



Euro-Mediterranean
Seismological Centre



Centre Sismologique
Euro-Méditerranéen



Felt report processing: from data collection to distribution

Matthieu Landès (EMSC)

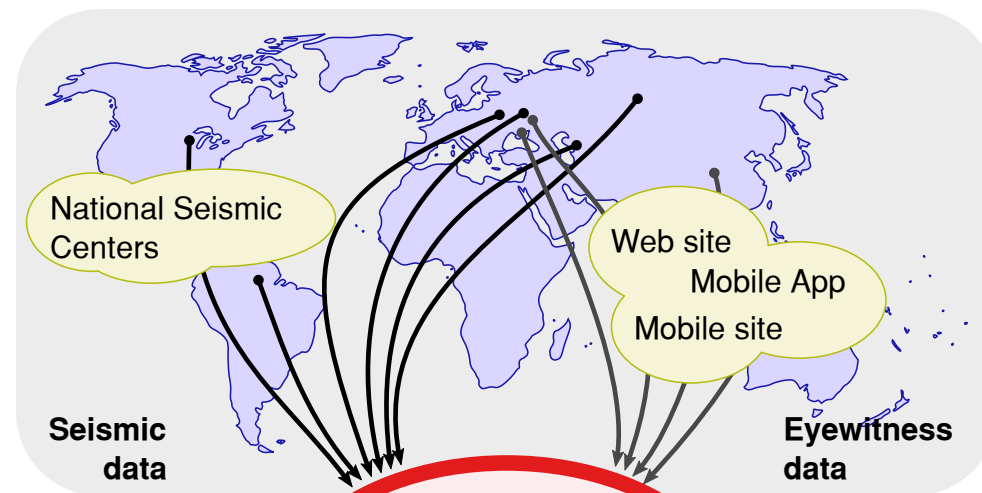
March 21, 2024

Find us on:



Overview

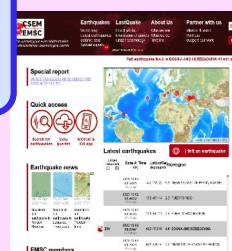
- **Collect data in real-time**
 - Origins, arrivals, moment tensors
 - Felt reports (intensities, comments)
 - Pictures
- **Give access through services**
 - Websites
 - Web services
- **Inform citizens**
 - LastQuake app
 - Social media



LastQuake
EMSC Mobile App



Websites

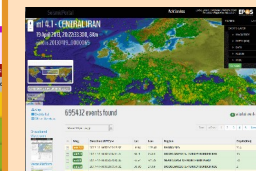


desktop

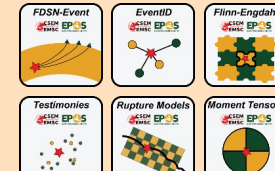


mobile

SeismicPortal



website



webservices

What is a felt report?

- When an earthquake strikes, EMSC try to engage eyewitnesses to report their feelings
 - Comments
 - **Felt intensity through thumbnails**
- Felt intensity data :
 - Same pictures for all countries
 - Intensity between 1 (not felt) and 12
 - Geolocation (if user share his location)

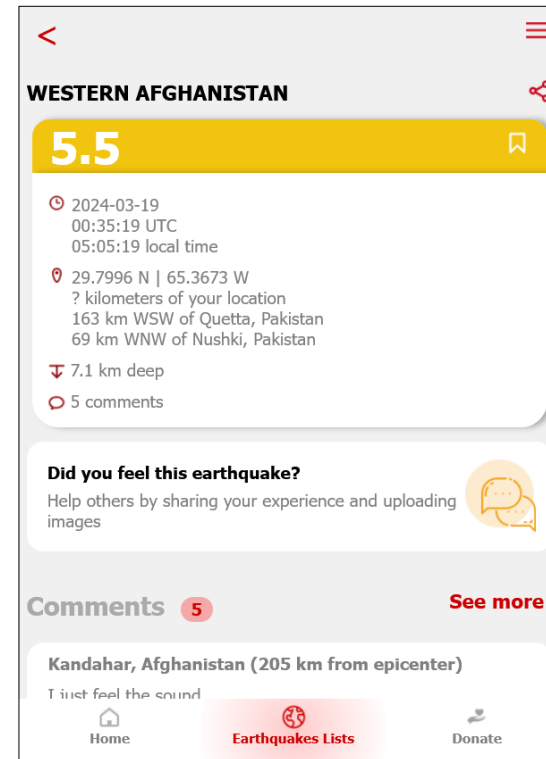


Macroseismology and felt reports

- **Macroseismology analyzes visible effects of earthquake and assign a macroseismic intensity**
 - Mercalli scale with 12 degrees
 - Based on questionnaires
 - Generally at national scale
- **EMSC felt reports**
 - Only thumbnails but designed to match the Mercalli scale
 - Just begin to be accepted by the community
 - No language dependency
 - Worldwide and fast to collect
- The aim is to collect quickly a lot of felt reports to study statistical properties and to infer early impact estimation... from minutes to few hours after the quake!

