EPOS DAYS 2026

Operational ShakeMap Services: Applications and Societal Impact

INGV ShaKeMap & HSIT Groups

EPOS DAYS 16 - 20 March 2026, Cagliari | Palazzo Doglio

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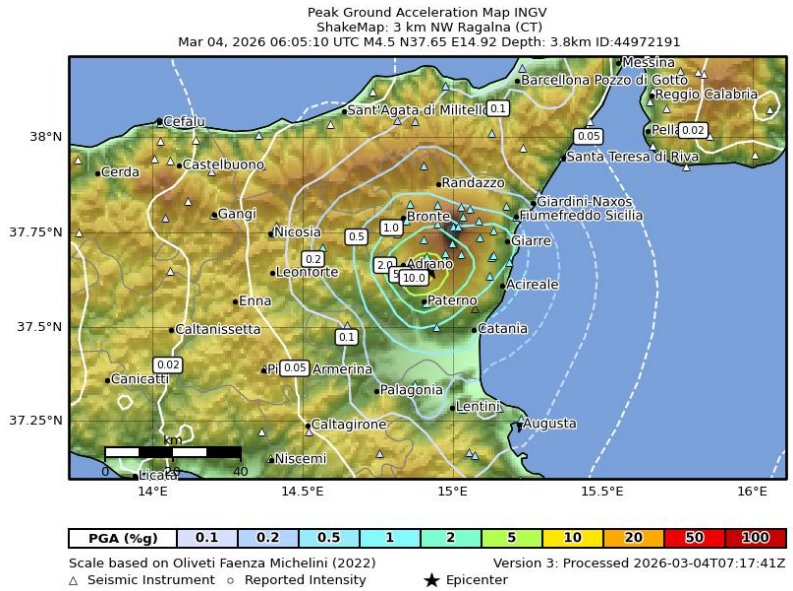
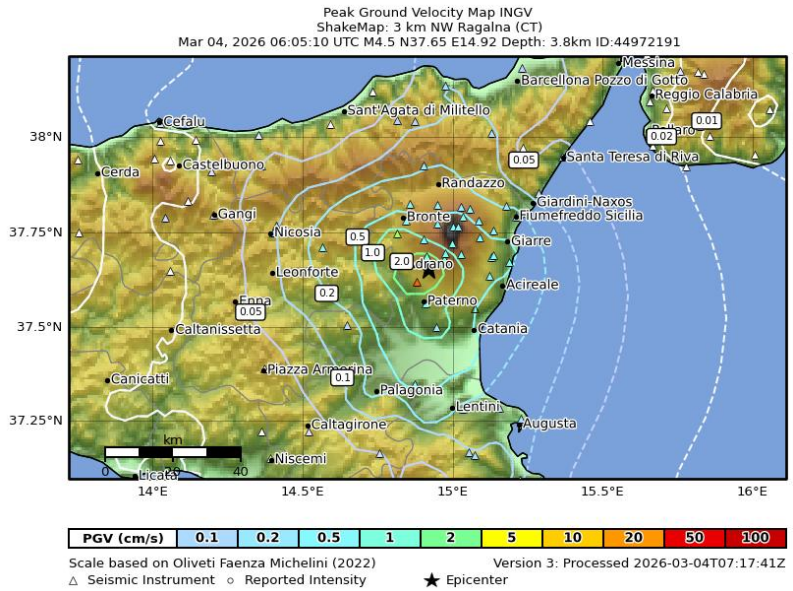
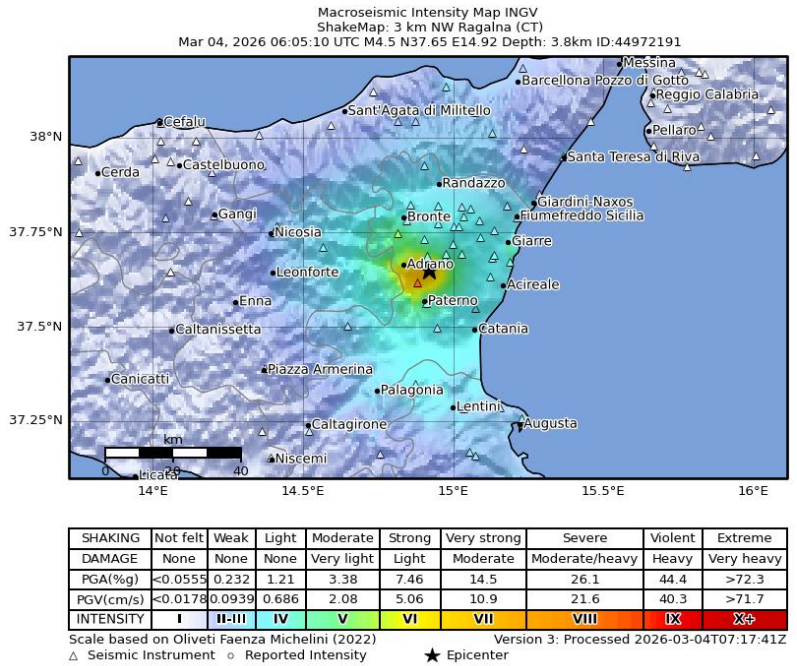
ShakeMap at INGV: Current operational framework

- **Publishing Peak Ground Motion (PGM) and intensity maps for M ≥ 3.0 since 2008**
  https://shakemap.ingv.it/







PGA **PGV** **INTENSITY**

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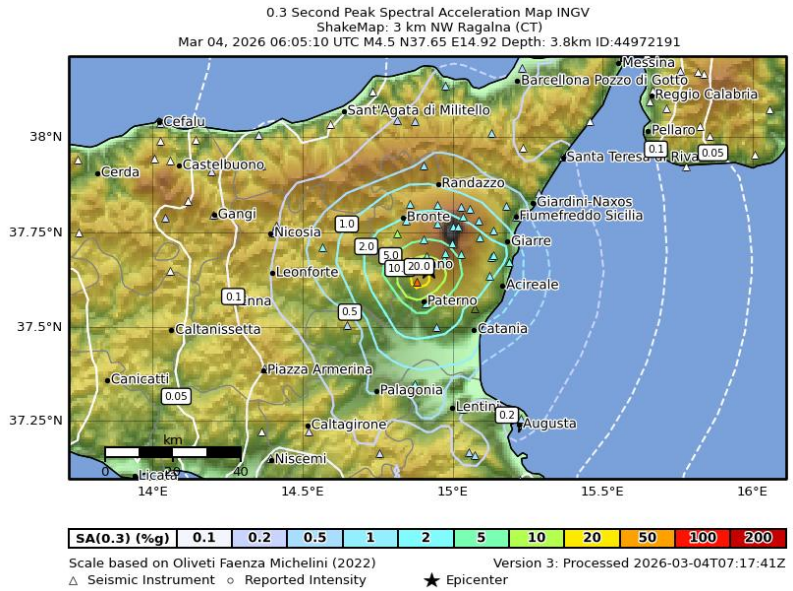

