

Aardbevingen in België: een vergeten risico ?

Koen Van Noten
Koninklijke Sterrenwacht van België

*Postgraduaat rampenmanagement, module nationaal
crisisbeheer - 01.04.2023*

*Copyright: Please use following reference when using slides
Van Noten, Koen. 2025. Aardbevingen in België: een vergeten risico? Postgraduaat rampenmanagement,
module nationaal crisisbeheer. Koninklijke Sterrenwacht van België*

koen.vannoten@seismology.be
<https://www.linkedin.com/koenvannoten>
<https://sites.google.com/site/koenvannoten/>

Seismo.info@oma.be
<https://www.astro.oma.be/nl/>
<https://seismologie.be/nl>



Programma

- Aardbeving ? & Myanmar 2025
- Monitoren van aardbevingen
- Evolutie seismisch netwerk
- Wat meten we allemaal ?
- Grote aardbevingen in België & impact
- Automatisering van het meten van impact
- Het nationale regionale rampenfonds
Vlaanderen/Brussel/Wallonië

RISICO'S IN BELGIË



NATUURLIJKE RISICO'S

Voorbeelden van natuurlijke risico's zijn: een storm, overstroming, bosbrand of een hittegolf.

[Lees meer →](#)



TECHNOLOGISCHE RISICO'S

Voorbeelden van technologische risico's zijn: een nucleair ongeval of een stroompanne.

[Lees meer →](#)



GEZONDHEIDSRISICO'S

Voorbeelden van gezondheidsrisico's zijn: een epidemie, ozonpiek, wintersmog of ziekten onder dieren.

[Lees meer →](#)



VEILIGHEIDSRISICO'S

Voorbeelden van veiligheidsrisico's zijn: een terroristische aanslag of een cyberaanval.

[Lees meer →](#)



HEVIG ONWEER EN STORM

Een hevige onweer of een storm kan verwoestend zijn en veel schade aanrichten.

[Lees meer →](#)



OVERSTROMING

Verskillende factoren zorgen ervoor dat rivieren buiten hun oevers treden.

[Lees meer →](#)



KOUDEGOLF

Een koudegolf is een periode waarin de temperaturen onder het vriespunt blijven.

[Lees meer →](#)



HITTEGOLF

De impact van een hittegolf is afhankelijk van de duur en de temperatuur.

[Lees meer →](#)



DROOGTE

Droogte is een periode waarbij er veel minder regen valt dan gewoonlijk.

[Lees meer →](#)



TEKORT AAN WATER

Een tekort aan drinkwater kan diverse oorzaken hebben.

[Lees meer →](#)



AARDBEVING

In ons land zijn aardbevingen eerder zeldzaam, maar af en toe veroorzaken ze schade.

[Lees meer →](#)



NATUURBRAND

Elk jaar zijn er brandgevaarlijke periodes in bos- en natuurgebieden.

[Lees meer →](#)



INVASIEVE EXOTEN

Invasieve exoten zijn soorten die van nature niet in onze streken voorkomen.

[Lees meer →](#)



RISICO'S UIT DE RUIMTE

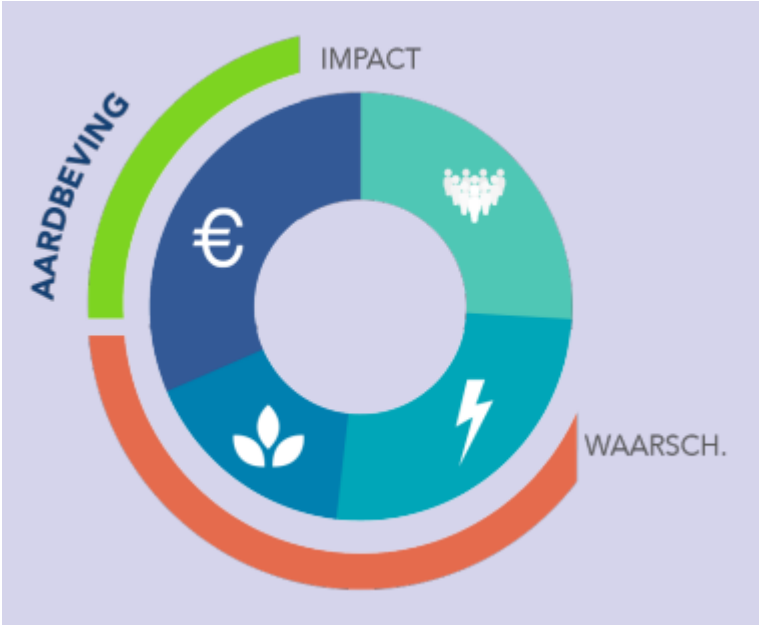
Sommige risico's uit de ruimte hebben we niet onder controle.

[Lees meer →](#)



Crisiscentrum
Centre de Crise

Natural Risks





Intro

Aardbeving

Artikel [Overleg](#)

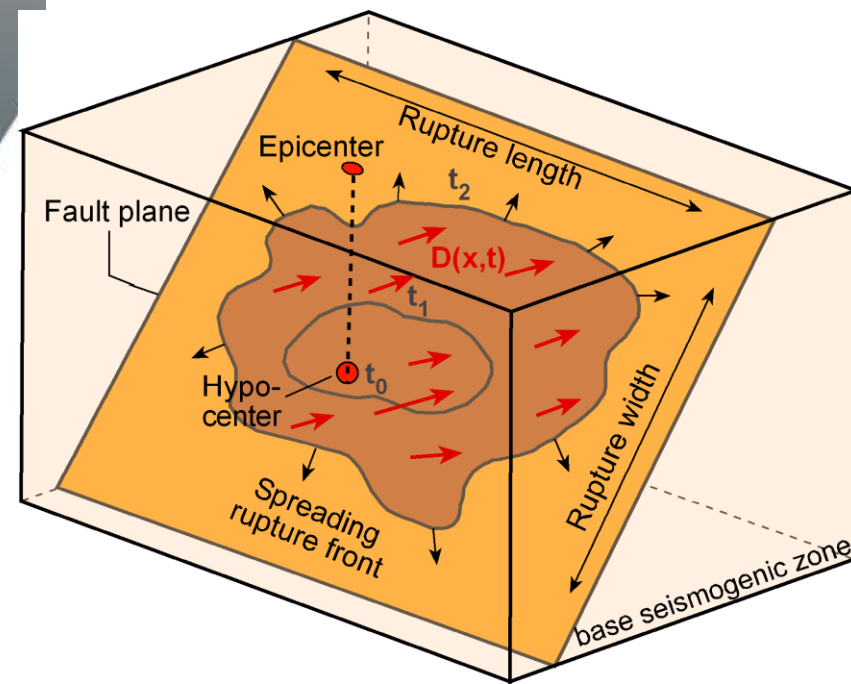
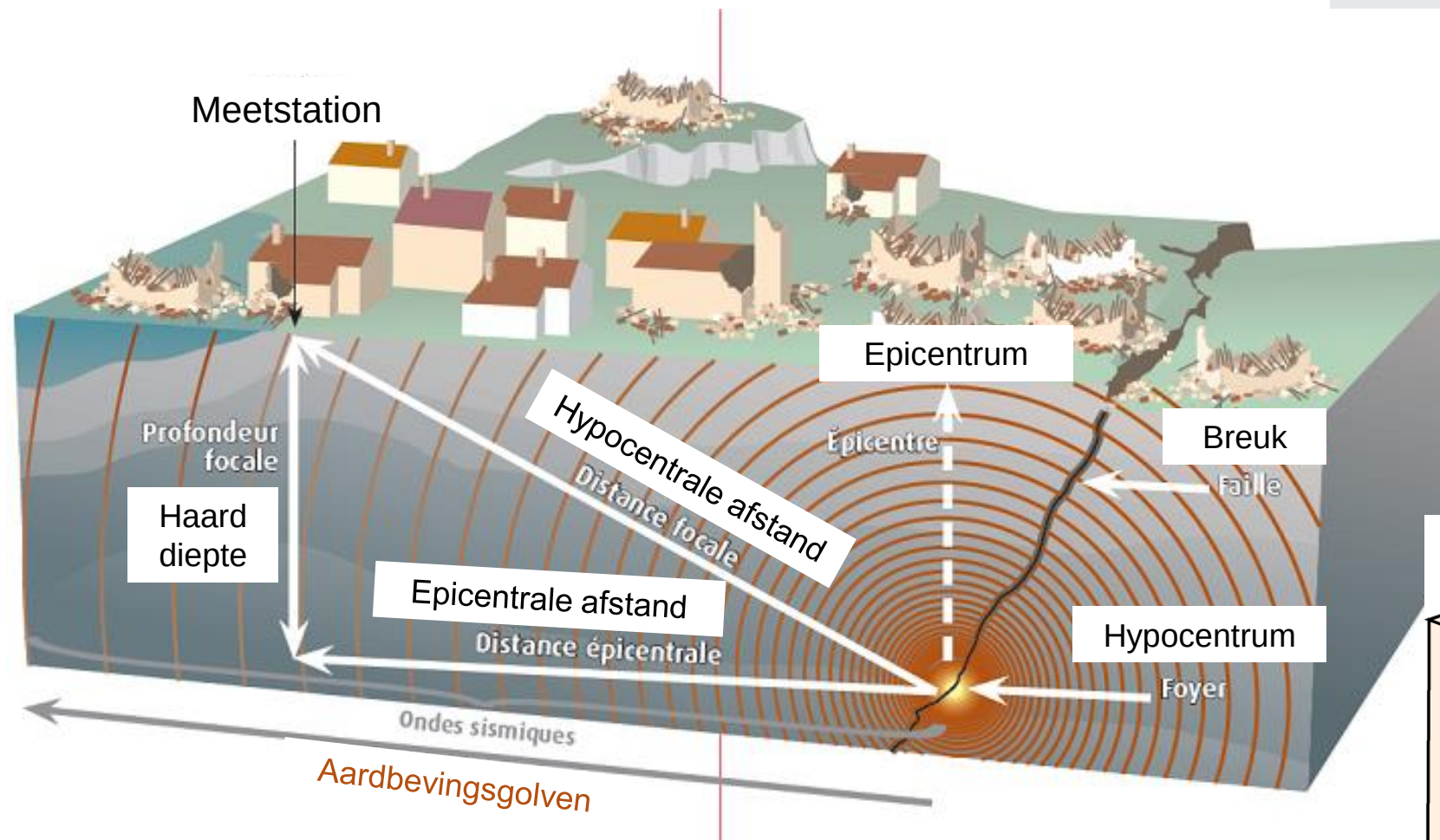
[Lezen](#) [Bewerken](#) [Brontekst bewerken](#)

Uit Wikipedia, de vrije encyclopedie

Een **aardbeving** is een trilling of schokkende beweging van de [aardkorst](#).

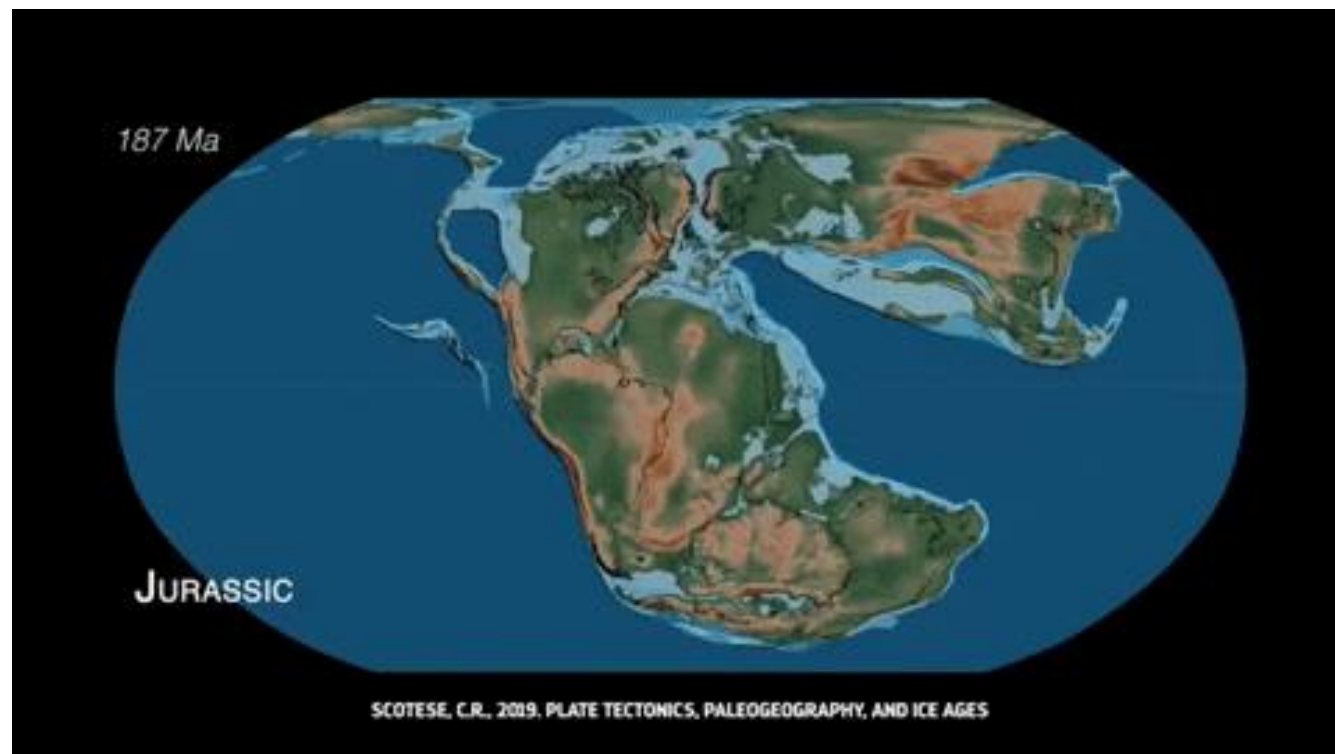
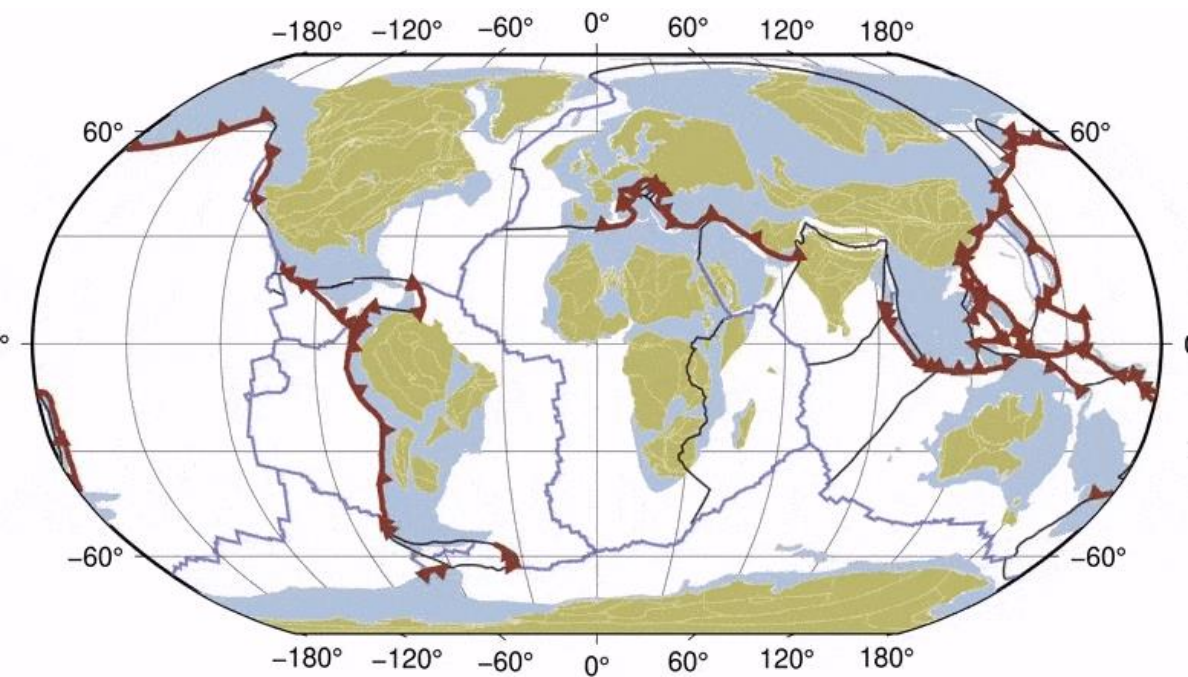
Aardbevingen vinden plaats als er in de aardkorst plotseling veel [energie](#) vrijkomt. De energie plant zich dan in een [golfbeweging](#) vanuit het centrum naar de omgeving voort. Het denkbeeldige punt waar de beving

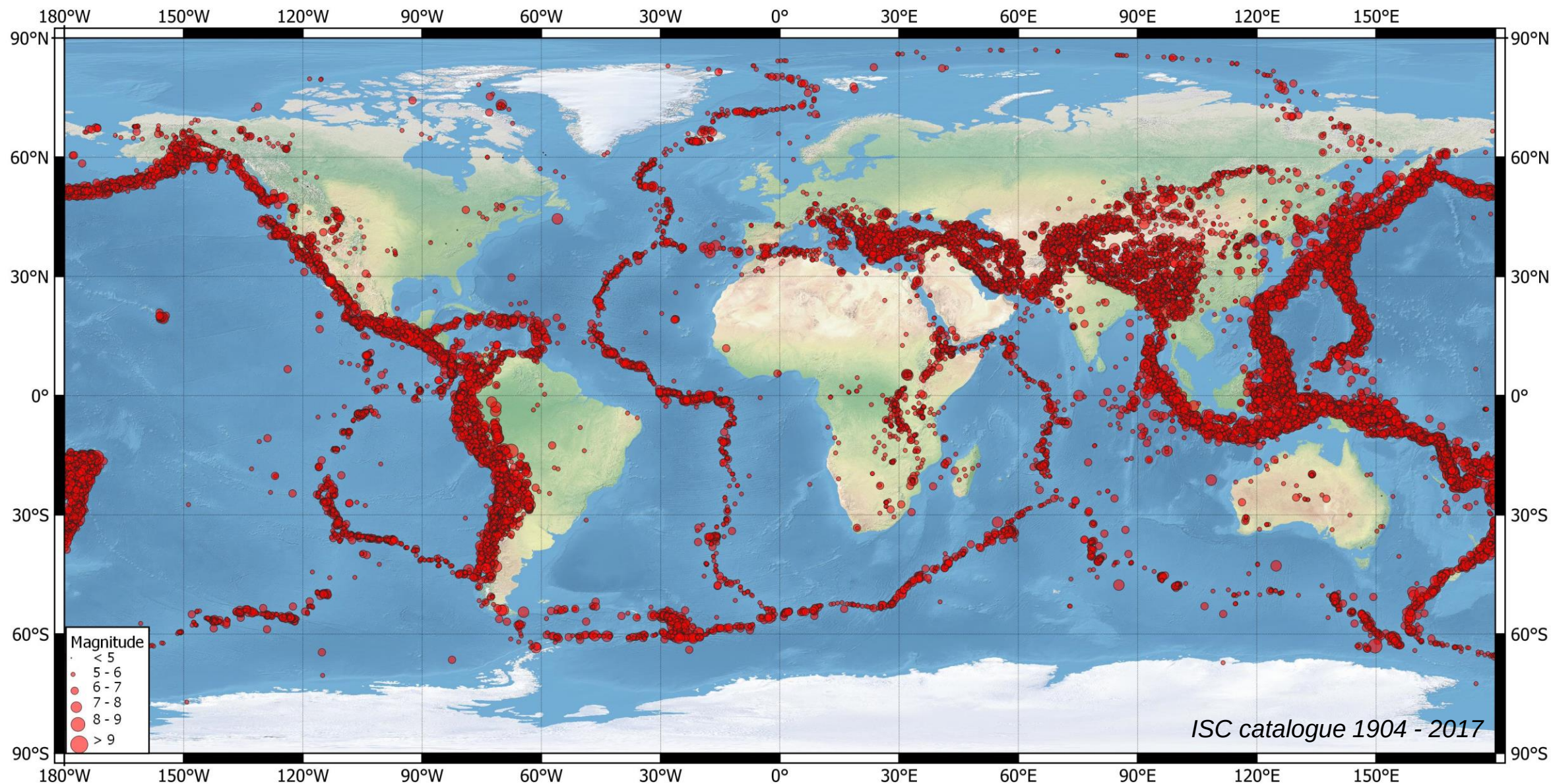
Terminologie - NL



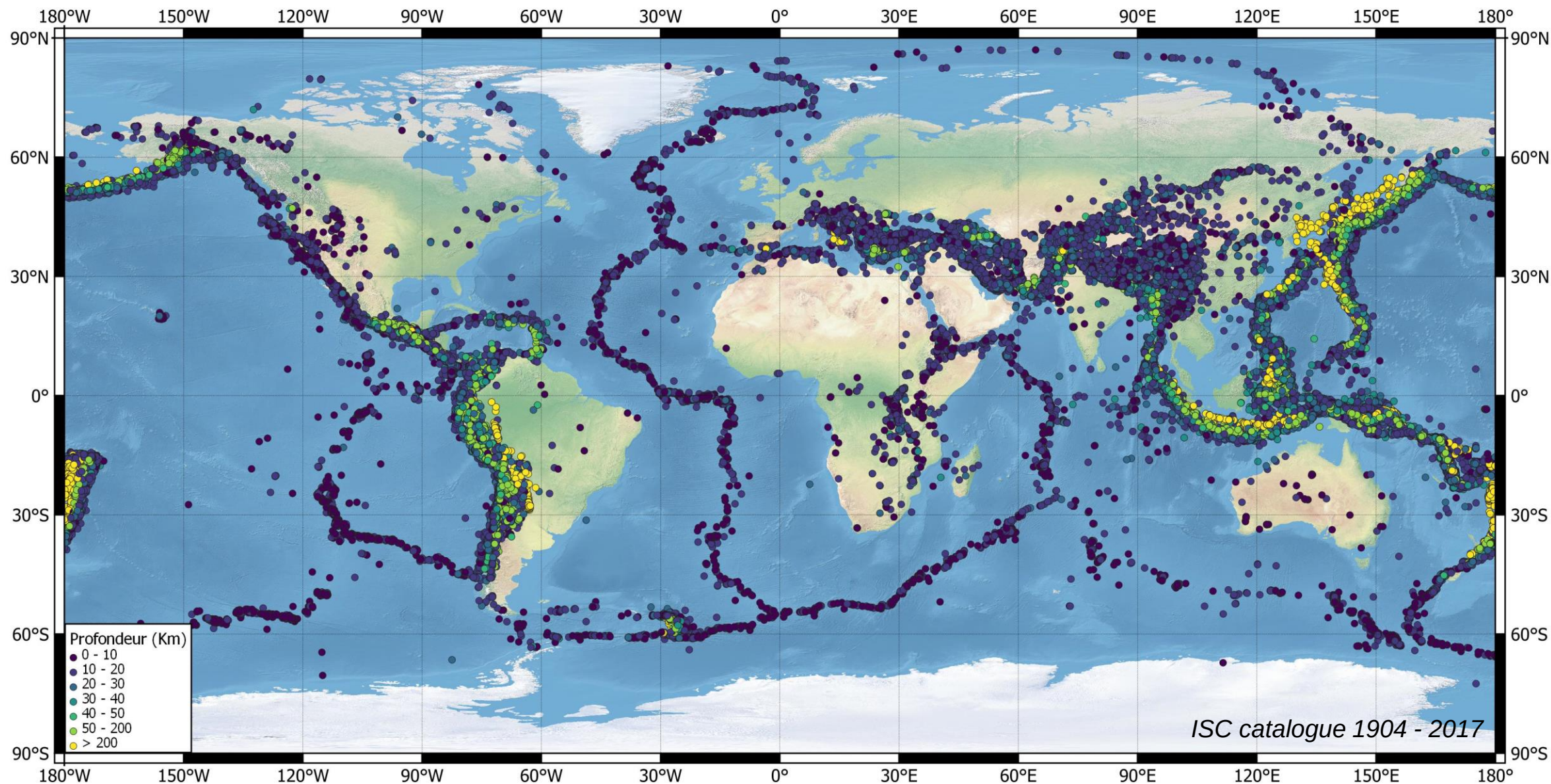
<https://www.georisques.gouv.fr/articles-risques/seismes/effets-et-consequences-dun-seisme>