The collection system (earthquake association)

- **When do eyewitnesses post felt report?**
 - Without seismic information, called orphan reports
 - Linked to traffic peaks
 - Directly associated to an existing event



The collection system

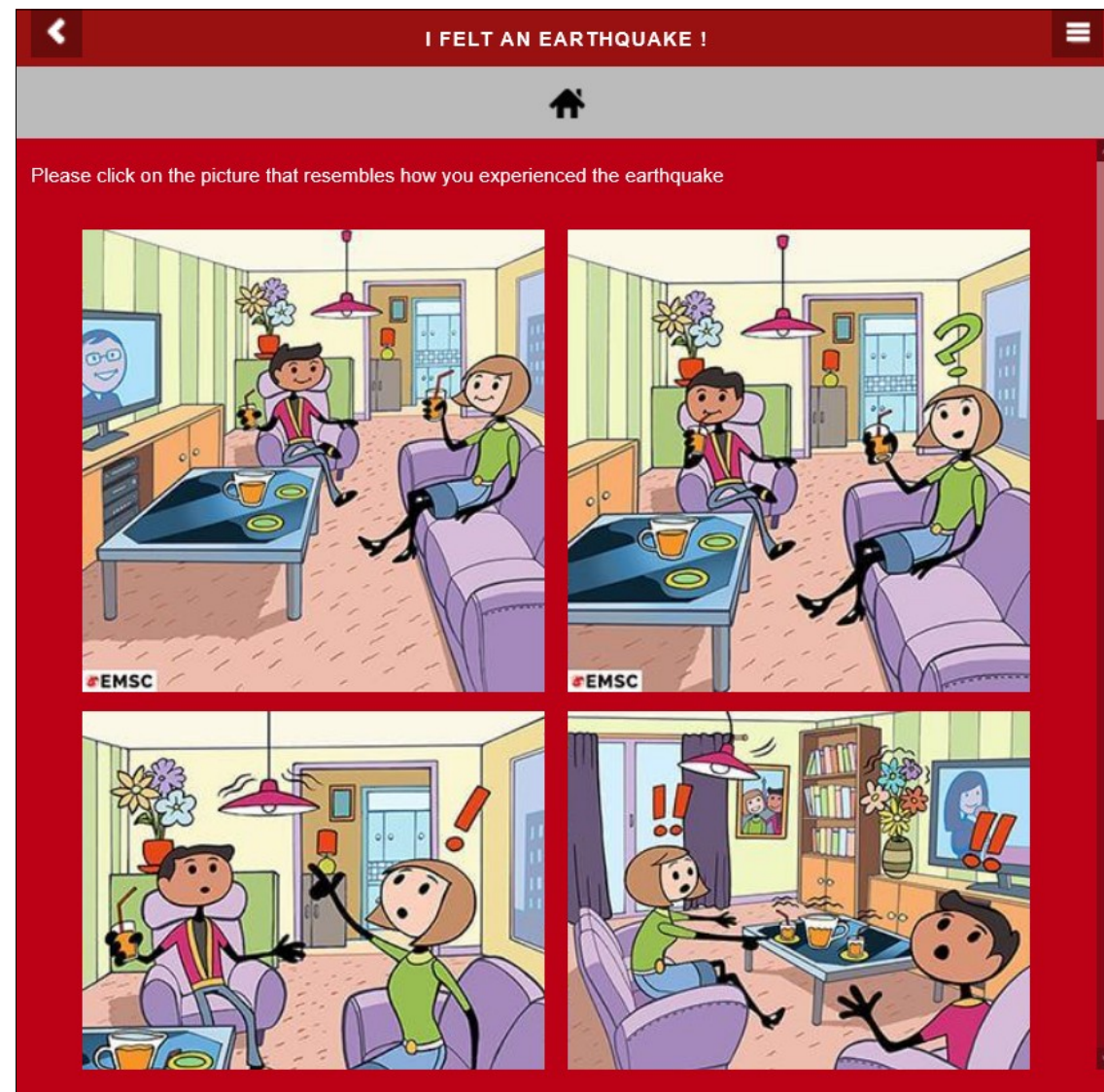
■ Different collection sources

- Mobile application Lastquake android, iOS

- Mobile website
m.emsc.eu

- Desktop website
www.emsc-csem.org

- Telegram since juin 2023



The collection system

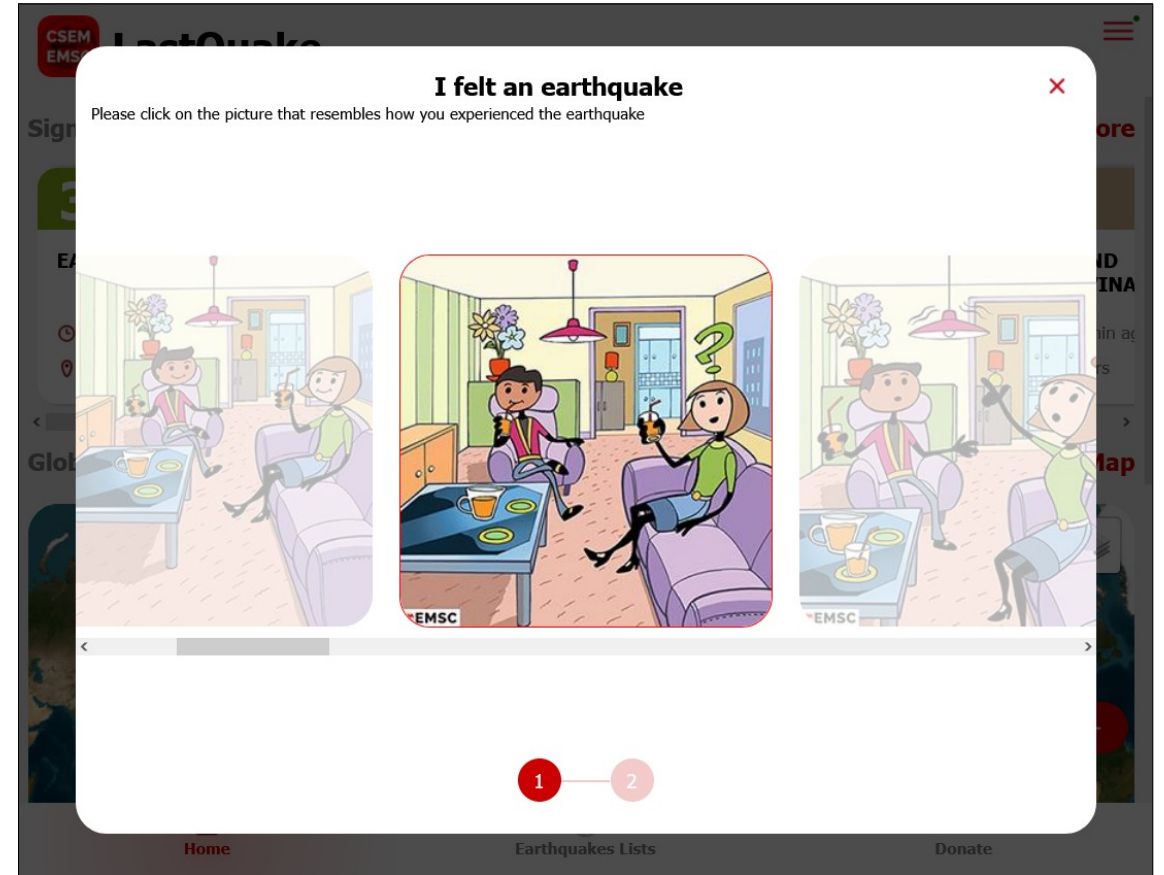