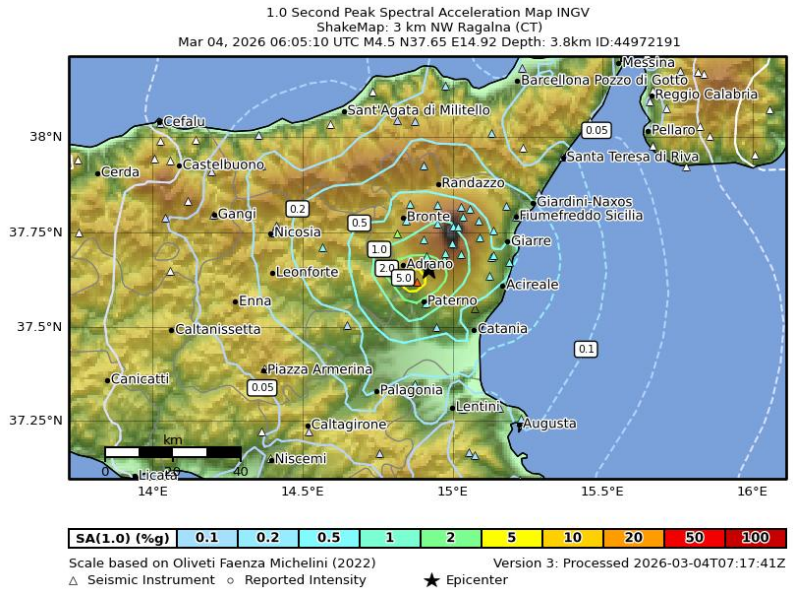

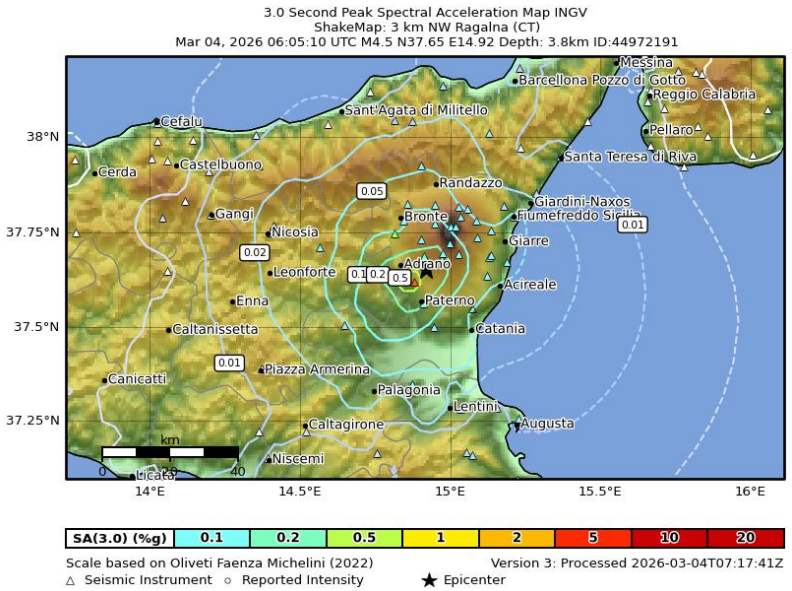

SA(0.3) **SA(1.0)** **SA(3.0)**

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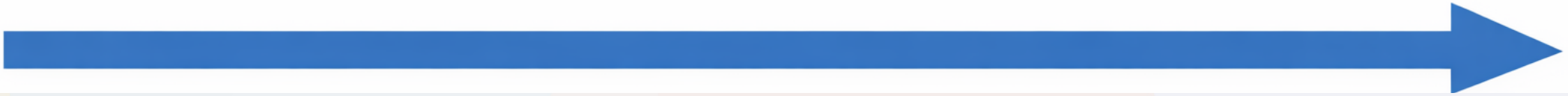
ShakeMap at INGV: Current operational framework

1	2	3	4
Initial automatic solution	**Automatic strong motion reprocessing**	**Integration of additional strong-motion data**	**Manual revision and validation**
Manually revised location and magnitude combined with automatic PGMs from Earthworm (real-time stream)	Archive-based computation of strong motion parameters (miniSEED), including an extended station set	Incorporation of PGMs from the Italian Civil Protection Department (DPC)	M ≥ 4.0: PGMs reviewed through ESM M ≥ 3.5: Event location and magnitude revised using BSI solutions
15–30 min	**≤ 45 min**	**2–3 h**	**1–3 days**



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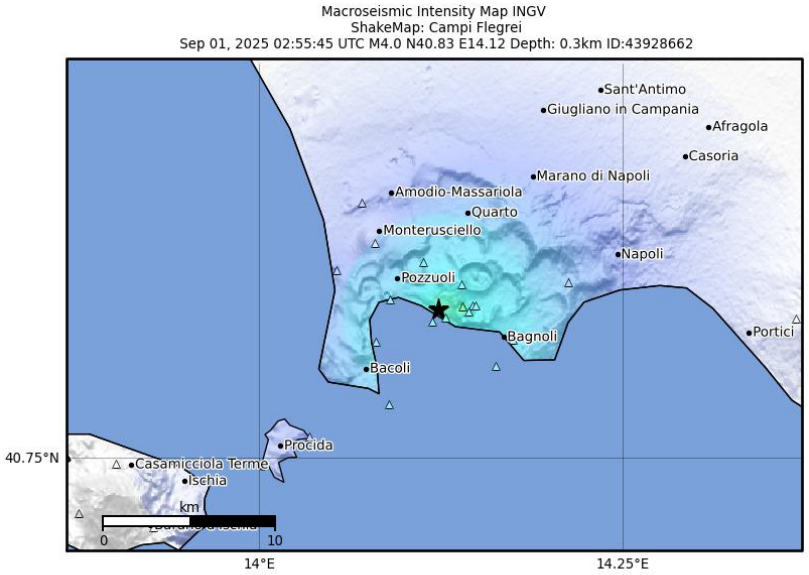
ShakeMap at INGV: Current operational framework

