University of Trieste
Department of Mathematics, Informatics and Geosciences
European Antelope User Group Meeting 2024
4-6 June, 2024 - Trieste, Italy

Ground motion data analysis in Antelope for civil protection and research purposes

SeisRaM group[1] – RAN group[2]
[1]Department of Mathematics, Informatics and Geosciences – University of Trieste
[2] Dipartimento della Protezione Civile – Presidenza del Consiglio dei Ministri

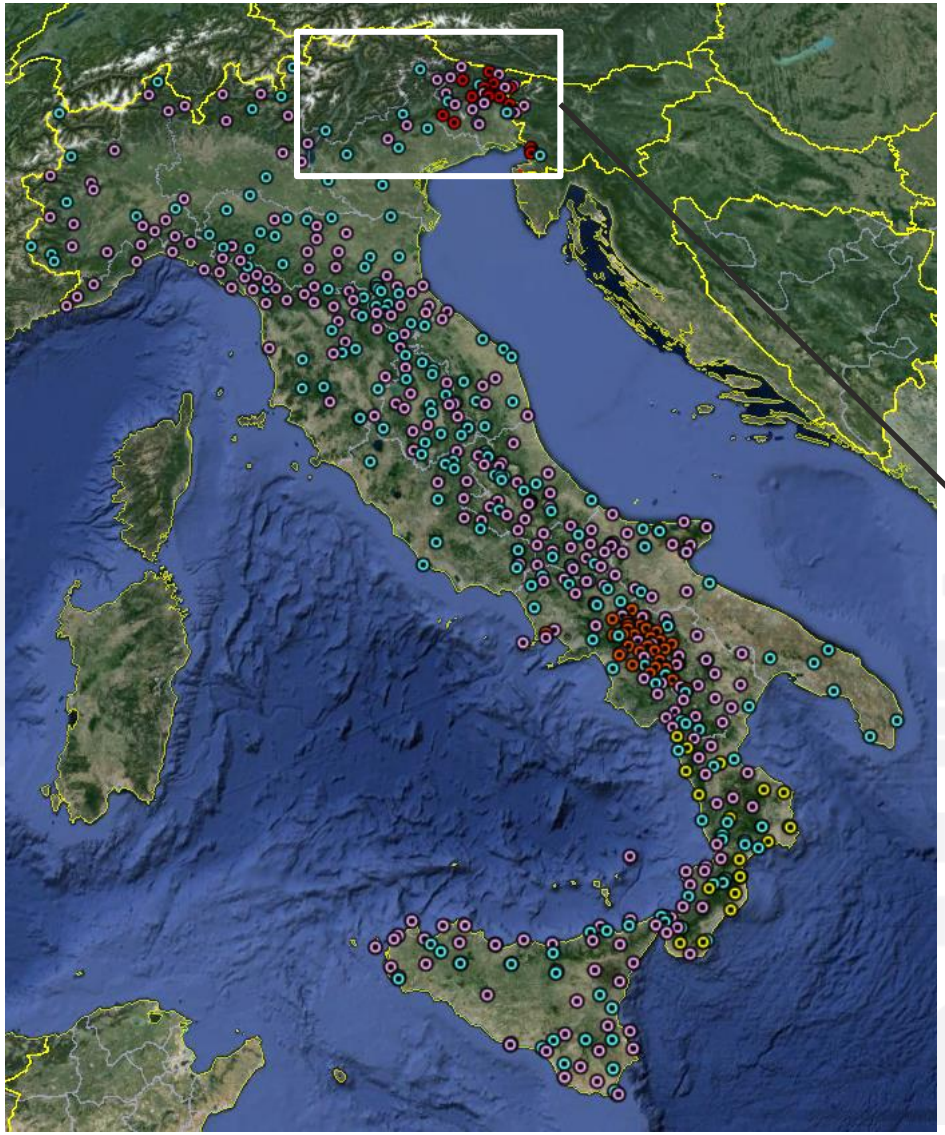
PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile

Rete Accelerometrica Nazionale

www.units.it

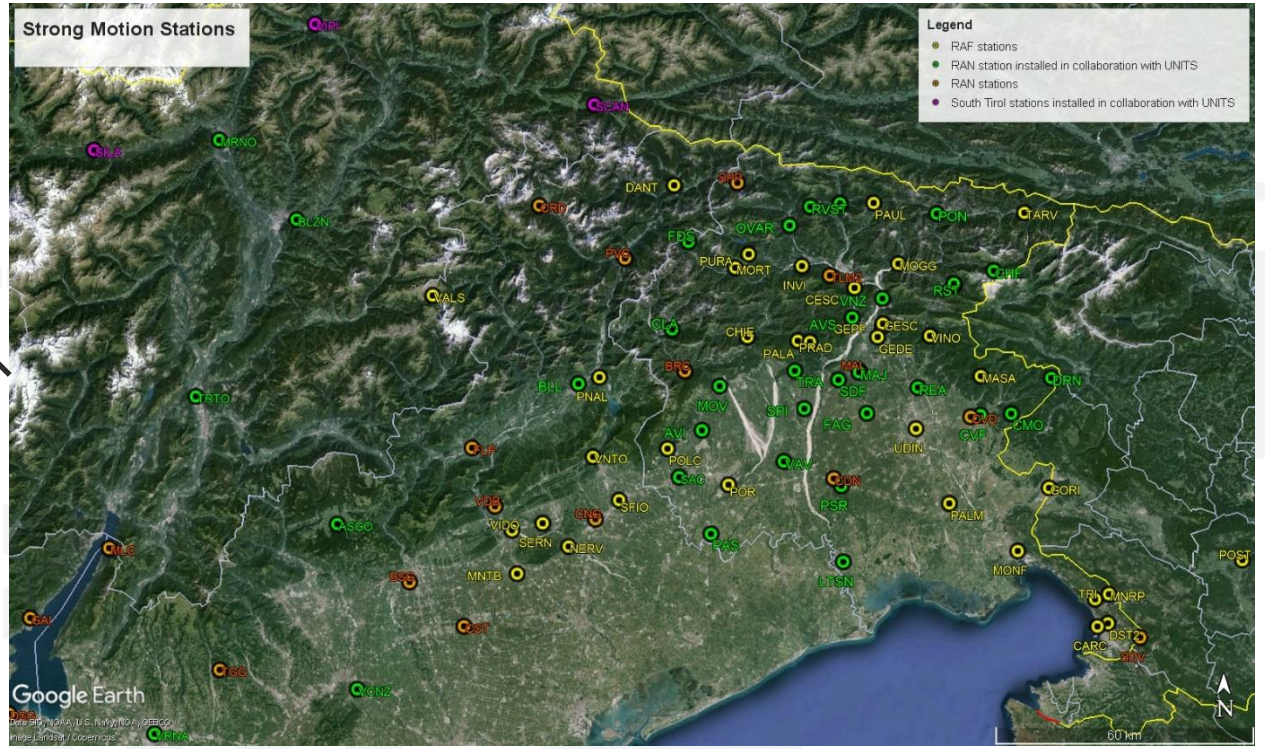
SEISRAM
SEISMOLOGICAL RESEARCH AND MONITORING GROUP

Rete Accelerometrica Nazionale - RAN



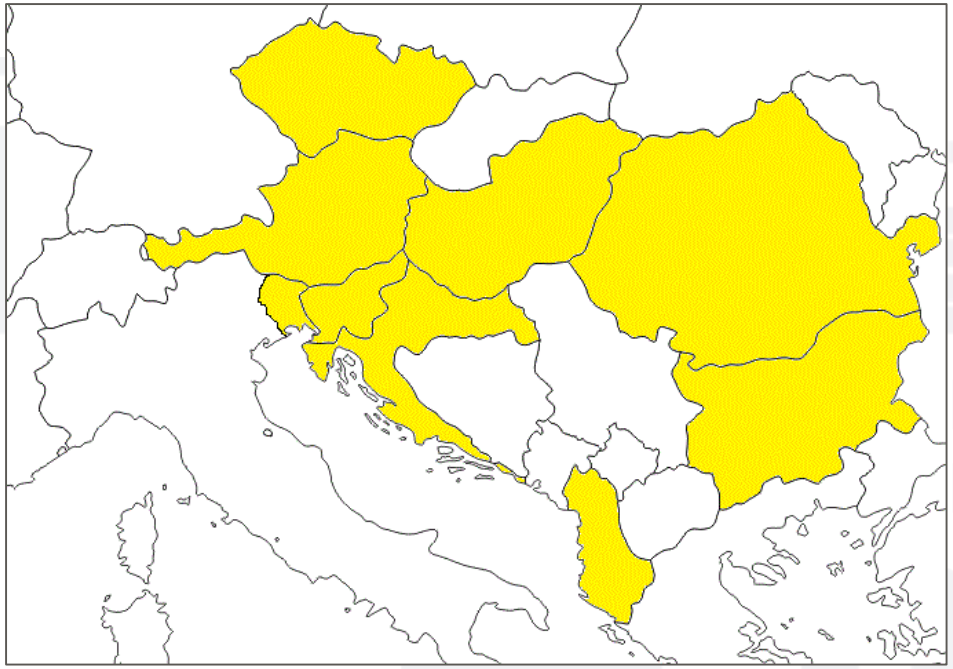
RAN-RAF Integrated Strong Motion Netowork

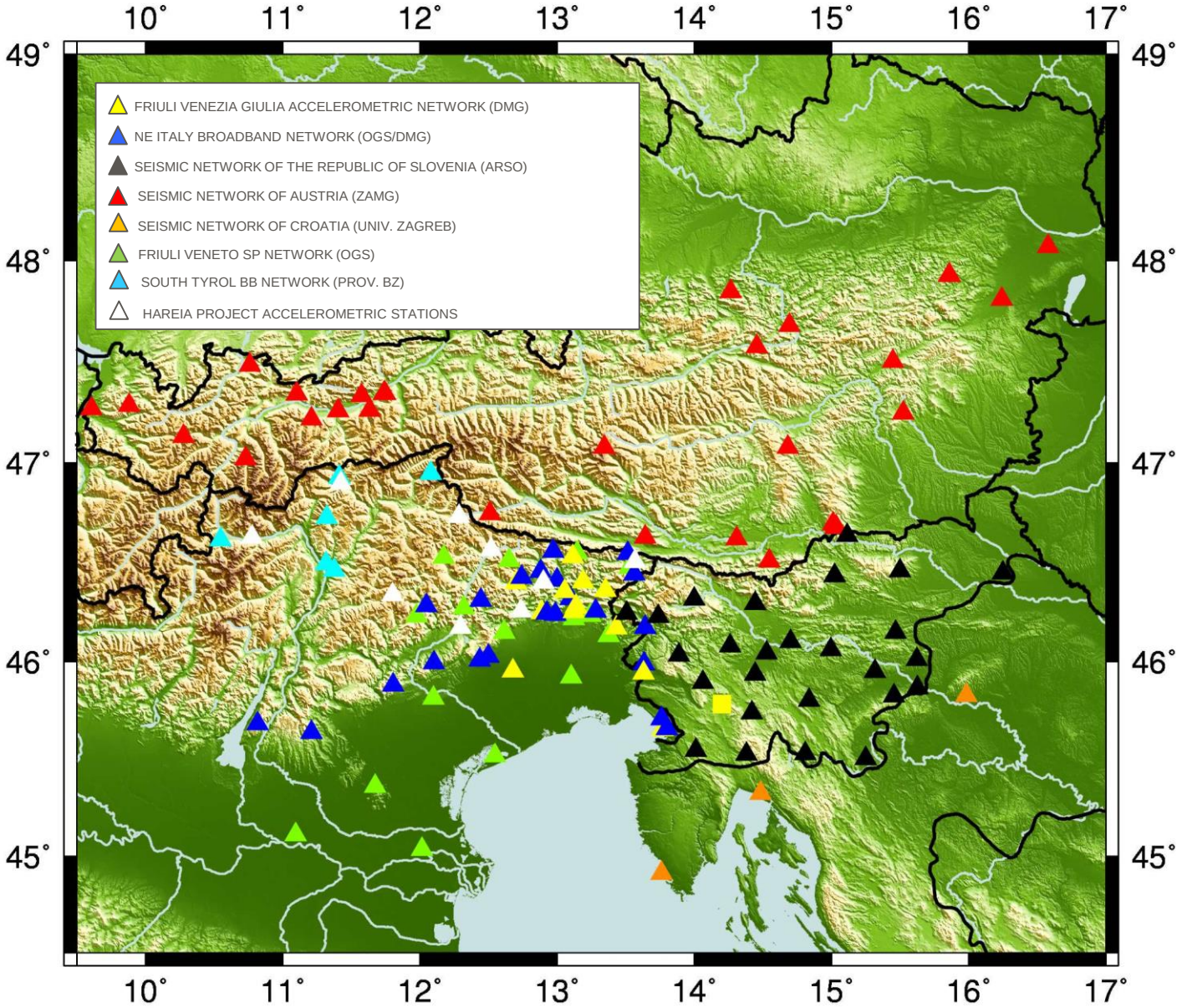
(RAF: FVG e Veneto Strong Motion Network – 37 SM stations)