Oorzaak? Platentektoniek





Most frequent earthquakes



Most frequent earthquakes



Surface rupture Turkey 2023



Measuring earthquakes

Seismographs

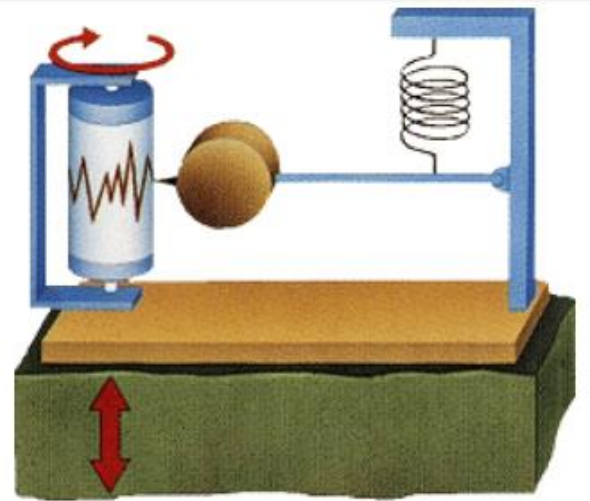


Seismometers in het ondergronds laboratorium in Ukkel (1909)
Links: twee horizontale Bosch-Omori-seismometers,
Rechts: de horizontale Wiechert-seismometer (1000 kg)

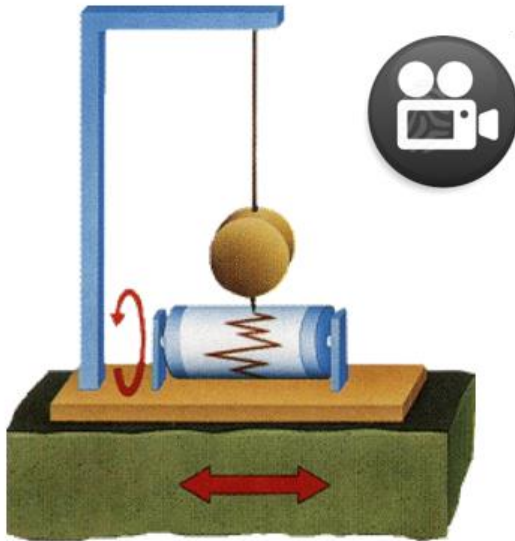


Moderne breedband-
seismometer (3 componenten)

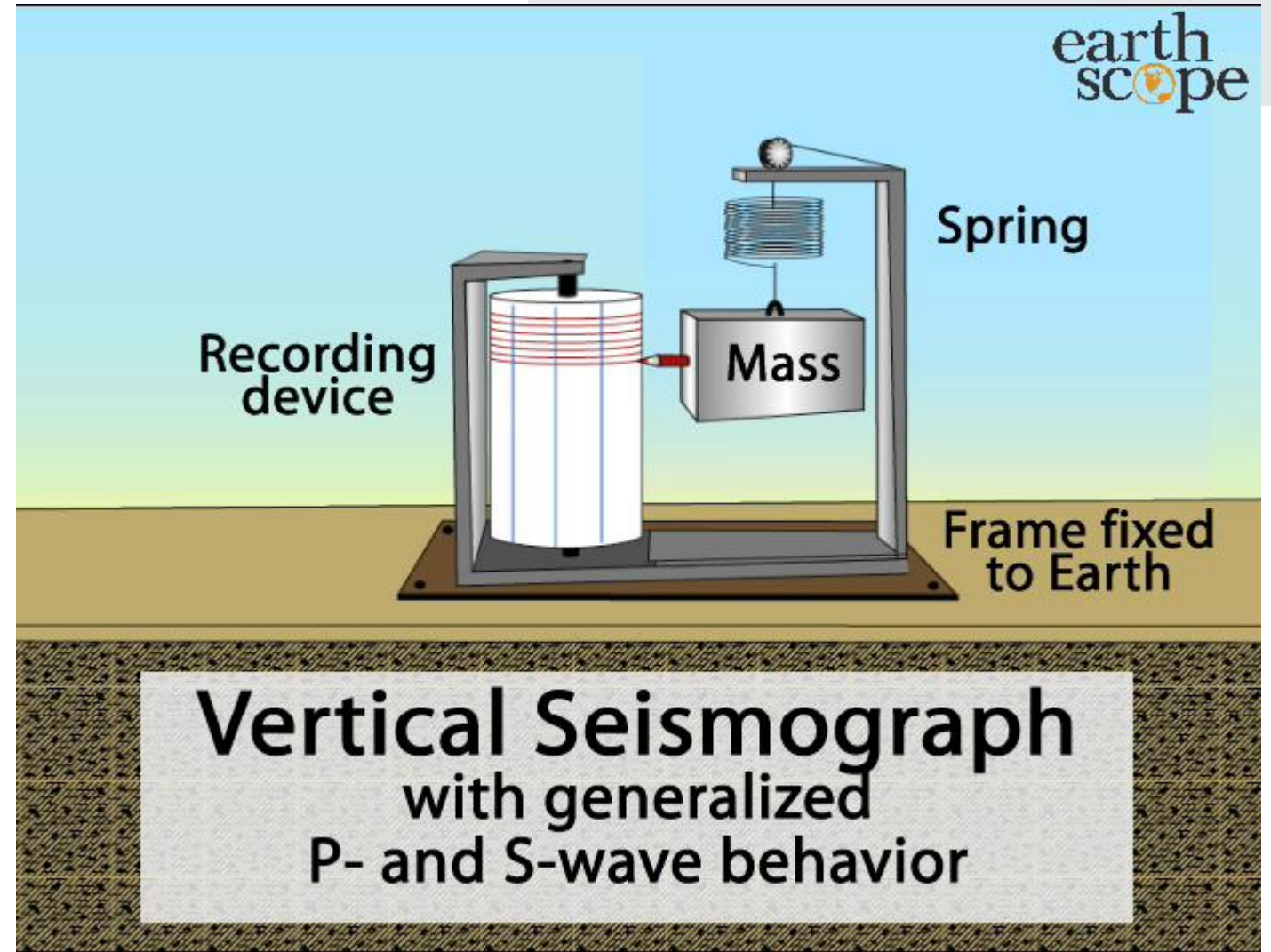
Seismographs



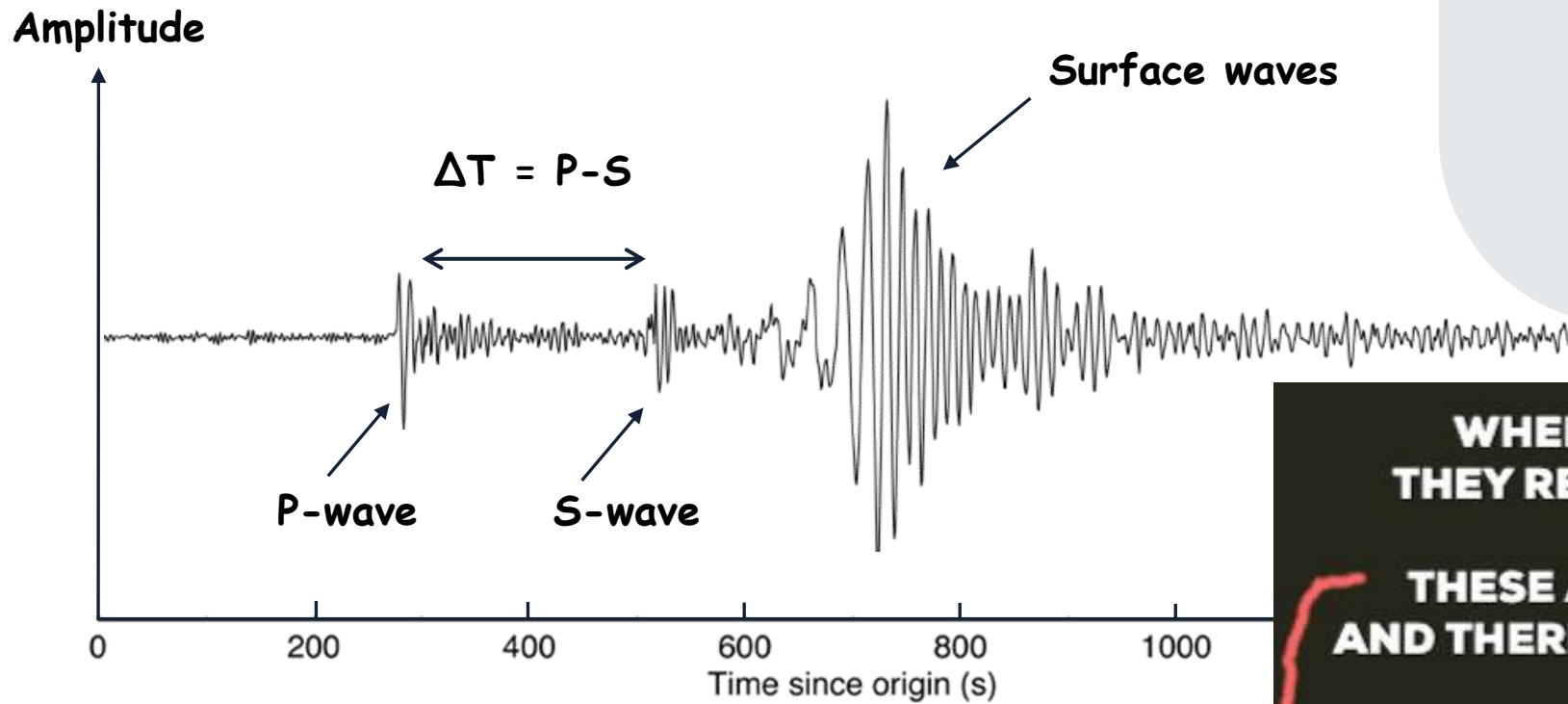
1 Vertical seismograph



2 Horizontal seismographs



Seismograms



P-waves (6 km/s) travel faster than S-waves (3.5 km/s)
Distance to an event can be calculated by $P - S$
(compare it to thunder and lightning)