■ Different collection sources

- Mobile application Lastquake android, iOS

- Mobile website
m.emsc.eu

- Desktop website
www.emsc-csem.org

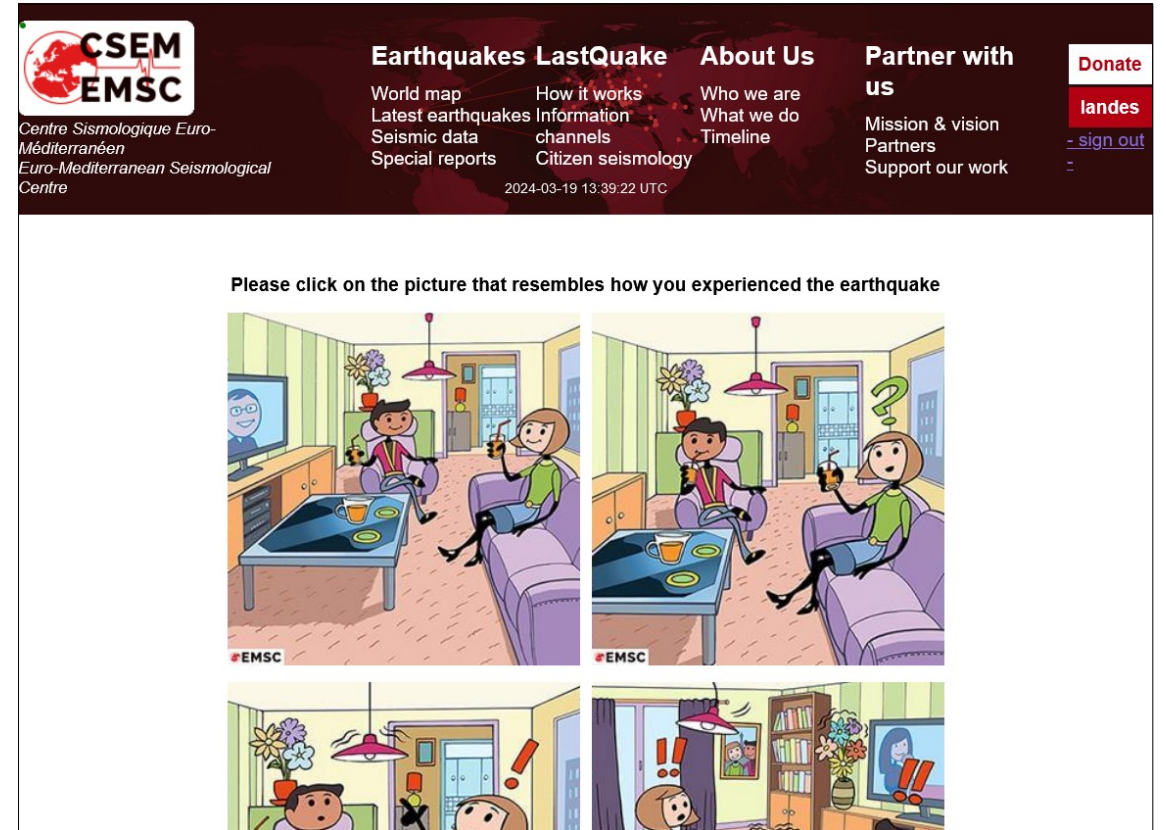
- Telegram since juin 2023



The collection system

■ Different collection sources

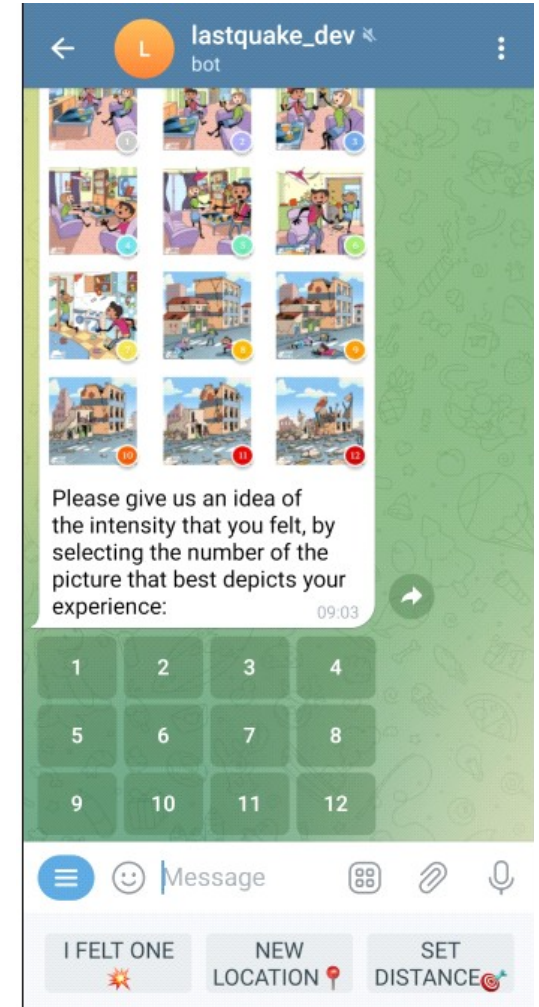
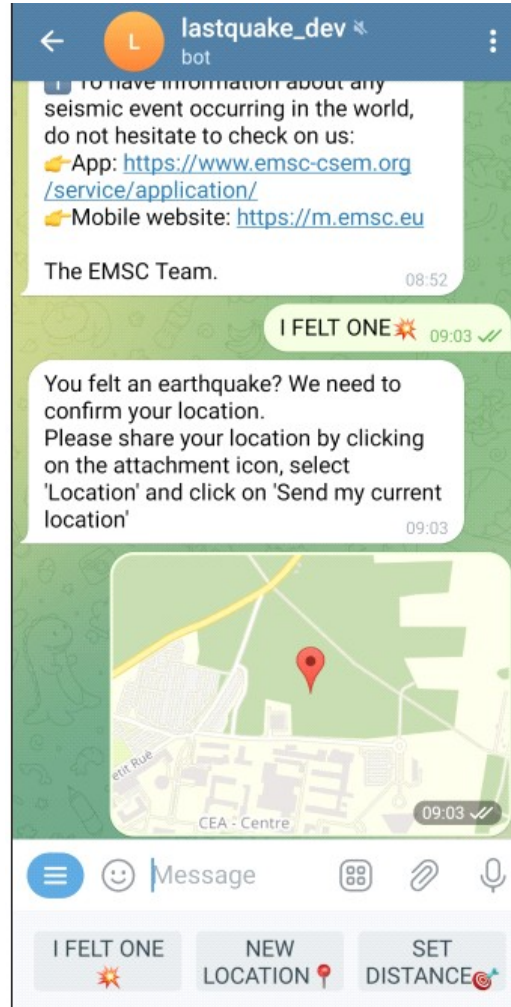
- Mobile application Lastquake android, iOS
- Mobile website m.emsc.eu
- Desktop website www.emsc-csem.org
- Telegram since juin 2023



The collection system

■ Different collection sources