CE³RN

Central and Eastern European Earthquake Research Network





PROXMOX Virtual Environment

SeisRaM HA cluster

- DELL POWEREDGE R720
- DELL POWEREDGE R720
- DELL POWEREDGE T630
- DELL POWEREDGE T710
- DELL POWEREDGE R740

SeisRaM HA IBM cluster

- IBM SYSTEM X3650 M4 MODEL 7915-E3G
- IBM SYSTEM X3650 M4 MODEL 7915-E3G
- IBM SYSTEM X3650 M4 MODEL 7915-E3G

Storage

- DELL POWERVAULT NX3000
- DELL EMC POWERVAULT ME5024I
- QNAP TS-879U-RP
- QNAP TS-H3087XU-RP

Switchs

- DELL S4112T-ON
- DELL S4112T-ON
- IBM 249824E
- IBM 249824E

UNIVERSITÀ DEGLI STUDI DI TRIESTE

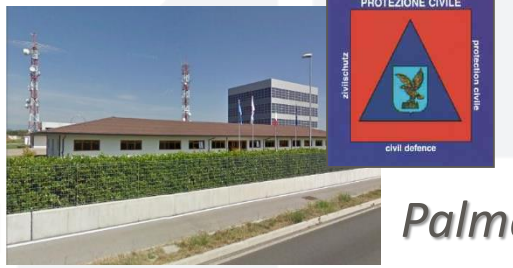
SEISRAM

CAED – Centro Acquisizione ed Elaborazione Dati

VPN

PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile

ROMA



Palmanova

CE³RN
Central and Eastern European Earthquake Research Network

rtexec.pf

- orbserver
- ACQ2orb
- orb2wf
- orb2db
- orb2dbt
- orbdetect
- orbassoc
- magnitudes
- orbwfmeas
- **TriggerOrigin**
- db2shake
- INGV2db
- dborigin2orb

Main_proc *(checks the validity of the o*

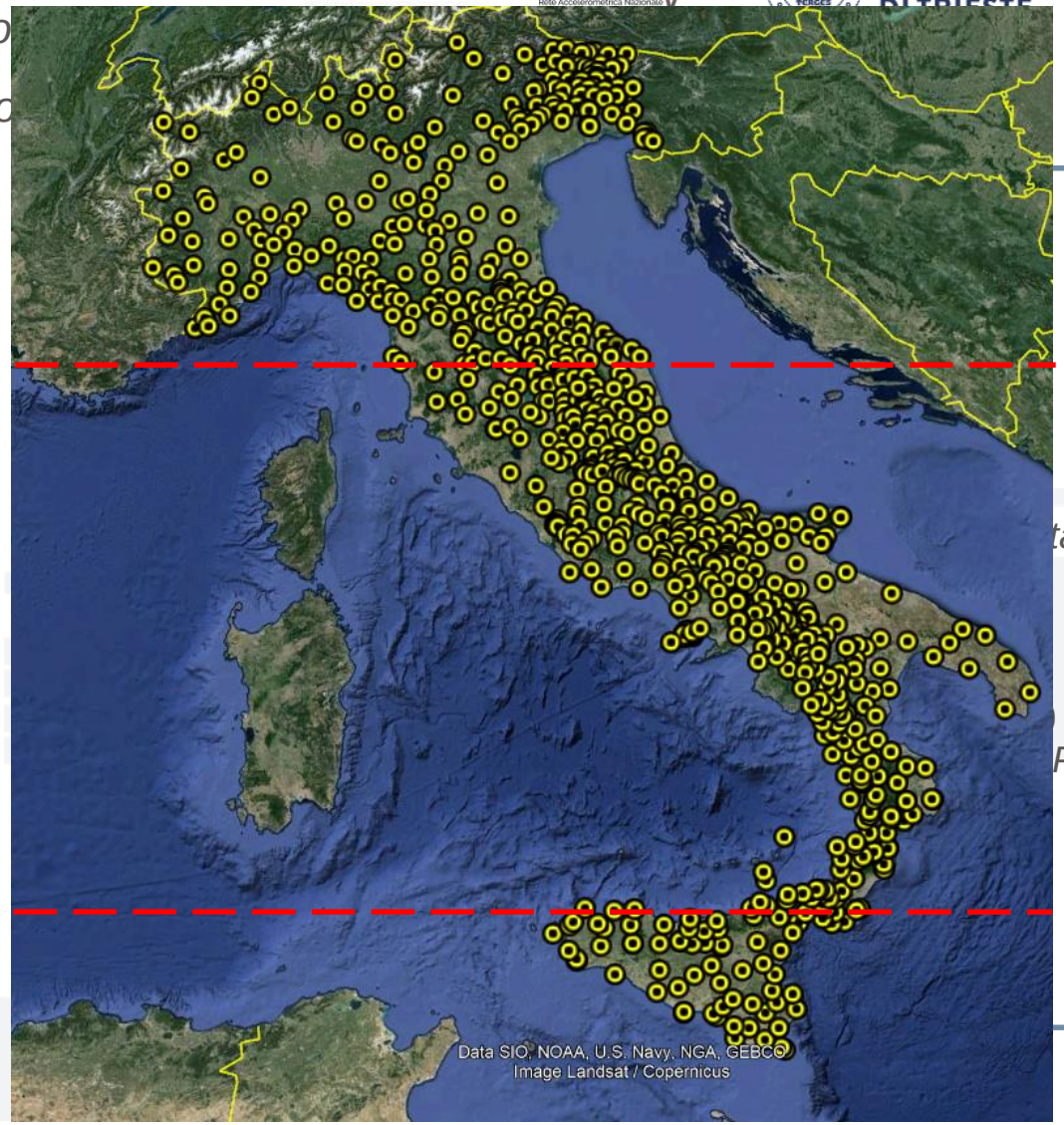
launch scripts and send the alert repo

Check preferred origin:

- *inside/outside polygon*
- *already computed*
- *preferred author*
- *Very close of previous origin*
- *number of assoc **
- *magnitude quality*
- *……*

** the threshold for the number of assoc is set differently for different areas of the territory depending on the density of stations*

New origin *(db.origin table)*



ta)

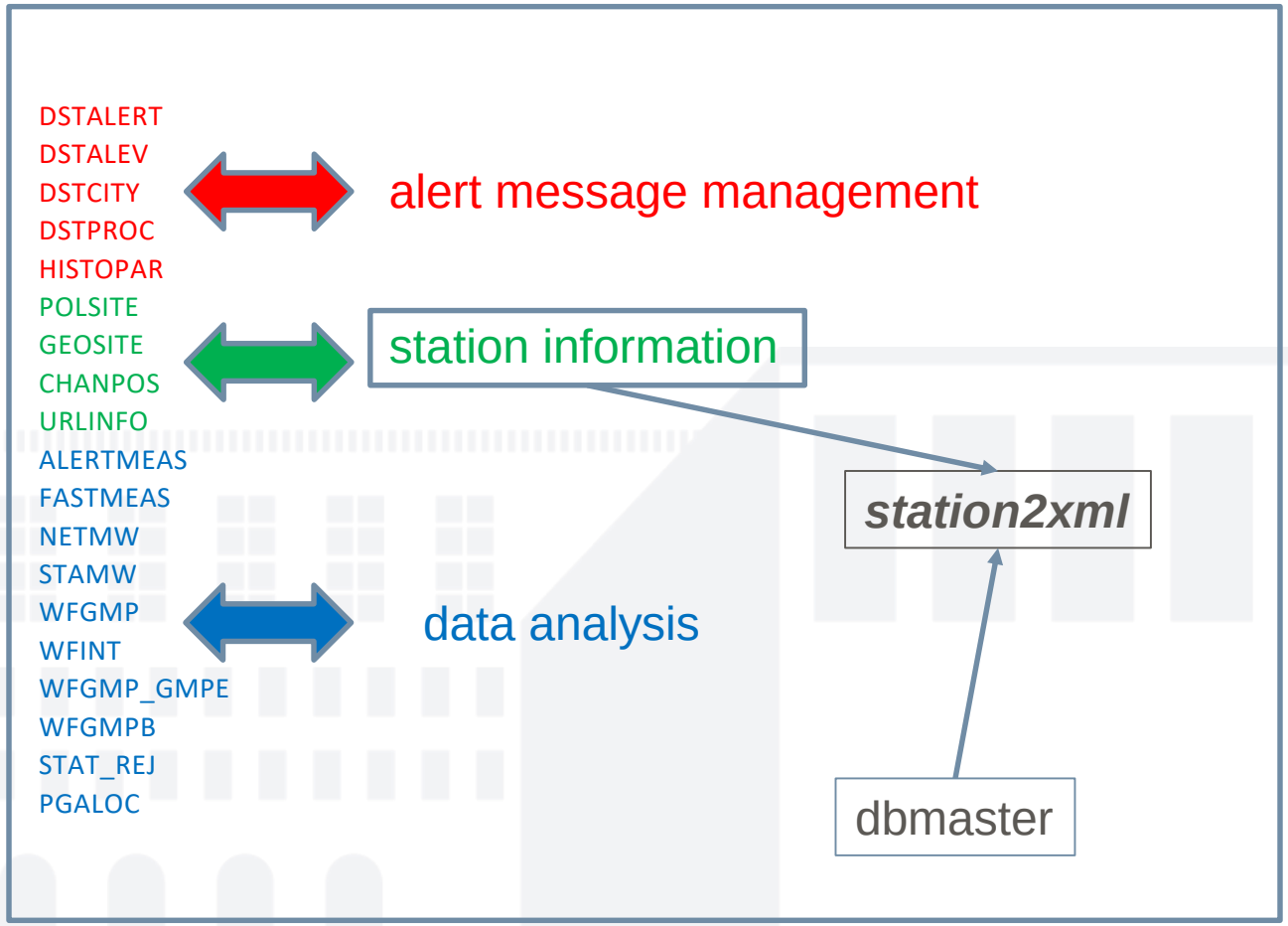
PC))

schema units.ext (CSS3.0)

Attributes

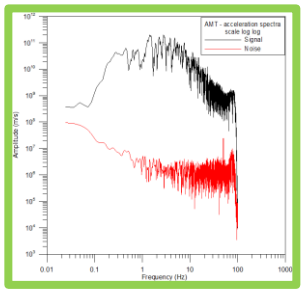
ADDR	FILTERA	NETF0	RLON
AG	FILTERV	NETM0	RMSA
ALERT	FLOOR	NETMW	ROTAZ
ALEV	FO	NOTE	RTVAL
ARIAS	GEO_MAP	NSTALOC	RTYPE
ASSMIN	GEO_PROF	NTEL	SIGMAMW
AZIM	GEOLOGY	PD	SMSLV
BUILDID	HOUSING	PGA	SMW
CAV	HOUSNER	PGAM	STALOC
CCOD	IA2	PGD	STRATIGRAPHY
CHAMW	ID	PGV	TC
CHANA	ID	PGVM	TIMEPMW
CHANV	ID2	PHONE	TIMESMW
CITY	INSTITUTION	PHOTOS	TOPO
CONTACT	INTENSITY	PMW	UNITSA
COUNTRY	IV2	PROVINCE	UNITSV
DISMIN	LEVEL	PSA03	URL
DISTA	LOCAT	PSA10	USTA
DISTANCE	M0	PSA30	V0
DISTMW	MAINTENANCE	QUALITY	VILLAGE
DURATION	MGMIN	RADIUS	VS30
EARTHQUAKE	MORPHO	RDELTA	
EC8	MSG	RECORD	
EMAIL_	MUNICIPALITY	REGION	
EMAILLV	MW	REJECT	
EPA	NAME	RESP_SPECT	
EQR	NEHRP	RJSTA	
F_0	NETEQR	RLAT	

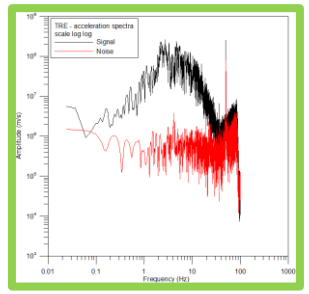
Relations



dbgmPar *(parallel python + C code (cmake))*

AUTOMATIC SELECTION OF BANDPASS FILTER CORNER FREQUENCIES





output tables:

wfgmp PGA, PGV, PGD, EPA, PSA03, PSA10, PSA30, Housner, Arias, RMSA, duration, intensity of zero crossing, Saragoni index, damage factor

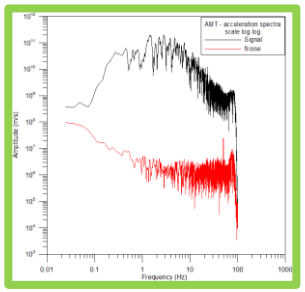
wfgmpB IA2, IV2, ID2, CAV

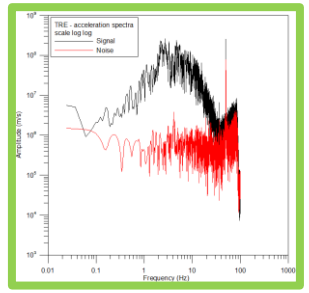
wfint INSTRUMENTAL INTENSITY

output files: response spectra

dbgmw *(C code)*

AUTOMATIC SELECTION OF BANDPASS FILTER CORNER FREQUENCIES



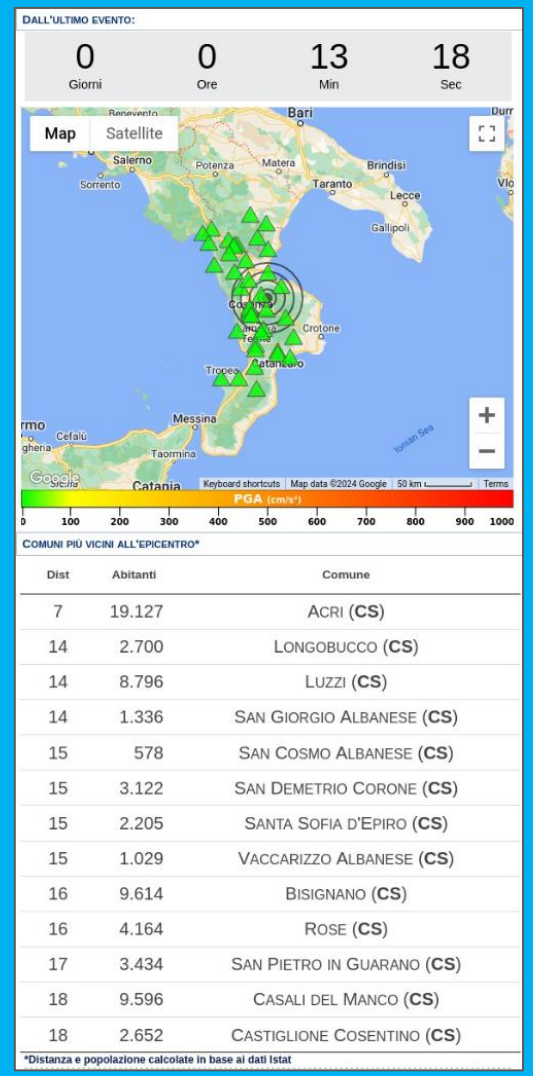


output tables:

stamw Mw, m0, f0, eqR, quality, ….

