EGU General Assembly 2022
Vienna, Austria & Online | 23–27 May 2022

The DEnse mulTi-paramEtriC observations and 4D high resoluTion imaging (DETECT) experiment, a new paradigm for near-fault observations

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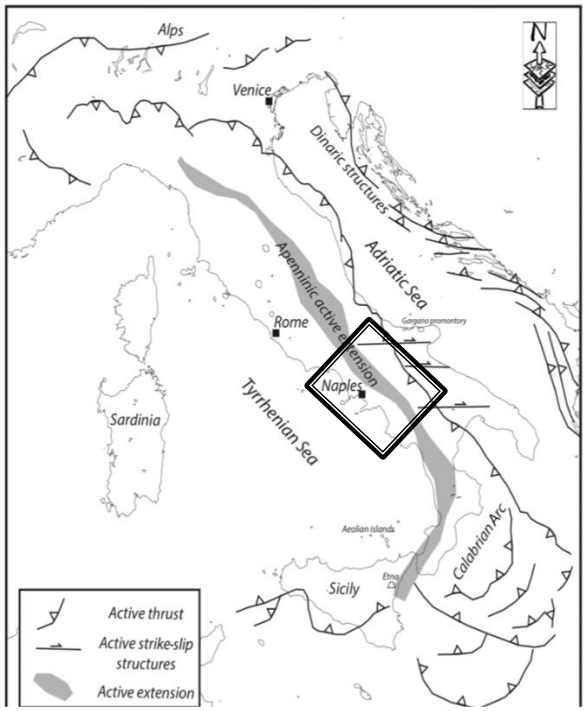
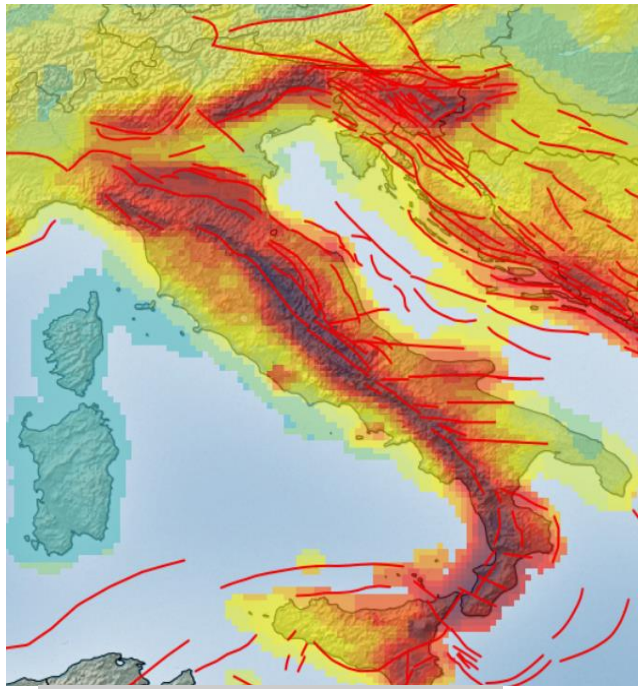
Target Area

- Located in southern Italy along the Apenninic active extension
- Several M6+ events occurred on the Campania- Lucania and Agri valley fault systems
- High hazard region