**WHEN EARTHQUAKES OCCUR
THEY RELEASE ENERGY AS WAVES.**

THESE ARE CALLED **SEISMIC WAVES
AND THERE ARE SEVERAL DIFFERENCES
BETWEEN THEM**

IRIS

Location

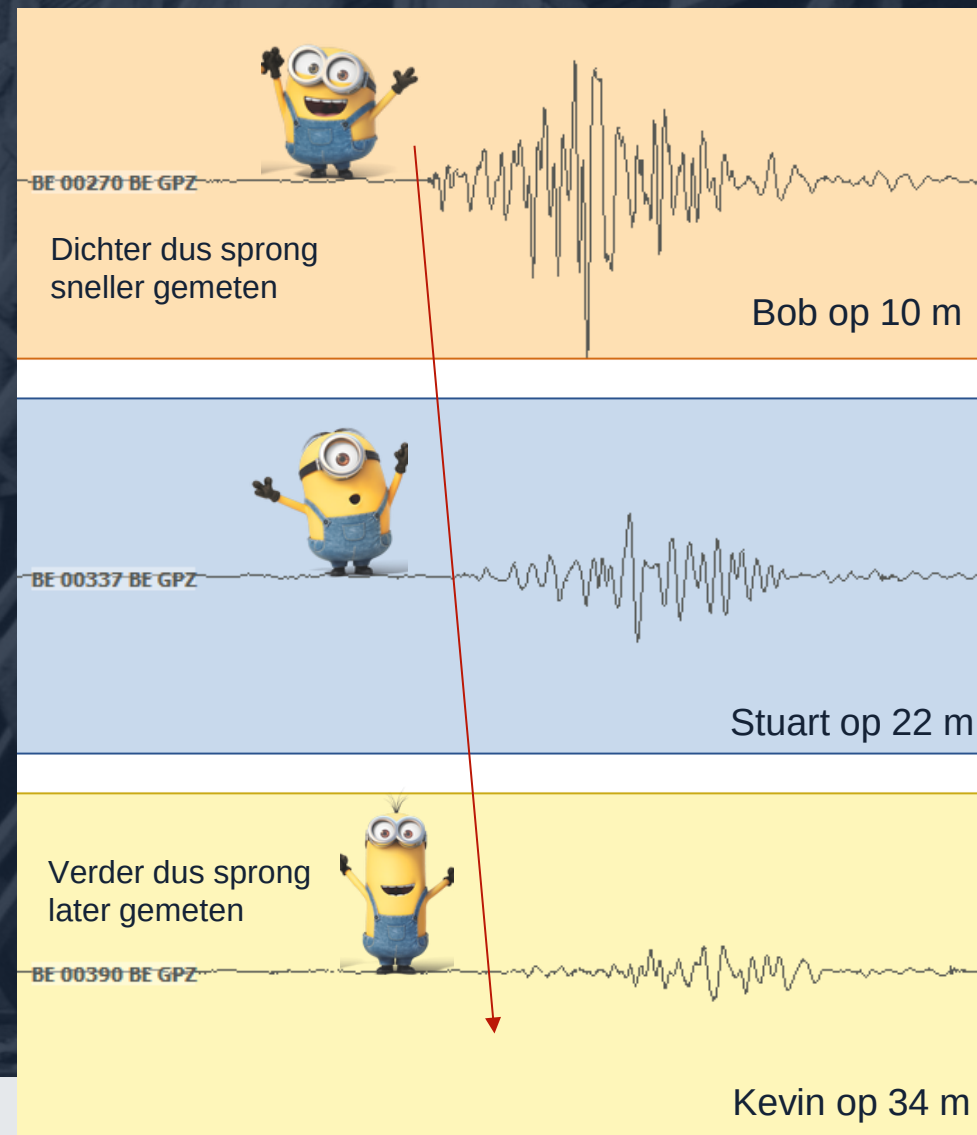


Aardbevingsbewustzijn op school

Location



Aardbevingsbewustzijn op school





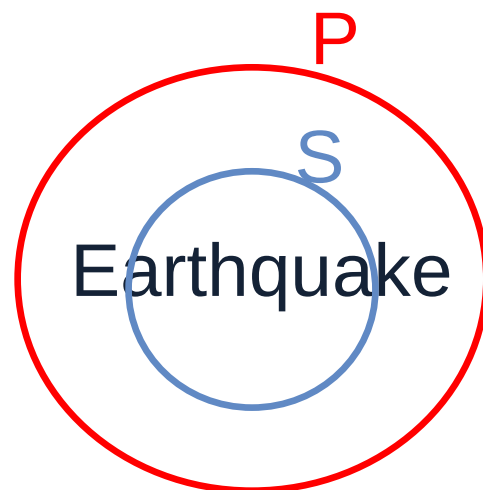
Earthquake





P
S
Earthquake







10 km

P



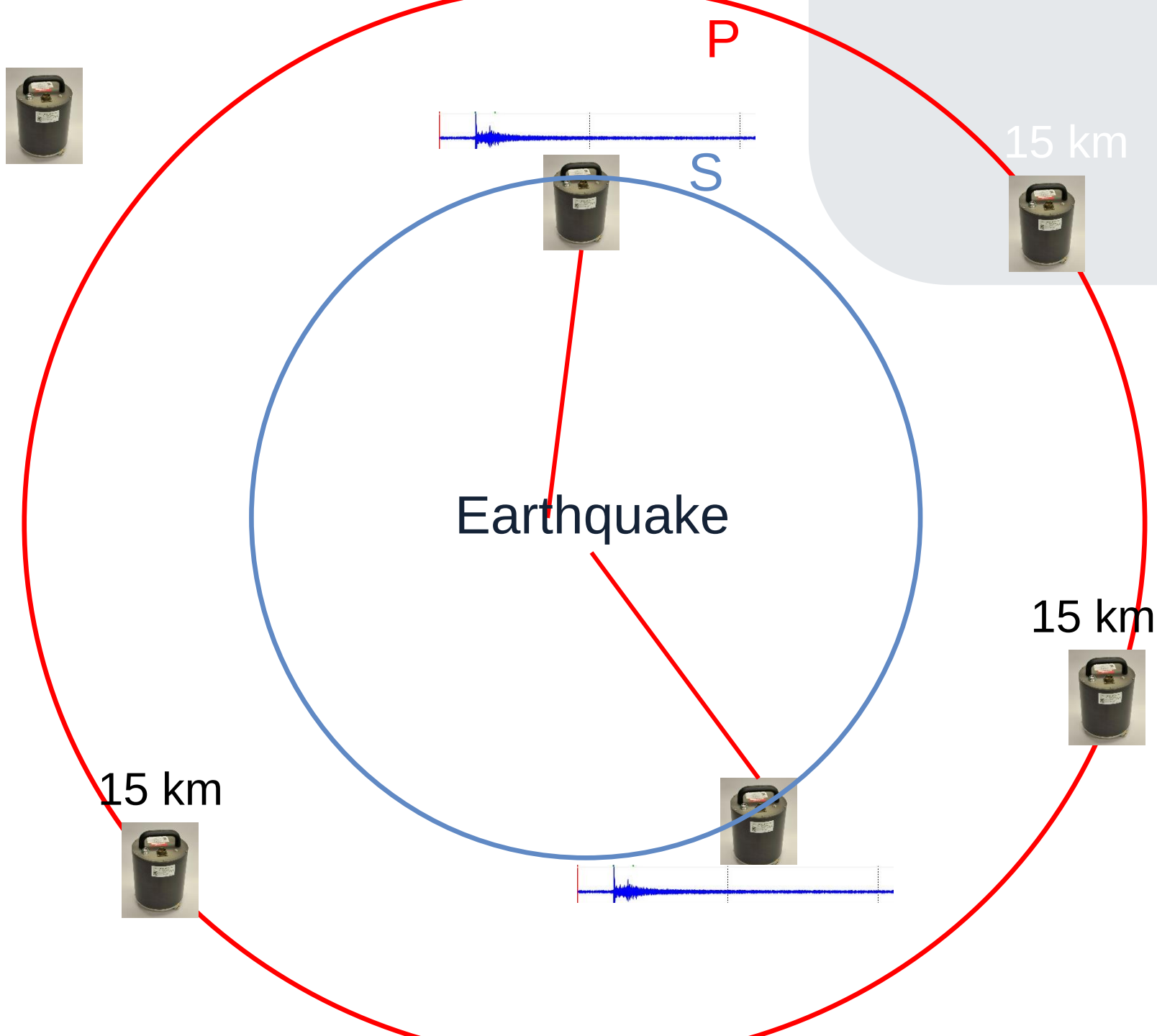
S

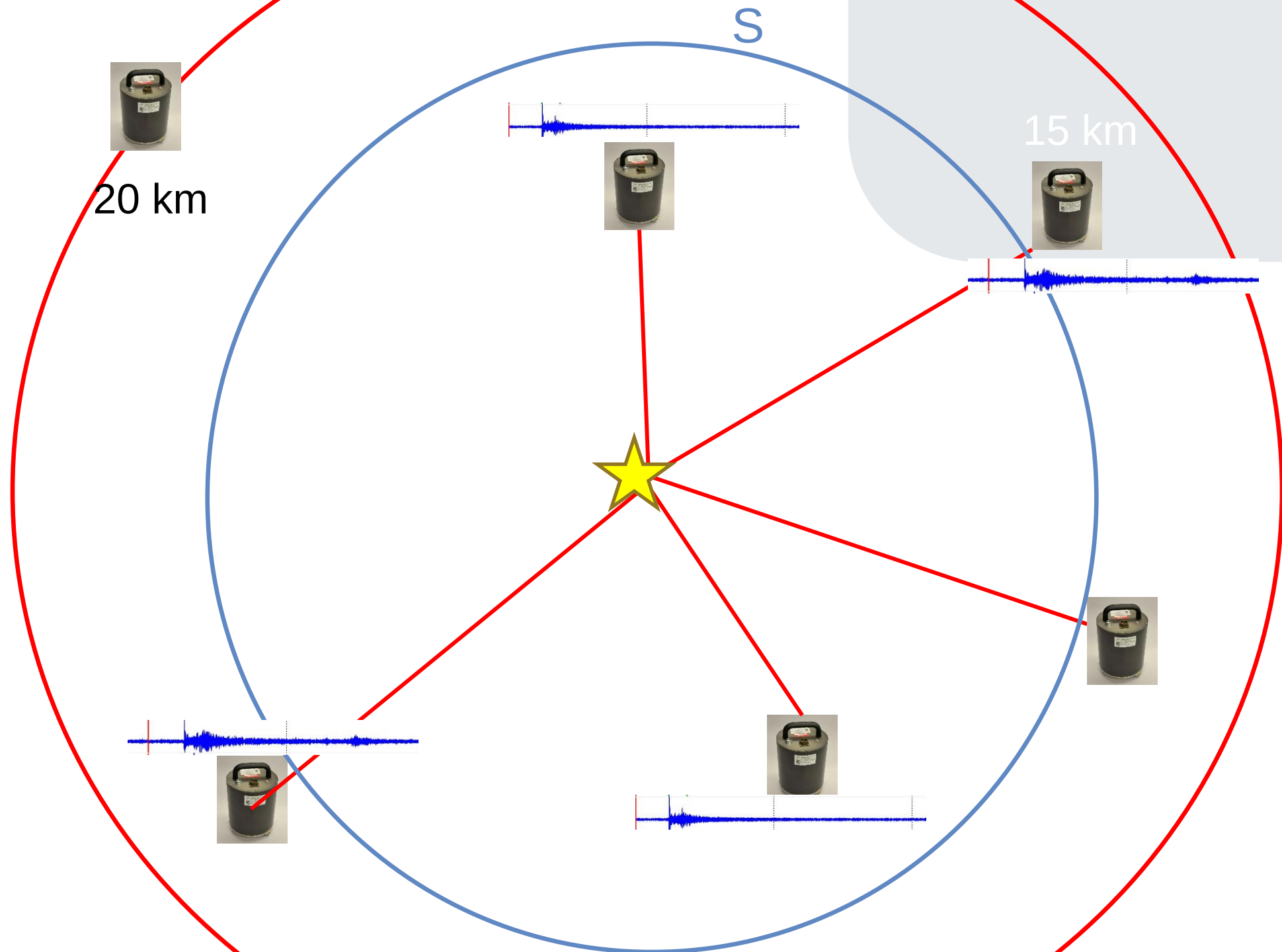
Earthquake

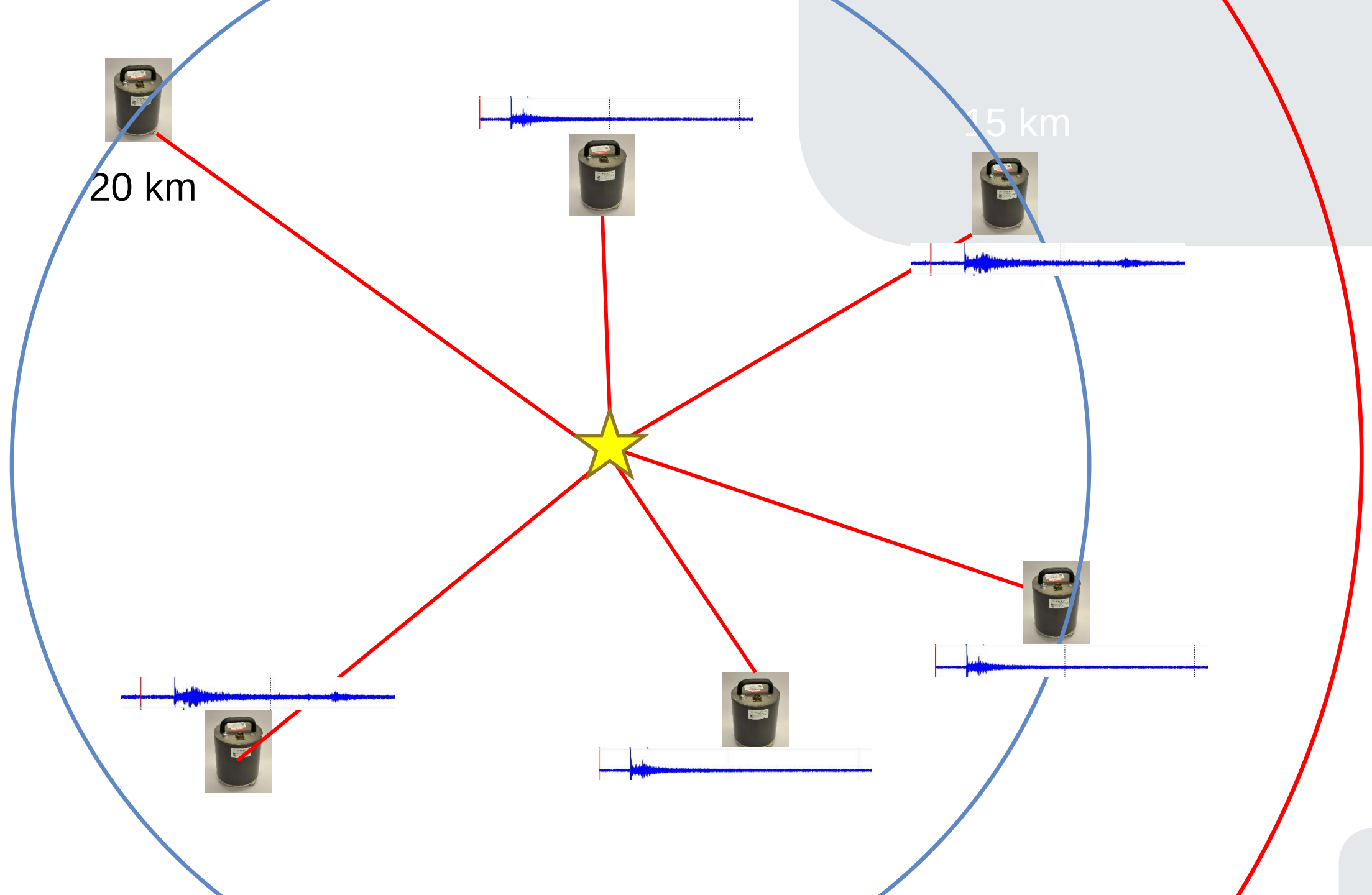


10 km

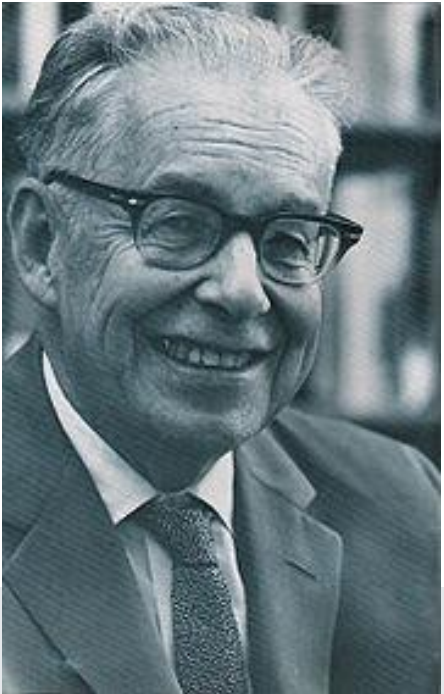






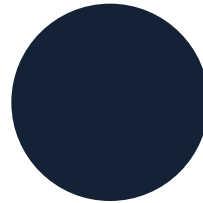


C. Richter



M 4

M 3



M 2



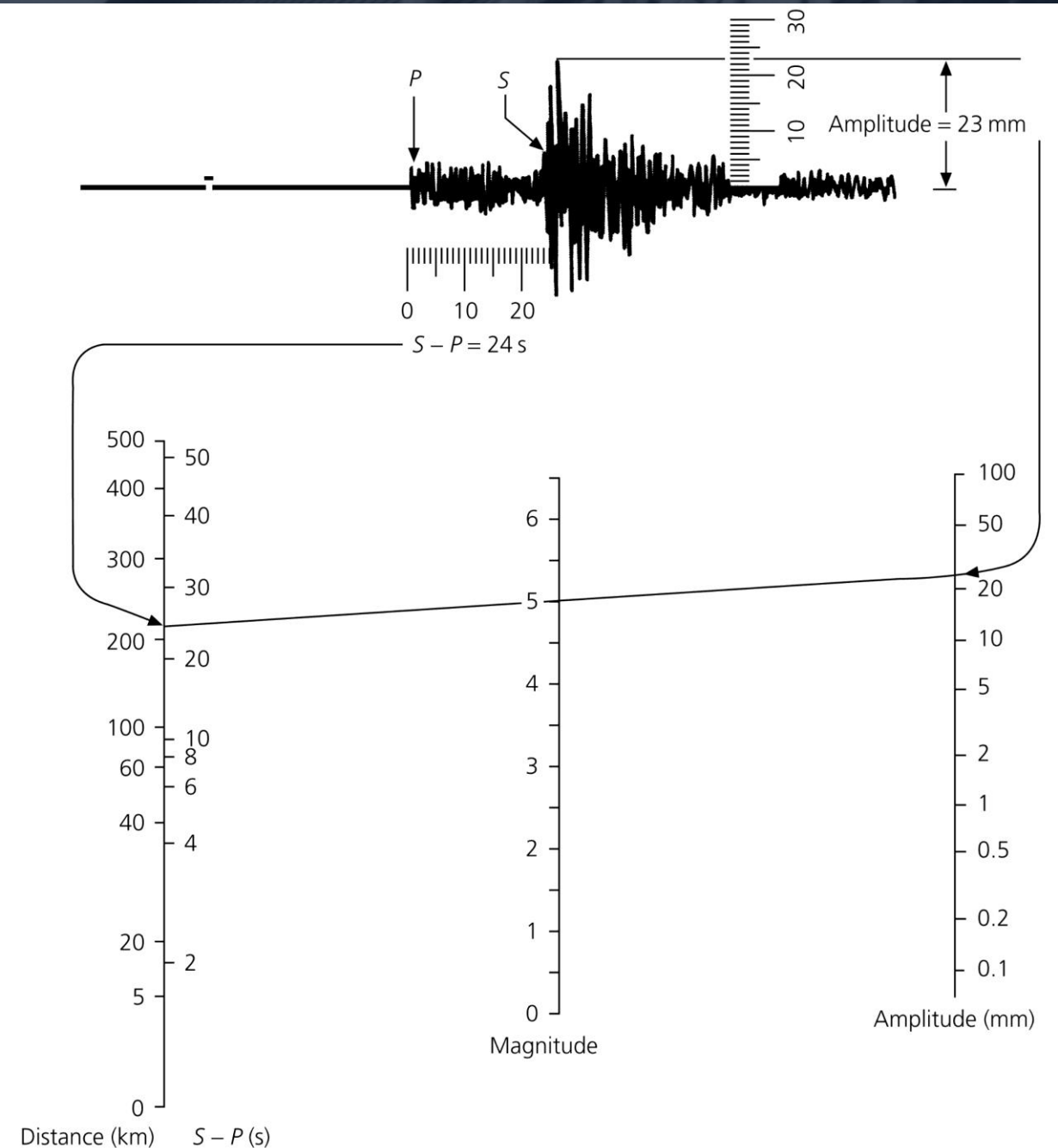
M 1



Size of an
earthquake
=
M A G N I T U D E
Logarithmic

Magnitude

- Local magnitude (M_L):
 - Based on displacement amplitude and distance
 - Richter scale
(but defined in California)
- Different magnitude scales:
 - Local magnitude (M_L): routinely determined by local networks
 - Moment magnitude (M_w): more universal, important to model ground motion and seismic hazard





Intensiteit
bepaald
door online
Did You Feel It?
DYFI?

Intensiteit bepaald
door terreinbezoek



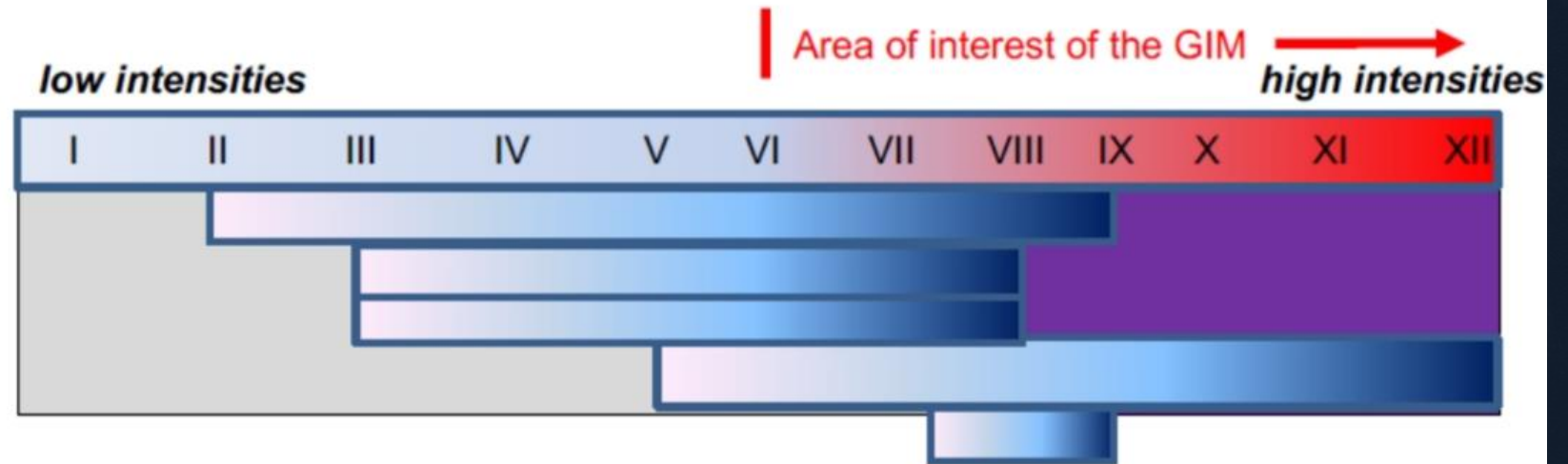
EMS-98 Intensity	Felt	Impact	Magnitude (Approximated Value)	Building Damage (Masonry)
I	Not felt	Not felt	2	
II-III	Weak	Felt indoors by a few people. People at rest feel a swaying or light trembling.	3	
IV	Light	Felt indoors by many people, outdoors by very few. A few people are awakened. Windows, doors and dishes rattle.	4	
V	Moderat	Felt indoors by most, outdoors by few. Many sleeping people awake. A few are frightened. Buildings tremble throughout. Hanging objects swing considerably. Small objects are shifted. Doors and windows swing open or shut.	5	
VI	Strong	Many people are frightened and run outdoors. Some objects fall. Many houses suffer slight non-structural damage like hair-line cracks and fall of small pieces of plaster.	6	
VII	Very strong	Most people are frightened and run outdoors. Furniture is shifted and objects fall from shelves in large numbers. Many well built ordinary buildings suffer moderate damage: small cracks in walls, fall of plaster, parts of chimneys fall down; older buildings may show large cracks in walls and failure of fill-in walls.	7	
VIII	Severe	Many people find it difficult to stand. Many houses have large cracks in walls. A few well built ordinary buildings show serious failure of walls, while weak older structures may collapse.	8	
IX	Violent	General panic. Many weak constructions collapse. Even well built ordinary buildings show very heavy damage: serious failure of walls and partial structural failure.	9	
X+	Extreme	Most ordinary well built buildings collapse, even some with good earthquake resistant design are destroyed.	10	

Impact ! EMS98 Intensiteit

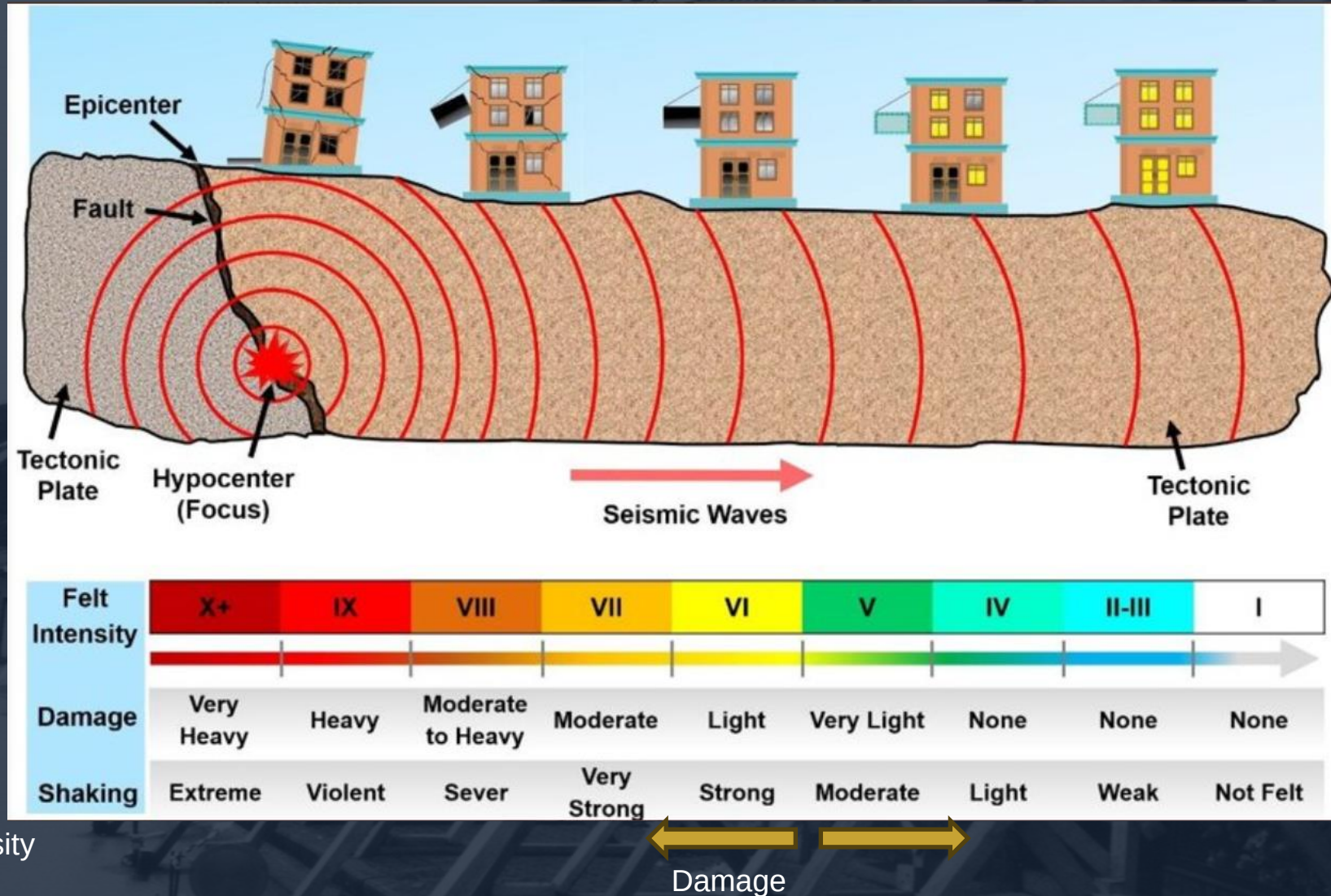
Intensity scale – Surface impact

Macro-seismic indicators taken into account (EMS98)

people
Objects
Furniture
Buildings
seismogeology



Intensity scale – Surface *impact*



Comparable example:
light bulb intensity
vs wattage

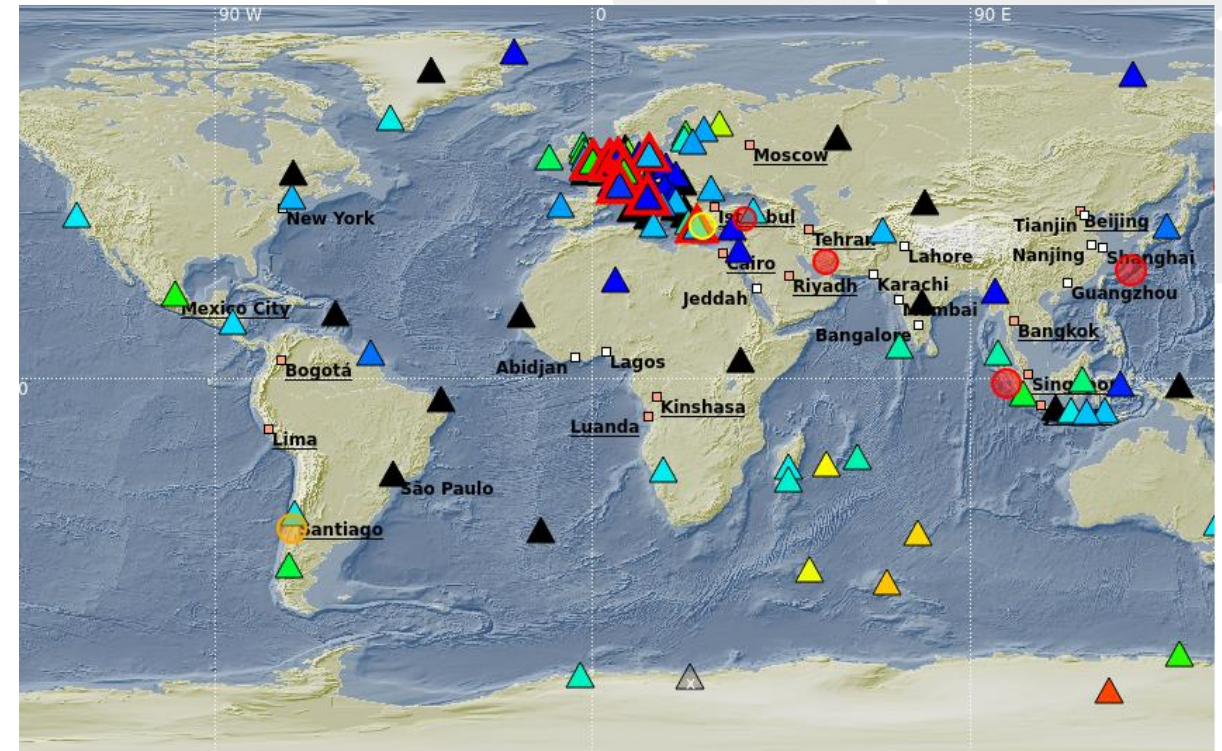
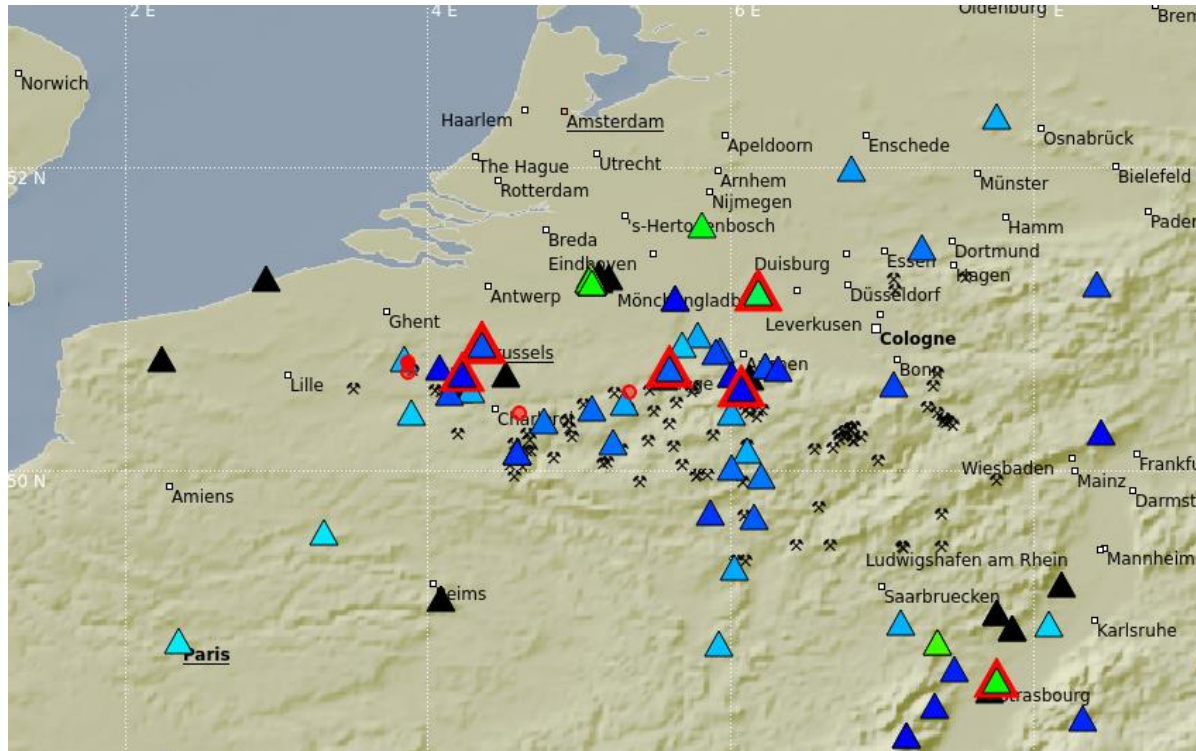


40
YEAR
COMMEMORATION
LIÈGE 83

Modern (Impact) Tools

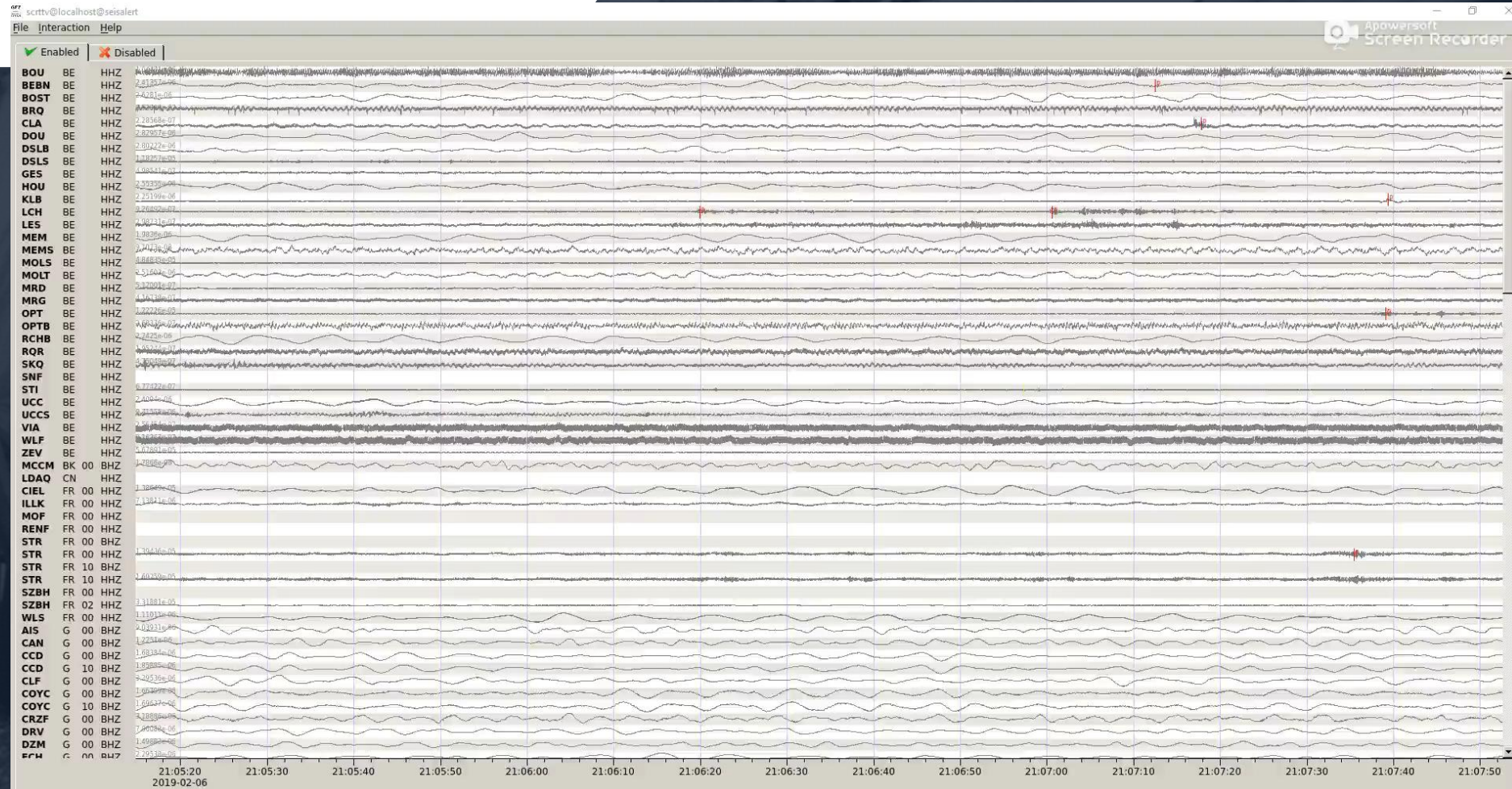
40 years of developments at the ROB

Local & Global Networks



Real time data

Automatic processing



Light earthquake in Koblenz (DE)