- Mobile application Lastquake android, iOS
- Mobile website m.emsc.eu
- Desktop website www.emsc-csem.org
- Telegram since juin 2023



The collection system

■ Parameters of a felt report

- Felt intensity
- and corrected intensity (comparison with USGS “Did you Feel It” system)

- Geolocation
 - When users share their location
 - Through postal address
 - From IP

- Identifier of the associated earthquake

- Collection time



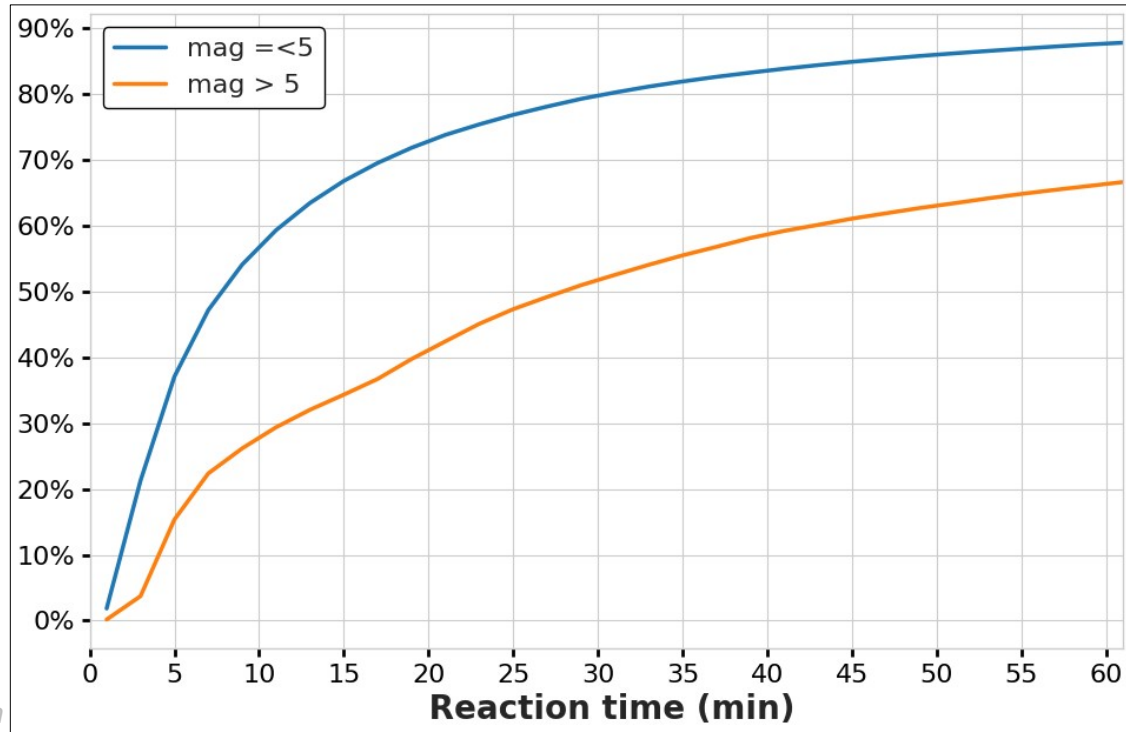
A few orders of magnitude

■ How fast?