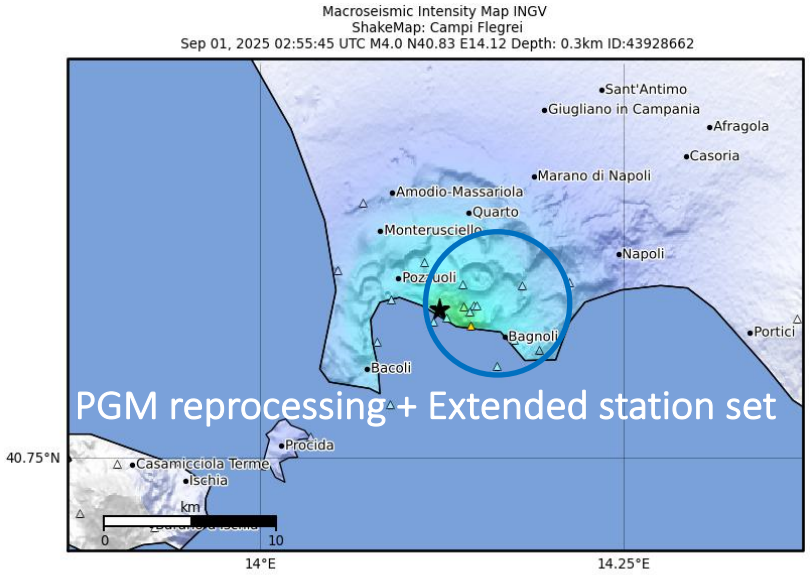


SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
DAMAGE	None	None	None	Very light	Light	Moderate	Moderate/heavy	Heavy	Very heavy
PGA(%g)	<0.0555	0.232	1.21	3.38	7.46	14.5	26.1	44.4	>72.3
PGV(cm/s)	<0.0178	0.0939	0.686	2.08	5.06	10.9	21.6	40.3	>71.7
INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based on Oliveti Faenza Michelini (2022) Version 1: Processed 2025-09-01T03:28:55Z

△ Seismic Instrument ○ Reported Intensity ★ Epicenter

1



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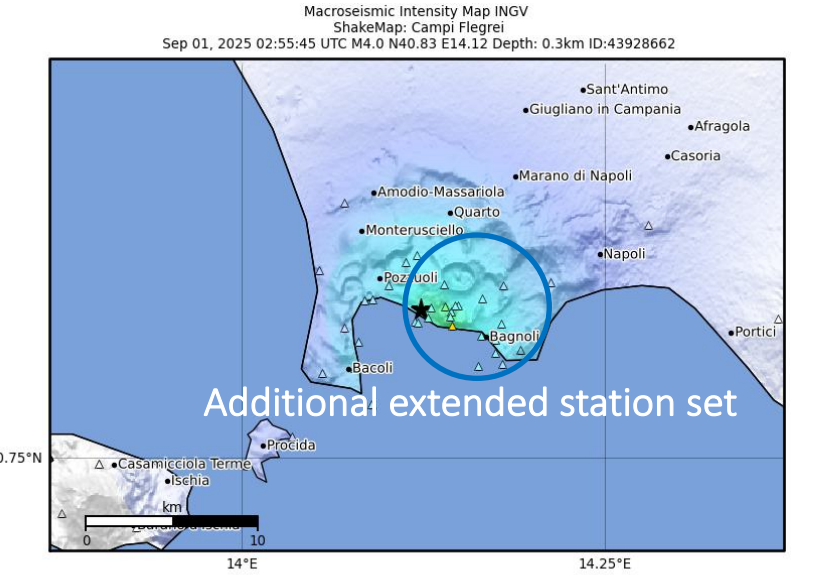
INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based on Oliveti Faenza Michelini (2022) Version 2: Processed 2025-09-01T03:37:46Z

△ Seismic Instrument ○ Reported Intensity ★ Epicenter

2



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INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based on Oliveti Faenza Michelini (2022) Version 3: Processed 2025-09-01T04:10:45Z

△ Seismic Instrument ○ Reported Intensity ★ Epicenter

3

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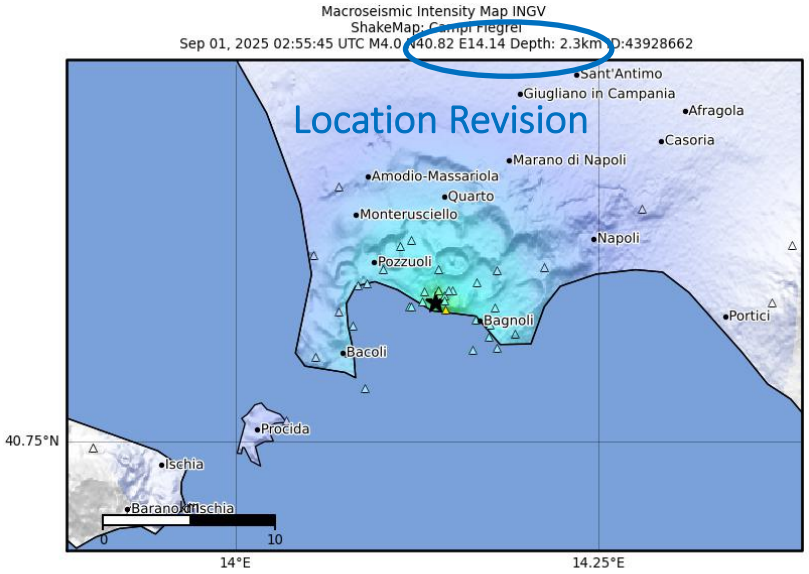
ShakeMap at INGV: Current operational framework



SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
DAMAGE	None	None	None	Very light	Light	Moderate	Moderate/heavy	Heavy	Very heavy
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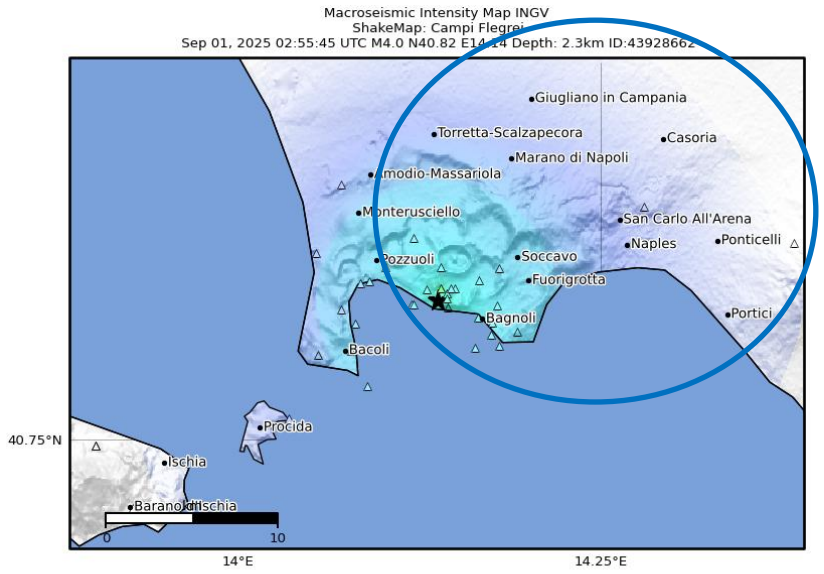
PGV(cm/s)	<0.0178	0.0939	0.686	2.08	5.06	10.9	21.6	40.3	>71.7
INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based on Oliveti Faenza Michelini (2022) Version 4: Processed 2025-09-03T02:04:56Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter

4

Manual PGM reprocessing from Version4 to Version10



SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
DAMAGE	None	None	None	Very light	Light	Moderate	Moderate/heavy	Heavy	Very heavy
PGA(%g)	<0.0555	0.232	1.21	3.38	7.46	14.5	26.1	44.4	>72.3
PGV(cm/s)	<0.0178	0.0939	0.686	2.08	5.06	10.9	21.6	40.3	>71.7
INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based on Oliveti Faenza Michelini (2022) Version 10: Processed 2026-01-10T02:18:25Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter

4

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ShakeMap at INGV: Background

INSTRUMENTAL SHAKEMAPS
(Michelini et al., 2008, 2020, Oliveti et al., 2022, 2025)

- Origin time, Location and Magnitude
- Station data
- Ground-motion models (GMM) for each tectonic regime
- Map of V_{S30} for the local site effects
- Ground motion intensity conversion equations (GMICE) calibrated for Italy
- Finite fault, when available

HISTORIC SHAKEMAPS
(Oliveti et al., 2023)

- Origin time, Location and Magnitude
- Macroseismic intensity data
- Intensity prediction equations (IPE): GMM + GMICE
- Map of V_{S30} for the local site effects
- Finite fault, when available

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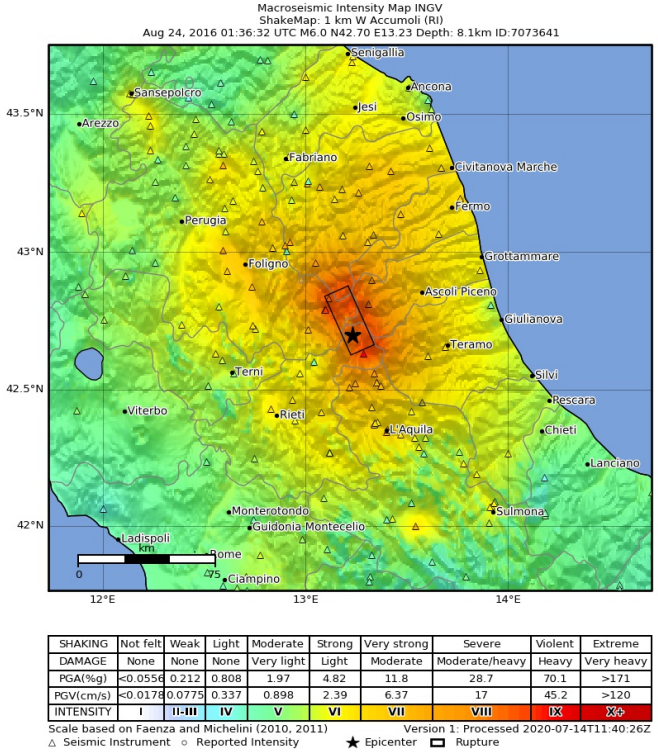

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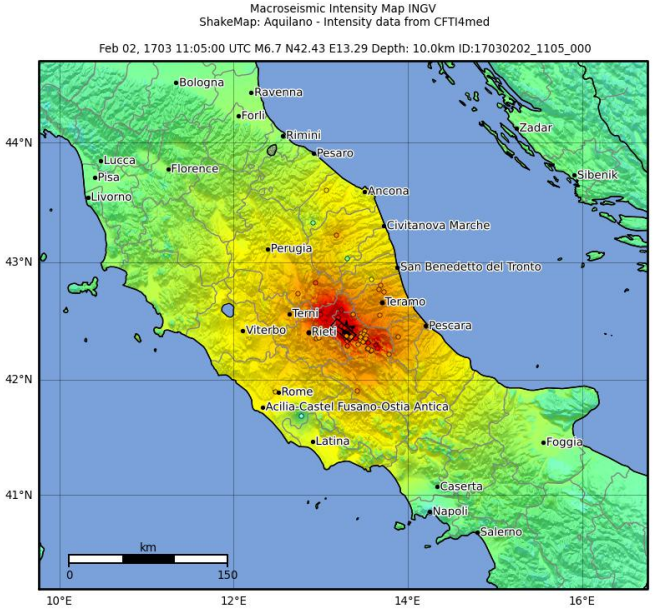
DAMAGE	None	None	None	Very light	Light	Moderate	Moderate/heavy	Heavy	Very heavy
PGA(%g)	<0.0556	0.212	0.808	1.97	4.82	11.8	28.7	70.1	>171
PGV(cm/s)	<0.0178	0.0775	0.337	0.898	2.39	6.37	17	45.2	>120
INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based on Faenza and Michelini (2010, 2011) Version 1: Processed 2020-07-14T11:40:26Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter ▭ Rupture

HISTORIC SHAKEMAPS
(Oliveti et al., 2023)