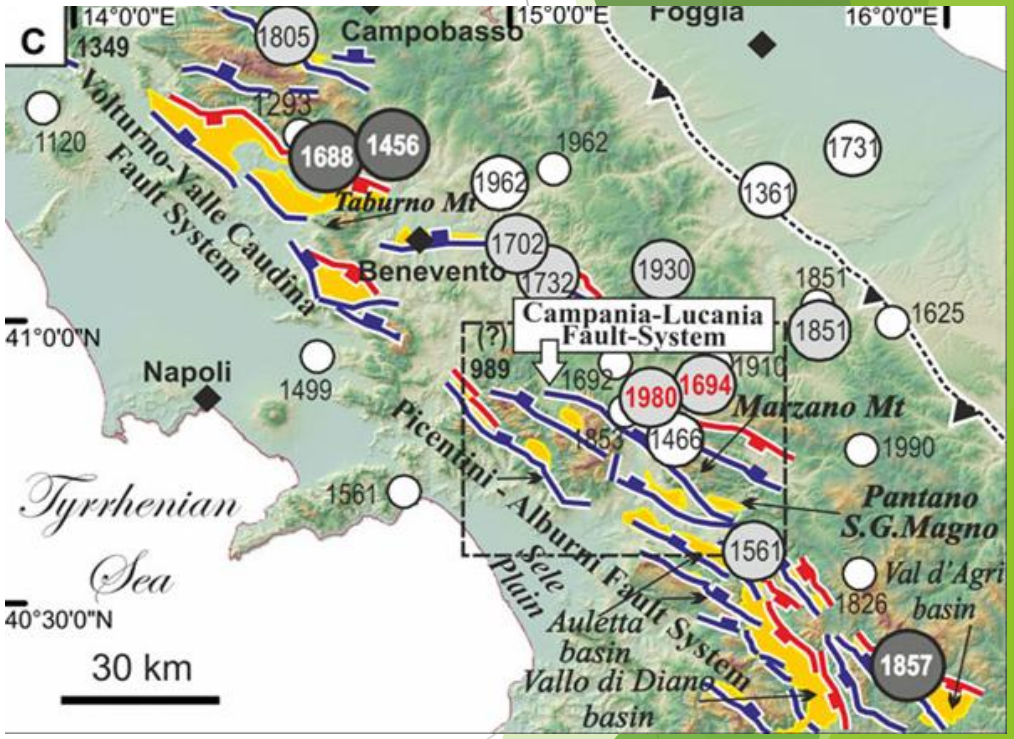
Pondrelli et al., 2020



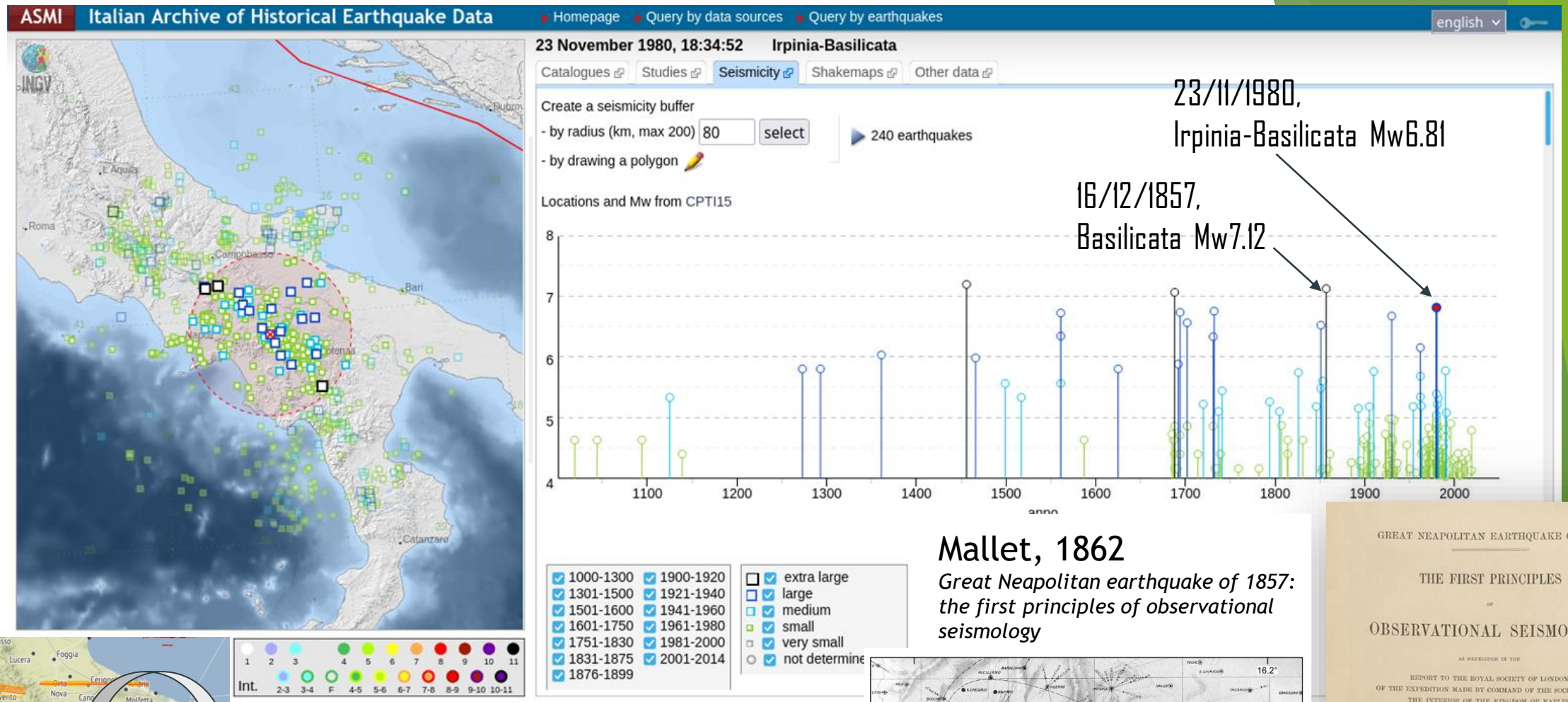
Hazard Map ESHM20

ESHM20, SA(5 Hz) – Mean Return Period 475yrs (POE 10%50years)

- 0.0001 < accl. [g] < 0.05005
- 0.1 < accl. [g] < 0.15
- 0.2 < accl. [g] < 0.25
- 0.3 < accl. [g] < 0.35
- 0.4 < accl. [g] < 0.45
- 0.5 < accl. [g] < 0.55
- 0.6 < accl. [g] < 0.65
- 0.7 < accl. [g] < 0.75
- accl. [g] > 0.8

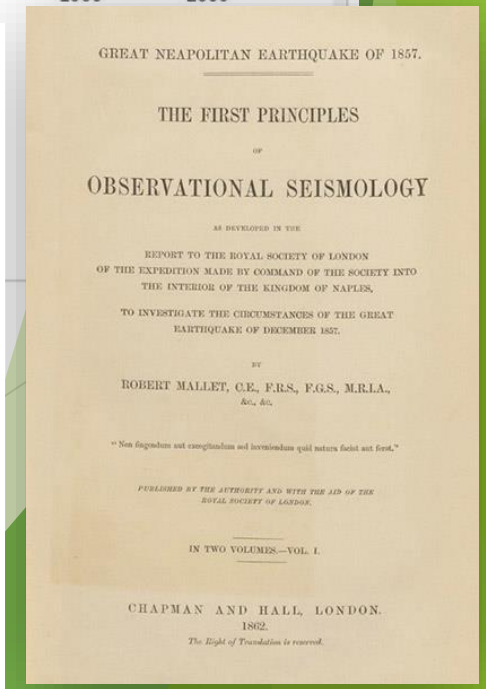


Bello et al. 2021



Mallet, 1862

Great Neapolitan earthquake of 1857: the first principles of observational seismology


GREAT NEAPOLITAN EARTHQUAKE OF 1857.

