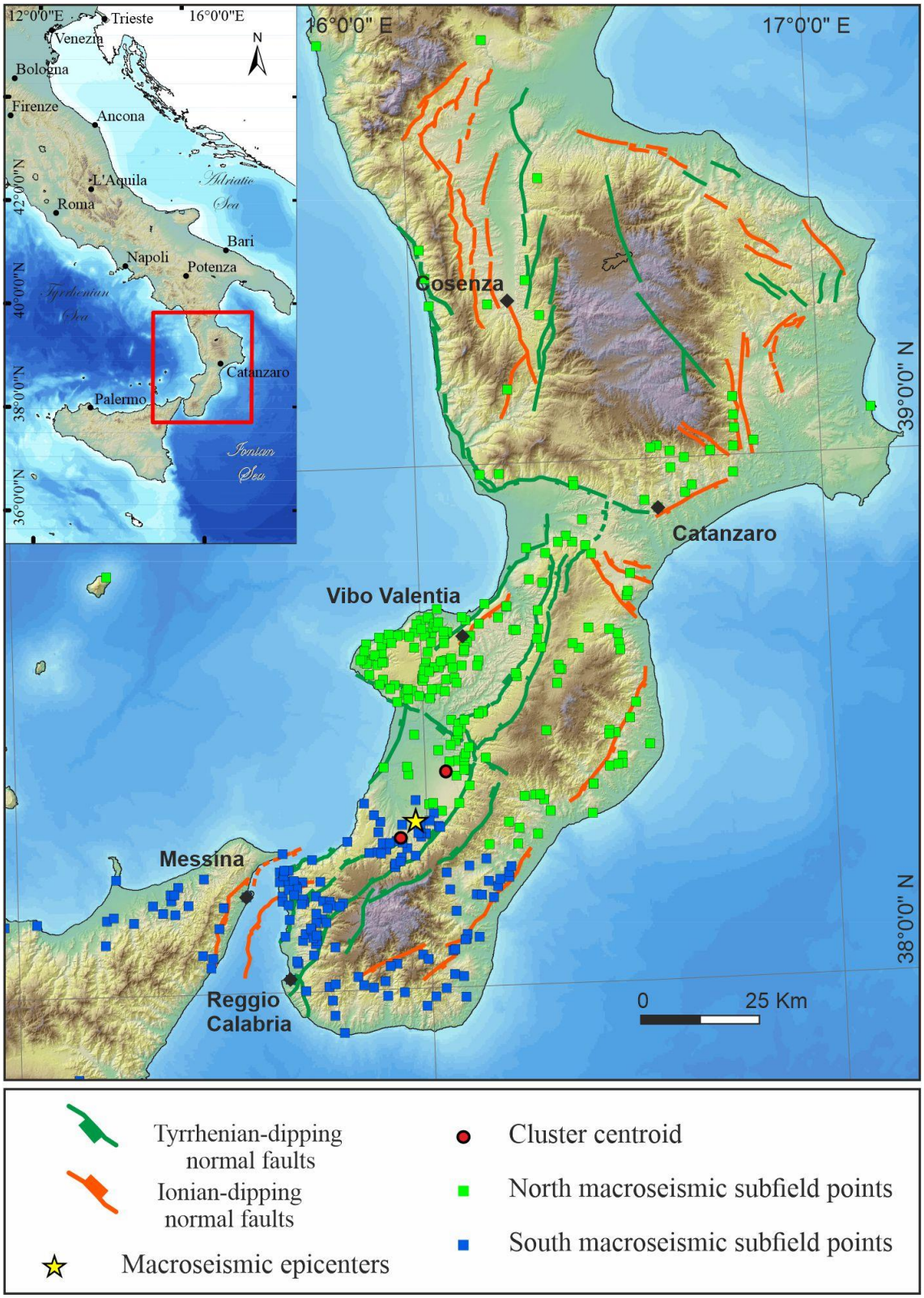

Figure S11. Separation of the macroseismic field of the 5 February 1783 earthquake based on the identification of centroids (red dots) obtained from the points of maximum intensity (I_{max}).