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Scale based on Oliveti Faenza Michelini (2022) Version 1: Processed 2023-03-12T17:55:28Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter ▭ Rupture

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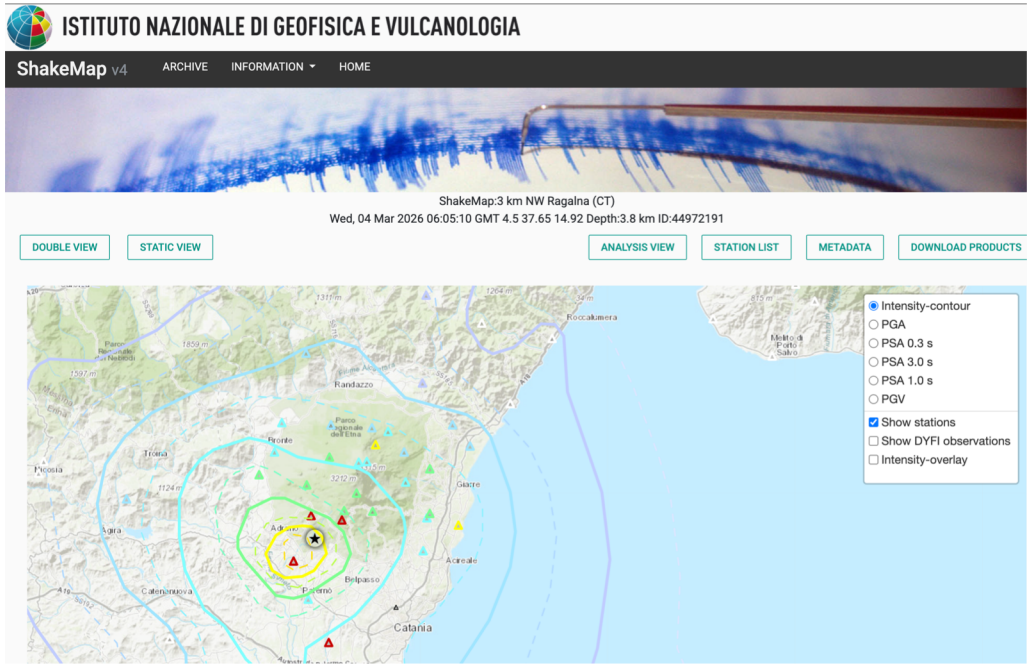
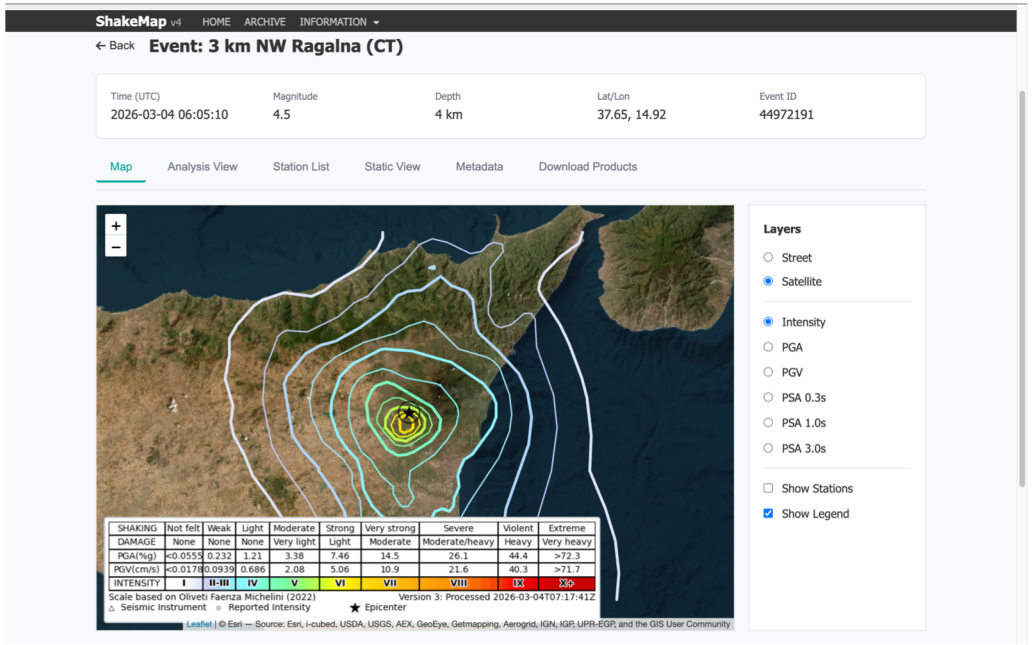
ShakeMap at INGV: Future developments

1 **New version of the ShakeMap website**, including additional layers, improved visualization tools and new products.



BEFORE



AFTER

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ShakeMap at INGV: Future developments

1 **New version of the ShakeMap website**, including additional layers, improved visualization tools and new products.

Event id	Year	Month	Day	Time (HH:MM)	Location	Depth (km)	↓Magnitude↑
44972191	2026	3	4	06:05	3 km NW Ragalna (CT)	3.8	4.5
44970911	2026	3	4	00:23	Croatia [Land]	5.8	3.8
44965171	2026	3	3	04:46	Croatia [Land]	14.7	3.5
44955881	2026	3	1	12:46	Tirreno Meridionale (MARE)	23.6	3.2
44955001	2026	3	1	09:10	Costa Croata Settentrionale (CROAZIA)	5.3	3.2
44952831	2026	2	28	19:41	Tirreno Meridionale (MARE)	282	3.1
44950051	2026	2	28	10:19	Campi Flegrei	2.7	3.5
44936371	2026	2	25	17:48	Costa Ionica Crotonese (Crotone)	23.6	3.8
44931191	2026	2	24	19:00	Albania	22.1	3.9
44927421	2026	2	24	06:39	Mar Ionio Meridionale (MARE)	10	3.5
44926501	2026	2	23	19:35	Bosnia and Herz. [Land]	10	3.4
44926331	2026	2	23	19:29	Bosnia and Herz. [Land]	10	3.9