THE FIRST PRINCIPLES

OF

OBSERVATIONAL SEISMOLOGY

AS DEVELOPED IN THE

REPORT TO THE ROYAL SOCIETY OF LONDON OF THE EXPEDITION MADE BY COMMAND OF THE SOCIETY INTO THE INTERIOR OF THE KINGDOM OF NAPLES, TO INVESTIGATE THE CIRCUMSTANCES OF THE GREAT EARTHQUAKE OF DECEMBER 1857.

BY

ROBERT MALLET, C.E., F.R.S., F.G.S., M.R.I.A., &c., &c.

"Non fingendum aut excogitandum sed inveniendum quid natura faciat aut ferat."

PUBLISHED BY THE AUTHORITY AND WITH THE AID OF THE ROYAL SOCIETY OF LONDON.

IN TWO VOLUMES.—VOL. I.

CHAPMAN AND HALL, LONDON.
1862.

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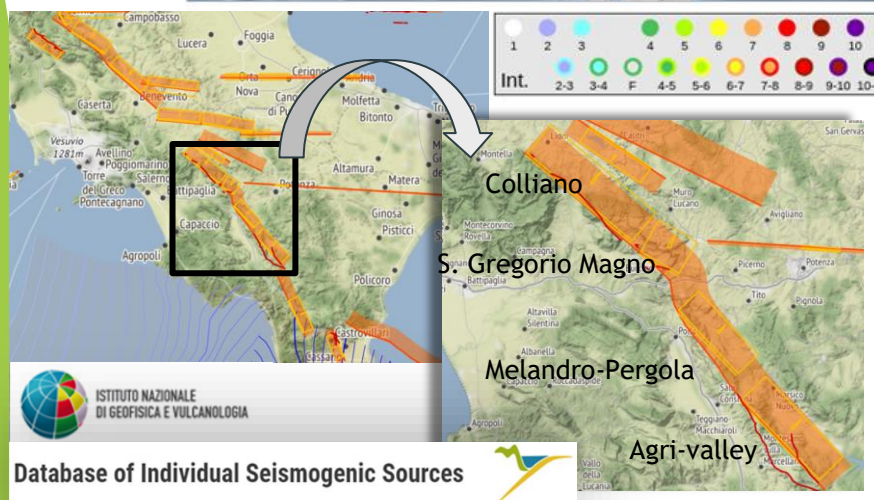
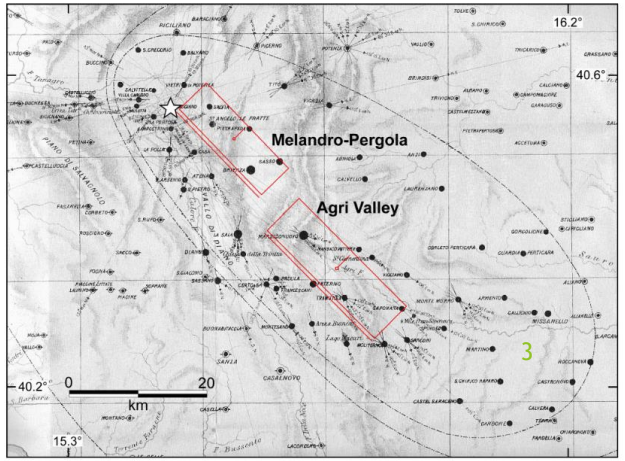


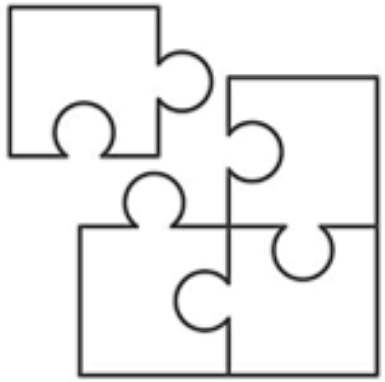
Irpinia-Agri Valley composite seismogenic source

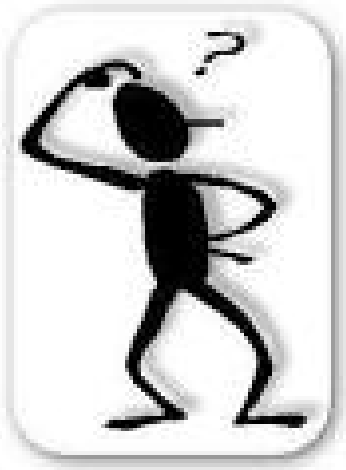
Burrato and Valensise, BSSA, 2007

Rise and fall of a hypothesized seismic gap: source complexity in the 16 December 1857, Southern Italy earthquake (Mw 7.0)