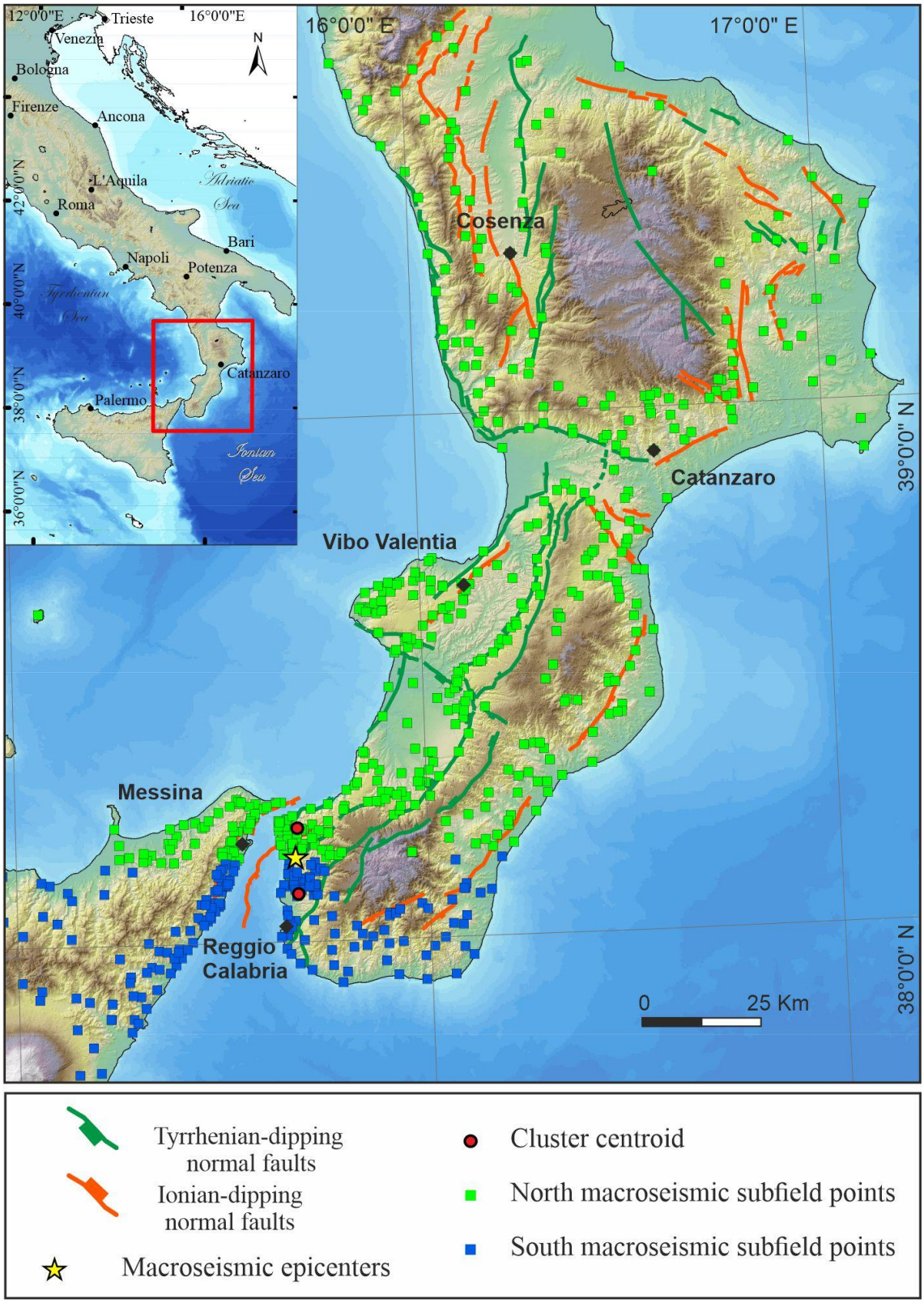

Figure S12. Separation of the macroseismic field of the 28 December 1908 earthquake based on the identification of centroids (red dots) obtained from the points of maximum intensity (I_{max}).