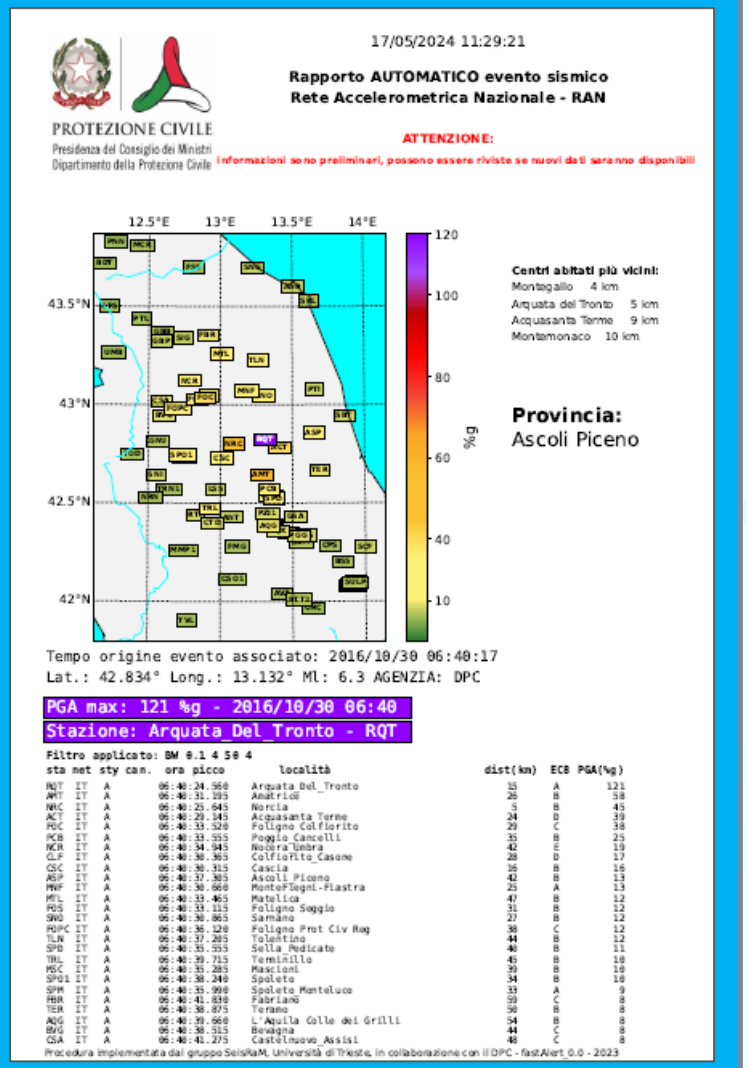
netmw netMw, ml, sigma, netm0, neteqR, usta, rjsta

FAST automatic, real time report for Civil Defence - fastAlert



Dist	Abitanti	Comune
7	19.127	ACRI (CS)
14	2.700	LONGOBUCCO (CS)
14	8.796	LUZZI (CS)
14	1.336	SAN GIORGIO ALBANESE (CS)
15	578	SAN COSMO ALBANESE (CS)
15	3.122	SAN DEMETRIO CORONE (CS)
15	2.205	SANTA SOFIA D'EPIRO (CS)
15	1.029	VACCARIZZO ALBANESE (CS)
16	9.614	BISIGNANO (CS)
16	4.164	ROSE (CS)
17	3.434	SAN PIETRO IN GUARANO (CS)
18	9.596	CASALI DEL MANCO (CS)
18	2.652	CASTIGLIONE COSENTINO (CS)

*Distanza e popolazione calcolate in base ai dati Istat



sta	net	sty	can.	ora picco	località	dist(km)	ECB	PGA(%g)
RQT	IT	A		06:40:24.560	Arquata_Del_Tronto	15	A	121
AMT	IT	A		06:40:31.195	Amatrice	26	B	58
NRC	IT	A		06:40:25.645	Norcia	5	B	45
ACT	IT	A		06:40:29.145	Acquasanta_Terme	24	D	39
FOC	IT	A		06:40:35.520	Foligno_Colfiorito	29	C	38
PCB	IT	A		06:40:33.555	Poggio_Cancelli	35	B	25
NCR	IT	A		06:40:34.945	Nocera_Umbra	42	E	19
CLF	IT	A		06:40:30.365	Colfiorito_Casone	28	D	17
CSC	IT	A		06:40:30.515	Cascia	16	B	16
ASP	IT	A		06:40:37.385	Ascoli_Piceno	42	B	13
MWF	IT	A		06:40:30.660	MonteFlagnI-Flastra	25	A	13
MTL	IT	A		06:40:33.465	Matelica	47	B	12
FOS	IT	A		06:40:33.115	Foligno_Saggio	31	B	12
SMO	IT	A		06:40:30.865	Sarnano	27	B	12
FOPC	IT	A		06:40:36.120	Foligno_Prot_Civ_Reg	38	C	12
TLN	IT	A		06:40:37.205	Tolentino	44	B	12
SPD	IT	A		06:40:35.555	Sella_Pedicate	40	B	11
TRL	IT	A		06:40:39.715	Temilillo	45	B	10
MSC	IT	A		06:40:35.285	Mascioni	39	B	10
SPO1	IT	A		06:40:38.240	Spoleto	34	B	10
SPM	IT	A		06:40:35.990	Spoleto_Monteluco	33	A	9
FBR	IT	A		06:40:41.830	Fabriano	59	C	8
TER	IT	A		06:40:38.875	Teramo	50	B	8
AQG	IT	A		06:40:39.660	L'Aquila_Colle_dei_Grilli	54	B	8
BVG	IT	A		06:40:38.515	Bevagna	44	C	8
CSA	IT	A		06:40:41.275	Castelnuovo_Assisi	48	C	8

Procedura implementata dal gruppo SeisRaM, Università di Trieste, in collaborazione con il DPC - fastAlert_0.0 - 2023

PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile

Rete Accelerometrica Nazionale

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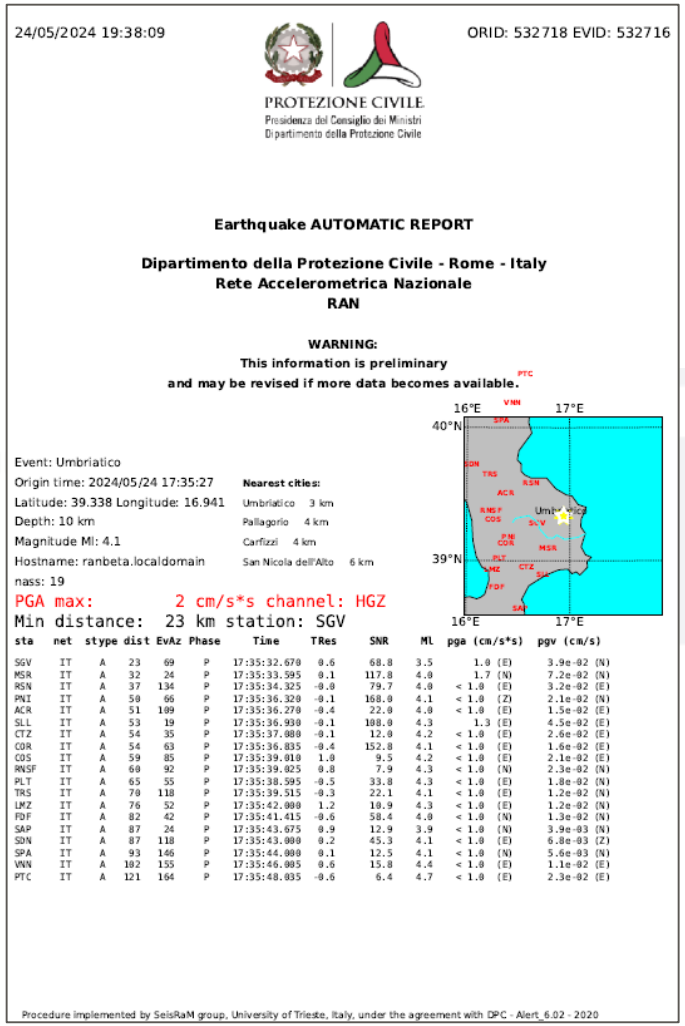
SEISRAM

Alert



sta	net	stype	dist	EvAz	Phase	Time	TRes	SNR	Ml	pga (cm/s*s)	pgv (cm/s)
SGV	IT	A	23	69	P	17:35:32.670	0.6	68.8	3.5	1.0 (E)	3.9e-02 (N)
MSR	IT	A	32	24	P	17:35:33.595	0.1	117.8	4.0	1.7 (N)	7.2e-02 (N)
RSN	IT	A	37	134	P	17:35:34.325	-0.0	79.7	4.0	< 1.0 (E)	3.2e-02 (E)
PNI	IT	A	50	66	P	17:35:36.320	-0.1	168.0	4.1	< 1.0 (Z)	2.1e-02 (N)
ACR	IT	A	51	109	P	17:35:36.270	-0.4	22.0	4.0	< 1.0 (E)	1.5e-02 (E)
SLL	IT	A	53	19	P	17:35:36.930	-0.1	108.0	4.3	1.3 (E)	4.5e-02 (E)
CTZ	IT	A	54	35	P	17:35:37.080	-0.1	12.0	4.2	< 1.0 (E)	2.6e-02 (E)
COR	IT	A	54	63	P	17:35:36.835	-0.4	152.8	4.1	< 1.0 (E)	1.6e-02 (E)
COS	IT	A	59	85	P	17:35:39.010	1.0	9.5	4.2	< 1.0 (E)	2.1e-02 (E)
RNSF	IT	A	60	92	P	17:35:39.025	0.8	7.9	4.3	< 1.0 (N)	2.3e-02 (N)
PLT	IT	A	65	55	P	17:35:38.595	-0.5	33.8	4.3	< 1.0 (E)	1.8e-02 (N)
TRS	IT	A	70	118	P	17:35:39.515	-0.3	22.1	4.1	< 1.0 (E)	1.2e-02 (N)
LMZ	IT	A	76	52	P	17:35:42.000	1.2	10.9	4.3	< 1.0 (E)	1.2e-02 (N)
FDF	IT	A	82	42	P	17:35:41.415	-0.6	58.4	4.0	< 1.0 (N)	1.3e-02 (N)
SAP	IT	A	87	24	P	17:35:43.675	0.9	12.9	3.9	< 1.0 (N)	3.9e-03 (N)
SDN	IT	A	87	118	P	17:35:43.000	0.2	45.3	4.1	< 1.0 (E)	6.8e-03 (Z)
SPA	IT	A	93	146	P	17:35:44.000	0.1	12.5	4.1	< 1.0 (N)	5.6e-03 (N)
VNN	IT	A	102	155	P	17:35:46.005	0.6	15.8	4.4	< 1.0 (E)	1.1e-02 (E)
PTC	IT	A	121	164	P	17:35:48.835	-0.6	6.4	4.7	< 1.0 (E)	2.3e-02 (E)

AUG Antelope Users Group

European Antelope User Group Meeting 2024
4-6 June, 2024 - Trieste, Italy

1924 2024

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Automatic, real time report for Civil Defence - REPO

03/04/2014 12:05:11 ORID: 618 EVID: 389

PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile

Earthquake AUTOMATIC REPORT

Dipartimento della Protezione Civile - Rome - Italy
Rete Accelerometrica Nazionale
RAN

WARNING:
These information are preliminary
and may be revised when more data are available.