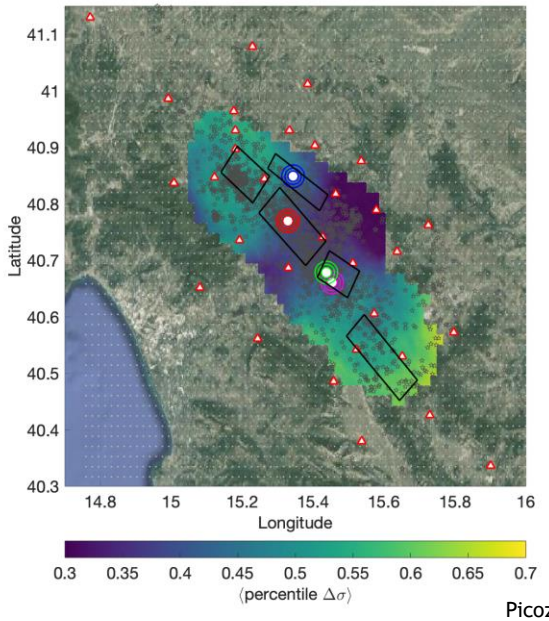


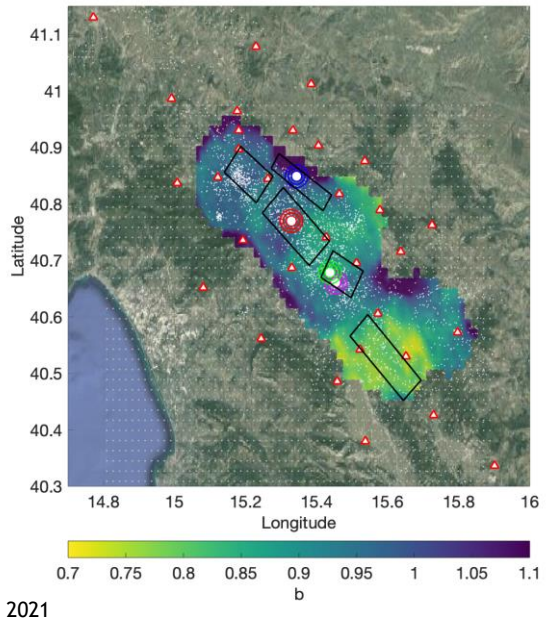
The Irpinia puzzle



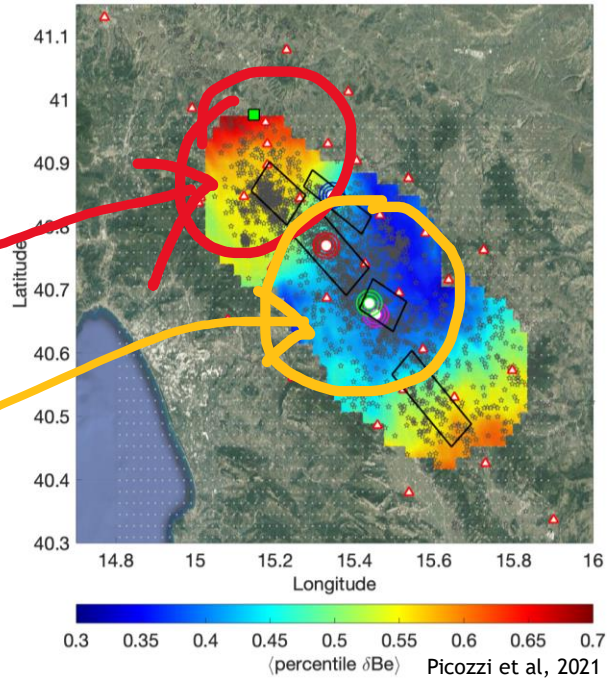


Spatial variability
and temporal changes in
medium and source properties





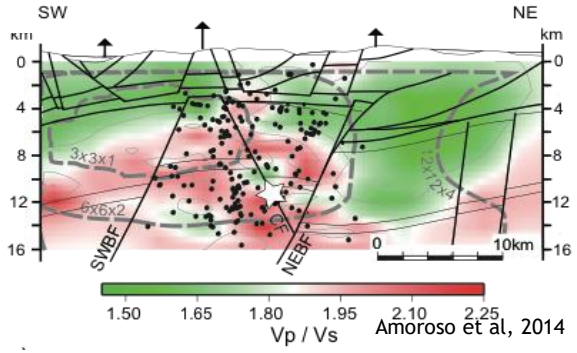
Picozzi et al 2021



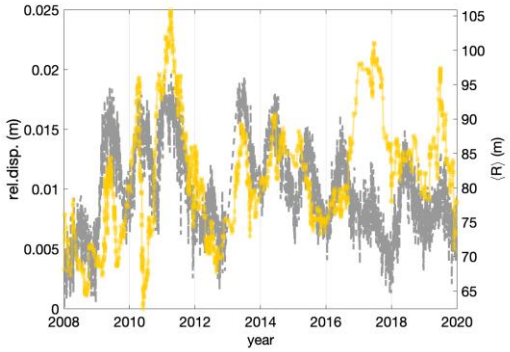
Picozzi et al, 2021

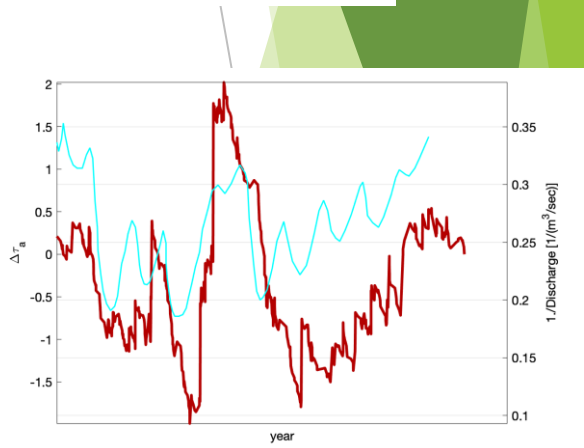
Strong segment?

Weak segments?