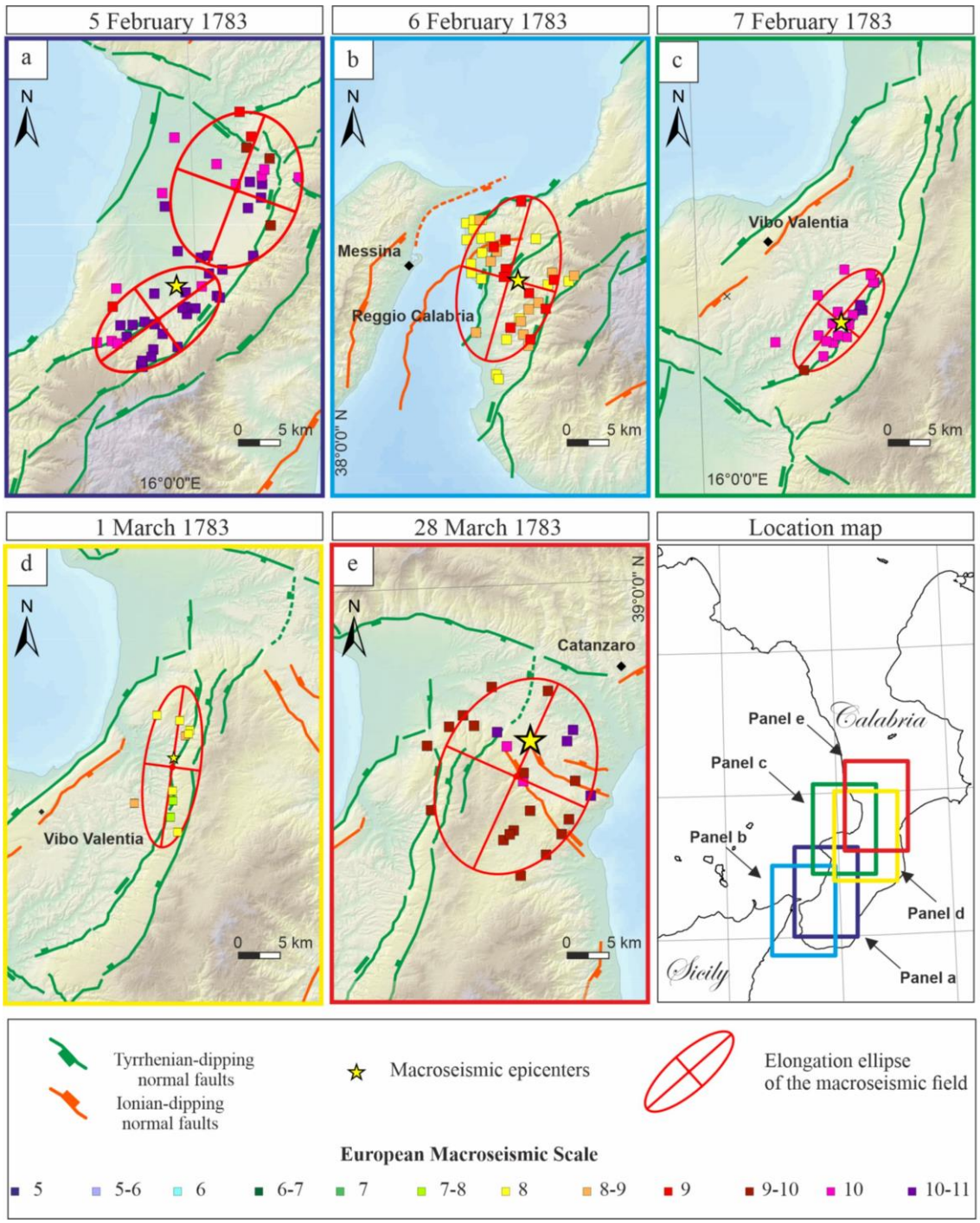

Figure S13. Ellipsis and barycenter of maximum elongation of the macroseismic field of the 1783 seismic sequence in central southern Calabria. (**a**) Ellipsis and highest selected points associated with the 5 February 1783 event; (**b**) Ellipse and highest selected points associated with the 6 February 1783 event; (**c**) Ellipse and highest selected points associated with the 7 February 1783 event; (**d**) Ellipse and highest selected points associated with the 1 March 1783 event; (**e**) Ellipse and highest selected points associated with the 28 March 1783 event.