- Half of felt reports are collected within 8min
- However collection can take hours after the strike
- Association issues during seismic crisis

■ In 2023, 460k felt reports for around 5k felt earthquakes

- 1% desktop, 30% mobile, 68% app

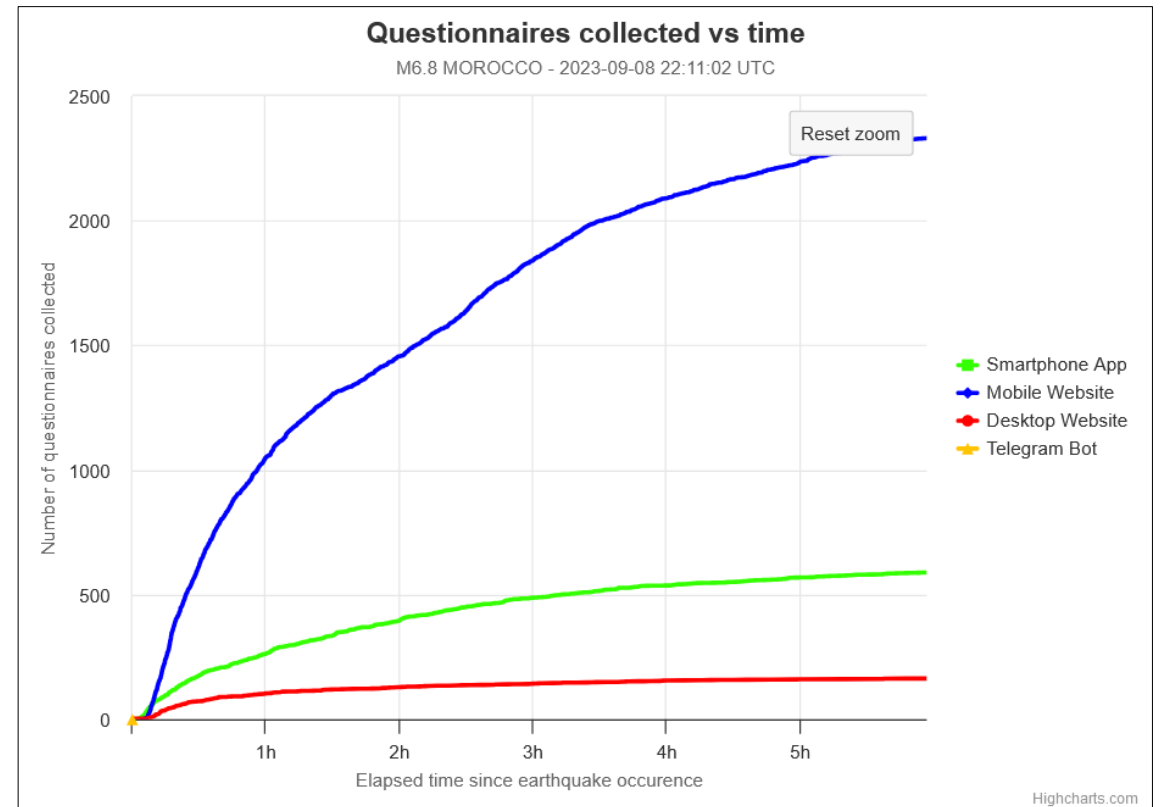
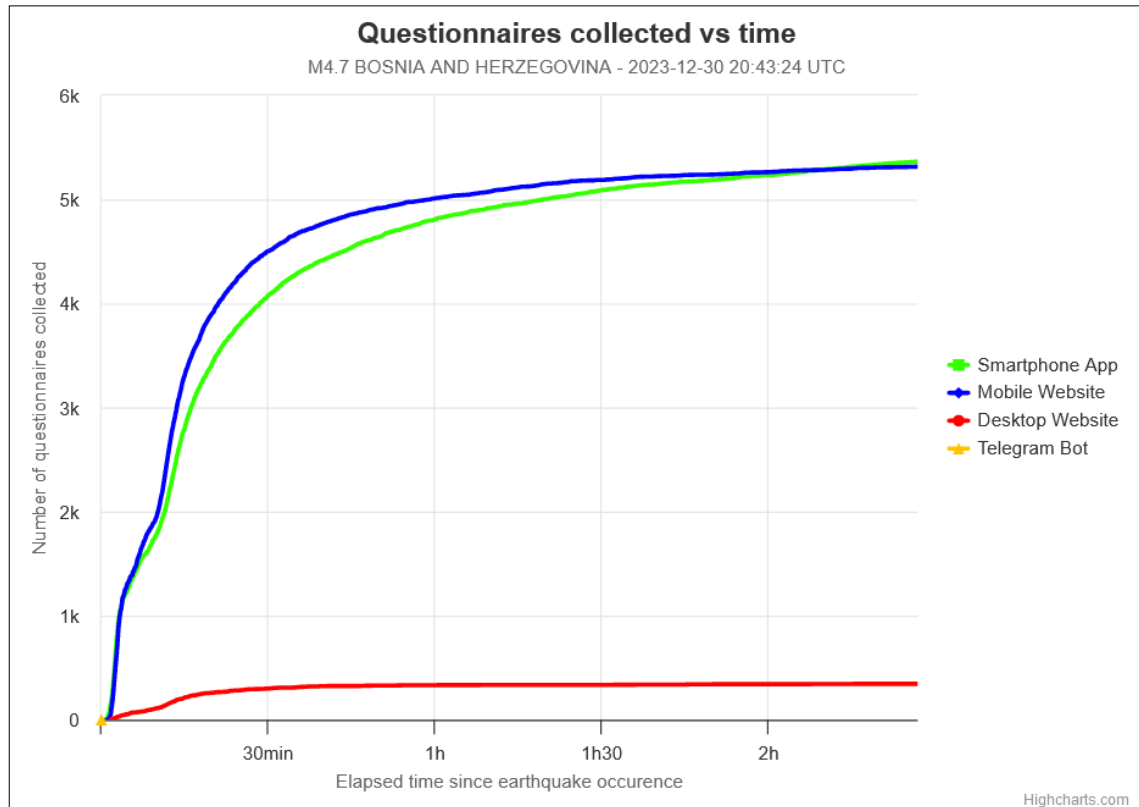


call

A few orders of magnitude

Two recent examples

- M4.7 in Bosnia and Herzegovina (11k)
- M6.8 in Morocco (5k)