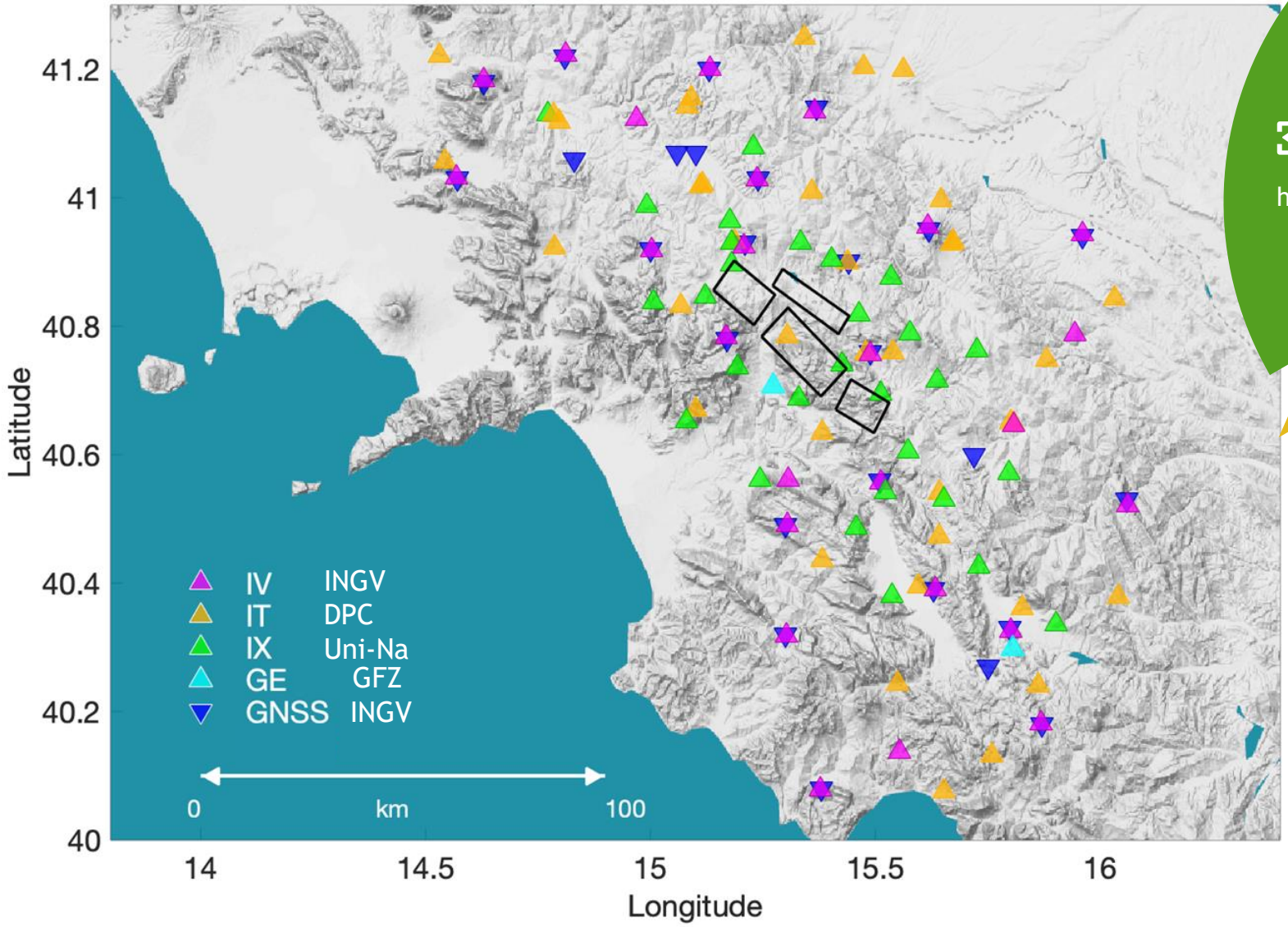
Amoroso et al, 2014





Residual apparent stress in time and the inverse of Caposele spring discharge (Picozzi et al., 2019)