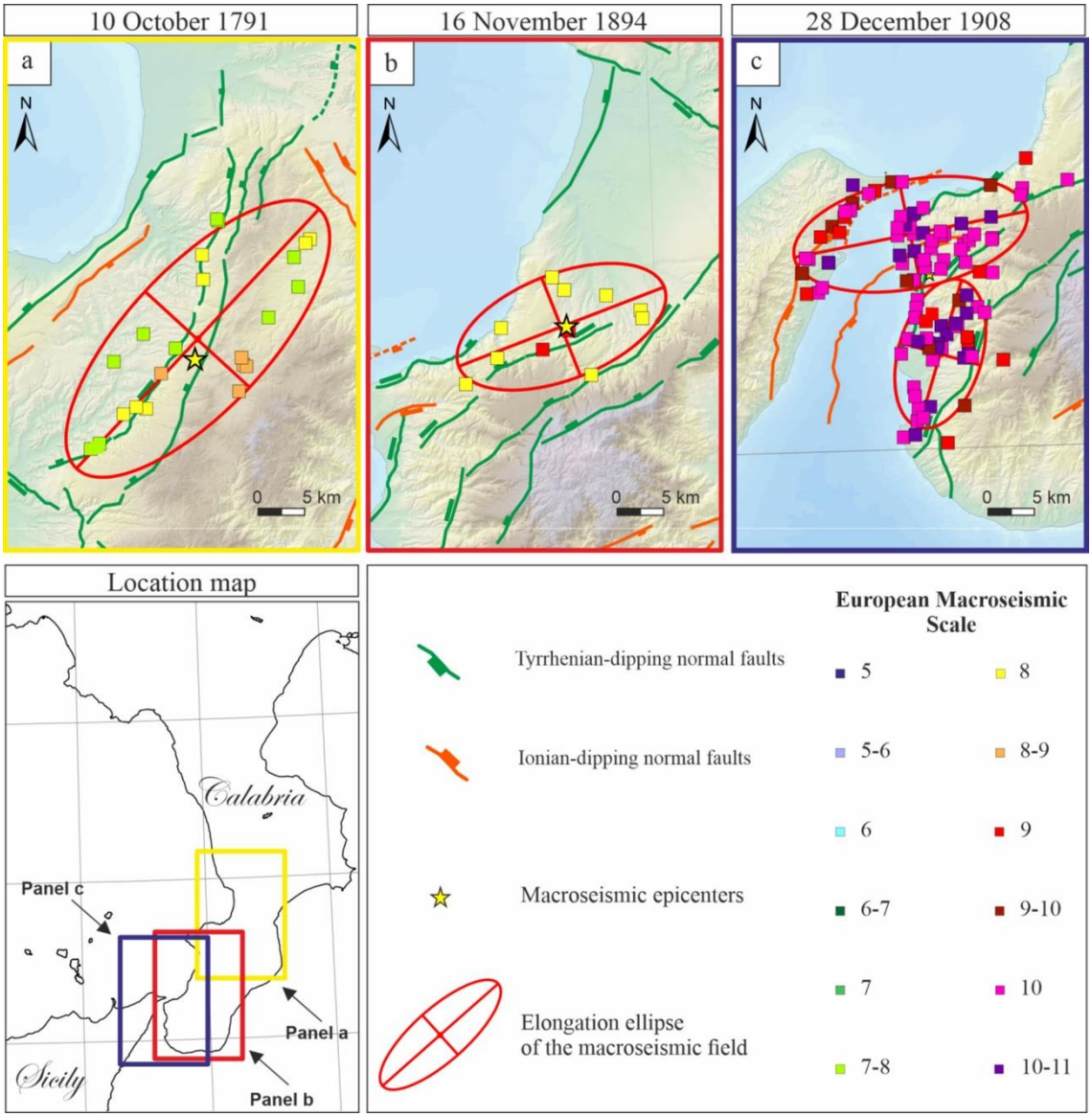

Figure S14. Ellipsis and barycenter of maximum elongation of the macroseismic field of the 1791, 1984 and 1908 in central and southern Calabria. (**a**) Ellipsis and highest selected points associated with the 10 October 1791 event; (**b**) Ellipse and highest selected points associated with the 16 November 1894 event; (**c**) Ellipse and highest selected points associated with the 28 December 1908 event.