BEERS log

GERMANY (10 KM KOBLENZ) - MLv 2.70

Origin Time: 2019-02-12 04:21:27.62 +/- 0.22 s

Latitude: 50.300 ° +/- 1.47 km

Longitude: 7.478 ° +/- 1.18 km

Depth: 2.8 km +/- 1.67 km

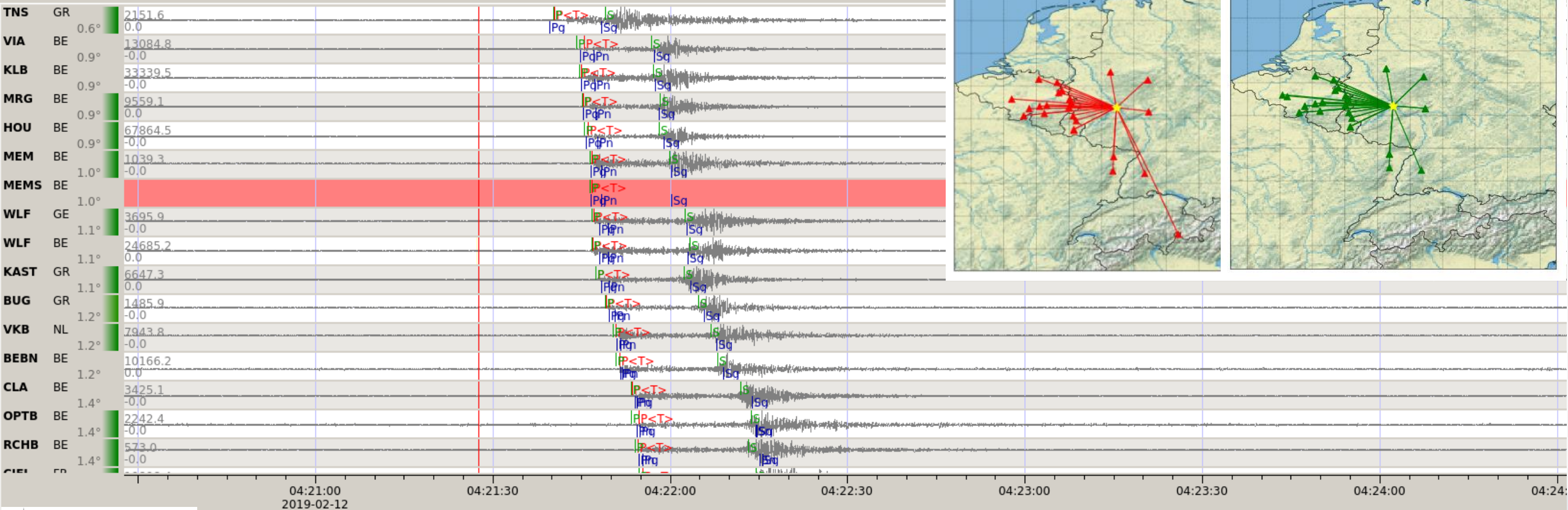
Event Type: earthquake

Location Type: manual solution

First Location: 2019-02-12 04:22:21.696

This Location: 2019-02-12 06:01:46.498

eventID: be2019czbt

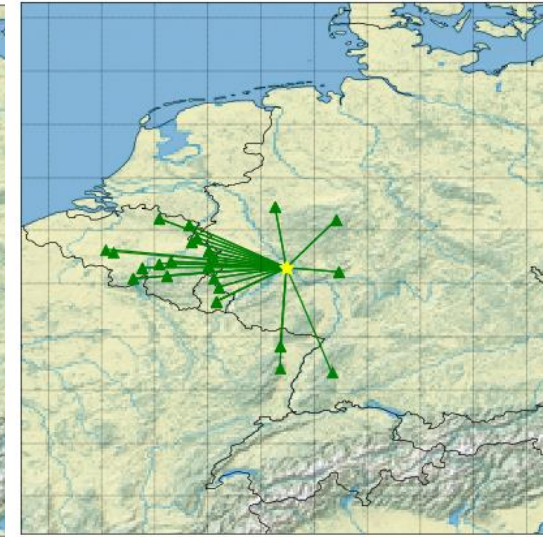


MLv 2.70

2019-02-12 04:21:28.858



2019-02-12 04:21:27.616



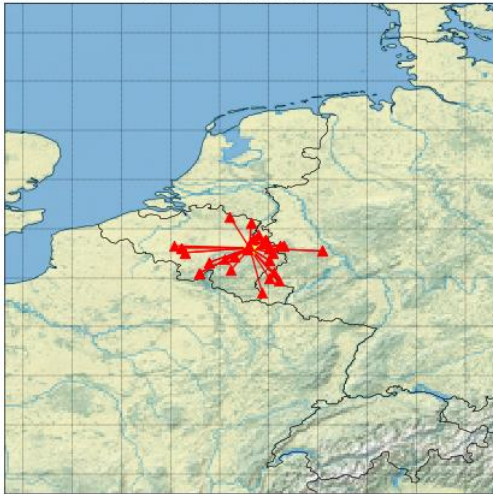
LIEGE (BE) - MLv 1.36

Origin Time: 2023-10-26 21:51:16.03 +/- 0.17 s
Latitude: 50.602 ° +/- 1.29 km
Longitude: 5.613 ° +/- 1.00 km
Depth: 14.1 km +/- 2.31 km
Event Type: unknown
Location Type: automatic solution
First Location: 2023-10-26 21:51:30.467
This Location: 2023-10-26 21:51:50.797
eventID: be2023vade

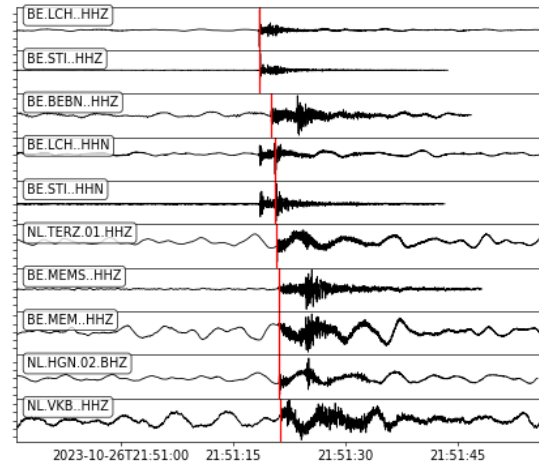
MLv 1.36 - LIEGE (BE)
2023-10-26 21:51:16.033



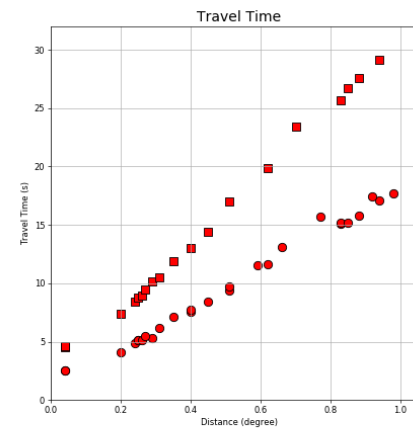
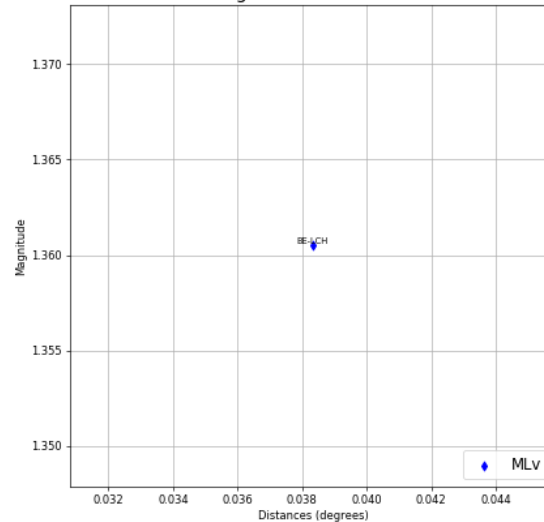
MLv 1.36 - LIEGE (BE)
2023-10-26 21:51:16.033



Seismograms and Magnitudes



Magnitude vs Distance



Cities at distances ≤ 200 km

City	Distance	Population
Liege	3.9 km	749110
Maastricht	28.3 km	122378
Hasselt	41.3 km	69222
Namur	54.7 km	106284
Charleroi	84.9 km	345367
Diekirch	89.2 km	6242
Eindhoven	92.4 km	398053
Brussels	93.9 km	1743000
Cologne	101.1 km	1004000
Arlon	103.2 km	26179
Bonn	104.6 km	680543
Dusseldorf	107.1 km	1220000
Antwerpen	108.7 km	920000
Grevenmacher	112.8 km	3958
Luxembourg	116.2 km	107260
Mons	120.0 km	91277
Duisburg	121.9 km	1276757
s-Hertogenbosch	122.1 km	134520

Automatic Alert: First alert

First location:
T0 + 14 seconds !

This location:
T0 + 34 seconds !

LIEGE (BE) - MLv 1.65

Origin Time: 2023-10-26 21:51:16.04 +/- 0.17 s

Latitude: 50.602 ° +/- 1.28 km

Longitude: 5.613 ° +/- 0.98 km

Depth: 14.1 km +/- 2.30 km

Event Type: unknown

Location Type: automatic solution

First Location: 2023-10-26 21:51:30.467

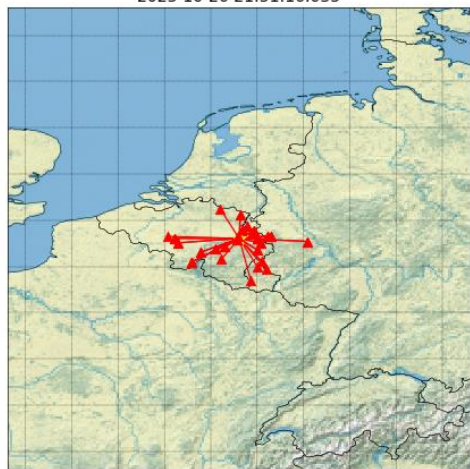
This Location: 2023-10-26 21:52:01.109

eventID: be2023vade

MLv 1.65 - LIEGE (BE)
2023-10-26 21:51:16.035



MLv 1.65 - LIEGE (BE)
2023-10-26 21:51:16.035



SMS

LIEGE (BE)
MLv 1.65
2023-10-26
21:51:16
automatic solution
Type: unknown
be2023vade

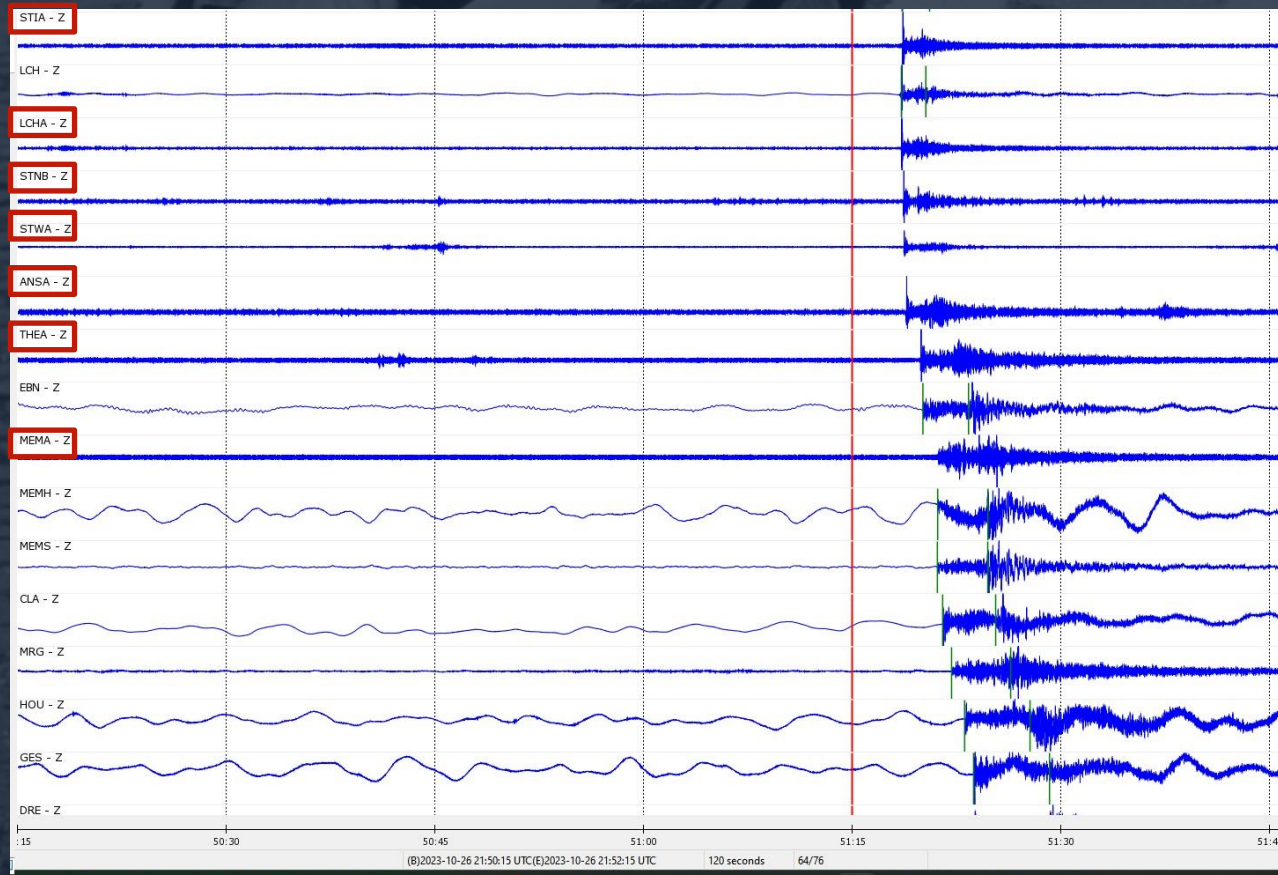
Automatic Alert: Updated alert

First location:
T0 + 14 seconds !

This location:
T0 + 45 seconds !



Automatic Alert: Updated alert



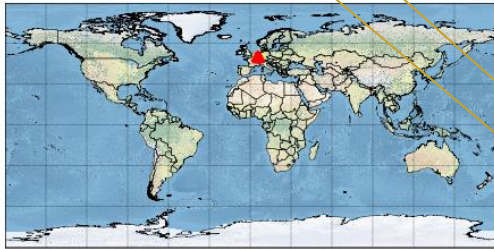
In-house software used
for scientific picking

Automatic Alerts & Manual location

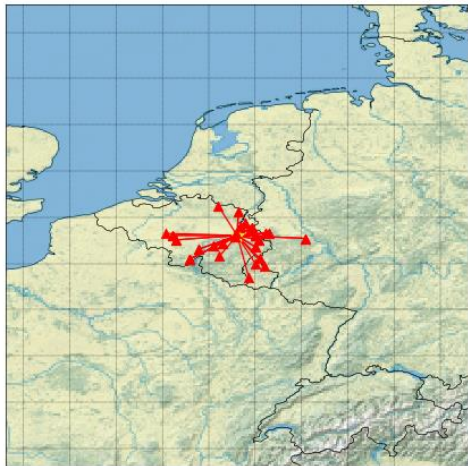
LIEGE (BE) - MLv 1.65

Origin Time: 2023-10-26 21:51:16.04 +/- 0.17 s
Latitude: 50.602° +/- 1.28 km
Longitude: 5.613° +/- 0.98 km
Depth: 14.1 km +/- 2.30 km
Event Type: unknown
Location Type: automatic solution
First Location: 2023-10-26 21:51:30.467
This Location: 2023-10-26 21:52:01.109
eventID: be2023vade

MLv 1.65 - LIEGE (BE)
2023-10-26 21:51:16.035



MLv 1.65 - LIEGE (BE)
2023-10-26 21:51:16.035



Earthquakes in Belgium

ANGLEUR (BE) - 2023-10-26 21:51:15 - MAGNITUDE 1.3

LAST UPDATE : 2023-10-27 00:54:38 BELGIAN TIME

Main parameters

Date and time	2023-10-26 21:51:15 UTC 2023-10-26 23:51:15 Belgian time
Type	Earthquake
Magnitude	M _L 1.3
Region	ANGLEUR (BE)
Epicentral coordinates	50.609° N, 5.608° E Uncertainty ± 0.4 km
Depth of hypocenter	16.5 ± 0.4 km

Data source : ROB (Royal Observatory of Belgium)

Location map



De seismo@oma.be

Pour Thomas Lecocq

Sujet New event recorded by the Belgian seismic network

New seismic event

Region: CHAUDFONTAINE (BE)
Time UTC: 2023-10-26 21:51:15
Local time: 2023-10-26 23:51:15
ML: 1.6 ± 0.3
Type: Earthquake
Lon: 5.609E, Lat: 50.599N
Depth: 15 km
ID: 20305
Operator: Koen

This event was verified by a seismologist.
The reported parameters are subject to change, however.
Please consult our website for the most up-to-date information:
<http://seismology.be/en/seismology/earthquakes-in-belgium/gmdwrjw2q>

OD Seismology & Gravimetry
Royal Observatory of Belgium

First location:
T0 + 14 seconds !

Manual Alert
T0 + 25 min

Revision
T0 + 60 min

*No 24/7 service !
Weekends/nights:
Availability
& Voluntary base*

Distance: 870 m

MYANMAR (8 KM MANDALAY) - M 7.36

Origin Time: 2025-03-28 06:20:58.05 +/- 0.45 s

Latitude: 22.017 ° +/- 6.91 km

Longitude: 96.150 ° +/- 7.21 km

Depth: 10.0 km +/- 0.00 km

Event Type: unknown

Location Type: automatic solution

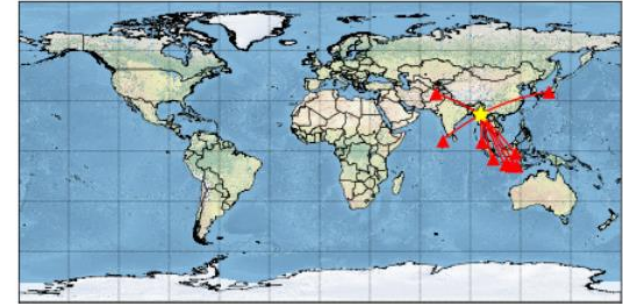
First Location: 2025-03-28 06:28:49.544

This Location: 2025-03-28 06:28:49.536

eventID: be2025gbpv

M 7.36 - MYANMAR (8 KM MANDALAY)

2025-03-28 06:20:58.055



Voorbeelden wereldwijd



een dag geleden

De Standaard
Na de aardbeving in Myanmar kondig...



2 dagen geleden

de Volkskrant
Dodental zware aardbeving Myanmar o...



14 uur geleden

De Morgen
Live - Aardbeving Myanmar. Myanmar...



GIF · 3 dagen geleden

HLN
Watervallen' storten van wolkenkr...



3 dagen geleden

de Volkskrant
Hevige aardbeving in Myanmar leidt ook tot...



2 dagen geleden

De Standaard
Aardbeving Myanmar - Mogelijk nog 9...



5 uur geleden

Stichting Vluchteling
Hulp na aardbeving in Myanmar is meteen gestart



2 dagen geleden

De Morgen
Live - Dodental aardbeving Myanmar ...



een dag geleden

HLN
Zeven rebellen gedood door militaire junta ...



een dag geleden

De Morgen
Live - Rebellen groep Myanmar legt w...



3 dagen geleden

VRT
Aardbeving Myanmar - Groot tekort aan ...



een dag geleden

De Standaard
Na de aardbeving in Myanmar kondig...



3 dagen geleden

Handicap International
Zware aardbeving in Myanmar: Handicap...



Grote schade en paniek door de aardbeving in Myanmar 2 dagen geleden

YouTube
Omgevallen tempels en ingestorte huizen...



2 dagen geleden

AD
Aardbeving in Myanmar kostte al ...



7 uur geleden

De Morgen
Live - Aardbeving Myanmar. 50 ...



3 dagen geleden

HLN
Zware aardbeving in Myanmar, ...



een dag geleden

VRT
Aardbeving Myanmar - 1.700 doden g...



2 dagen geleden

NOS
Junta meldt 1644 doden na a...



2 dagen geleden

Knack
Slachtofferbalans aardbeving Myanmar...



3 dagen geleden

Het Nieuwsblad
Een zware aardbeving zoals in M...



12 uur geleden

HBVL
Satellietbeelden tonen de verwoe...



een dag geleden

Trouw
Aardbeving Myanmar: 'Ik dacht echt d...



2 dagen geleden

Telegraaf
LIVE | 'Waarschuwing voor mogelijk nieuwe...



2 dagen geleden

NOS
Waarschuwing voor nieuwe aardbeving bij ...



13 uur geleden

NRC
Dodental aardbeving Myanmar stijgt bo...



15 uur geleden

Rode Kruis
Rode Kruis: Hitte Myanmar brengt getroffen...



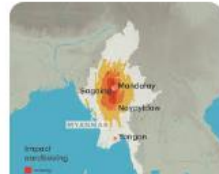
3 dagen geleden

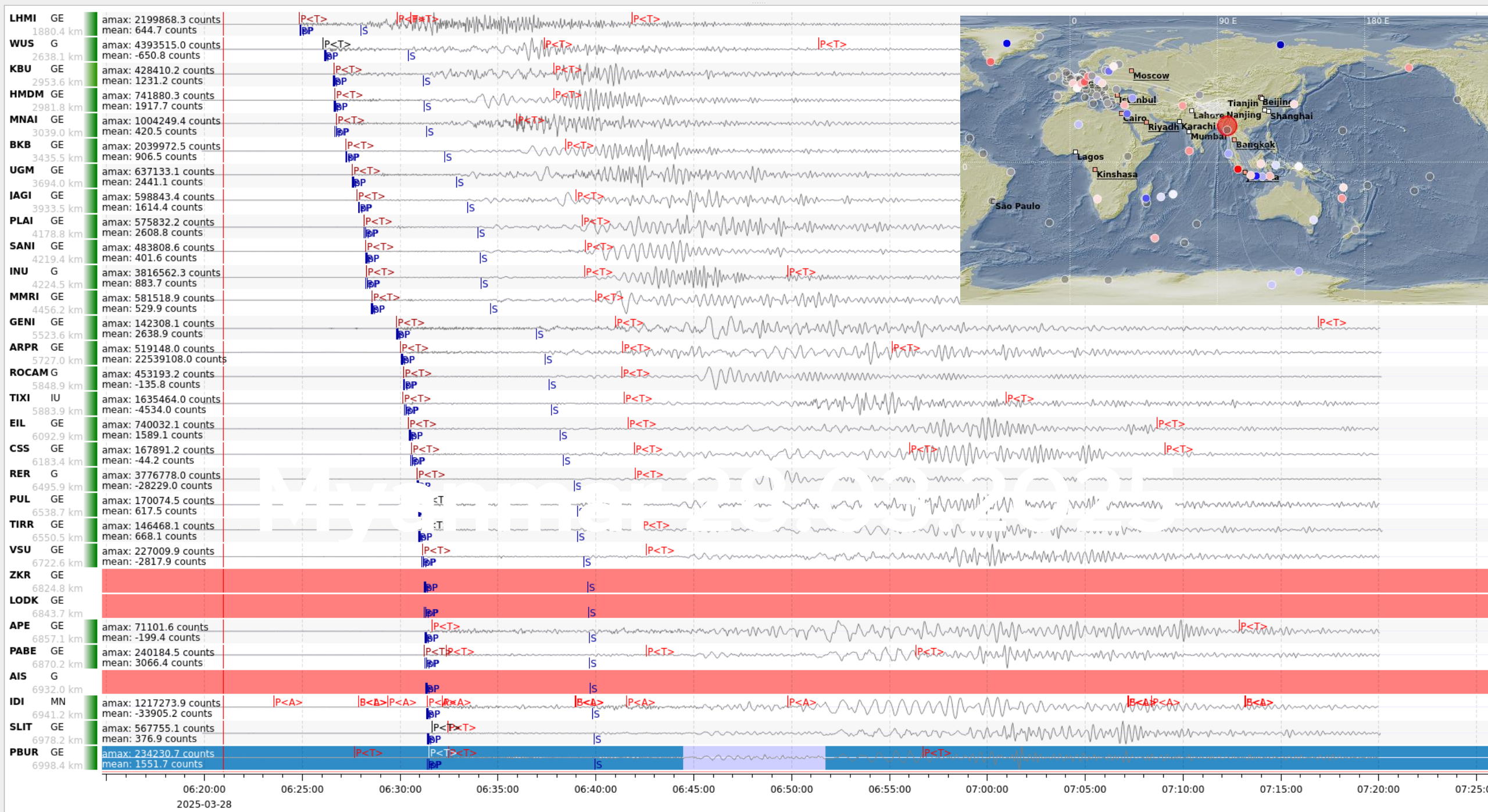
Het Nieuwsblad
Vrees voor vele duizenden slachtoffers...