INFO - Irpinia Near-Fault Observatory



Irpinia Near-Fault Observatory

INFO (IX):
31 stations, dense
http://isnet.unina.it/

INGV

INGV (IV): 14 stations of the national network

DPC (IT): 15 strong motion stations of the national network

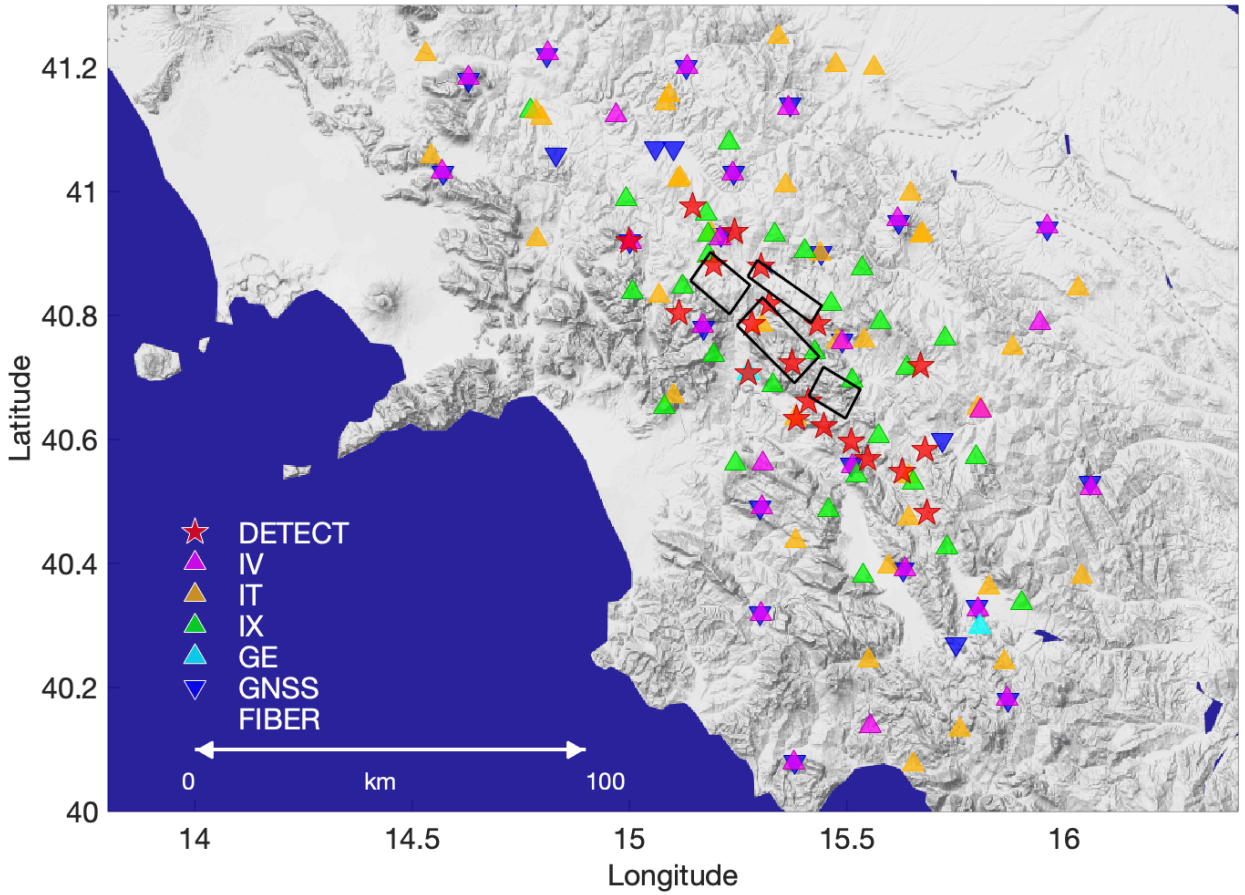
PROTEZIONE CIVILE NAZIONALE

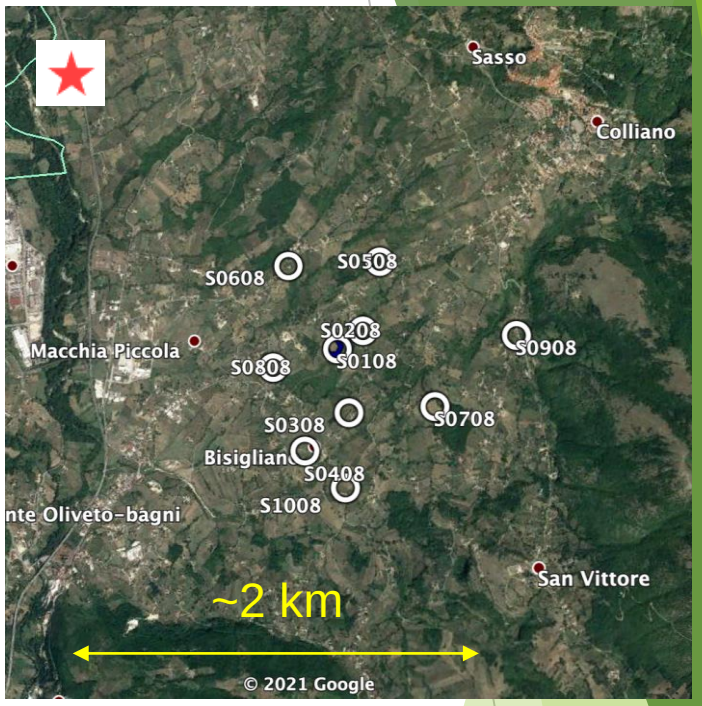
GNSS

RING RETE INTEGRATA NAZIONALE GNSS
ISTITUTO NAZIONALE DI GEOFISICA E VULCANOLOGIA

DETECT experiment

August 2021 → August 2022





GFZ Helmholtz Centre Potsdam

Instruments provided by:

Geophysical Instrument Pool Potsdam (GIPP)

20 arrays (200 stations)

- 21 with TC-BB
- 20 with SP MARK-1Hz
- 159 with 4.5Hz geoph.