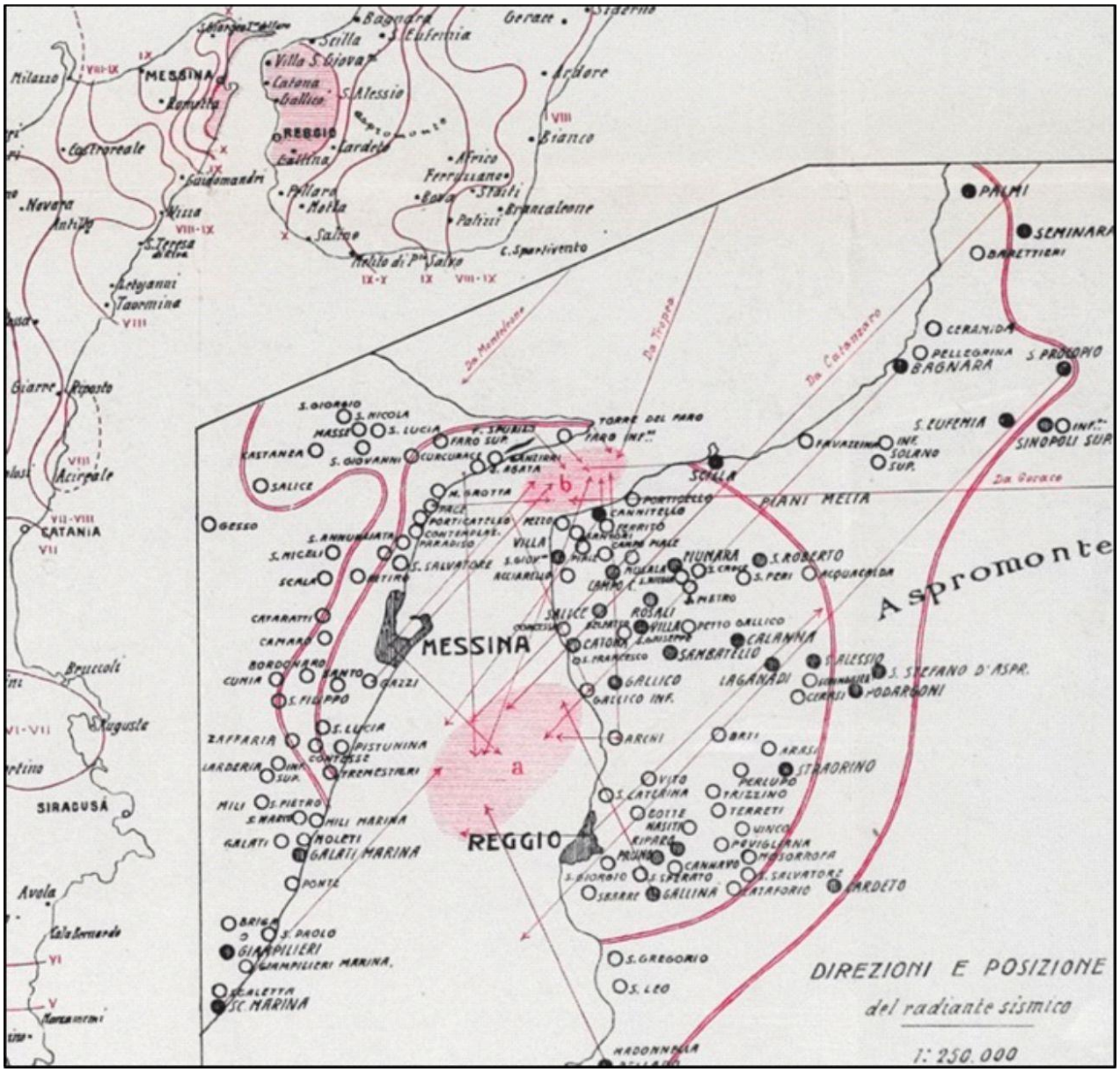

Figure S15. Macroseismic intensity trend according to Baratta (1910). The area of maximum damage has a semicircular shape and affects both side of the Messina Strait, more developed in Calabria. The two pink areas indicated with "a" and "b" are identified by Bar-atta as "centers of shaking", primary and secondary respectively. He obtained them through observations on the direction of the shock with the method originally proposed by Robert Mallet.

Table S13. List of historical earthquakes in southern Calabria (CPTI15 v4.0 from 1172 to 2020 with Mw≥5.5).