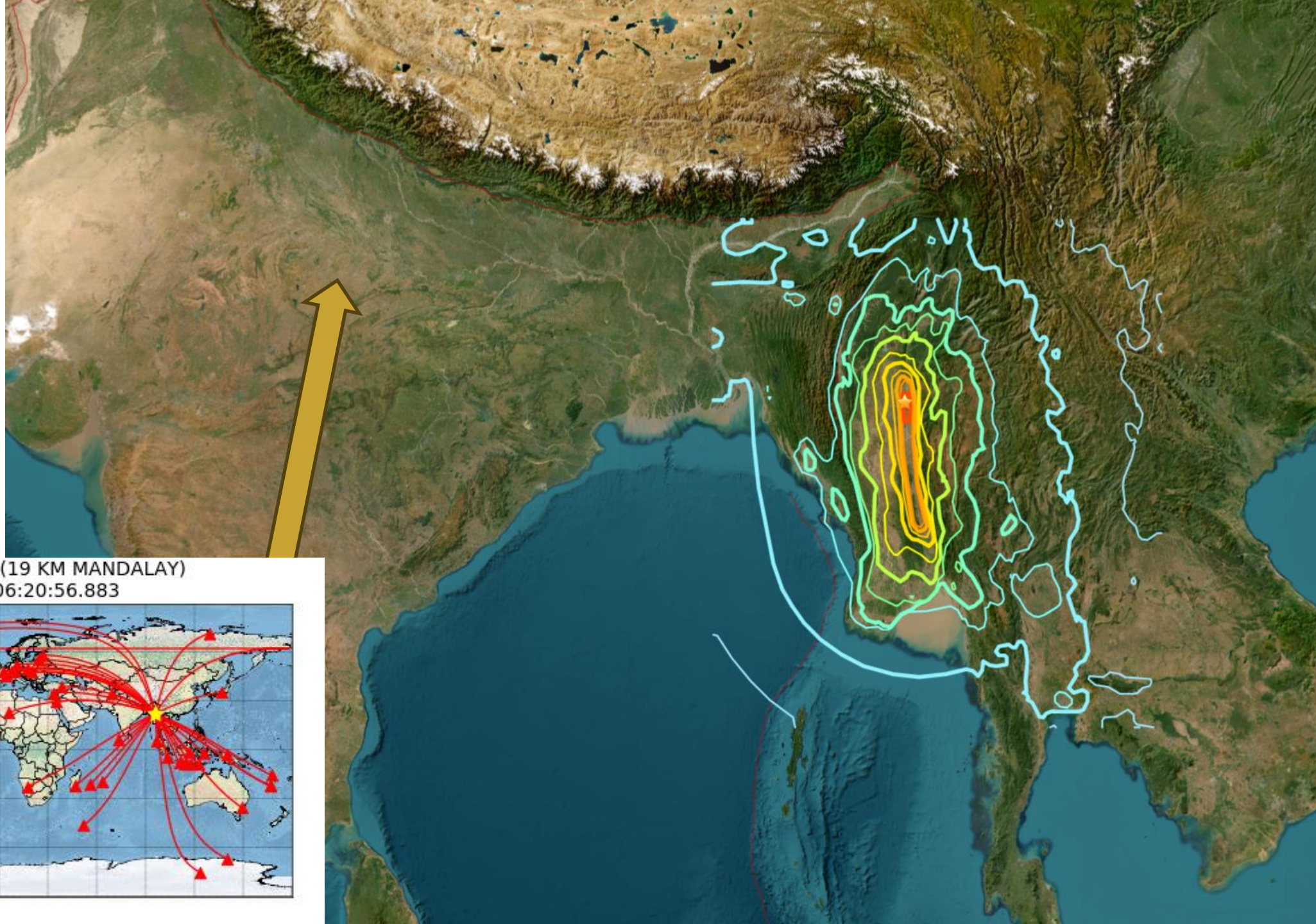
3 dagen geleden

ZOA
ZOA start noodactie voor Mya...

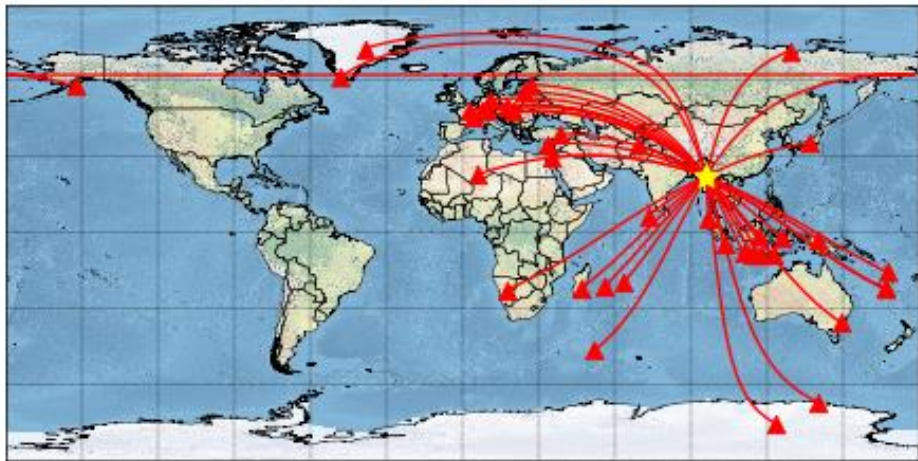




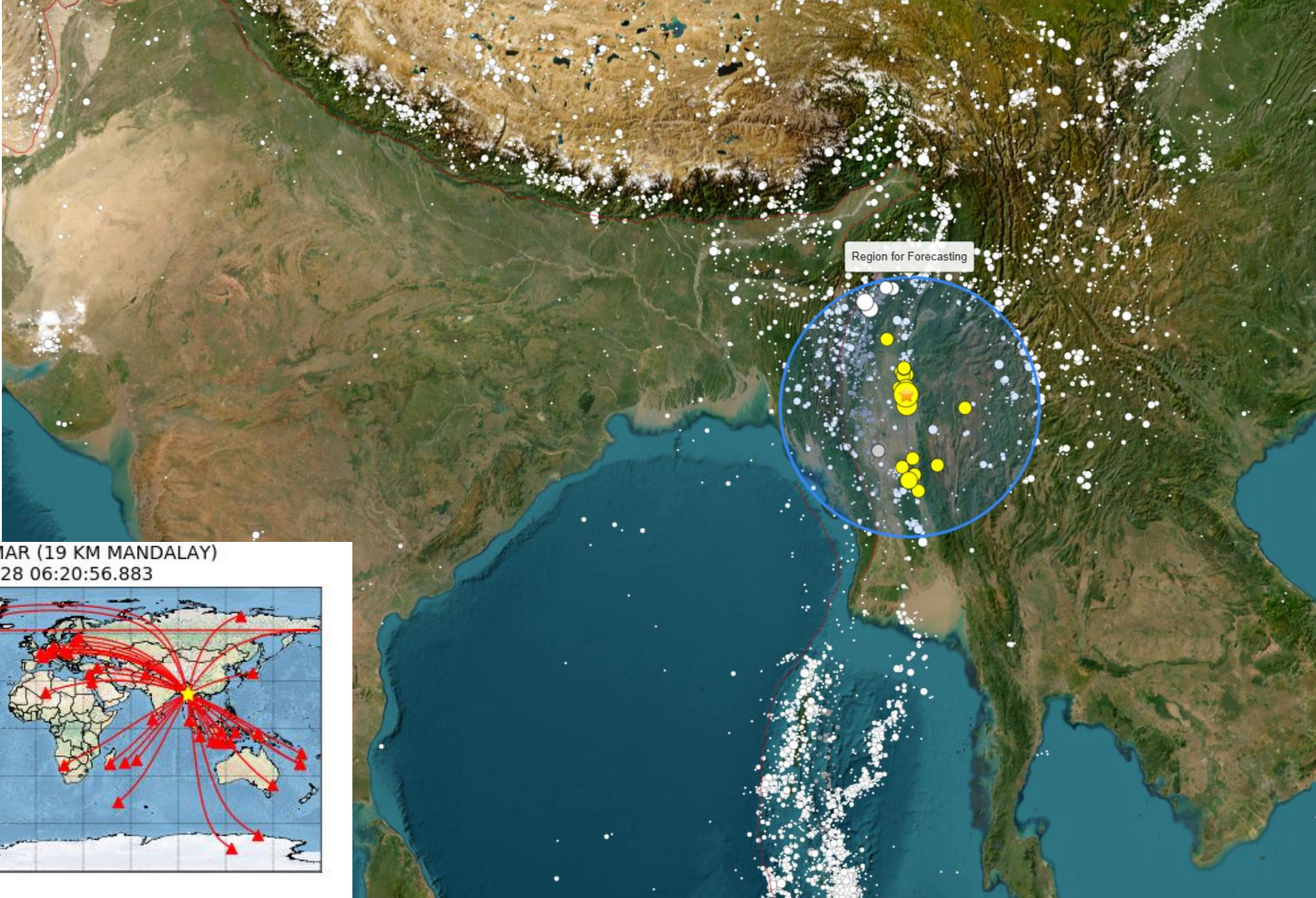
28.03.2025
Mw 7.7 Myanmar



M 7.12 - MYANMAR (19 KM MANDALAY)
2025-03-28 06:20:56.883



28.03.2025
Mw 7.7 Myanmar



M 7.12 - MYANMAR (19 KM MANDALAY)
2025-03-28 06:20:56.883



Hoe informatie
te lezen ?

SHAKEMAPS !

M 7.7 - 2025 Mandalay, Burma (Myanmar) Earthquake

2025-03-28 06:20:52 (UTC) | 21.996°N 95.926°E | 10.0 km depth

Moment Tensor

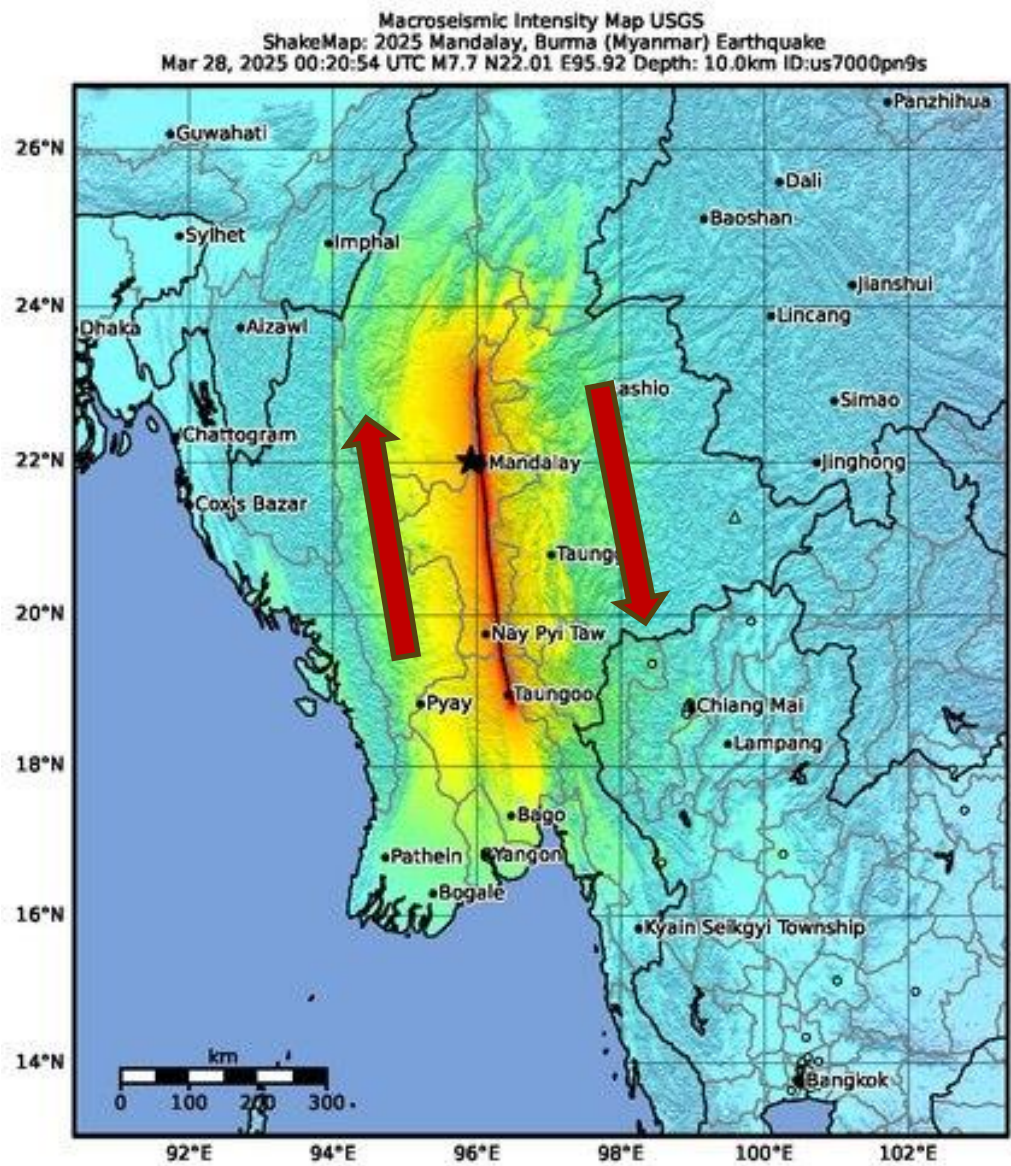
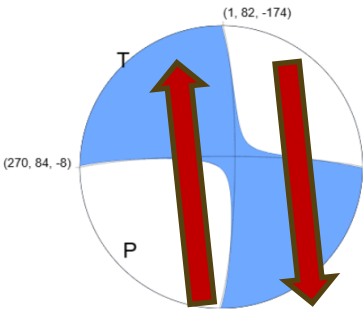
[View all moment-tensor products \(2 total\)](#)

Contributed by [US](#), last updated 2025-03-29 19:16:12 (UTC)

- ✓ The data below are the most preferred data available
- ✓ The data below have been reviewed by a scientist

W-phase Moment Tensor (Mww)

Moment	4.634e+20 N-m
Magnitude	7.71 Mww
Depth	40.5 km
Percent DC	93%
Half Duration	38.50 s
Catalog	US
Data Source	US
Contributor	US



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)	<0.0464	0.297	2.76	6.2	11.5	21.5	40.1	74.7	>139
PGV(cm/s)	<0.0215	0.135	1.41	4.65	9.64	20	41.4	85.8	>178
INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

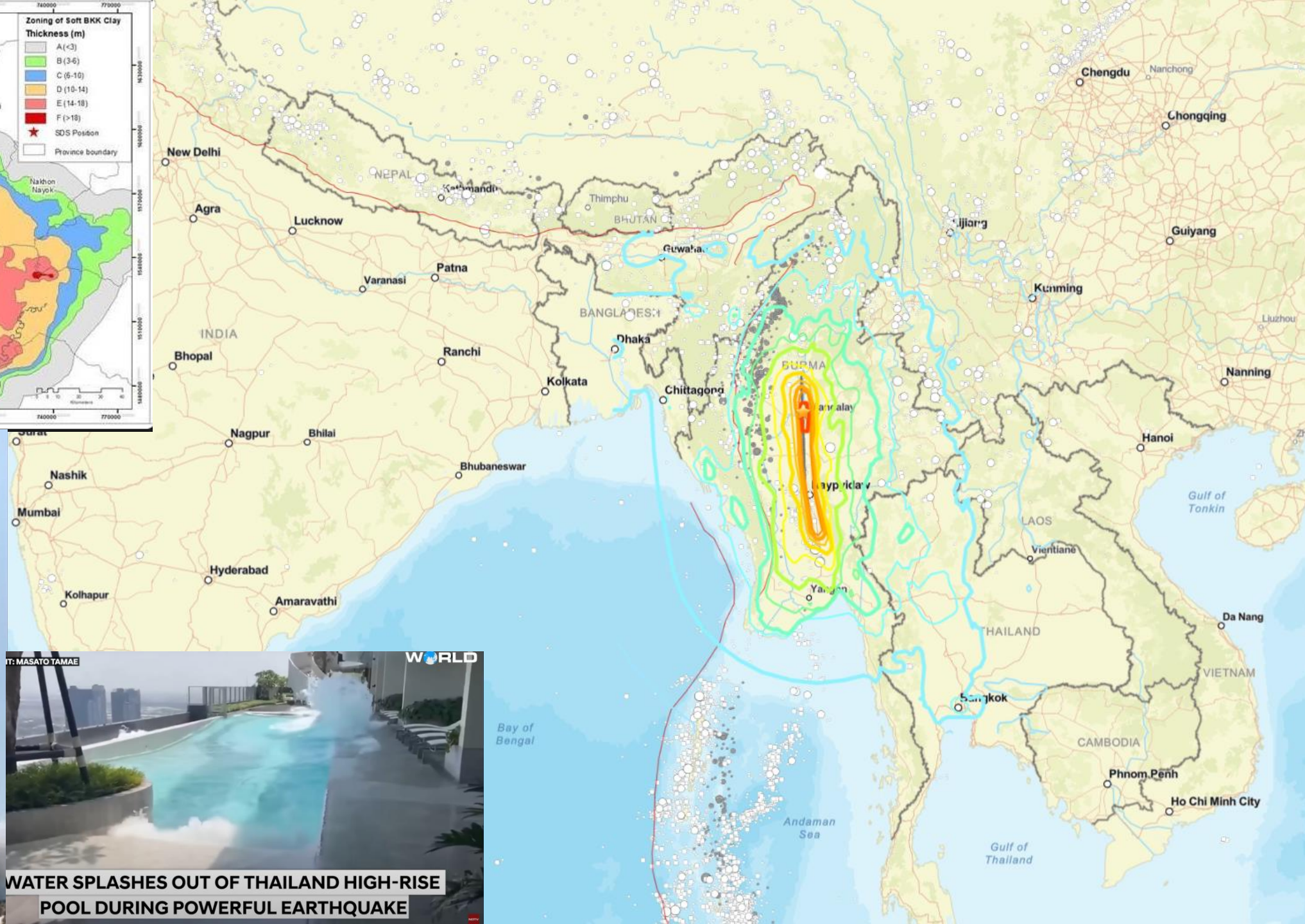
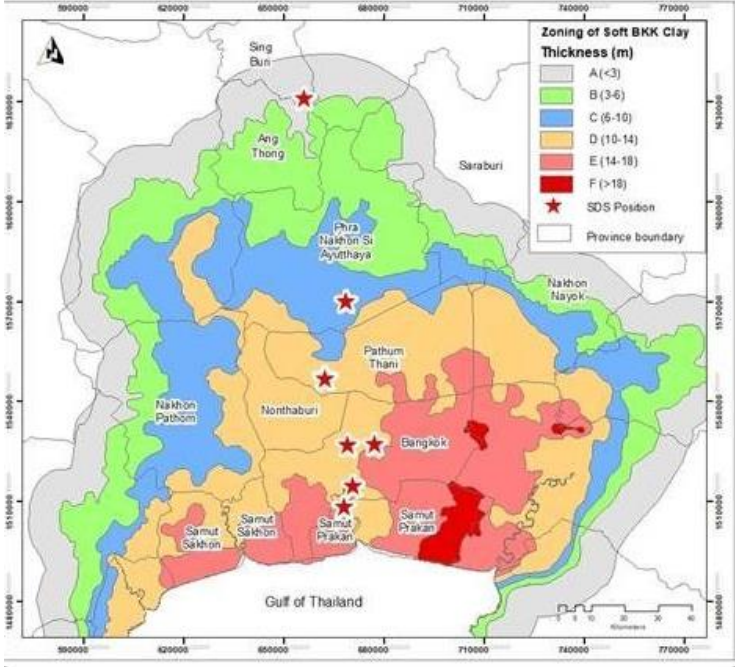
Scale based on Worden et al. (2012)