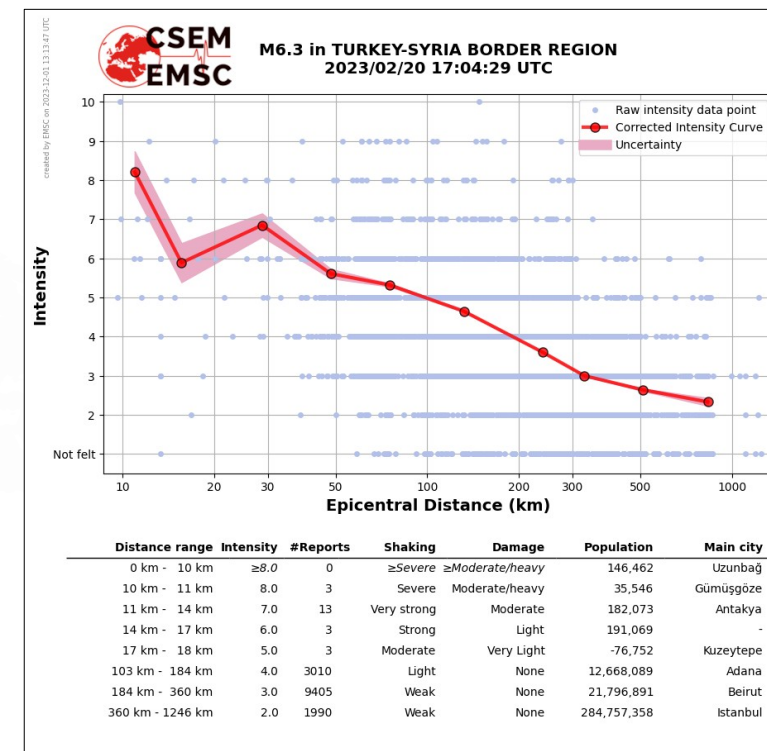
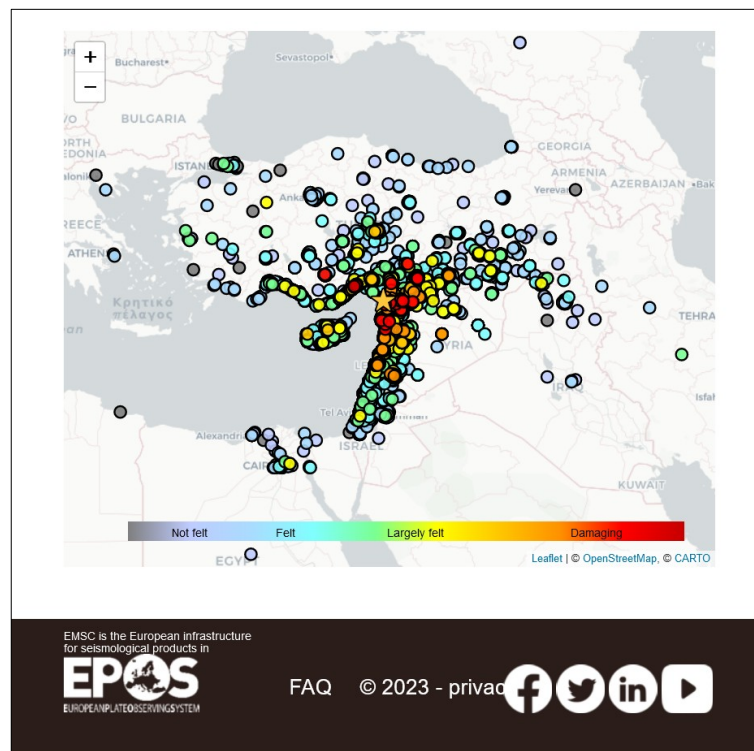
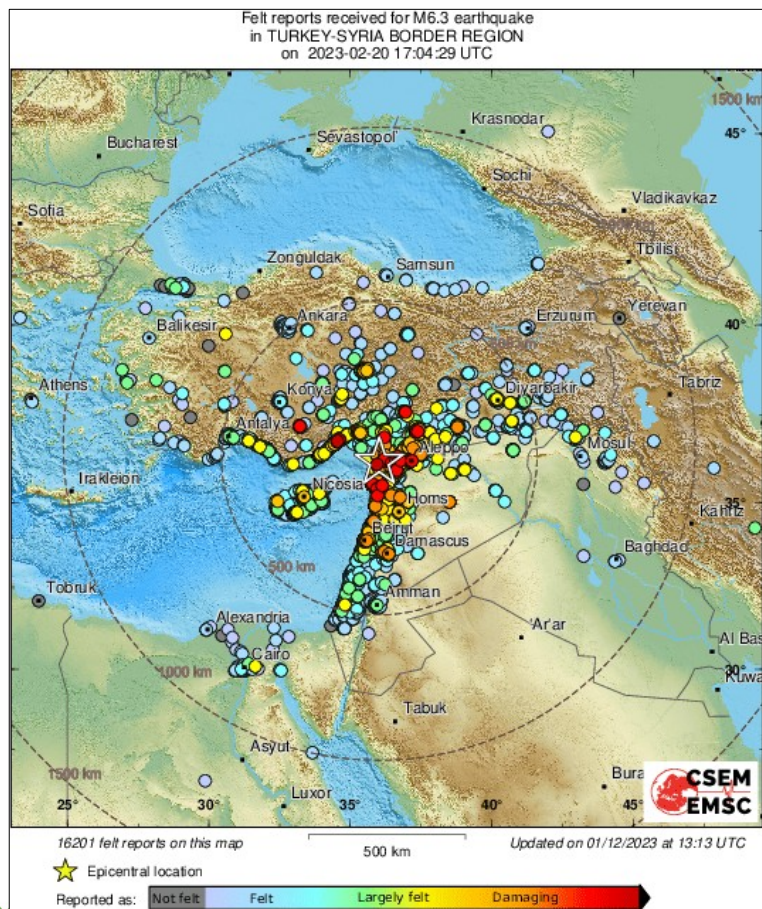
Felt report integration into the system