Id	Date	Epicentral	Mw	MdpN	Io
01	26/9/1172	Messina	5.60	1	8
02	24/5/1184	Valle del Crati	6.80	6	9
03	25/2/1509	Stretto di Messina	5.60	4	8
04	20/7/1609	Calabria centrale	5.80	5	8-9
05	25/8/1613	Monti Nebrodi	5.60	2	8
06	4/4/1626	Calabria centrale	6.10	7	9
07	8/6/1638	Crotonese	6.80	213	11
08	27/3/1638	Calabria centrale	7.10	41	10
09	19/6/1640	Calabria centrale	5.80	3	8-9
10	5/11/1659	Calabria centrale	6.60	126	10
11	26/1/1708	Pollino	5.60	7	8
12	7/12/1743	Calabria centrale	5.90	27	8-9
13	21/3/1744	Sila Piccola	5.70	29	8
14	0/8/1749	Messina	5.80	1	8-9
15	14/7/1767	Valle del Crati	5.90	8	8-9
16	28/3/1780	Sicilia nord-orientale	5.50	10	7-8
17	5/2/1783	Calabria meridionale	7.10	356	11
18	6/2/1783	Stretto di Messina	6.20	8	9-10
19	7/2/1783	Calabria centrale	6.70	191	10-11
20	1/3/1783	Calabria centrale	5.90	18	9-10
21	28/3/1783	Calabria centrale	7.00	323	11
22	10/3/1786	Golfo di Patti	6.10	10	9
23	13/10/1791	Calabria centrale	6.10	76	9
24	8/3/1832	Crotonese	6.70	99	10
25	12/10/1835	Cosentino	5.90	36	9
26	25/4/1836	Calabria settentrionale	6.20	44	9
27	12/2/1854	Cosentino	6.30	89	10
28	4/10/1870	Cosentino	6.20	54	9-10
29	6/3/1886	Cosentino	5.60	10	7-8
30	3/12/1887	Calabria settentrionale	5.60	142	8
31	16/11/1894	Calabria meridionale	6.10	303	9
32	8/9/1905	Calabria centrale	7.00	895	10-11
33	23/10/1907	Aspromonte	6.00	274	8-9
34	28/12/1908	Stretto di Messina	7.10	772	11
35	1/7/1909	Stretto di Messina	5.50	35	8
36	28/6/1913	Calabria settentrionale	5.60	151	8
37	7/3/1928	Calabria centro-meridionale	5.90	30	7-8
38	2/1/1932	Ionio settentrionale	5.50	16	5
39	11/5/1947	Calabria centrale	5.70	254	8
40	15/4/1978	Golfo di Patti	6.00	330	8

Keys: **Mw:** Equivalent Magnitude; **MDP**: Macroseismic Data Points; **I_0**: Epicentral Intensity.

Figure S16. Map of historical earthquakes in the CPTI15 [1] catalog related to earthquakes occurring in the study area from 1172 to 2020 having ≥ 5.5.