△ Seismic Instrument ○ Reported Intensity

★ Epicenter □ Rupture

Version 8: Processed 2025-03-28T18:12:21Z

Mw 7.7 Myanmar

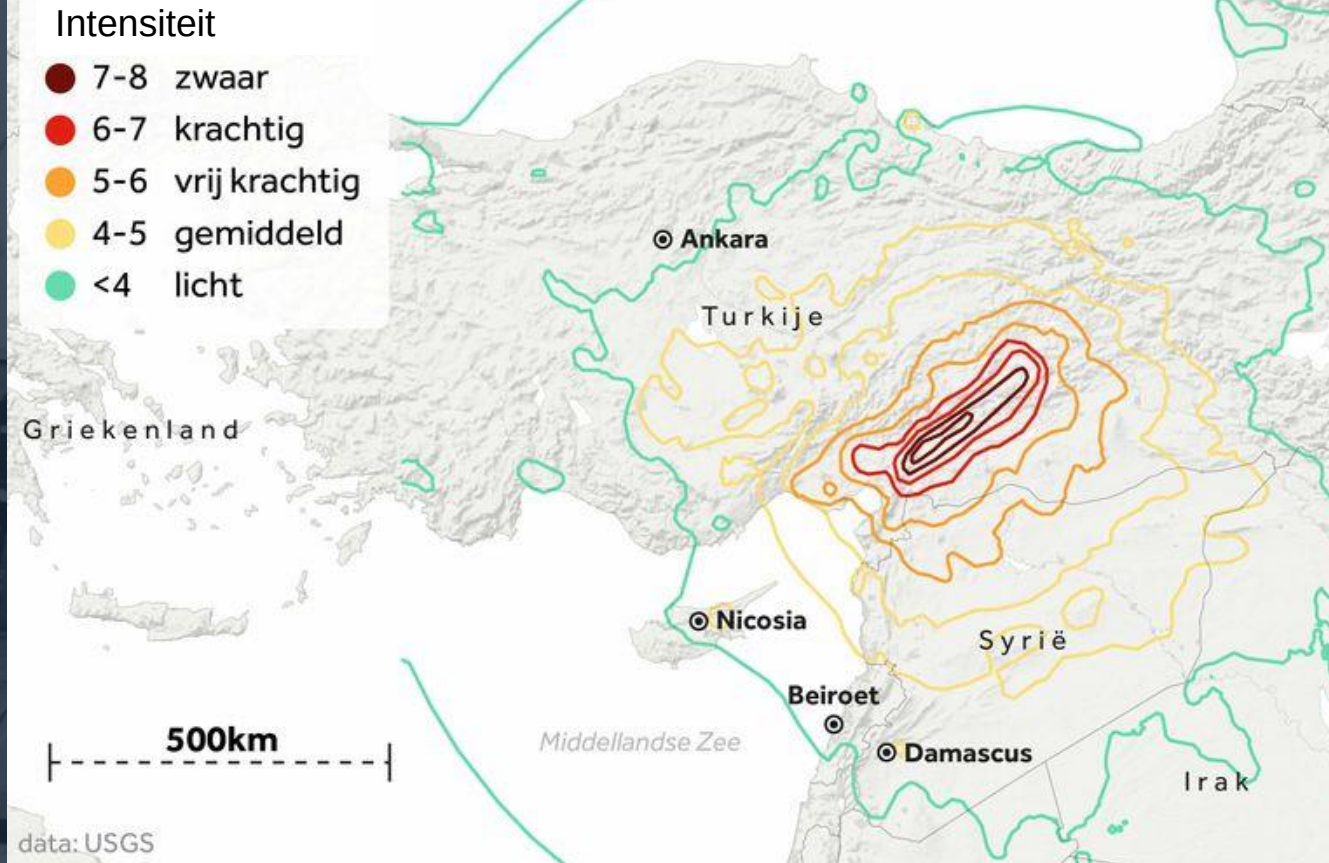


WATER SPLASHES OUT OF THAILAND HIGH-RISE POOL DURING POWERFUL EARTHQUAKE

Intensity scale – Surface impact

Zware aardbeving met kracht van 7,8

Om 4.17 uur lokale tijd



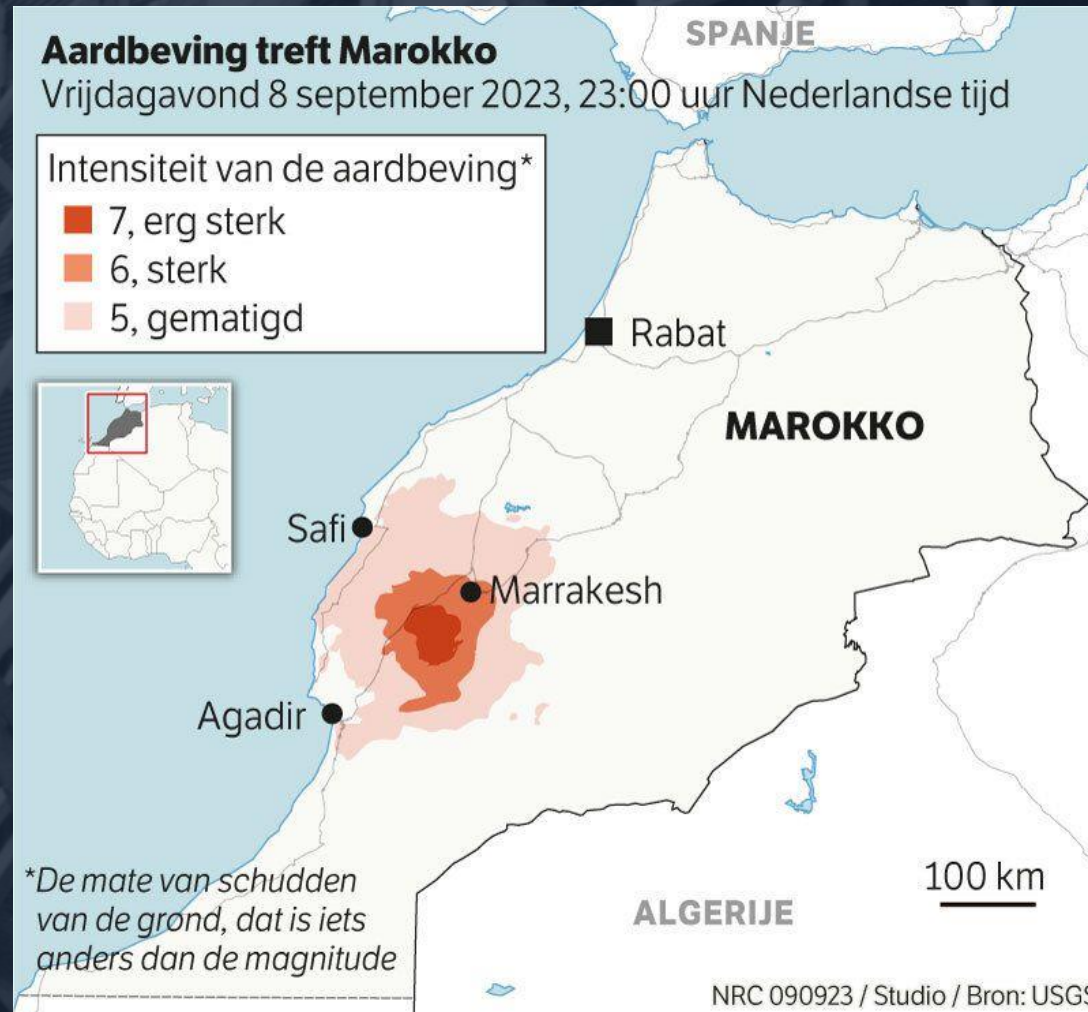
6 Februari 2023 – Mw 7.8

Aardbeving treft Marokko

Vrijdagavond 8 september 2023, 23:00 uur Nederlandse tijd

Intensiteit van de aardbeving*

- 7, erg sterk
- 6, sterk
- 5, gematigd



6 September 2023 – Mw 6.8



Measuring earthquakes in Belgium

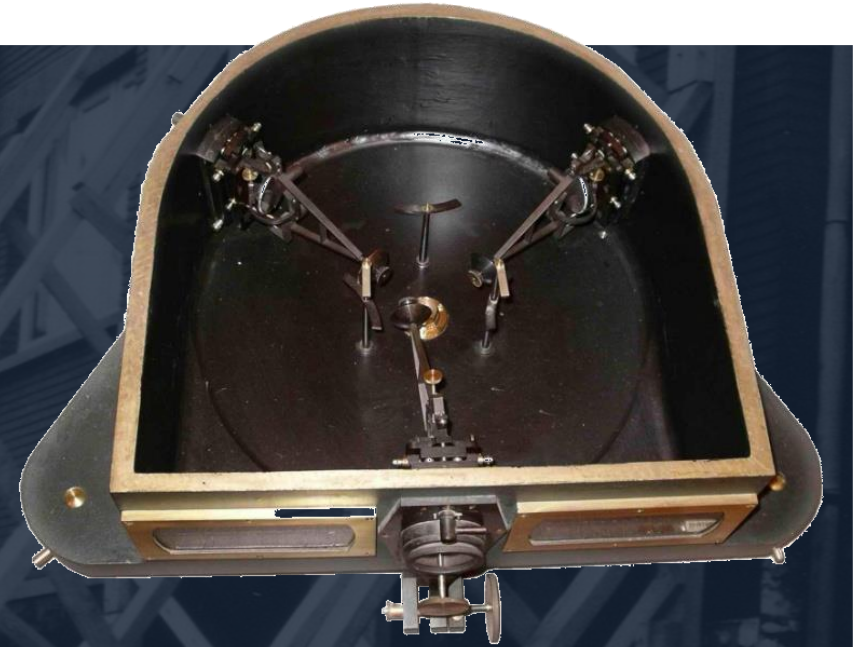
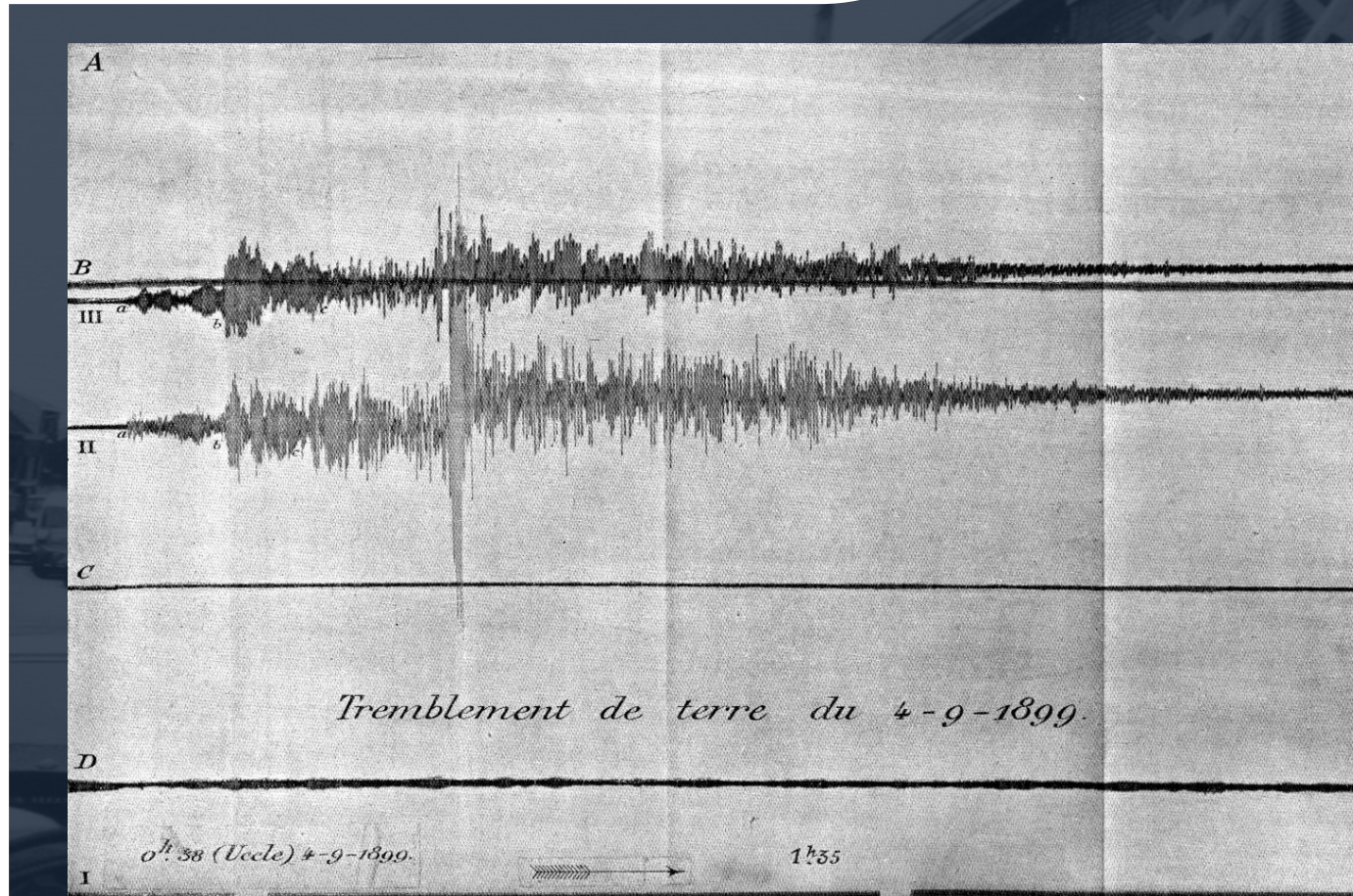
Why Seismology in Belgium ?





**Royal Observatory
of Belgium**

Seismic monitoring in Belgium in 1899



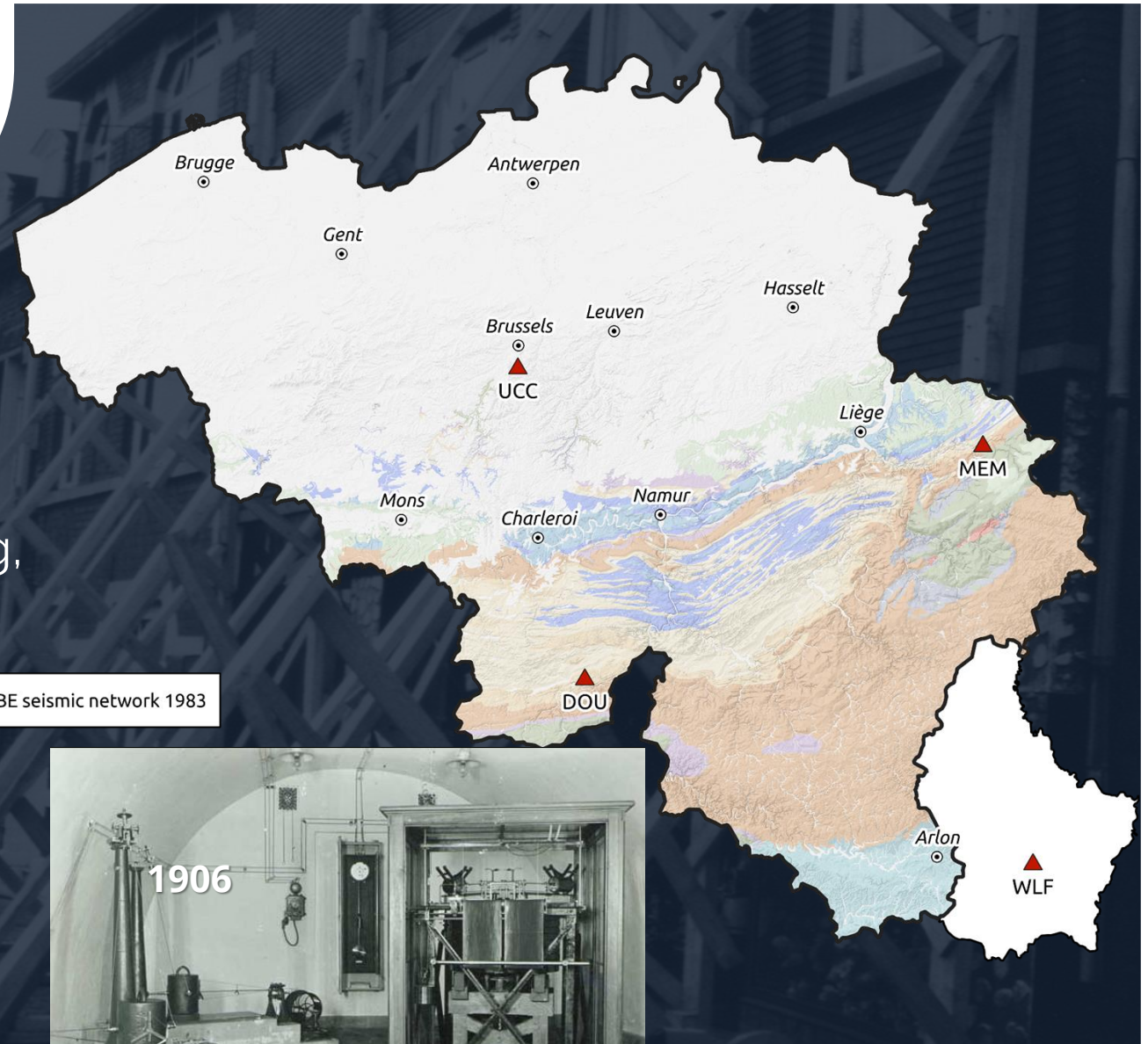
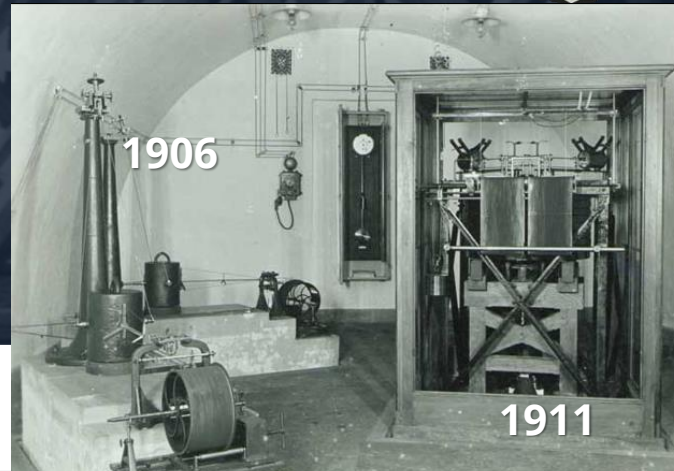
Alaska Fairbanks 1899

Seismic monitoring in Belgium in 1983

Four seismic stations: Uccle, Dourbes (RMI), Membach and Walferdange

- Autonomous, paper recording, hourly radio signals
- Collection of recordings:
 - UCC: daily
 - DOU: 2 times a week
 - WLF: paper changed every 3 days, but sent weekly
 - MEM: 2 monthly visits

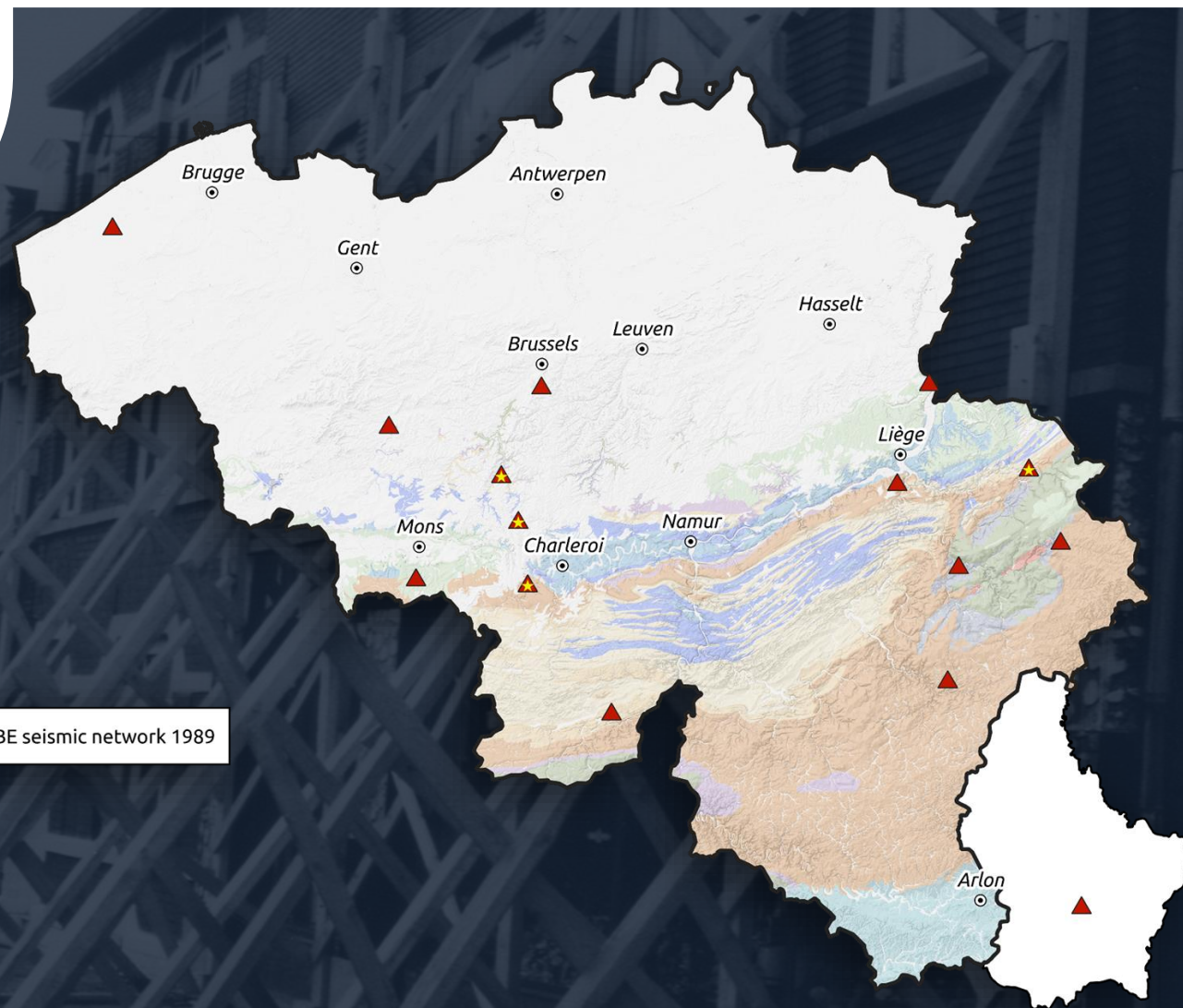
BE seismic network 1983



Seismic monitoring in Belgium in 1989

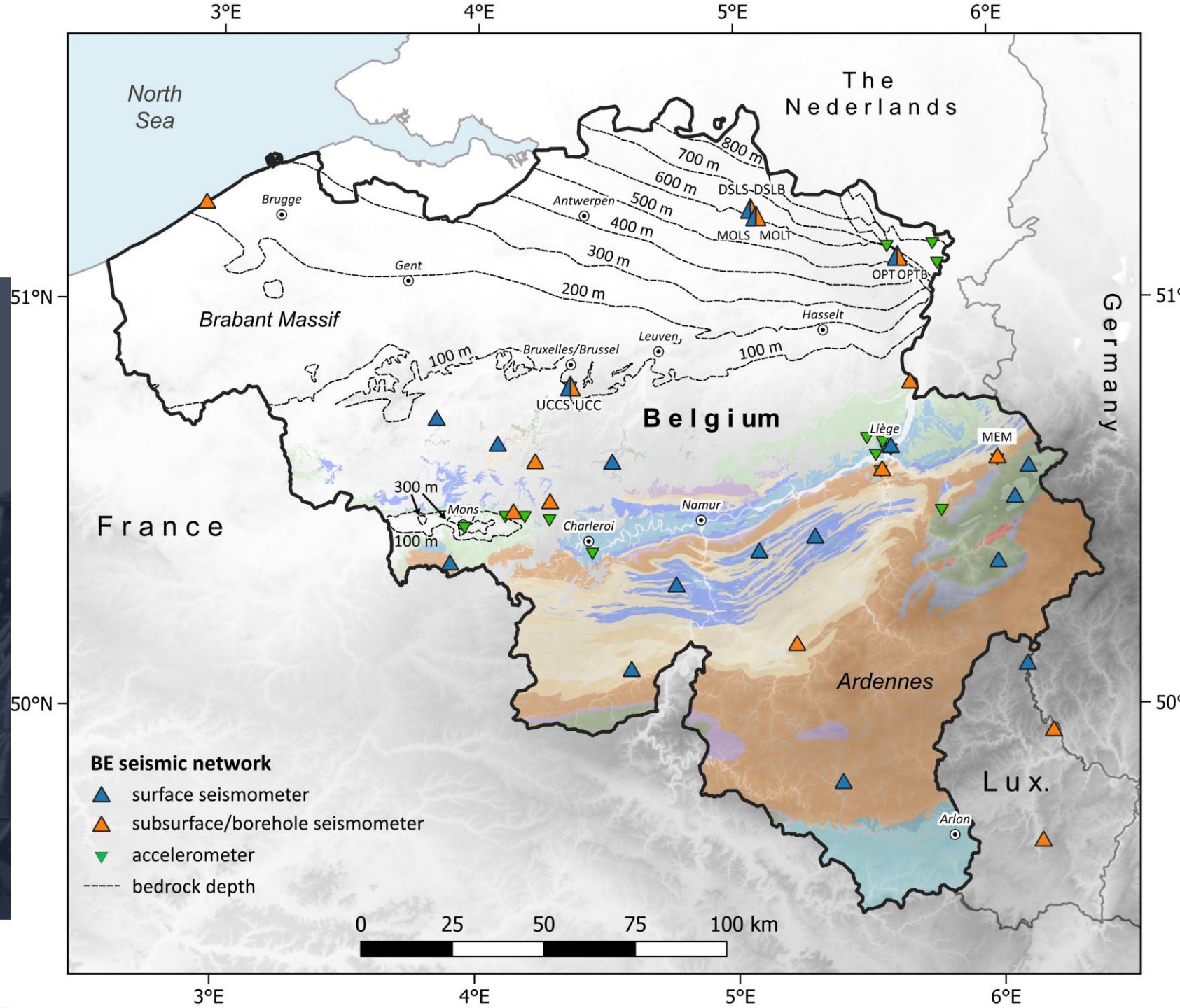
12 seismic stations

BE seismic network 1989



Seismic monitoring in Belgium in 2025

29 seismic stations
16 accelerometers





Only earthquakes ?