BEFORE **AFTER**

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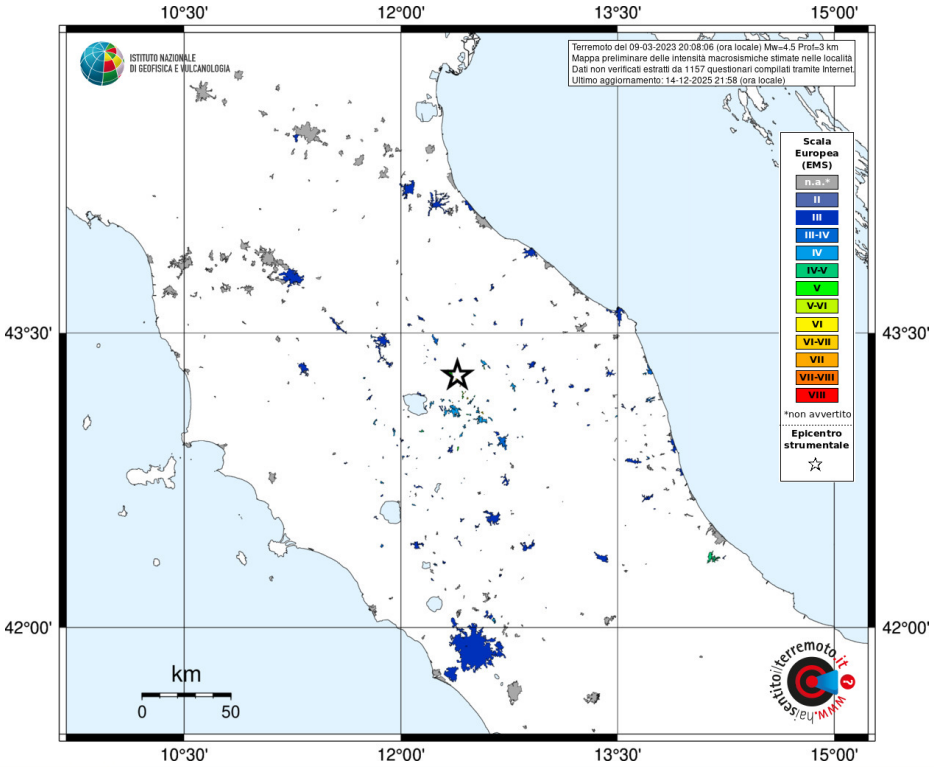
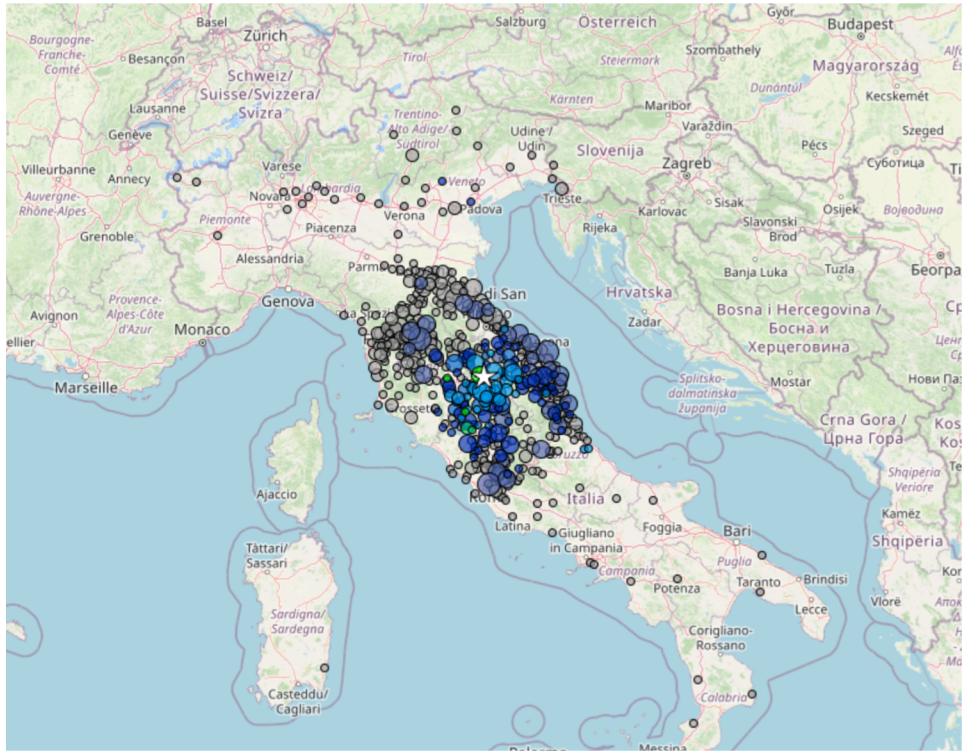
ShakeMap at INGV: Future developments

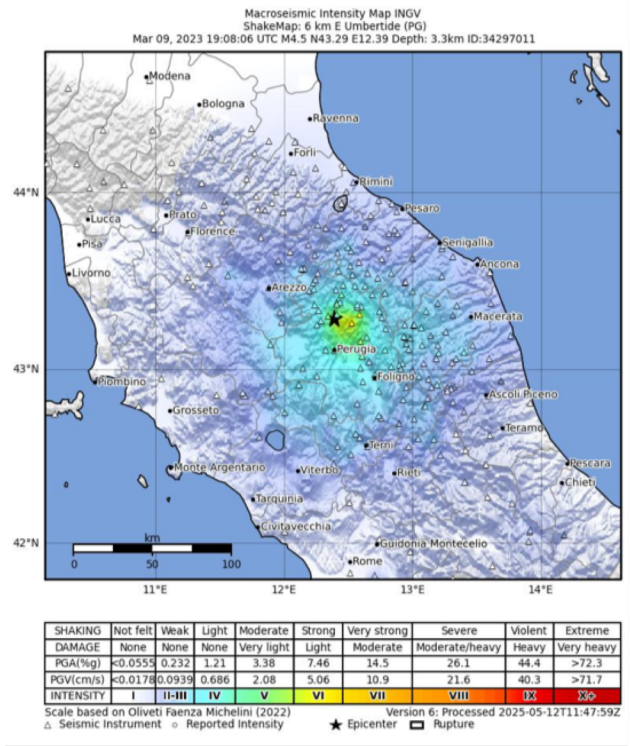
2 **Integration of “Hai Sentito Il Terremoto” (HSIT) data** (http://www.haisentitoilterremoto.it) …..