Event: NORTHERN_ITALY
Origin time: 2012/05/29 07:00:03
Latitude: 44.851 Longitude: 11.086
Magnitude Ml: 5.8
AGENCY: INGV

Seismic Moment: 1.13e+18 Nm
Mw: 5.8
AGENCY: UniTS

Records analyzed by procedure: 197
Selected limits: max distance=150. km min PGA= 0.1 cm/s*s
min PGA to show response spectra= 0.1 cm/s*s
Records inside the selected limits: 185 response spectra inside the limits: 185

Nearest station: MRN distance: 3.81 km
HGZ - PGA=895.78 cm/s*s, PGV=21.64 cm/s

Procedure implemented by SeisRaM group, University of Trieste, Italy - ver: SPT_1.24 - 2014 - costa@units.it

PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile

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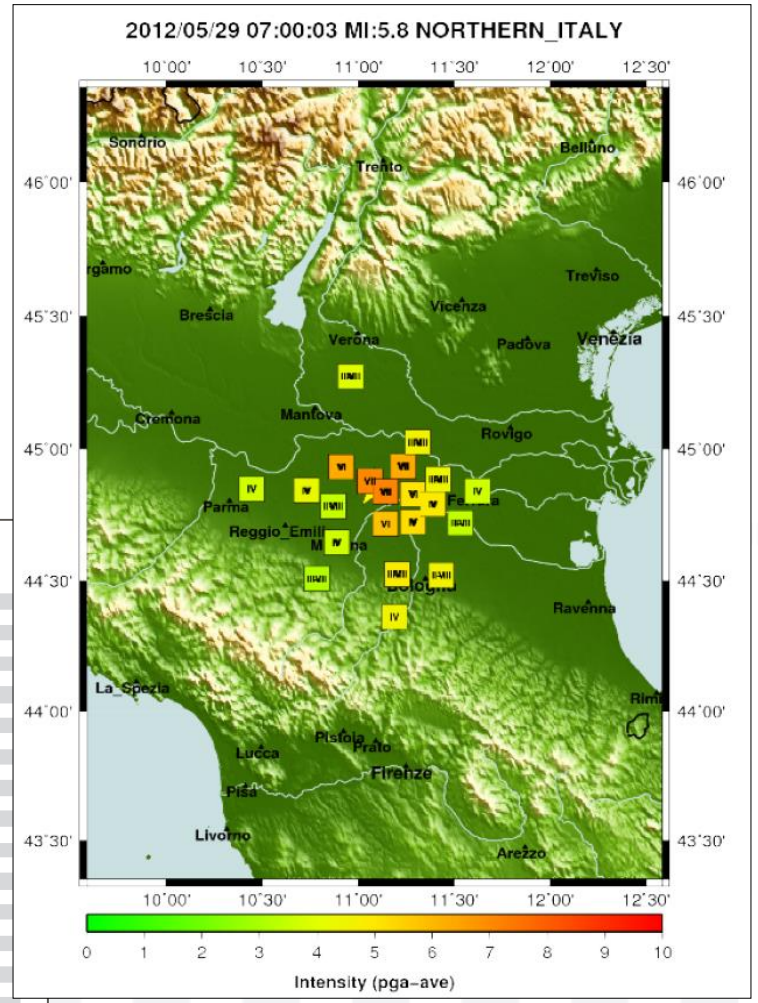
SEISRAM



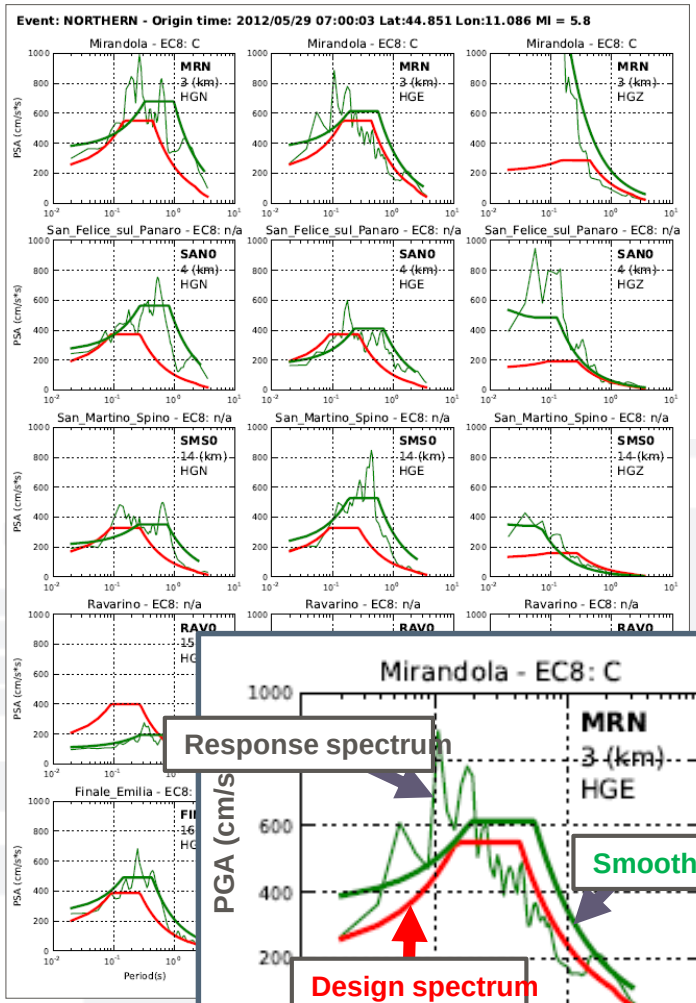
SeisRaM

Event: KNEZAK - Origin time: 2014/04/22 08:58:27 Lat:45.633 Lon:14.258 Ml = 4.7 Agency: UniTS
Seismic moment: 2.670e+16 Nm - Mw = 4.5 Agency: UniTS

sta	chan	dista km	filter Hz	PGA cm/s*s	EPA cm/s*s	PGV cm/s	PGD cm	PSA03 cm/s*s	PSA10 cm/s*s	PSA30 cm/s*s	EC8	location
KNDS	HHN	15	0.1-50.0	37.72	18.21	0.82	0.05	46.81	3.25	0.34	na	Knezji Dol, SL
KNDS	HHE	15	0.1-50.0	23.92	13.69	0.69	0.06	27.62	3.59	0.28	na	Knezji Dol, SL
KNDS	HHZ	15	0.1-50.0	17.14	6.61	0.33	0.02	15.04	0.78	0.11	na	Knezji Dol, SL
CEY	HHN	17	0.1-50.0	47.72	10.45	0.75	0.05	17.87	3.40	0.32	na	Cerknica, SL
CEY	HHE	17	0.1-50.0	30.33	9.38	0.70	0.04	11.35	1.94	0.22	na	Cerknica, SL
CEY	HHZ	17	0.1-50.0	17.83	4.48	0.27	0.02	9.18	0.86	0.12	na	Cerknica, SL
SKDS	HGN	21	0.1-50.0	30.76	9.61	0.62	0.04	15.55	2.15	0.20	na	Skadanscina, SL
SKDS	HGE	21	0.1-50.0	19.71	7.32	0.44	0.03	14.50	1.60	0.14	na	Skadanscina, SL
SKDS	HGZ	21	0.1-50.0	13.09	4.50	0.27	0.02	10.94	0.76	0.10	na	Skadanscina, SL
SKDS	HHN	21	0.2-50.0	30.33	9.88	0.65	0.03	15.58	2.16	0.22	na	Skadanscina, SL
SKDS	HHE	21	0.2-50.0	21.62	7.46	0.43	0.02	14.51	1.65	0.16	na	Skadanscina, SL
SKDS	HHZ	21	0.1-50.0	13.35	4.49	0.27	0.02	10.97	0.77	0.10	na	Skadanscina, SL
JAVS	HHN	33	0.1-50.0	6.13	2.86	0.14	0.02	4.66	0.80	0.15	na	Javornik, SL
JAVS	HHE	33	0.1-50.0	11.36	6.15	0.31	0.03	10.40	1.63	0.20	na	Javornik, SL
JAVS	HHZ	33	0.1-50.0	4.70	2.64	0.12		5.09	0.64	0.05	na	Javornik, SL
DST2	HHN	36	0.1-47.0	7.46	4.97	0.27	0.02	9.90	1.04	0.12	A	DST-Trieste_station
DST2	HHE	36	0.1-46.4	9.09	4.13	0.20	0.01	8.00	0.61	0.10	A	DST-Trieste_station
DST2	HHZ	36	0.1-47.8	4.49	2.65	0.12		5.70	0.47	0.05	A	DST-Trieste_station
GBAS	HHN	37	0.1-50.0	3.23	1.26	0.07		2.35	0.33	0.05	na	Gornja Brezovica, SL
GBAS	HHE	37	0.1-50.0	3.71	1.43	0.07		3.31	0.40	0.03	na	Gornja Brezovica, SL
GBAS	HHZ	37	0.1-50.0	2.43	0.96	0.06		1.56	0.38	0.03	na	Gornja Brezovica, SL
TRI	HHN	39	0.1-47.3	12.38	1.97	0.15		2.33	0.46	0.05	A	TRI-Trieste_station
TRI	HHE	39	0.1-45.6	13.66	3.60	0.19		4.30	0.31	0.08	A	TRI-Trieste_station
TRI	HHZ	39	0.1-47.5	31.18	4.24	0.34		5.12	0.30	0.08	A	TRI-Trieste_station
GBRS	HHN	45	0.1-50.0	11.89	3.11	0.20		2.86	0.56	0.06	na	Gornja Briga, SL
GBRS	HHE	45	0.1-50.0	15.31	3.81	0.25		4.30	0.46	0.07	na	Gornja Briga, SL
GBRS	HHZ	45	0.1-50.0	4.42	1.12	0.07		1.75	0.47	0.06	na	Gornja Briga, SL
VISS	HHN	49	0.1-50.0	3.78	2.32	0.13	0.01	4.22	1.16	0.09	na	Visnje, SL
VISS	HHE	49	0.1-50.0	3.68	2.00	0.10		2.71	0.69	0.05	na	Visnje, SL

dista = epicentral distance
filter = automatic band pass butterworth filter
EC8 = site classification (Eurocode from ITACA)

PGA,PGV,PGD = peak ground acceleration, velocity and displacement
EPA = effective ground acceleration (Kramer, 1996)
PSA03,PSA10,PSA30 = spectral acceleration (0.3, 1.0, 3.0 sec)



AUG Antelope Users Group

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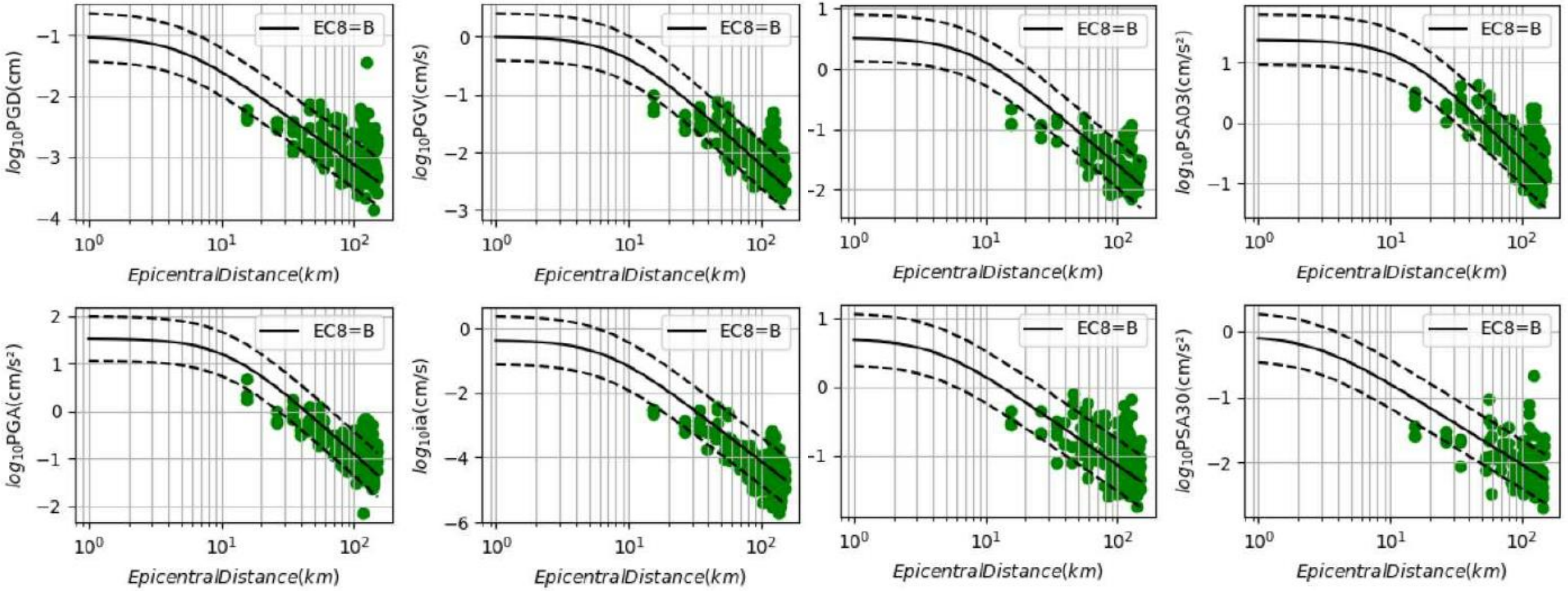
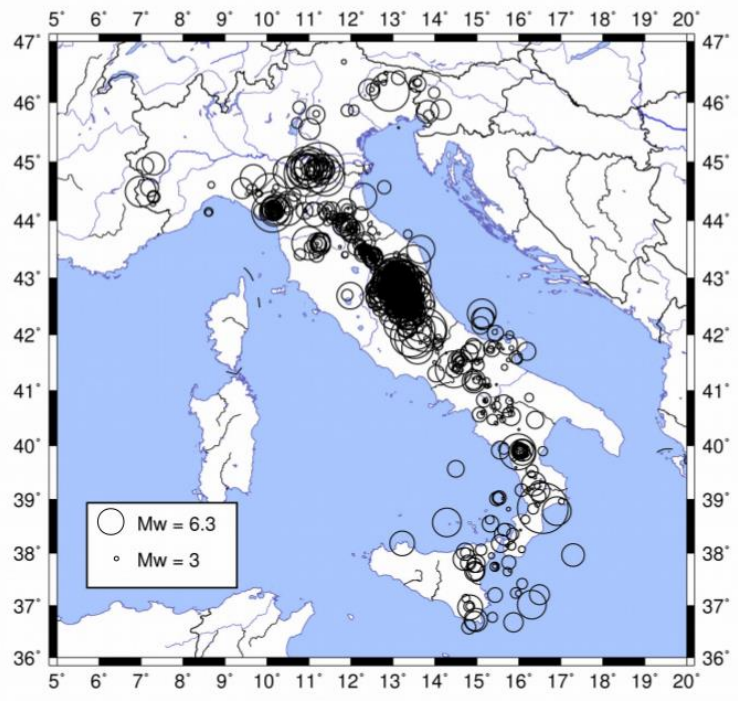
SEISRAM