GEOFON

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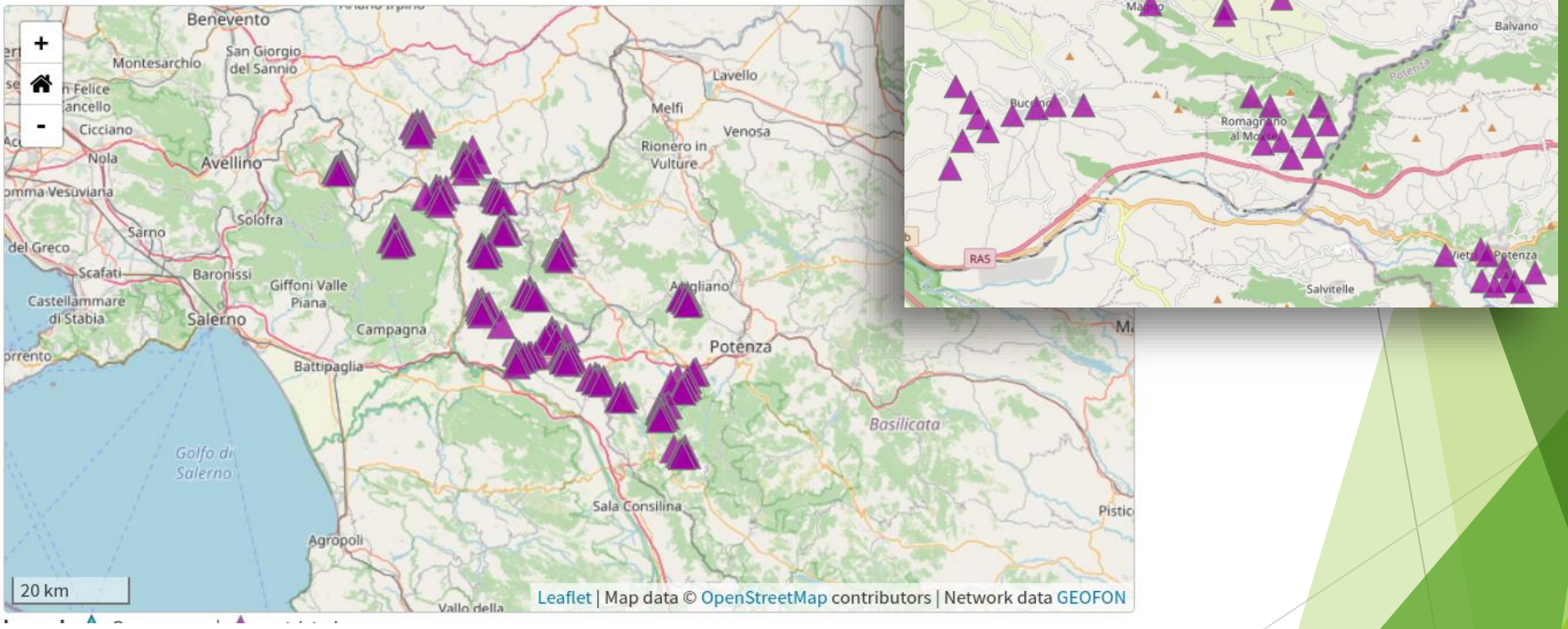
The ZK Seismic Network, 2021–2023



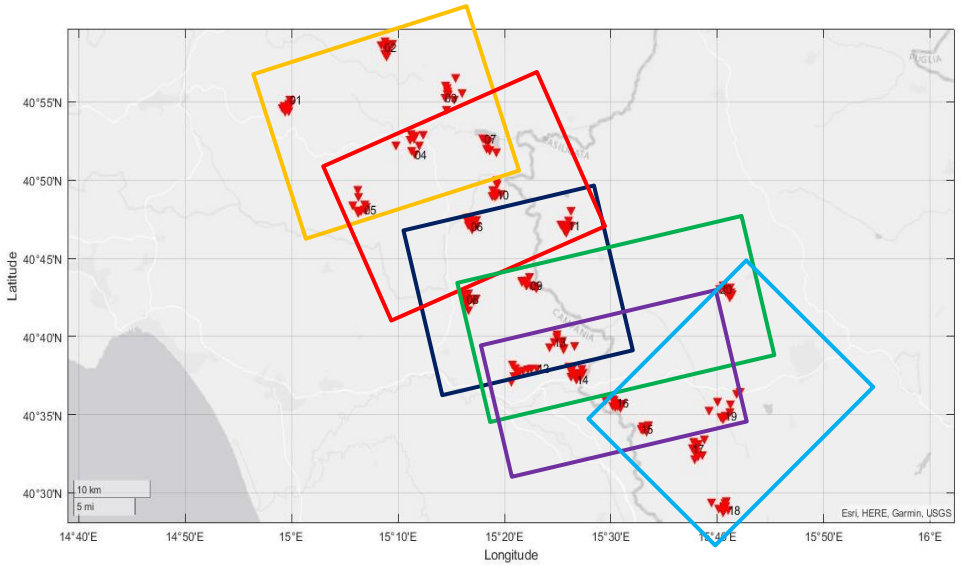
Cite as: Dino Bindi; Fabrice Cotton; Matteo Picozzi; Aldo Zollo (2021): The Irpinia seismic Array. GFZ Data Services. Other/Seismic Network. doi:10.14470/MX7576871994.

Network code: ZK
Type: Temporary
Time Range: 2021–2023
Terms of use: Restricted until 09/2025
Archived at: GFZ
Institution(s): Università di Napoli Federico II (Naples, Italy), Deutsches GeoForschungsZentrum (Potsdam, Germany)