Quarry blasts
Jemelle, Lhoist



Induced events
Geothermie centrale Dessel



Not only earthquakes

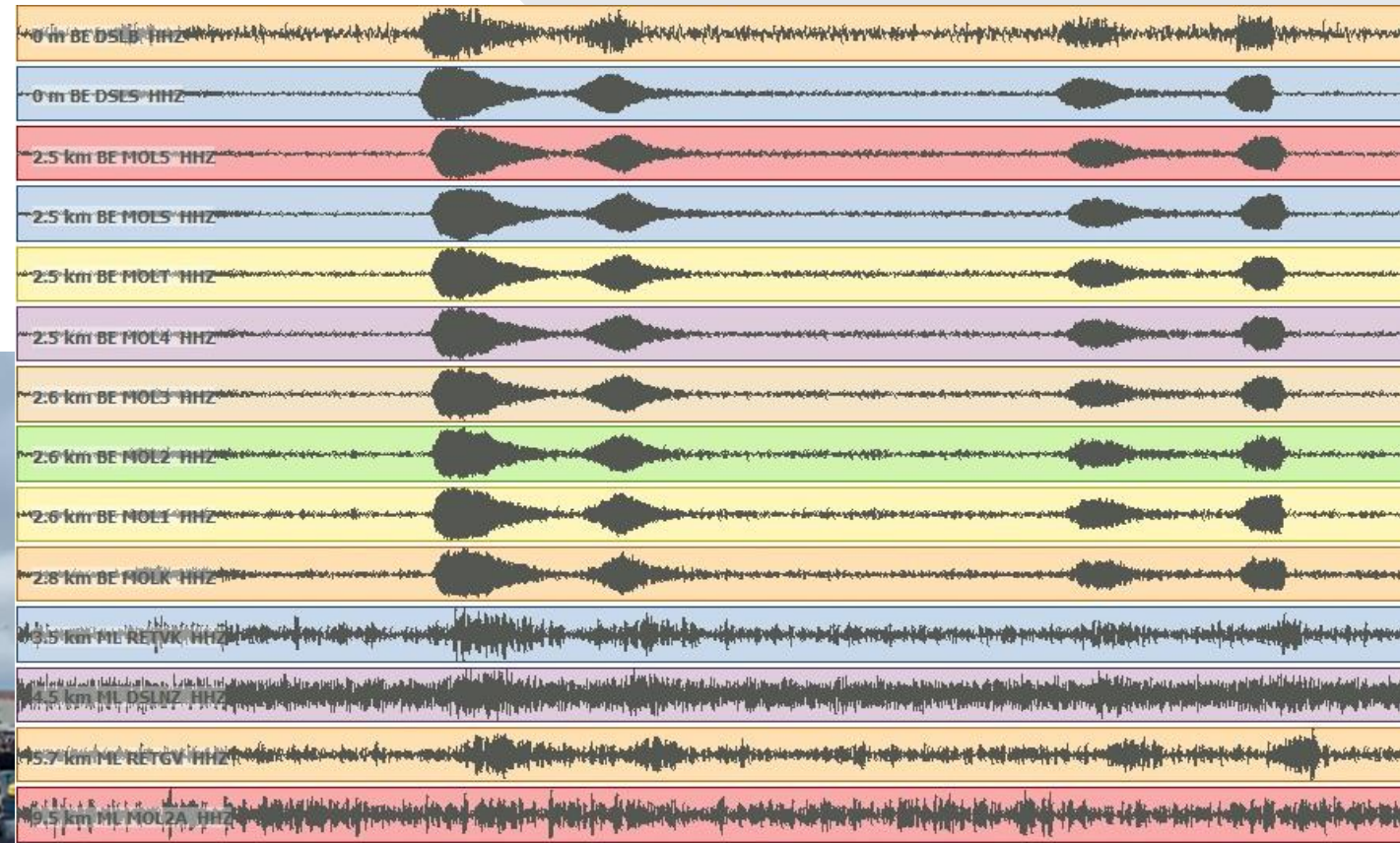
Sonic Booms



WW II explosions at sea



Concerts/Festivals



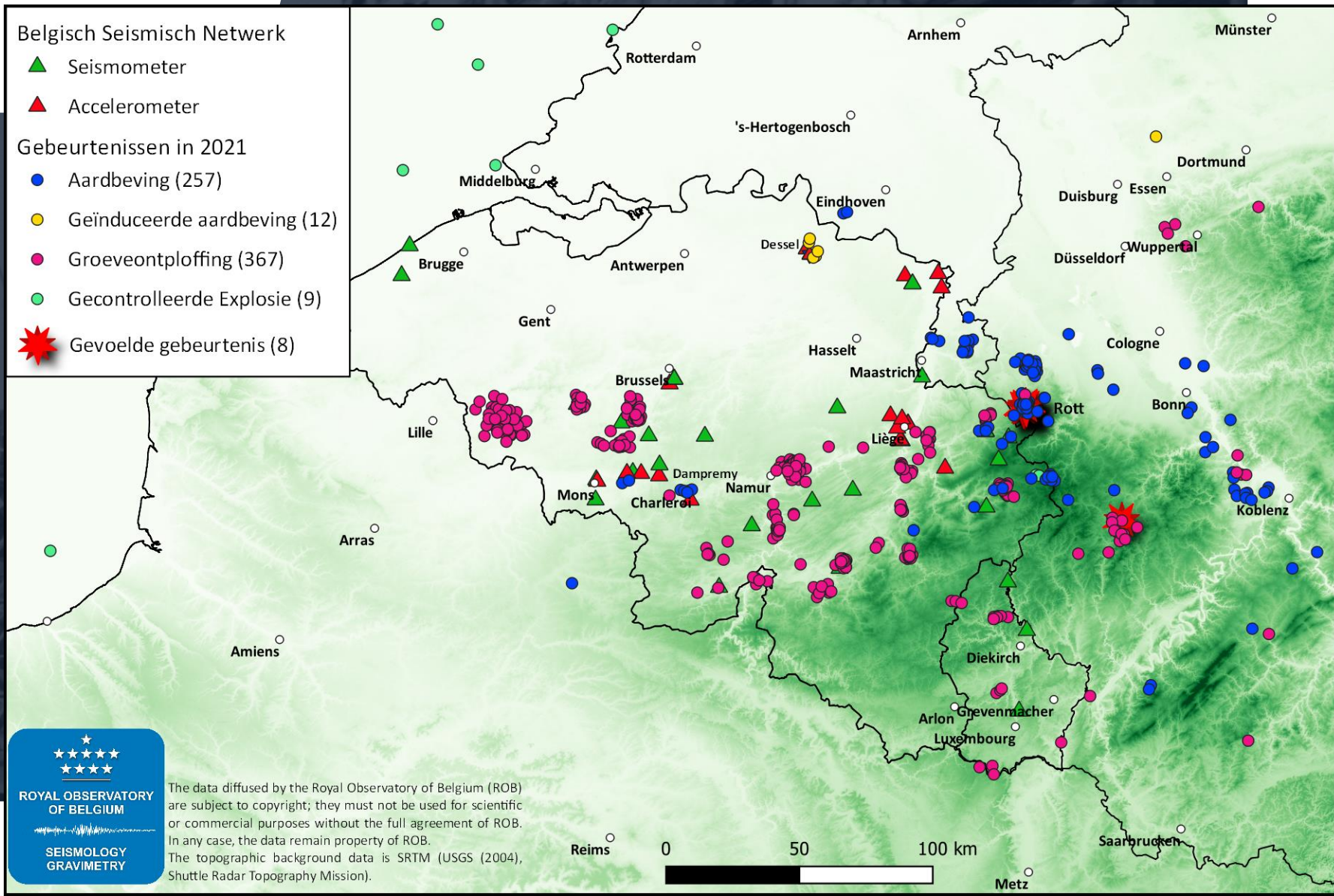
Seismic activity in 2021

Belgisch Seismisch Netwerk

- ▲ Seismometer
- ▲ Accelerometer

Gebeurtenissen in 2021

- Aardbeving (257)
- Geïnduceerde aardbeving (12)
- Groeveontploffing (367)
- Gecontroleerde Explosie (9)
- ★ Gevoelde gebeurtenis (8)



40
LIÈGE 83

Seismologie.be

1.4K followers • 17 following



The data diffused by the Royal Observatory of Belgium (ROB) are subject to copyright; they must not be used for scientific or commercial purposes without the full agreement of ROB. In any case, the data remain property of ROB. The topographic background data is SRTM (USGS (2004), Shuttle Radar Topography Mission).

Seismic activity in 2022

Belgisch Seismisch Netwerk

▲ Seismometer

2022 Aardbevingscatalogus

● Aardbeving [99]

● Geïnduceerde aardbeving [40]

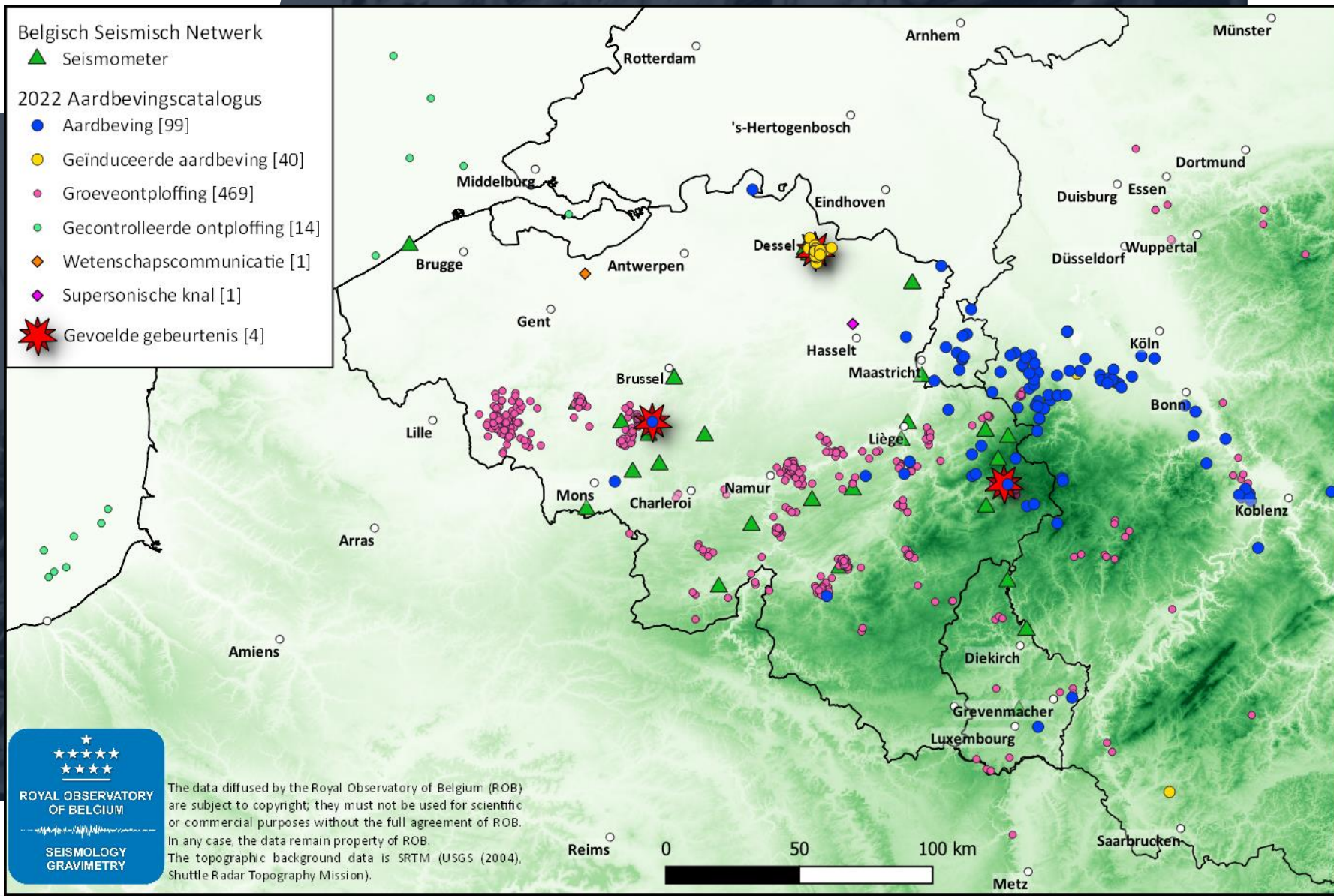
● Groeveontploffing [469]

● Gecontroleerde ontploffing [14]

● Wetenschapscommunicatie [1]

● Supersonische knal [1]

★ Gevoelde gebeurtenis [4]



40
LIÈGE 83

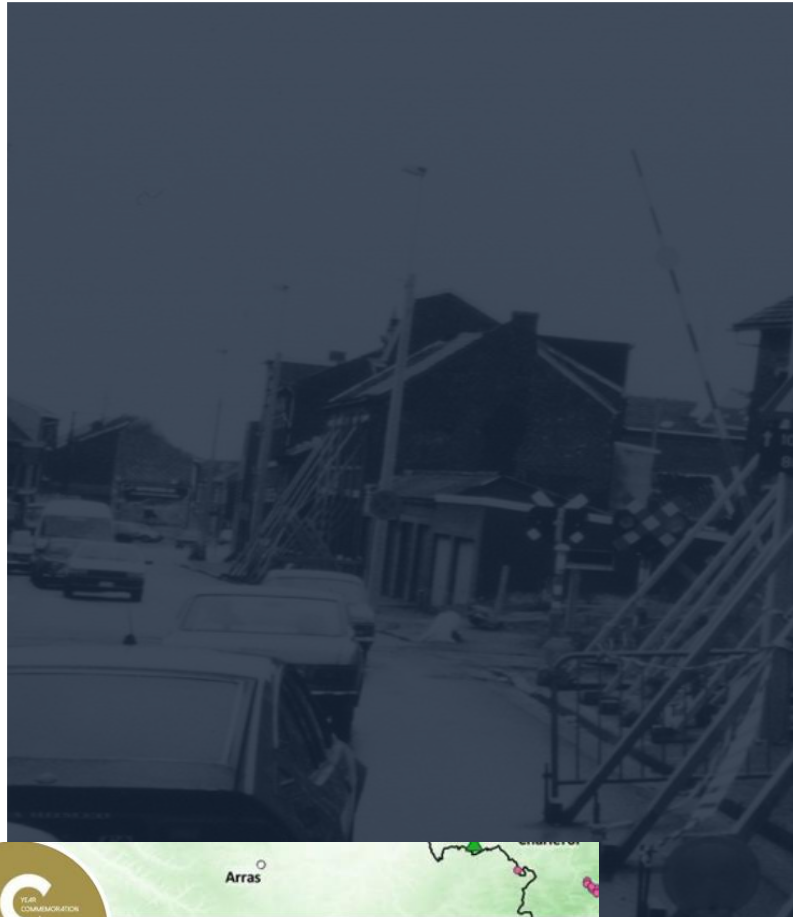
Seismologie.be

1.4K followers • 17 following

★ ★ ★ ★ ★
ROYAL OBSERVATORY
OF BELGIUM
SEISMOLOGY
GRAVIMETRY

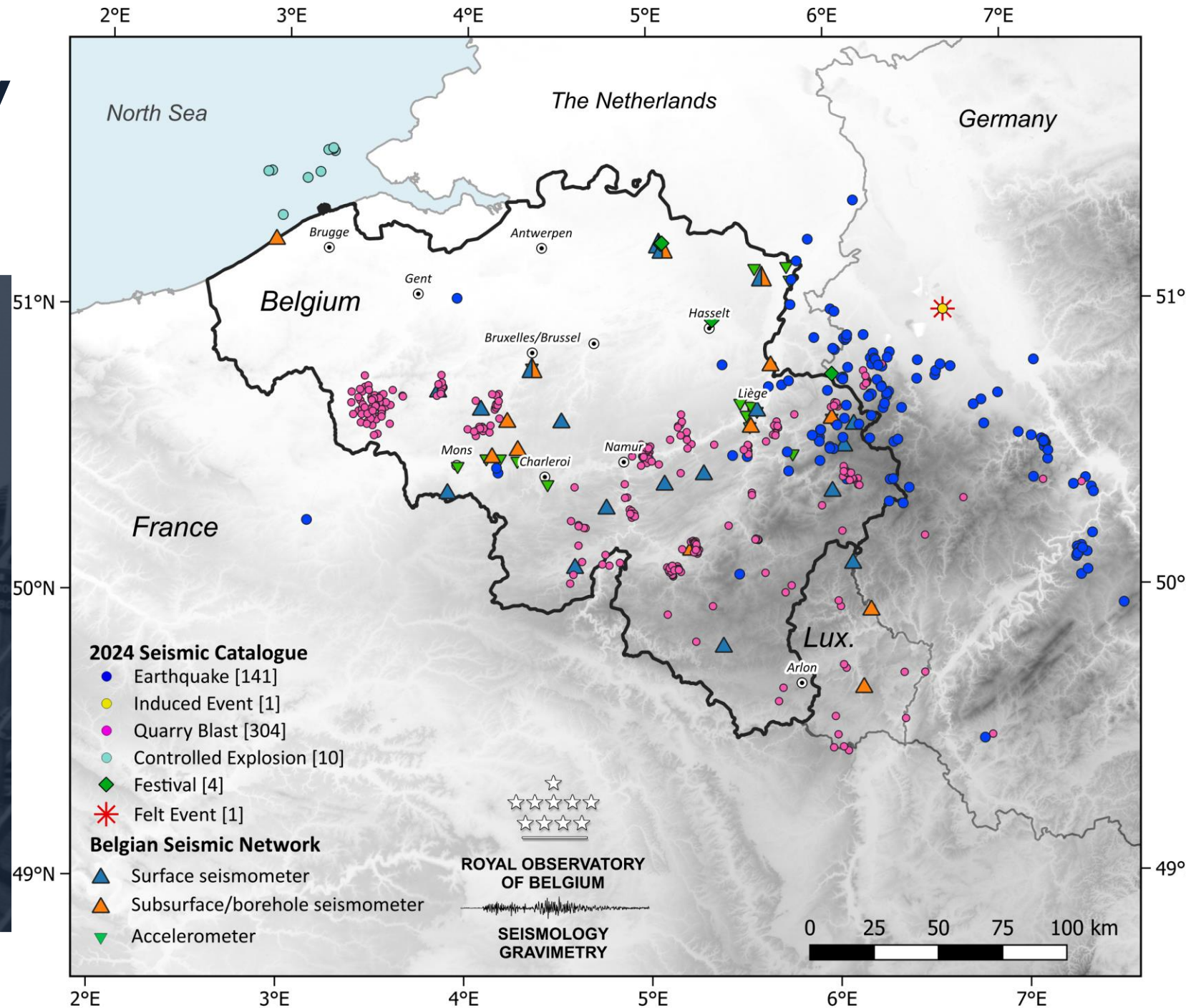
The data diffused by the Royal Observatory of Belgium (ROB) are subject to copyright; they must not be used for scientific or commercial purposes without the full agreement of ROB. In any case, the data remain property of ROB. The topographic background data is SRTM (USGS (2004), Shuttle Radar Topography Mission).