Automatic, real time report for Civil Defence - REPO

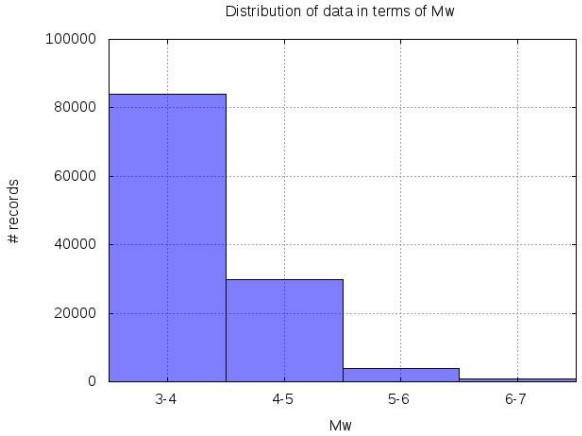


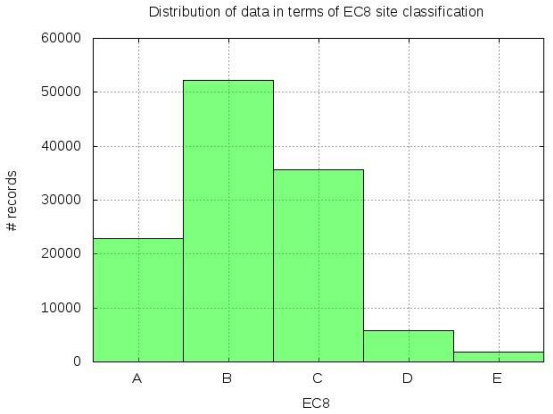
RAN-RAF Dataset 2011-2017

(Tiberi et al. 2018)



The entire database counts 1985 earthquakes with a moment magnitude between 3.0 and 6.4 of the strongest event of Amatrice sequence occurred the 30th of October, 2016.
The total number of records are 118021 up to 150 km.



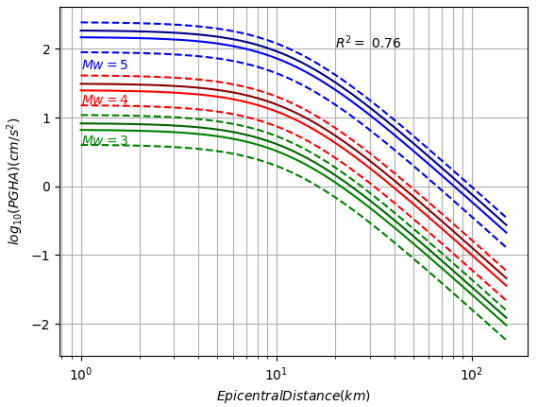


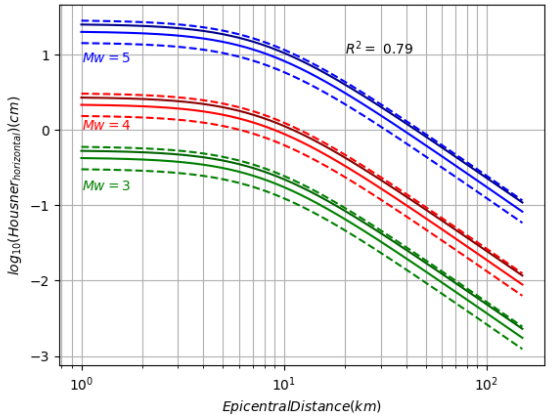
GMPE functional form:

$$Log_{10}Y = a + b\,Mw + c\,Mw^{\wedge}2 + c\log_{10}((R^2 + d^2)^{1/2}) + s1SA + s2SB + s3SC + s4SD + s5SE$$

Ground motion parameters analyzed:

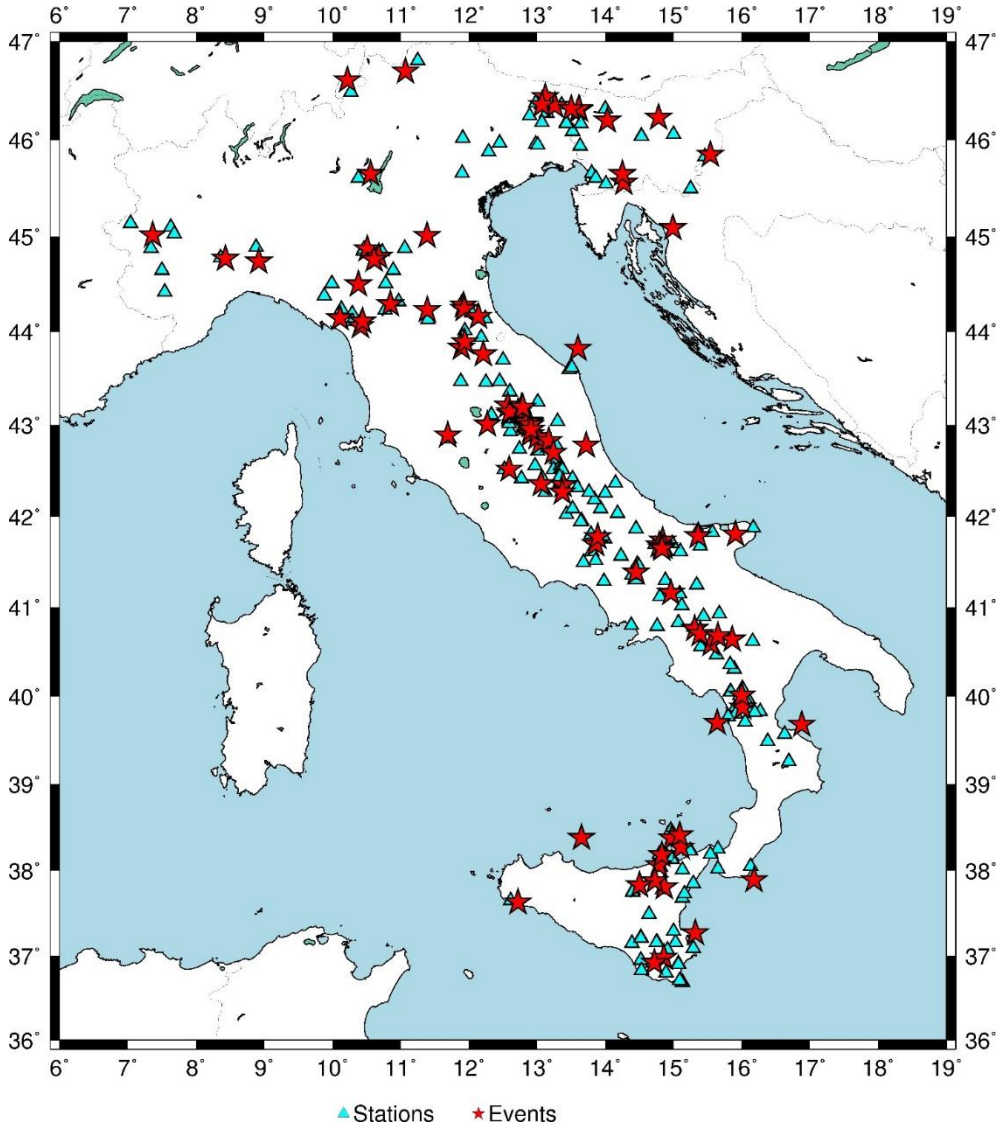
PGA PGV PGD PSA03 PSA10 PSA30 Arias Intensity Housner Intensity

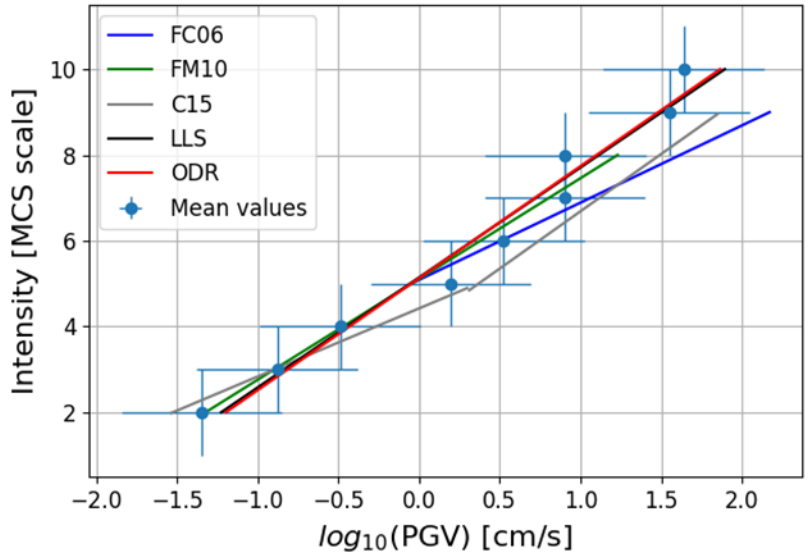




A new estimation of MCS instrumental intensity for the Italian territory from high quality accelerometric data, using GMICEs and Gaussian Naïve Bayes Classifiers

(Cataldi et al. 2019)





Comparison of the Intensity - PGV relationship obtained in this study with the two different algorithms (LLS, ODR) and three previous studies: Faenza and Michelini (2010), FM10; Faccioli and Cauzzi (2006), FC06; Caprio et al. (2015), C15. **(Bottom)** Comparison of the Intensity - PGA relationship obtained in this study with the two different algorithms (LLS, ODR) and the same previous three studies.

20-05-2024 18:45:33 ORID: 532395

PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile

Earthquake AUTOMATIC REPORT

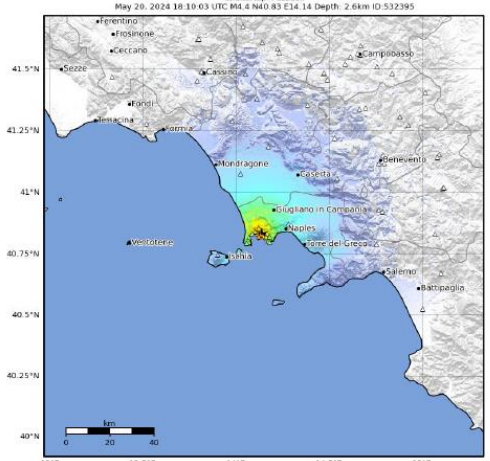
Seismological Research and Monitoring group
DATI: Rete Accelerometrica Nazionale
-o-

WARNING:
These information are preliminary
and may be revised when more data are available.