GFZ Helmholtz Centre Potsdam

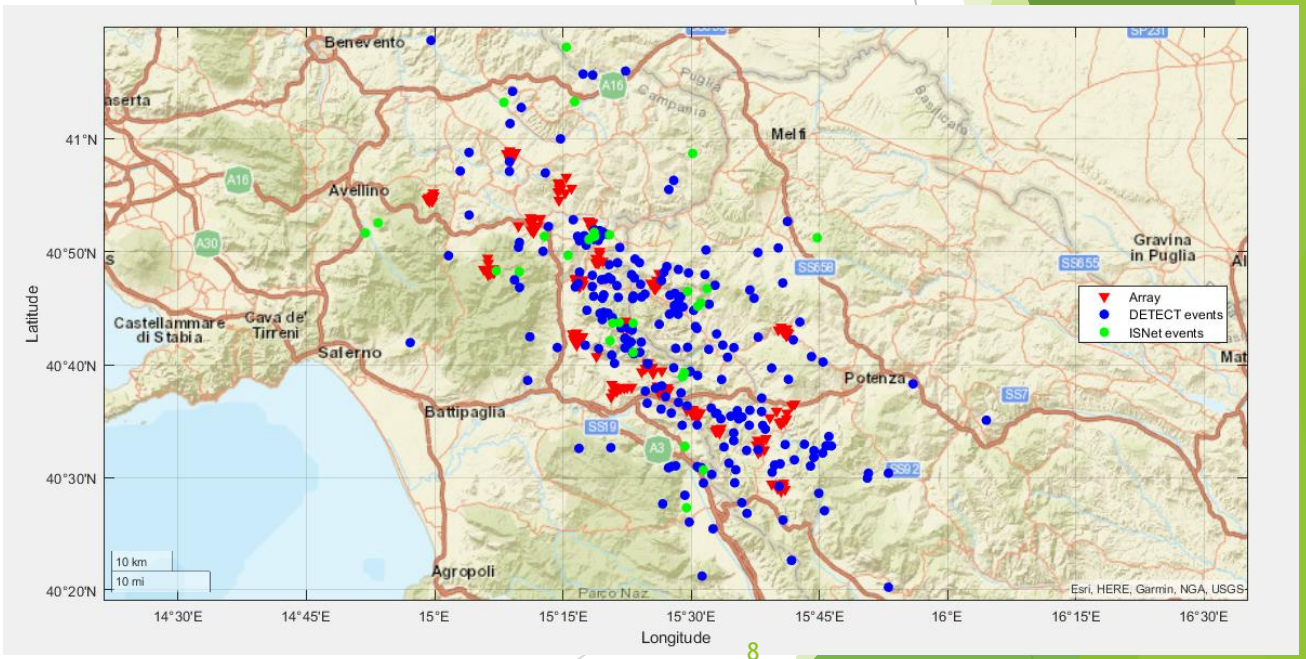
Preliminary Results for October 2021 (1 months)

Detection



LEGEND: SUB1 SUB2 SUB3 SUB4 SUB5 SUB6

EQTransformer + EQCorrscan (ML + template matching; Mousavi et al, 2020; Chamberlain et al, 2018) on **all** the **arrays**.
The whole network is divided in **6 overlapping sub-networks** of **6 arrays** each one.



Location (preliminary)

Final catalog contains **351 events** (**visually confirmed**).

Location was performed with CC picks for the new events (**316 out of 351**)

Average RMS 0.32 s, H_err=5.3 km, Z_err=2.5 km

Magnitude

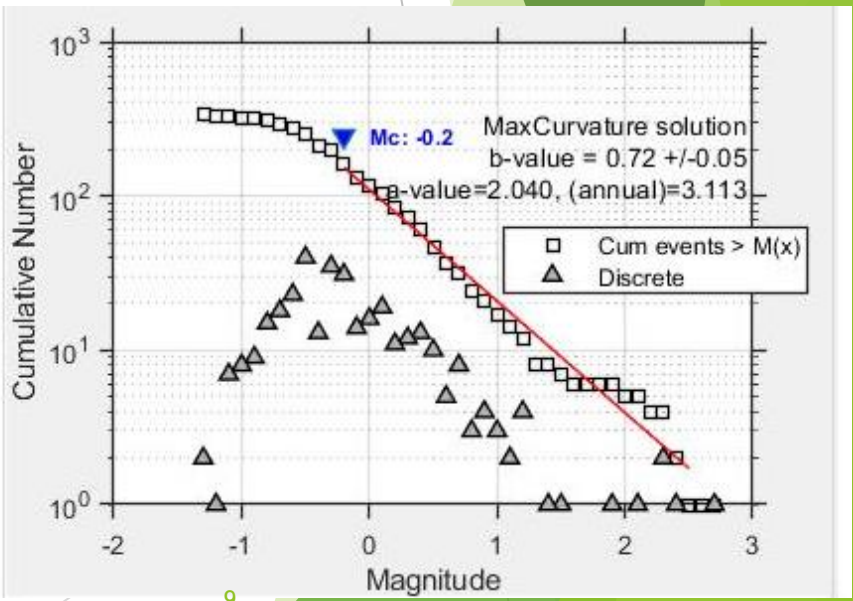
We estimated the local magnitude using the Bobbio et al (2009) relation for Irpinia

The frequency-magnitude distribution is consistent with G-R scaling and features $\boldsymbol{b = 0.72 \pm 0.05}$. The magnitude of completeness is estimated to be $\boldsymbol{Mc = -0.2}$

Table: location and magnitude comparison for events detected by both INFO and DETECT. Nstat column contains the number of stations used for location

	INFO					DETECT				
TIME	LAT	LON	Z	ML	Nstat	LAT	LON	Z	ML	Nstat
2021-10-01 06:19:05	40.728	15.387	6.7	0.4 ± 0.2	3	40.697	15.381	5.0	0.3	12
2021-10-03 04:22:31	40.852	15.302	8.0	2.3 ± 0.2	24	40.857	15.293	8.0	2.3	140
2021-10-03 04:31:03	40.851	15.301	7.7	0.8 ± 0.2	7	40.870	15.301	10.4	0.8	96
2021-10-16 10:15:08	40.828	15.260	6.9	0.6 ± 0.3	5	40.804	15.280	9.7	0.4	15

Frequency-magnitude distribution of the final catalog. b-value and Mc are estimated using ZMAP



October 2021 seismicity from DETECT experiment

Thank you for the attention!