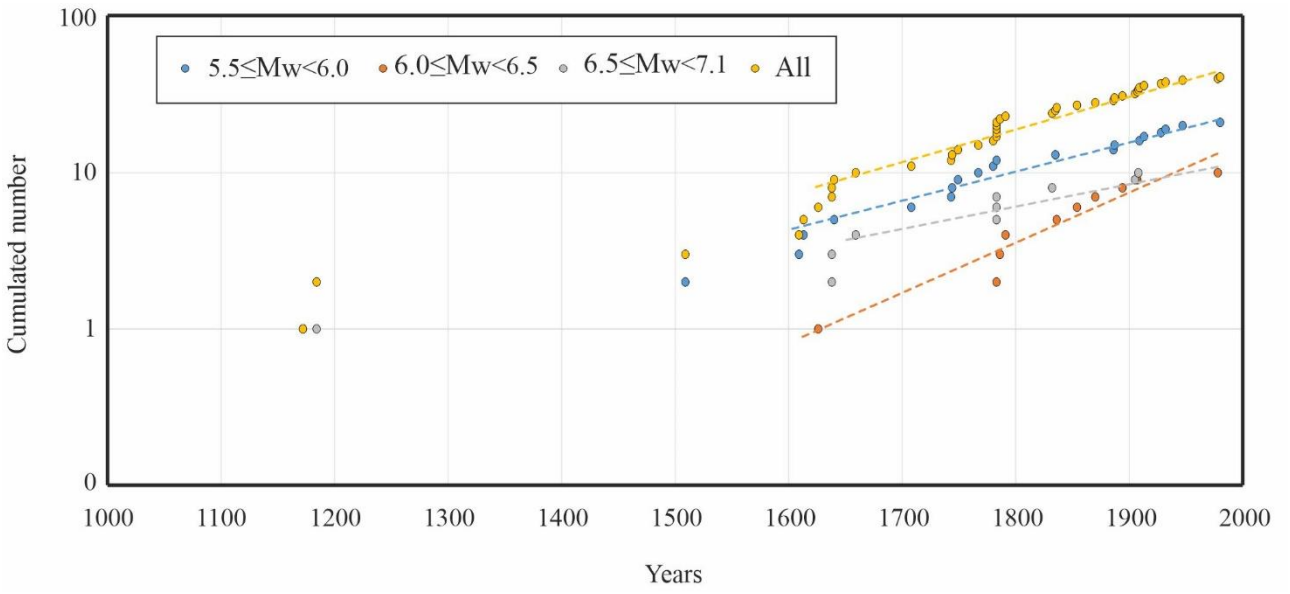

Figure S17. Time-completeness graph for the earthquakes listed in Table S13 with magnitude Mw≥5.5 occurring in the Southern Calabria from 1172 to 2020.