Event: Pozzuoli
Origin time: 20-05-2024 18:10:03
Latitude: 40.8277 Longitude: 14.138
Magnitude Ml: 4.4
AGENCY: SeisRaM

Intensity

Macrosismic Intensity Map SeisRaM-UniTS
ShakeMap: Pozzuoli
May 20, 2024 18:10:03 UTC M4.4 N40.83 E14.14 Depth: 2.6km ID:532395

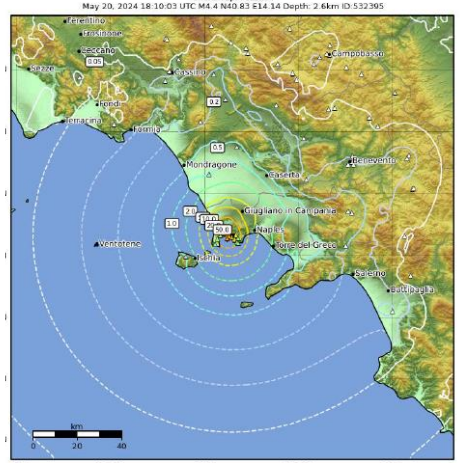


SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
DAMAGE	None	None	None	Very light	Light	Moderate	Moderate/heavy	Heavy	Very heavy
PGA(%g)	<0.0454	0.193	0.817	2.14	5.61	14.7	38.5	101	>265
PGV(cm/s)	<0.0213	0.0861	0.349	0.886	2.25	5.72	14.5	36.9	>93.7
INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based on Tiberi et al. (2018) Version 1: Processed 2024-05-20T18:42:08Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter

PGA

Peak Ground Acceleration Map SeisRaM-UniTS
ShakeMap: Pozzuoli
May 20, 2024 18:10:03 UTC M4.4 N40.83 E14.14 Depth: 2.6km ID:532395



PGA (%g) 0.1 0.2 0.5 1 2 5 10 20 50 100 200

Scale based on Tiberi et al. (2018) Version 1: Processed 2024-05-20T18:42:08Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter

PGV

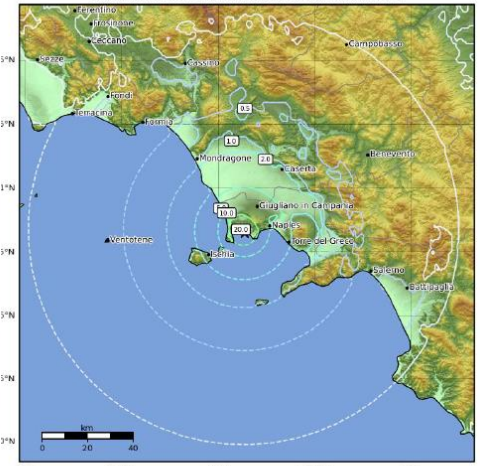
Peak Ground Velocity Map SeisRaM-UniTS
ShakeMap: Pozzuoli
May 20, 2024 18:10:03 UTC M4.4 N40.83 E14.14 Depth: 2.6km ID:532395

PGV (cm/s) 0.1 0.2 0.5 1 2 5 10 20 50 100

Scale based on Tiberi et al. (2018) Version 1: Processed 2024-05-20T18:42:08Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter

PGD

Peak Ground Displacement Map SeisRaM-UniTS
ShakeMap: Pozzuoli
May 20, 2024 18:10:03 UTC M4.4 N40.83 E14.14 Depth: 2.6km ID:532395

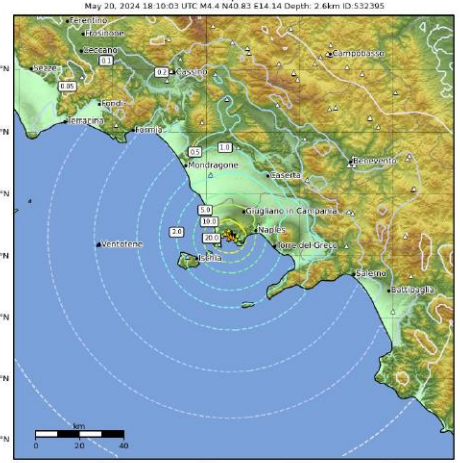


PGD (cm) 0.1 0.2 0.5 1 2 5 10 20 50 100 200

Scale based on Tiberi et al. (2018) Version 1: Processed 2024-05-20T18:42:08Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter

PSA 0.3

0.3 Second Peak Spectral Acceleration Map SeisRaM-UniTS
ShakeMap: Pozzuoli
May 20, 2024 18:10:03 UTC M4.4 N40.83 E14.14 Depth: 2.6km ID:532395



SA(0.3) (%g) 0.1 0.2 0.5 1 2 5 10 20 50 100 200

Scale based on Tiberi et al. (2018) Version 1: Processed 2024-05-20T18:42:08Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter

PSA 1.0

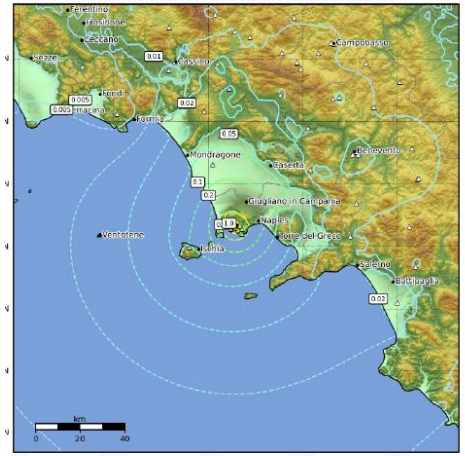
1.0 Second Peak Spectral Acceleration Map SeisRaM-UniTS
ShakeMap: Pozzuoli
May 20, 2024 18:10:03 UTC M4.4 N40.83 E14.14 Depth: 2.6km ID:532395

SA(1.0) (%g) 0.1 0.2 0.5 1 2 5 10 20 50 100 200

Scale based on Tiberi et al. (2018) Version 1: Processed 2024-05-20T18:42:08Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter

PSA 3.0

3.0 Second Peak Spectral Acceleration Map SeisRaM-UniTS
ShakeMap: Pozzuoli
May 20, 2024 18:10:03 UTC M4.4 N40.83 E14.14 Depth: 2.6km ID:532395



SA(3.0) (%g) 0.1 0.2 0.5 1 2 5 10 20 50 100 200

Scale based on Tiberi et al. (2018) Version 1: Processed 2024-05-20T18:42:08Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter

IA

Arias Intensity Map SeisRaM-UniTS
ShakeMap: Pozzuoli
May 20, 2024 18:10:03 UTC M4.4 N40.83 E14.14 Depth: 2.6km ID:532395

IA (cm/s) 0.1 0.2 0.5 1 2 5 10 20 50 100 200

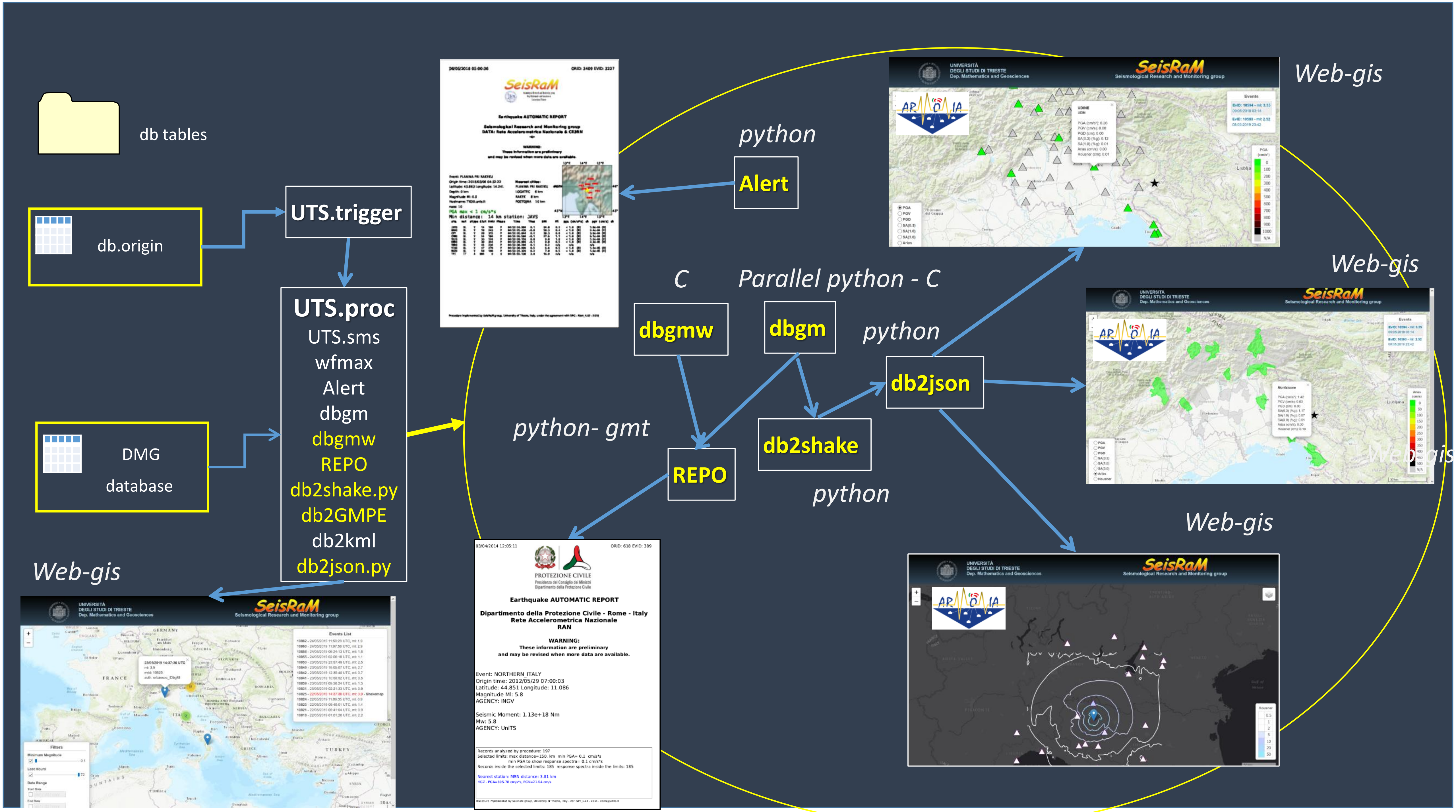
Scale based on Tiberi et al. (2018) Version 1: Processed 2024-05-20T18:42:08Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter

IH

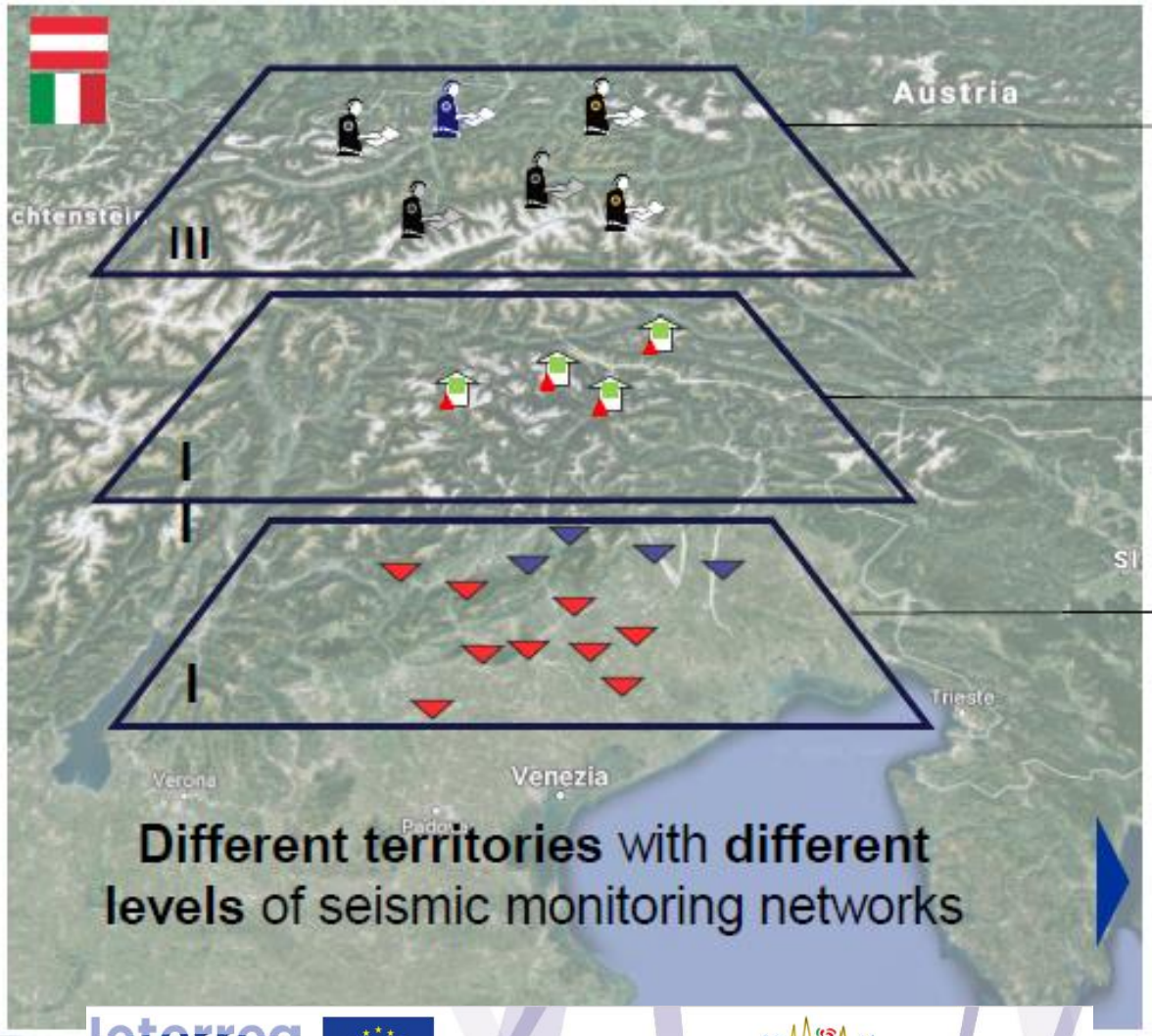
Housner Intensity Map SeisRaM-UniTS
ShakeMap: Pozzuoli
May 20, 2024 18:10:03 UTC M4.4 N40.83 E14.14 Depth: 2.6km ID:532395