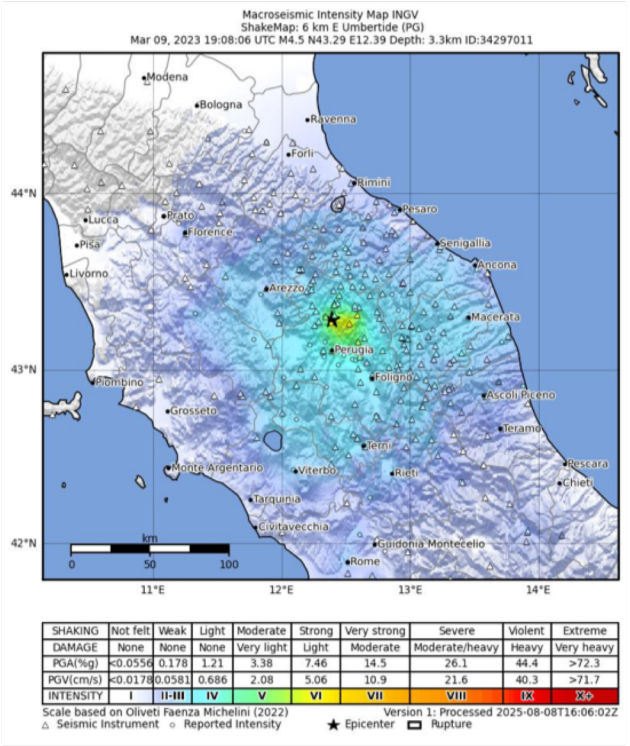


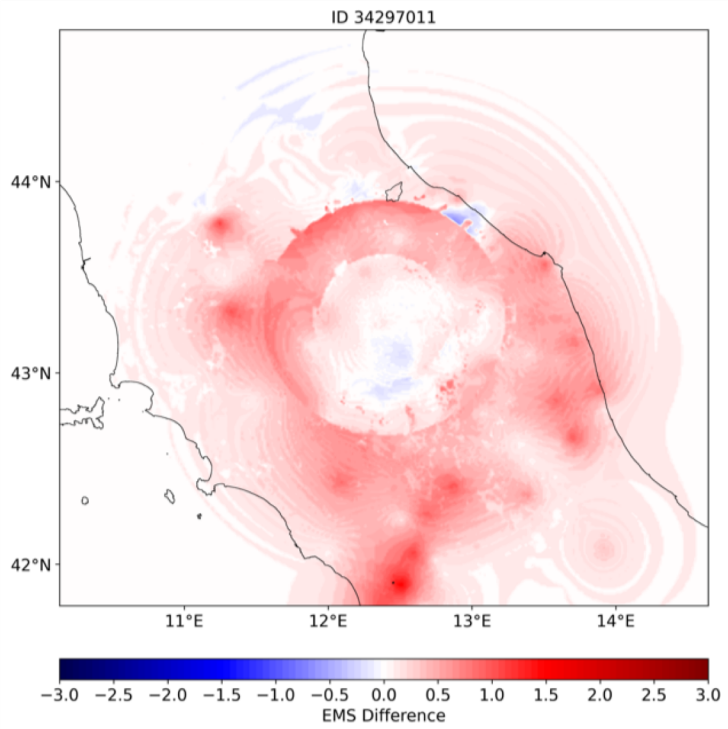


ShakeMap at INGV: Future developments

2 …. into the ShakeMap framework.



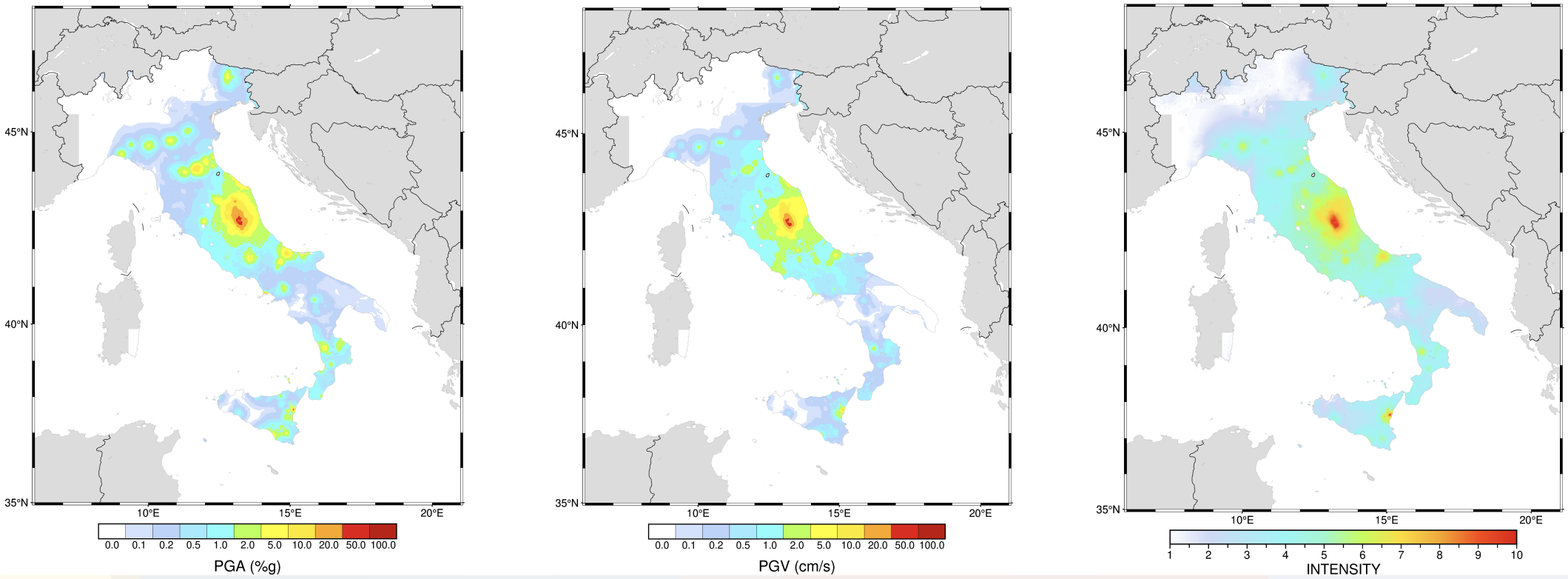




ShakeMap at INGV: Future developments

3 **Maps of the maximum per-grid-point shaking** over a selected time window in a given region.