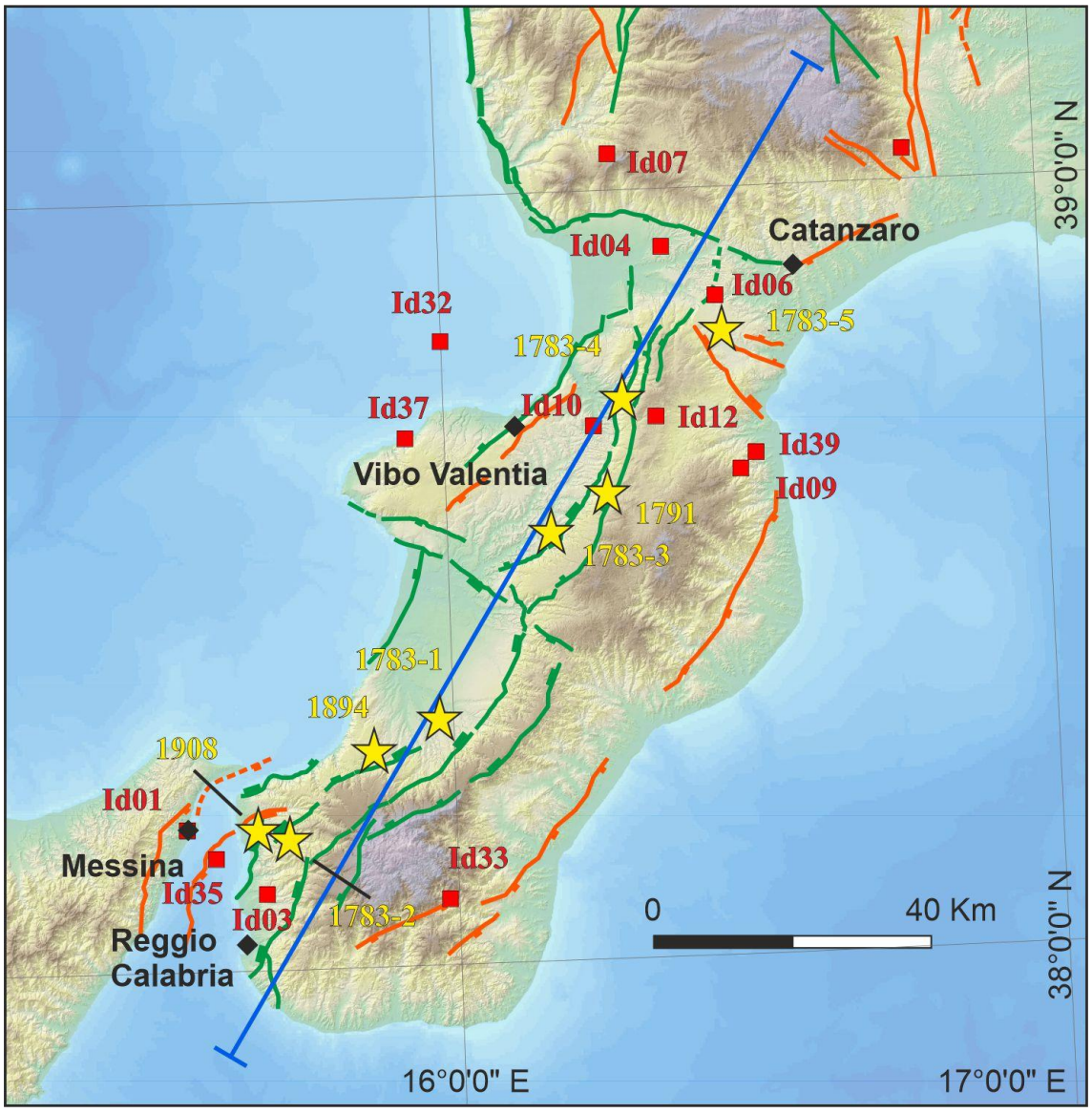

Figure S18. Map of historical earthquakes used for the Space-time diagram (see Fig. 10 in main paper).

Table S14. Elliptical source parameters of the historical earthquakes used for space-time evolution analysis for southern Calabria.

Id	Date	Epicentral	Mw	MdpN	Io	Displacement [m]	Area (Km^2)	Length (Km)	Width (Km)	Reference
04	20/7/1608	Calabria centrale	5.8	5	8-9	0.27	69.27	9.80	9.00	CPTI14
06	4/4/1626	Calabria centrale	6.1	7	9	0.4	131.88	14.54	11.55	CPTI14
08	27/3/1638	Calabria centrale	7.1	41	10	1.45	1154.25	55.24	26.61	CPTI14
09	19/6/1640	Calabria centrale	5.8	3	8-9	0.27	69.27	9.80	9.00	CPTI14
10	5/11/1659	Calabria centrale	6.6	126	10	0.78	380.76	28.03	17.30	CPTI14
12	7/12/1743	Calabria centrale	5.9	27	8-9	0.31	85.19	11.14	9.74	CPTI14
14	0/8/1749	Messina	5.8	1	8-9	0.27	69.27	9.80	9.00	CPTI14
1783-1	5/2/1783	Southern Calabria	6.56	215	10-11	0.74	350.69	26.61	16.78	This paper
			6.57	152	10-11	0.75	357.98	26.96	16.91	
1783-2	6/2/1783	Messina	6.22	81	9	0.46	171.65	17.07	12.81	This paper
1783-3	7/2/1783	Central Calabria	6.67	227	10-11	0.81	467.36	31.65	18.80	This paper
1783-4	1/3/1783	Central Calabria	6	21	8-9	0.35	105.96	12.72	10.60	This paper
1783-5	28/3/1783	Central Calabria	6.81	336	10-11	0.98	623.92	37.89	20.97	This paper
1791	13/10/1791	Central Calabria	5.89	76	8-9	0.30	84.86	11.09	9.74	This paper
1894	16/11/1894	Southern Calabria	6.08	302	9	0.39	126.23	14.16	11.35	This paper
32	8/9/1905	Calabria centrale	7	895	10-11	1.28	920.78	47.86	24.50	CPTI14
33	23/10/1907	Aspromonte	6	274	8-9	0.35	105.96	12.72	10.60	CPTI14
1908	28/12/1908	Messina	6.6	497	10-11	0.78	380.76	28.03	17.30	This paper
			6.5	317	10-11	0.68	310.04	24.61	16.04	
35	1/7/1909	Stretto di Messina	5.5	35	8	0.21	32.20	6.20	6.61	CPTI14
37	7/3/1928	Calabria centro-meridionale	5.9	30	7-8	0.31	85.19	11.14	9.74	CPTI14
39	11/5/1947	Calabria centrale	5.7	254	8	0.27	49.66	8.10	7.81	CPTI14
40	15/04/1978	Golfo di Patti	6	330	8	0.35	105.96	12.72	10.60	CPTI14

Keys: **Mw:** Equivalent Magnitude; **MDP**: Macroseismic Data Points; $\mathbf{I_0}$: Epicentral Intensity. **Area**, **Length**, **Width:** Geometric parameters of elliptical seismic sources. Displacement is calculated from the value of the seismic moment using the Hanks and Kanamori's (1979) formulas.