IH (cm) 0.1 0.2 0.5 1 2 5 10

Scale based on Tiberi et al. (2018) Version 1: Processed 2024-05-20T18:42:08Z


db tables
db.origin
DMG
database
UTS.trigger
UTS.proc
UTS.sms
wfmax
Alert
dbgm
dbgmw
REPO
db2shake.py
db2GMPE
db2kml
db2json.py
Web-gis
python
Alert
C
Parallel python - C
dbgmw
dbgm
python
db2json
python- gmt
REPO
db2shake
python
Web-gis
Web-gis
Web-gis
SeisRaM
Earthquake AUTOMATIC REPORT
PROTEZIONE CIVILE
Earthquake AUTOMATIC REPORT
Dipartimento della Protezione Civile - Rome - Italy
Rete Accelerometrica Nazionale
RAN
WARNING:
These information are preliminary
and may be revised when more data are available.
Event: NORTHERN_ITALY
Origin time: 2012/05/29 07:00:03
Latitude: 44.851 Longitude: 11.086
Magnitude Ml: 5.8
AGENCY: INGV
Seismic Moment: 1.13e+18 Nm
Mw: 5.8
AGENCY: UniTS

Multi-level monitoring



Level III
Feeling of the shaking by CP volunteers and technicians feedback about actual damages

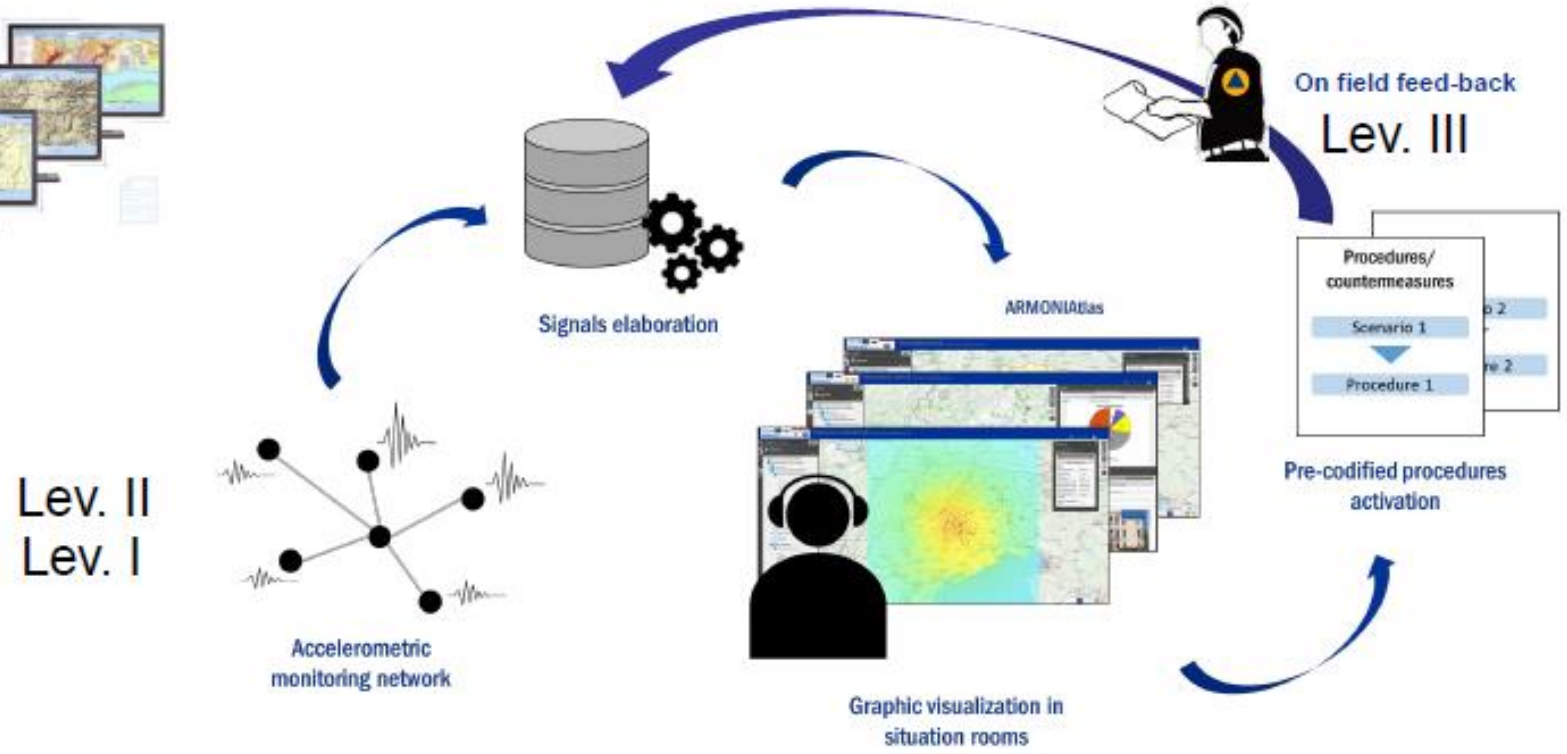
Level II
SentiNet at sentinel buildings (bottom and top of the structures)

Level I
Seismic networks

Integration and harmonization

Prof. ing. Stefano Grimaz–Università di Udine

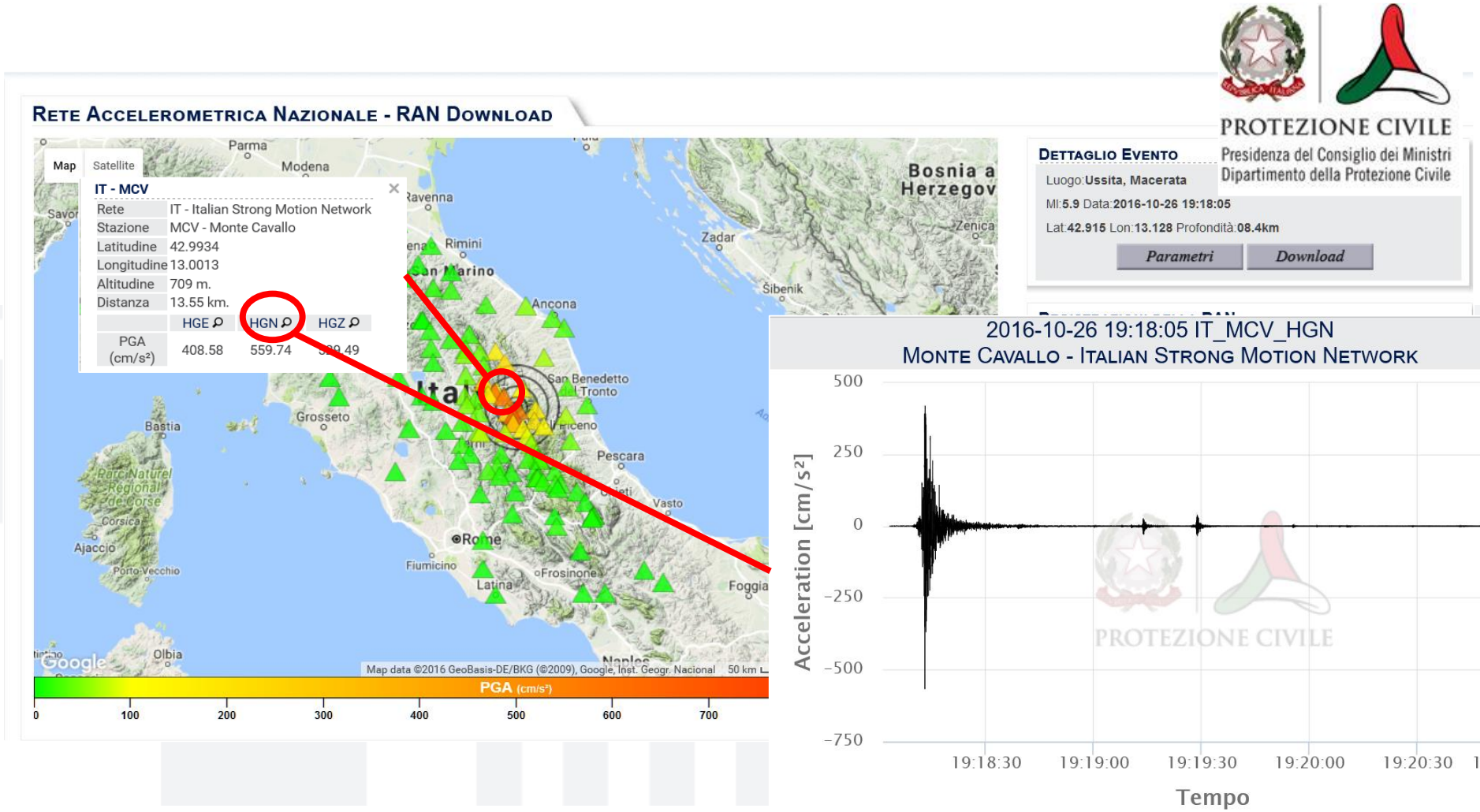
Idea of the ARMONIAtlas



- **Automatic elaboration** of ground motion data from seismic networks
- Organization of available information to generate **situational scenarios**.

Prof. ing. Stefano Grimaz–Università di Udine

http://ran.protezionecivile.it



PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile

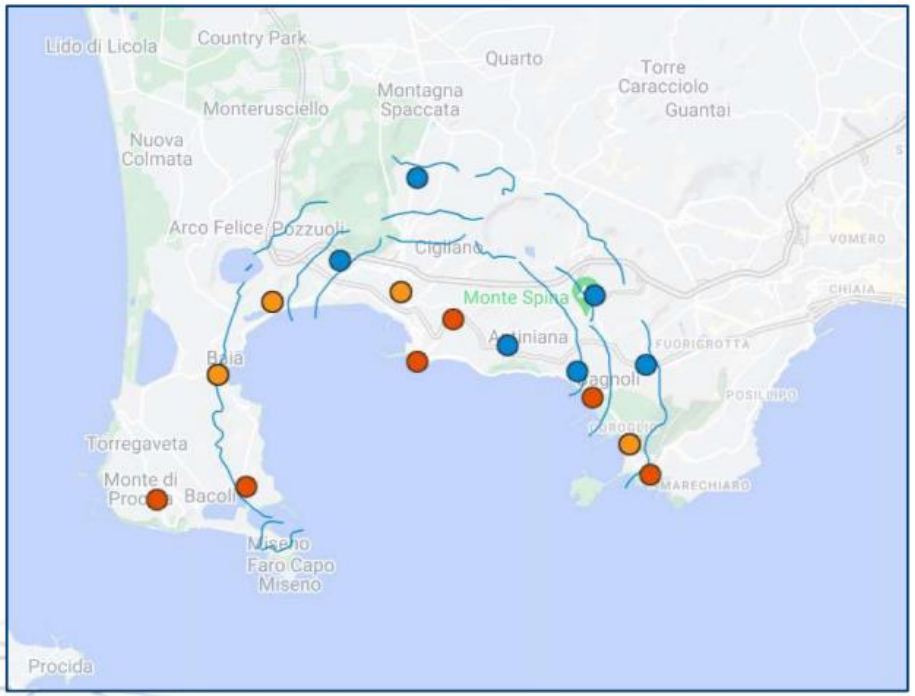
RAN Rete accelerometrica nazionale

Rete Accelerometrica Nazionale

www.protezionecivile.gov.it

Postazioni RAN nell'area dei Campi Flegrei

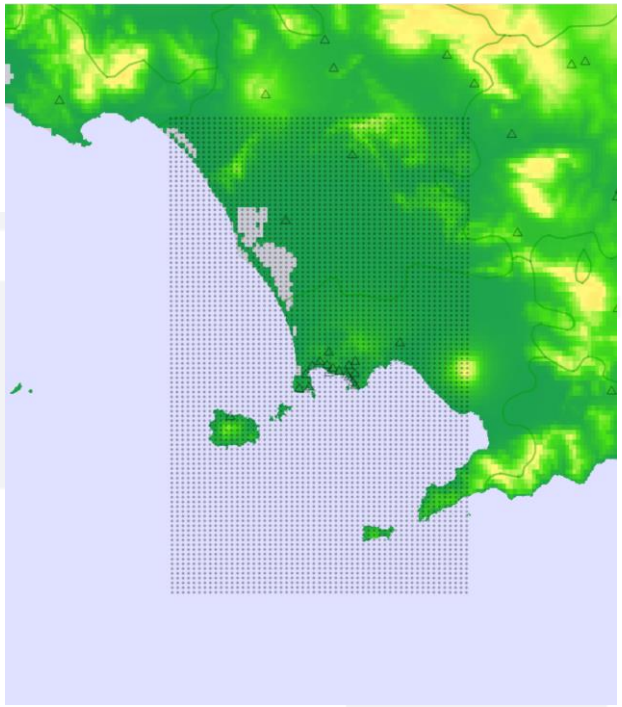
Art. 2 comma 1 lettera d, del decreto-legge n. 140 del 12 ottobre 2023 convertito con modificazioni nella legge n. 183 del 7 dicembre 2023