- **Eyewitness post a felt report**
- **Early processing**
 - Basic filtering to avoid inconsistent associations
 - Early association rules
- **Database insertion**
- **Consistency check for each event**
 - Intensity/distance/magnitude filtering
 - Manual association of orphan felt reports
- **Internal publication of new/updated/deleted felt reports**
 - Trigger EMSC felt report products
 - Data publication for external access



Internal felt report processing

- Maps
- Trigger creation (orphan reports close in distance/time)
- Research (early impact assessment, finite rupture, ...)



How to access felt reports?

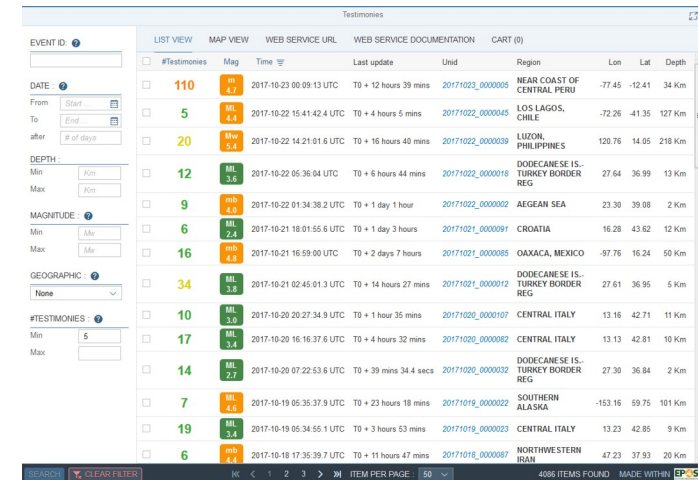
- **Collaborations**
- **Seismic Portal**
- **Real-time messaging system (HMB)**



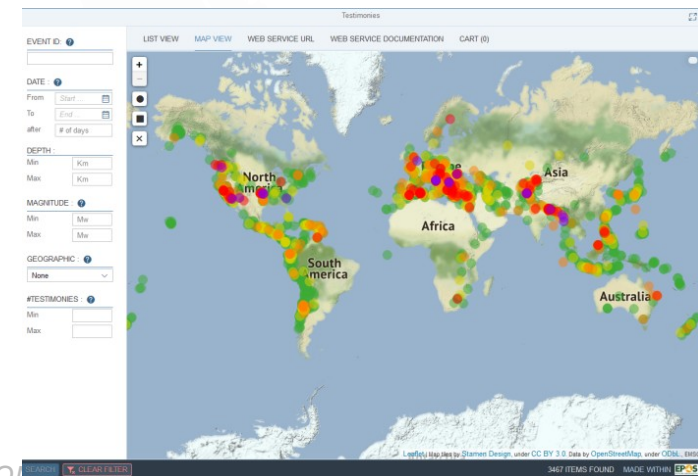
Felt reports web service

- Integrated into EPOS
- What kind of data ?
 - Access to all Intensities collected and associated to seismic events
 - Open access ... but limited parameters (for now, no collection time)
 - No designed for real time
- How to use this service ?
 - Search and select events with fdsn-event parameters
 - Possibility to download data