INSTRUMENTAL SHAKEMAPS *(2016-2026 M≥4)*



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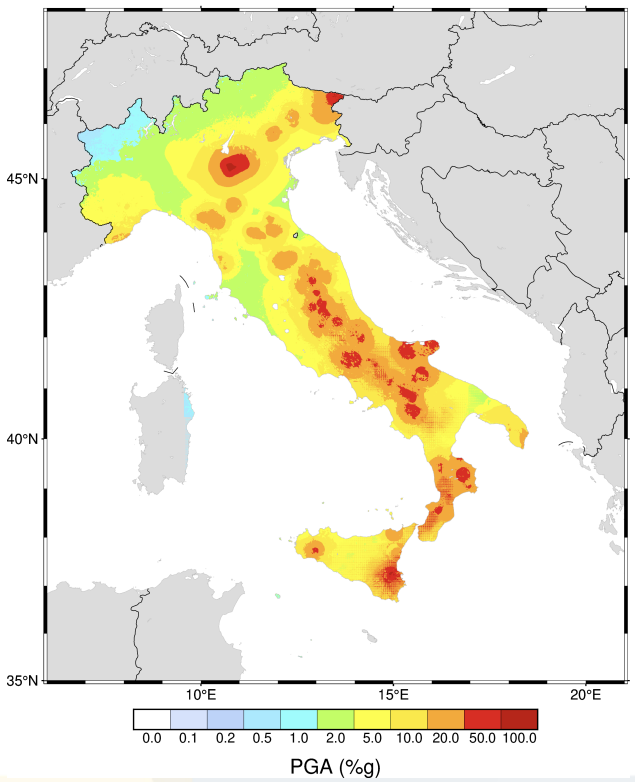
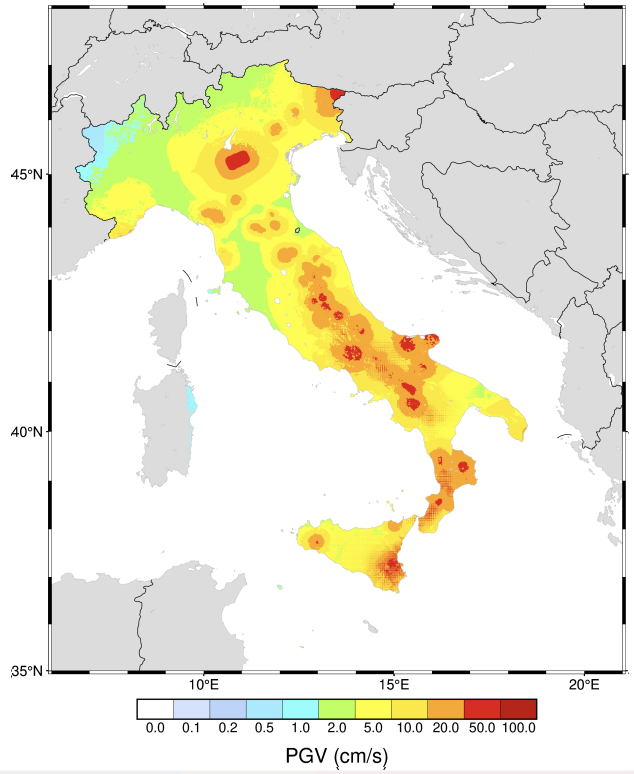
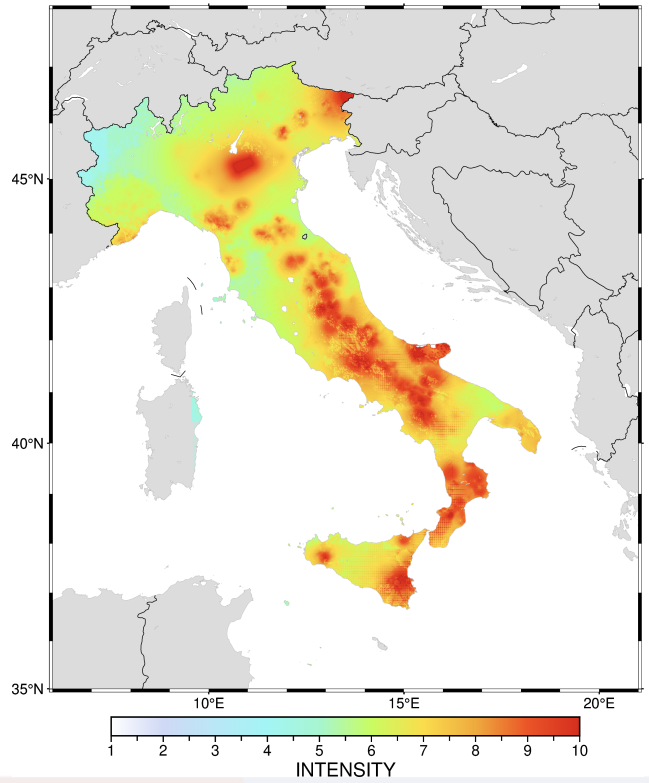
ShakeMap at INGV: Future developments

3 **Maps of the maximum per-grid-point shaking** over a selected time window in a given region.

HISTORIC SHAKEMAPS *(1117-1980 M>6)*







ShakeMap at INGV: Final remarks

- **ShakeMap products are progressively updated** as more refined earthquake parameters become available and PGMs are automatically or manually reprocessed using a extended station network.

- **Historic ShakeMaps and maps of maximum shaking** provide valuable information for **hazard assessment**, enabling the **quantification of shaking** from past events and supporting **seismic risk modelling** (e.g., fragility curve development, loss model calibration, and scenario planning).

- **Integration of HSIT ("Hai Sentito Il Terremoto") data** helps **compensate for areas with limited instrumental station coverage**, improving the spatial representation of shaking and strengthening citizen-science contributions to seismology.

- **Modernization of the ShakeMap website** will make the platform **more user-friendly**, while enabling access to new products such as **ShakeMap + HSIT integrated maps** and **maximum shaking maps** over selected time windows and regions.

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ShakeMap at INGV: Final remarks

- Supports **rapid situational awareness** for civil protection authorities and emergency managers.
- Contributes to **long-term seismic hazard and risk mitigation strategies**.
- Provides **reliable shaking information for infrastructure operators, engineers, and risk analysts**.
- Enhances **public communication and awareness** about earthquake impacts.

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EPOS DAYS 2026

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