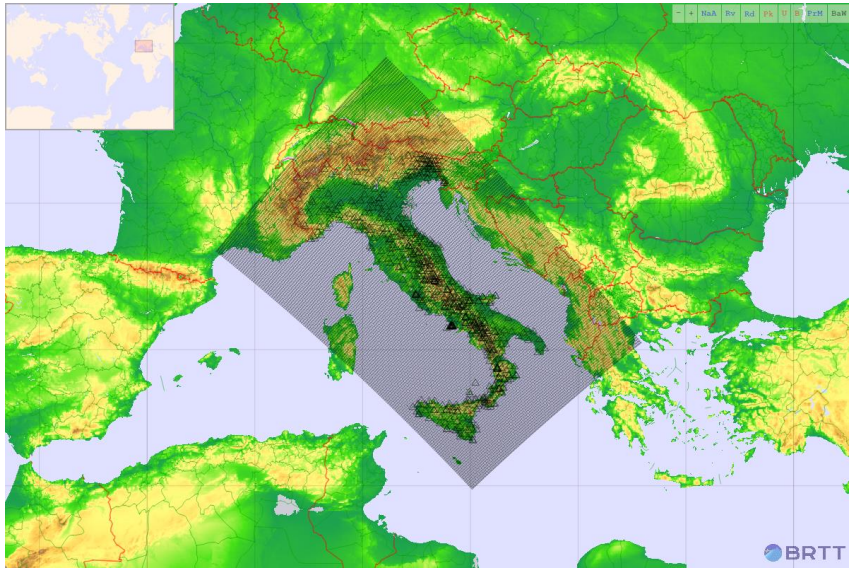


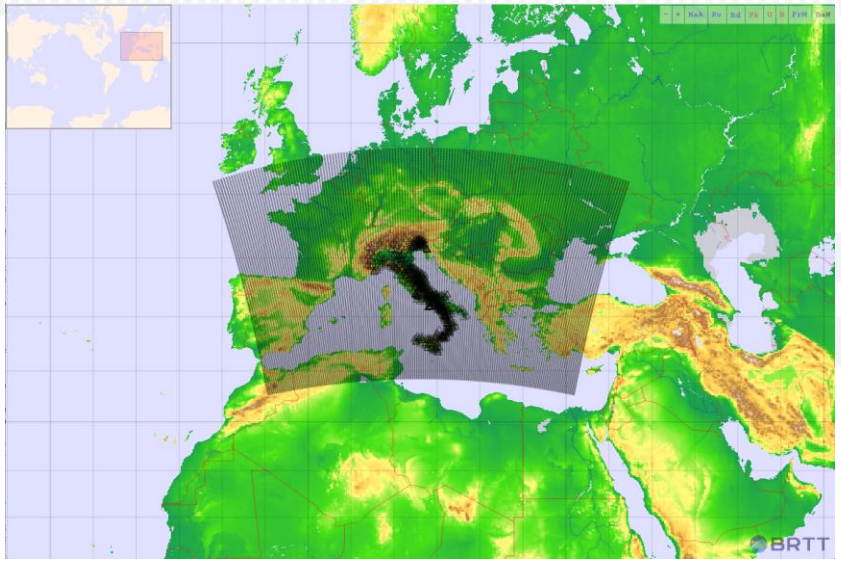
- **DPC RAN stazioni operative**
- **DPC RAN stazioni realizzate con fondi DPC dopo pubblicazione D.L. 140/23**
- **DPC RAN stazioni realizzate con fondi DPC dopo approvazione del Piano straordinario di vulnerabilità Art. 2 D.L. 140/23**

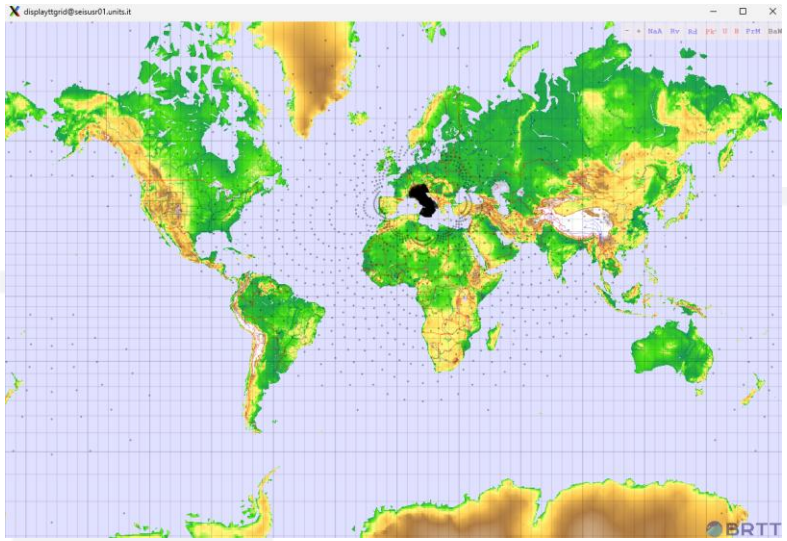
https://ran.protezionecivile.it

Pozzuoli grid

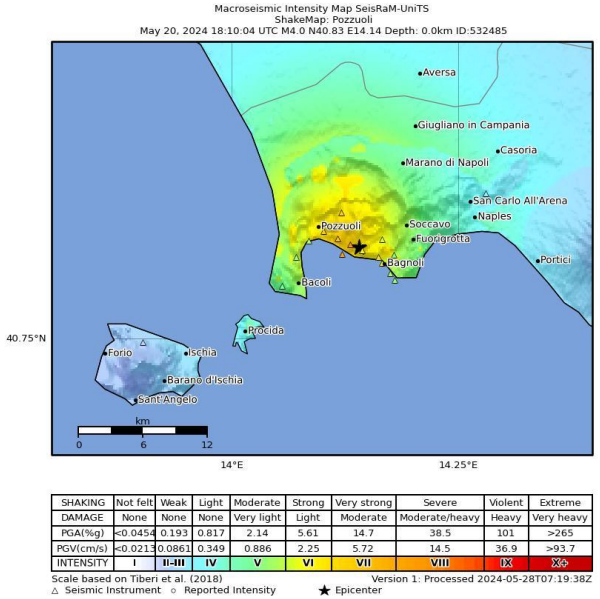






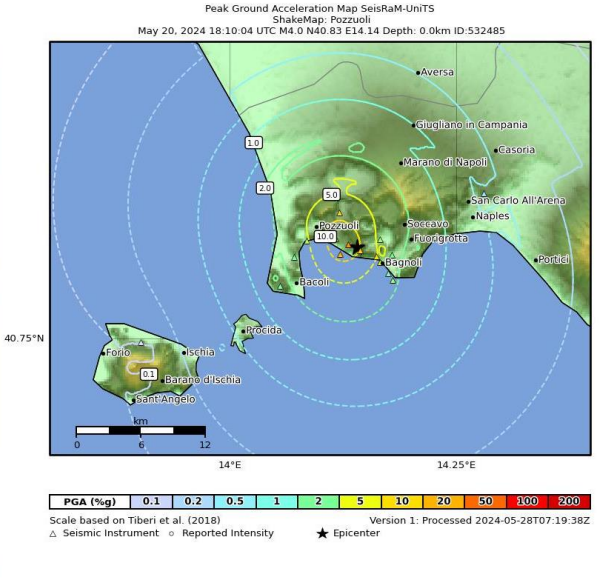


GRID space
100 m



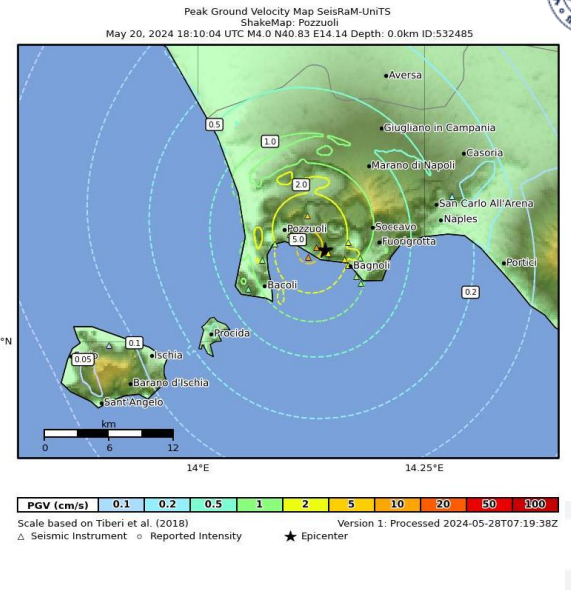
SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
DAMAGE	None	None	None	Very light	Light	Moderate	Moderate/heavy	Heavy	Very heavy
PGA(%g)	<0.0454	0.193	0.817	2.14	5.61	14.7	38.5	101	>265
PGV(cm/s)	<0.0213	0.0861	0.349	0.886	2.25	5.72	14.5	36.9	>93.7
INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based on Tiberi et al. (2018) Version 1: Processed 2024-05-28T07:19:38Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter



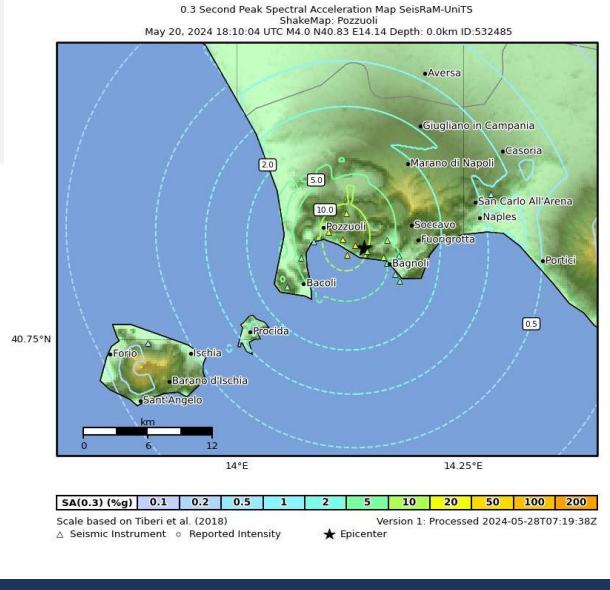
PGA (%g)	0.1	0.2	0.5	1	2	5	10	20	50	100	200

Scale based on Tiberi et al. (2018) Version 1: Processed 2024-05-28T07:19:38Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter



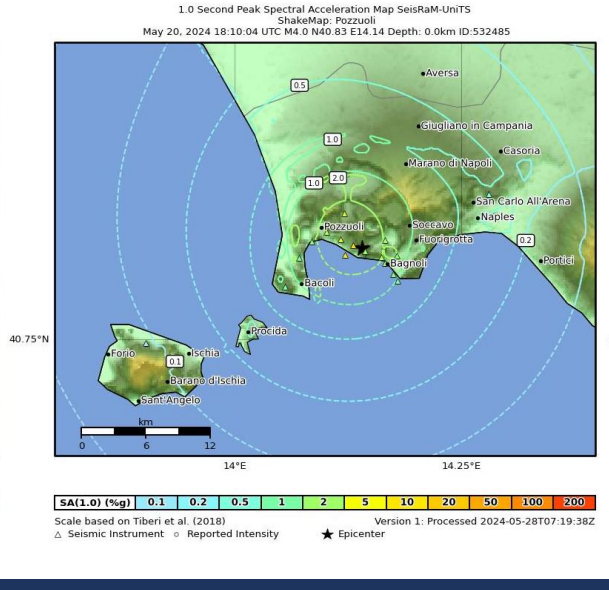
PGV (cm/s)	0.1	0.2	0.5	1	2	5	10	20	50	100

Scale based on Tiberi et al. (2018) Version 1: Processed 2024-05-28T07:19:38Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter



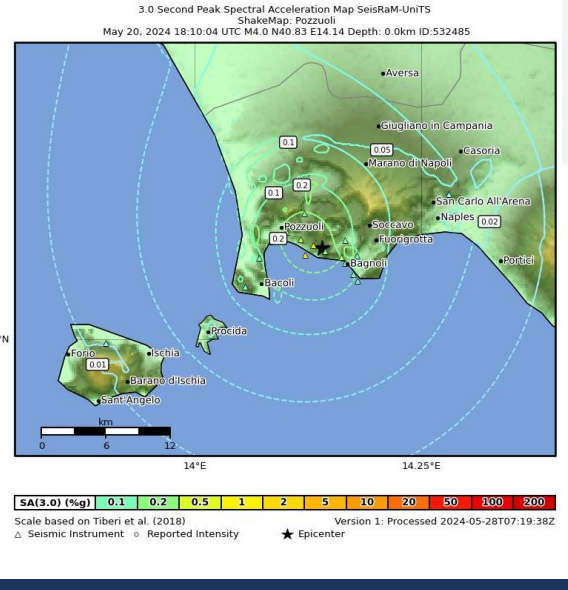
SA(0.3) (%g)	0.1	0.2	0.5	1	2	5	10	20	50	100	200

Scale based on Tiberi et al. (2018) Version 1: Processed 2024-05-28T07:19:38Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter



SA(1.0) (%g)	0.1	0.2	0.5	1	2	5	10	20	50	100	200

Scale based on Tiberi et al. (2018) Version 1: Processed 2024-05-28T07:19:38Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter



SA(3.0) (%g)	0.1	0.2	0.5	1	2	5	10	20	50	100	200

Scale based on Tiberi et al. (2018) Version 1: Processed 2024-05-28T07:19:38Z
△ Seismic Instrument ○ Reported Intensity ★ Epicenter