- Interactive session:
<https://www.seismicportal.eu/testimonies-ws/>



EVENT ID	#Testimonies	Mag	Time	Last update	Unit	Region	Lon	Lat	Depth
110	110	4.7	2017-10-23 00:09:13 UTC	T0 + 12 hours 39 mins	20171022_000000	NEAR COAST OF CENTRAL PERU	-77.45	-12.41	34 Km
5	5	4.4	2017-10-22 15:41:42.4 UTC	T0 + 4 hours 5 mins	20171022_000004	LOS LAGOS, CHILE	-72.26	-41.35	127 Km
20	20	5.4	2017-10-22 14:21:01.6 UTC	T0 + 16 hours 40 mins	20171022_000009	LIZON, PHILIPPINES	120.76	14.05	218 Km
12	12	3.6	2017-10-22 05:36:04 UTC	T0 + 6 hours 44 mins	20171022_000018	DODECANESE IS.-TURKEY BORDER REG	27.64	36.99	13 Km
9	9	4.0	2017-10-22 01:34:38.2 UTC	T0 + 1 day 1 hour	20171022_000002	AEGEAN SEA	23.30	39.08	2 Km
6	6	2.4	2017-10-21 18:01:55.6 UTC	T0 + 1 day 3 hours	20171021_000091	CROATIA	16.28	43.62	12 Km
16	16	4.0	2017-10-21 16:59:00 UTC	T0 + 2 days 7 hours	20171021_000085	OAXACA, MEXICO	-97.76	16.24	50 Km
34	34	3.8	2017-10-21 02:45:01.3 UTC	T0 + 14 hours 27 mins	20171021_000012	DODECANESE IS.-TURKEY BORDER REG	27.61	36.95	5 Km
10	10	3.0	2017-10-20 20:27:34.9 UTC	T0 + 1 hour 35 mins	20171020_0000107	CENTRAL ITALY	13.16	42.71	11 Km
17	17	3.4	2017-10-20 16:16:37.6 UTC	T0 + 4 hours 32 mins	20171020_0000082	CENTRAL ITALY	13.13	42.81	10 Km
14	14	2.7	2017-10-20 07:22:53.6 UTC	T0 + 39 mins 34.4 secs	20171020_0000032	DODECANESE IS.-TURKEY BORDER REG	27.30	36.84	2 Km
7	7	4.0	2017-10-19 05:35:37.9 UTC	T0 + 23 hours 18 mins	20171019_0000022	SOUTHERN ALASKA	-153.16	59.75	101 Km
19	19	3.4	2017-10-19 06:34:55.1 UTC	T0 + 3 hours 53 mins	20171019_0000023	CENTRAL ITALY	13.23	42.85	9 Km
6	6	4.7	2017-10-18 17:35:39.7 UTC	T0 + 11 hours 47 mins	20171018_0000089	NORTHWESTERN IRAN	47.23	37.93	20 Km



Real-time exchange of felt reports

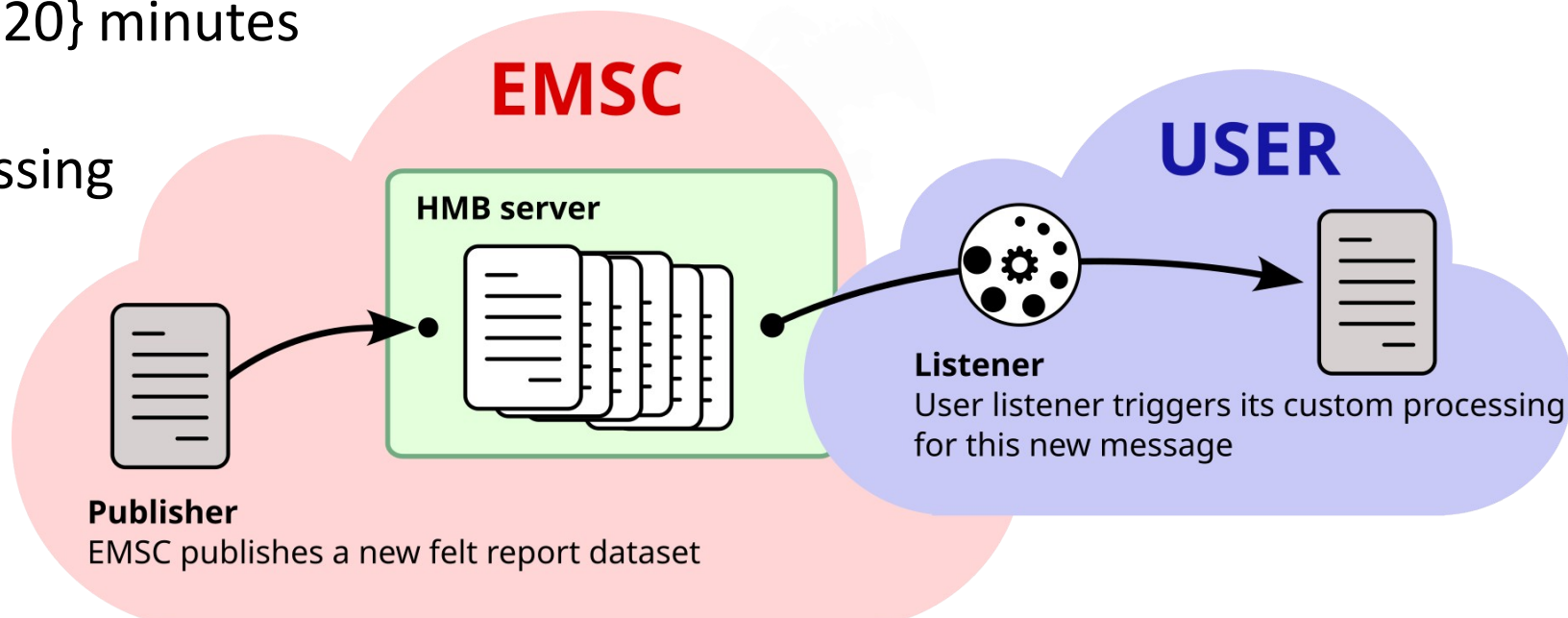
▪ Data exchange via HMB

- HMB is a messaging protocol developed by GFZ
- Possibility to exchange any kind of data (binary, text, ...)
- Already in use Internally to received seismic data from some contributors

▪ Depending of the usage, users publish or listen to messages

- For felt reports, EMSC publishes new felt report datasets for $T_0 + \{10, 20, 30, 60, 120\}$ minutes
- Users listen to new data and launch their processing

▪ Used with ETH to test early rupture model estimation constrained by felt reports



Conclusions

- Felt reports are an important part of the EMSC's strategy and we take care to ensure the quality of this dataset.
- Using web sites, Lastquake app and social media, we try to develop/improve the commitment of eyewitnesses to reports their feelings.
- **The access to these data is open** via the Seismic Portal web service, and will be improved within Geo-INQUIRE.
- Our aim is now to **develop real-time exchange with seismological institutes for early products** like early damage assessment or shakemaps.



Euro-**M**editerranean
Seismological **C**entre



Centre **S**ismologique
Euro-**M**éditerranéen

Find us on:



Thanks !