Seismic activity in 2024



Seismologie.be

1.4K followers • 17 following



Geïnduceerde aardbevingen

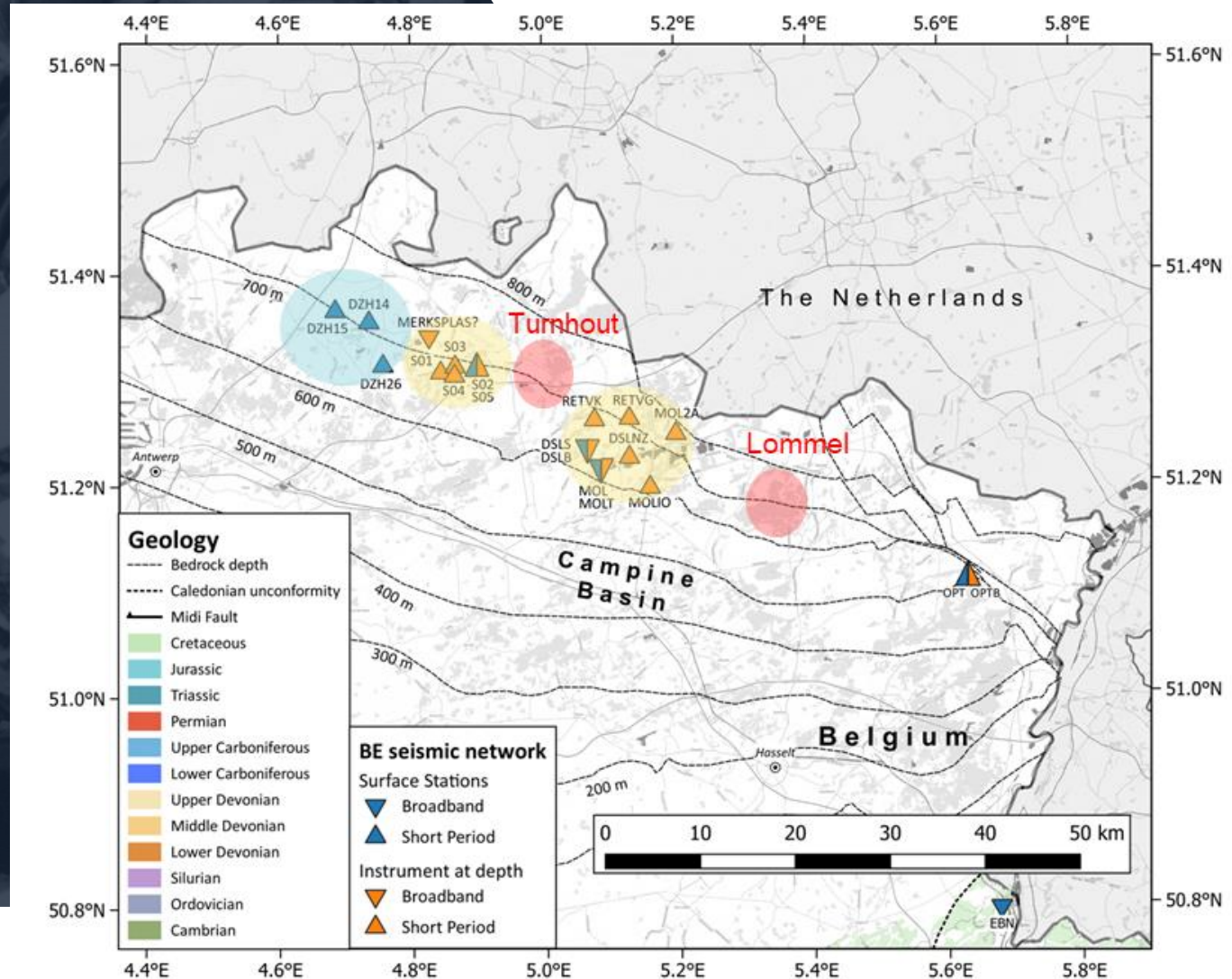
Other networks

VITO – geotherm

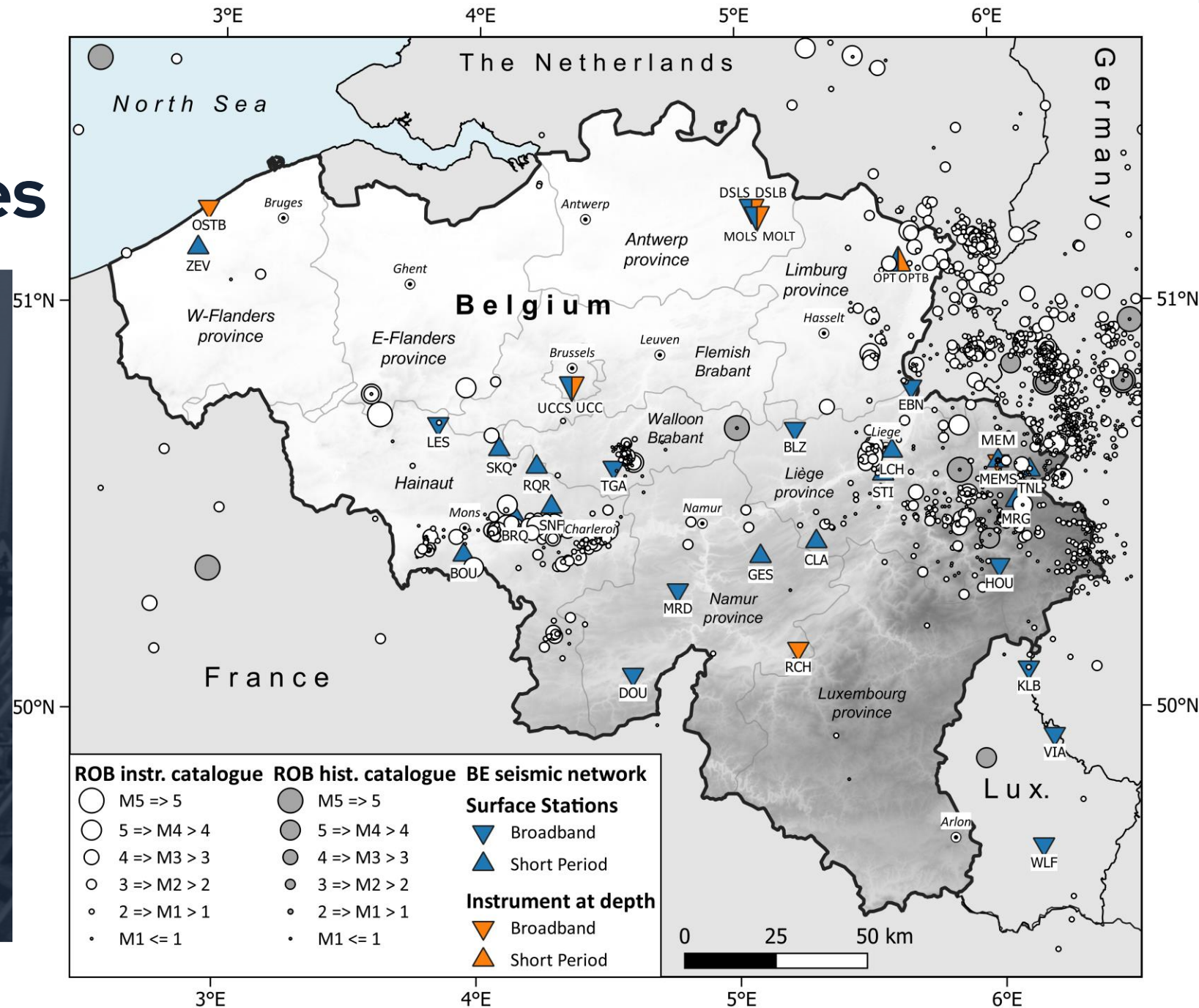
Janssen – geotherm

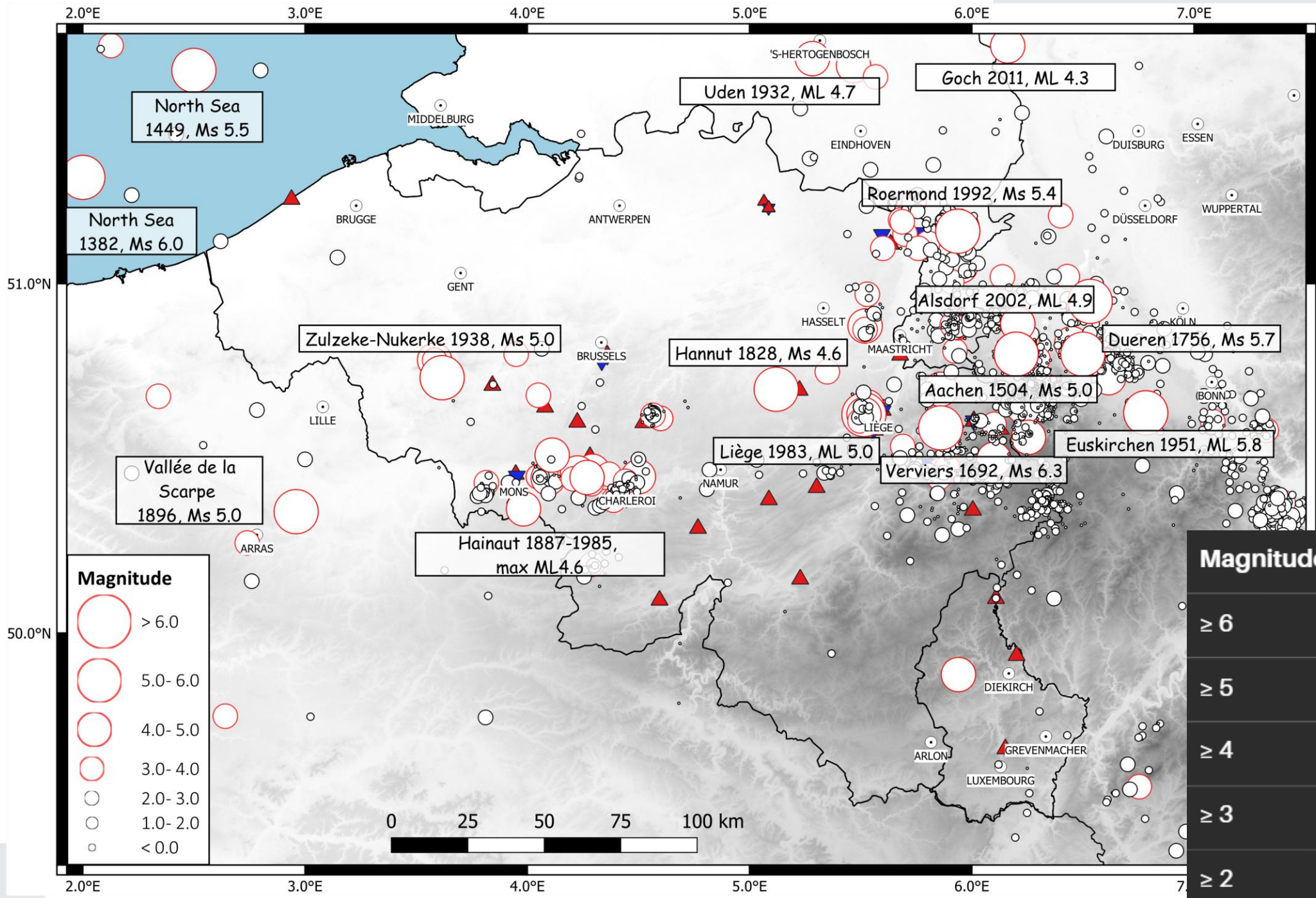
Fluxys - Gas storage

Future Geotherm
of interest



Aantal aardbevingen Nombre de séismes

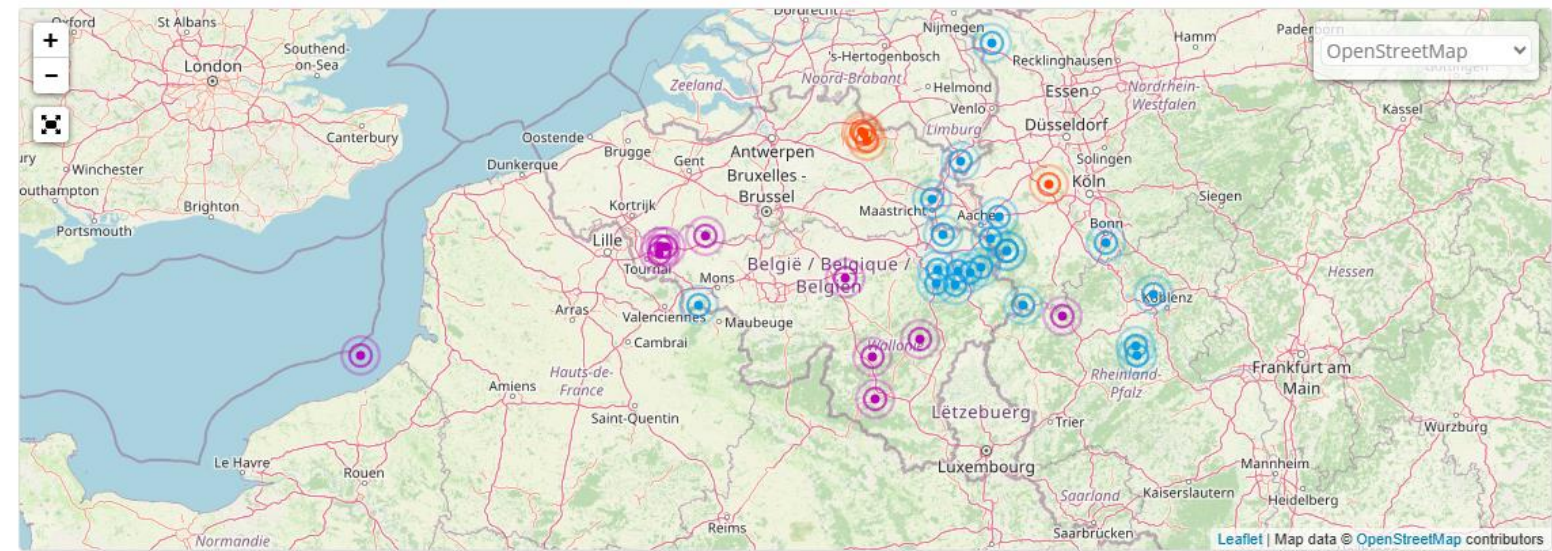




Magnitude	Event Statistics
≥ 6	1 every 315 years
≥ 5	1 every 40 years
≥ 4	1 every 5 years
≥ 3	1.5 per year
≥ 2	11 per year

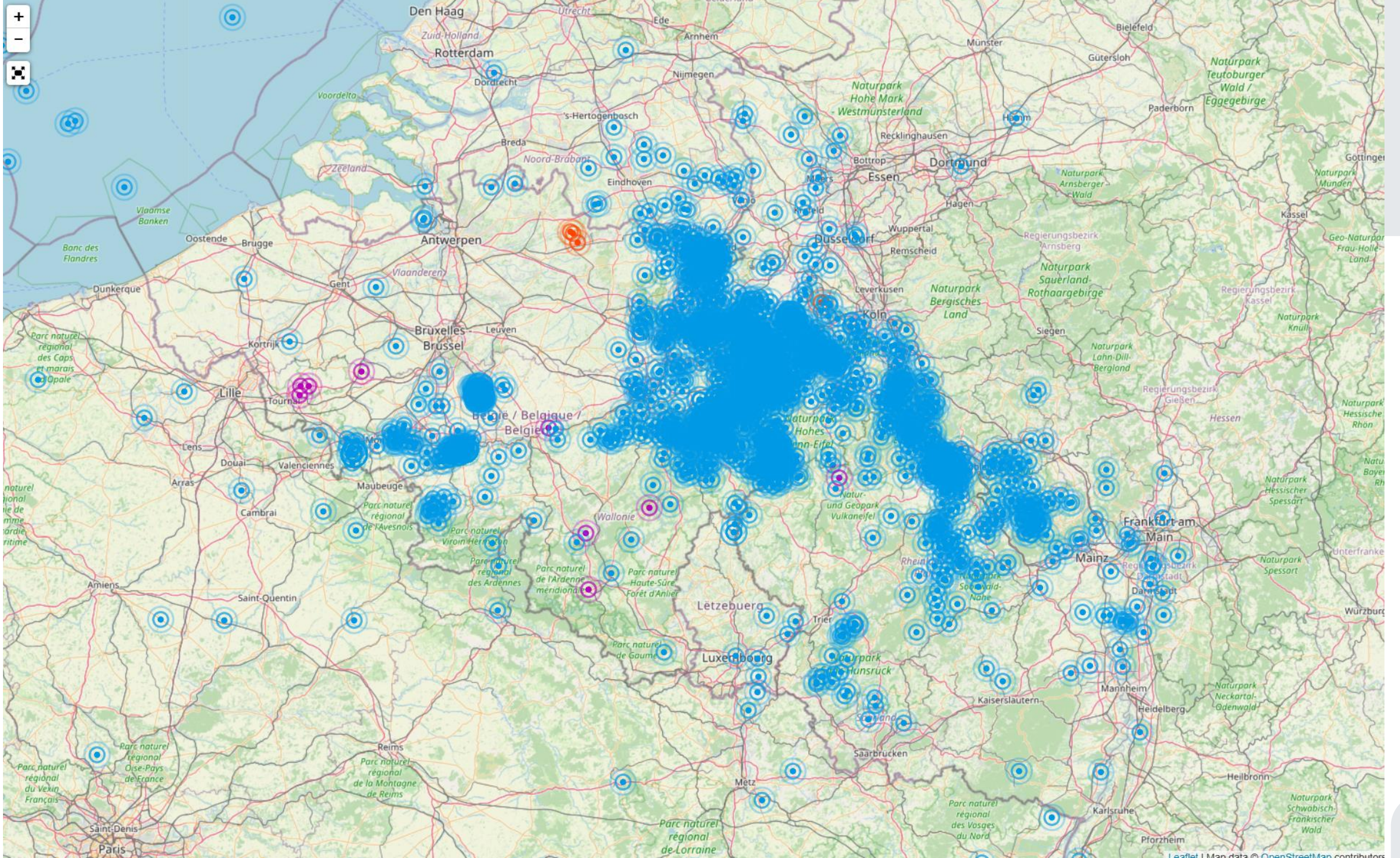
Startpagina

RECENTE AARDBEVINGEN



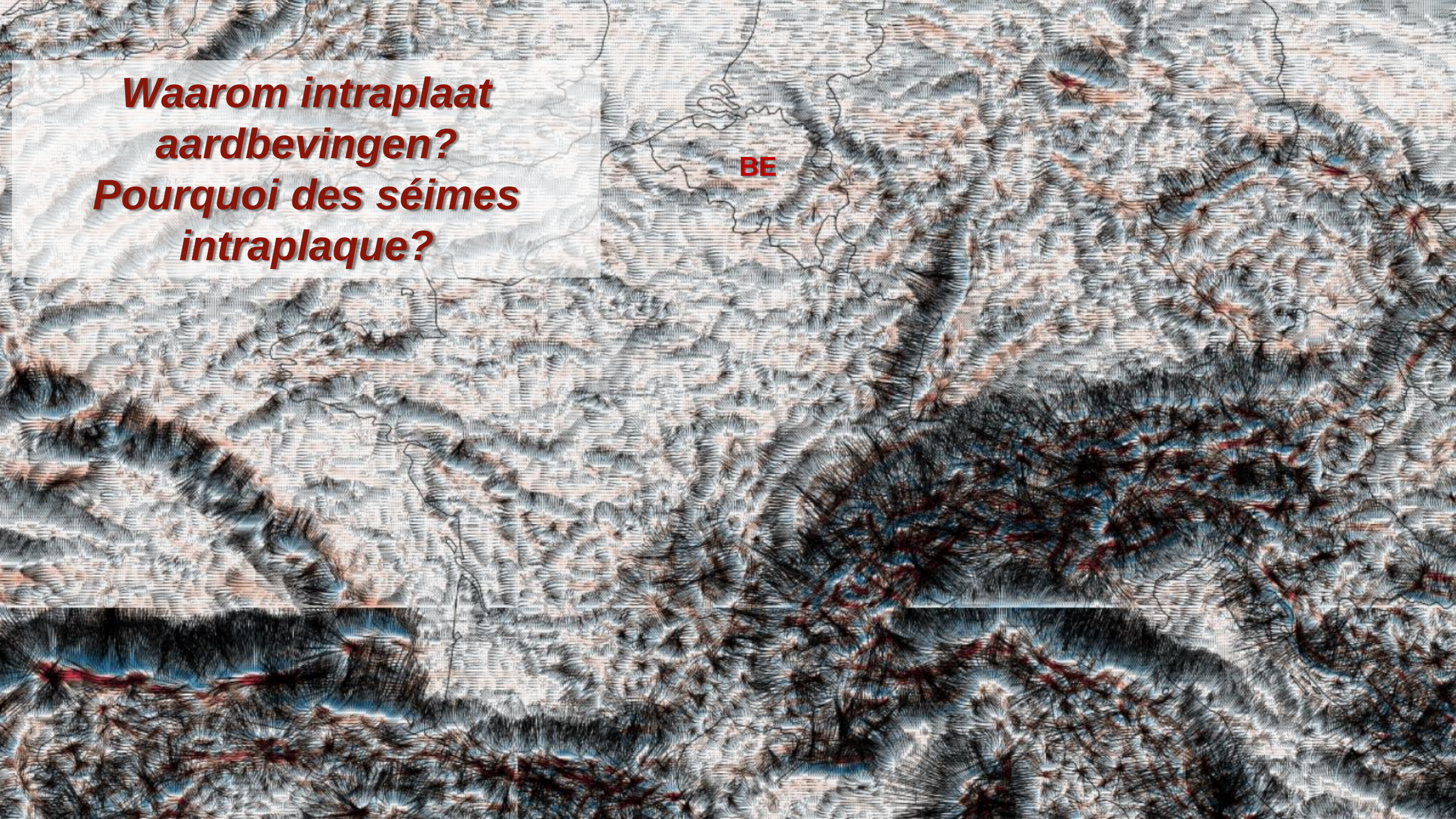
Aardbevingen

M _L	Regio	Type	Belgische tijd	UTC tijd
1.6	GOCH (DE)	Aardbeving	2025-03-29 03:21:45	2025-03-29 02:21:45
0.7	DALHEM (BE)	Aardbeving	2025-03-28 22:12:07	2025-03-28 21:12:07
0.3	BAELEN (BE)	Aardbeving	2025-03-24 23:43:07	2025-03-24 22:43:07
-0.4	LAMMERSDORF (DE)	Aardbeving	2025-03-22 19:49:36	2025-03-22 18:49:36
1.1	JALHAY (BE)	Aardbeving	2025-03-22 02:39:52	2025-03-22 01:39:52
1.8	BONN (DE)	Aardbeving	2025-03-21 11:32:38	2025-03-21 10:32:38
0.1	SPA (BE)	Aardbeving	2025-03-17 02:33:20	2025-03-17 01:33:20
1.2	MOERSDORF (DE)	Aardbeving	2025-03-16 08:20:17	2025-03-16 07:20:17
0.7	SCHEID (DE)	Aardbeving	2025-03-15 06:03:58	2025-03-15 05:03:58



***Waarom intraplaat
aardbevingen?
Pourquoi des séismes
intraplaque?***

BE





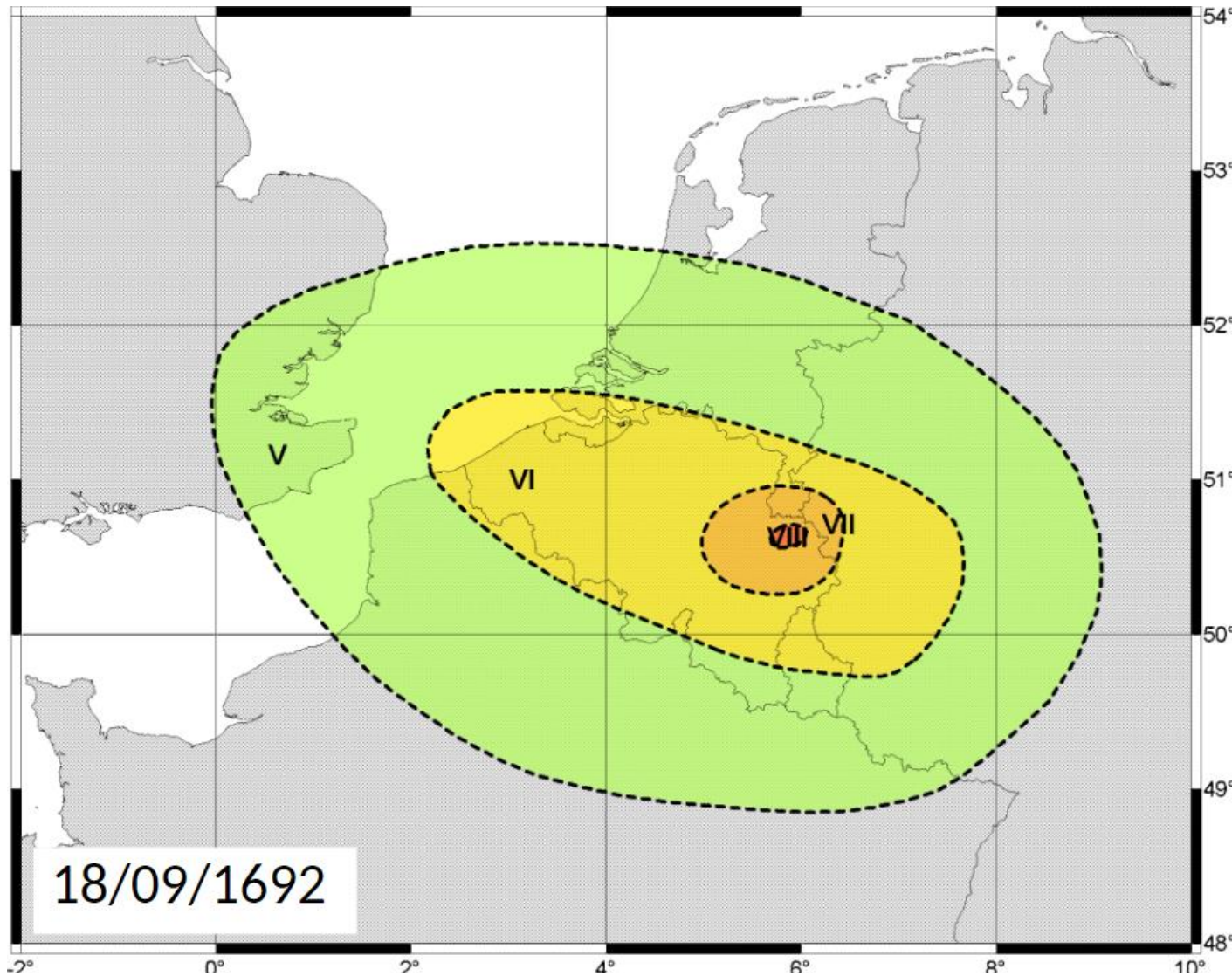
**Aardbevingen in België ?
Séismes en Belgique?**

**Grootste historische
events**

**Les plus grands séismes
historiquement**



1692 Verviers – M6.3

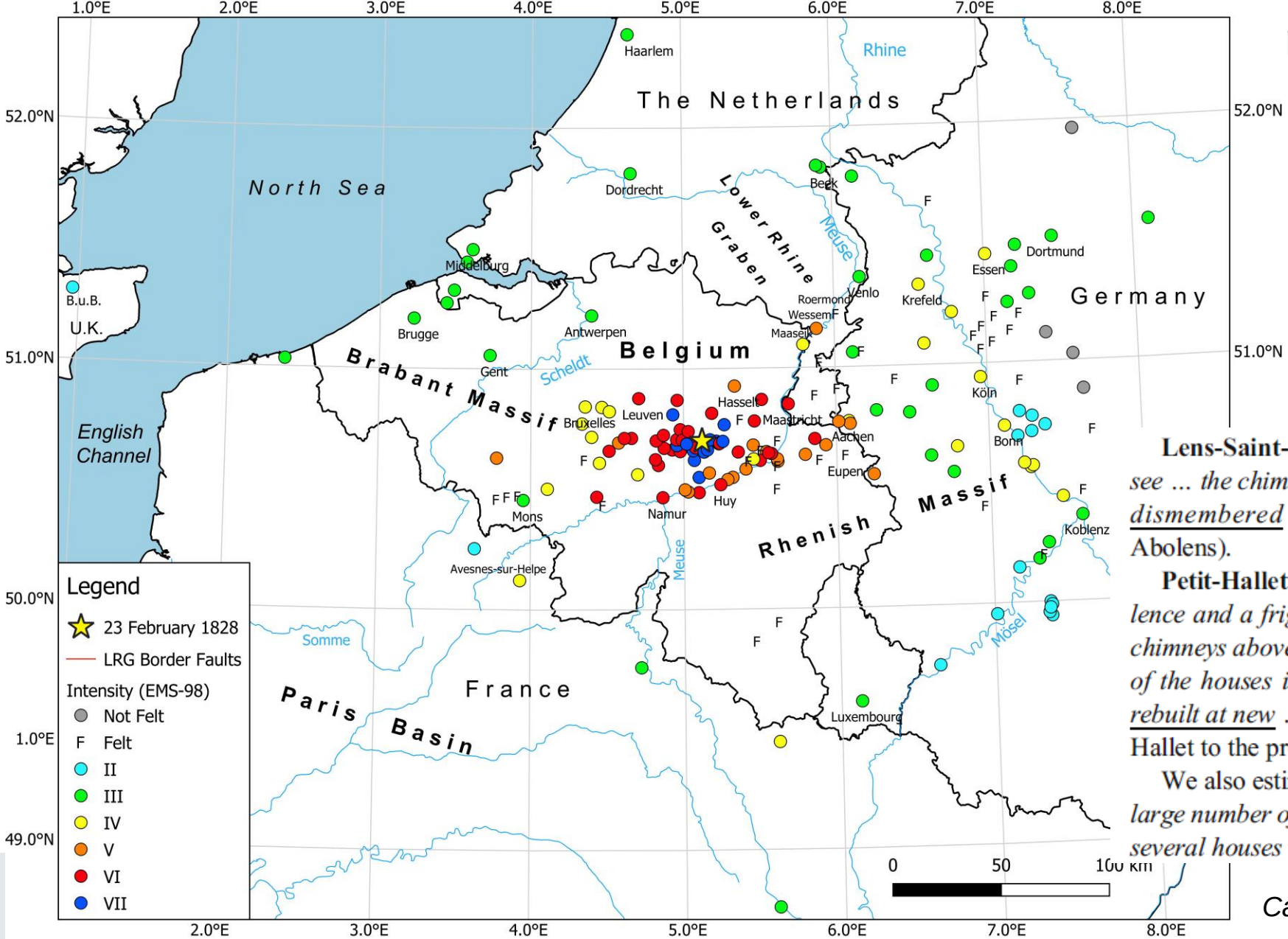


- Largest known earthquake in Belgium
- Damage over almost entire territory



*Crapoel castle, Walhorn:
"1692 TERRAE MOTU DIRUTUM - REAEDIFICARUNT 1698"*

1828 Hannut Mw5.1



J Seismol
<https://doi.org/10.1007/s10950-020-09977-6>

ORIGINAL ARTICLE

The 23 February 1828 Belgian earthquake: a destructive moderate event typical of the seismic activity in Western Europe

Thierry Camelbeeck · Elisabeth Knuts ·
Pierre Alexandre · Thomas Lecocq · Koen Van Noten

Lens-Saint-Servais: « ... what was my surprise to see ... the chimneys of houses overturned, the buildings dismembered ... »—(Pascal Lamarche, priest of Abolens).

Petit-Hallet: « We felt an earth tremor ... with violence and a frightful noise, which overturned a part of chimneys above the roofs and cracked most of the walls of the houses in the village. Some of them need to be rebuilt at new ... »—(Letter of the burgomaster of Petit Hallet to the province governor, 30 September 1828).

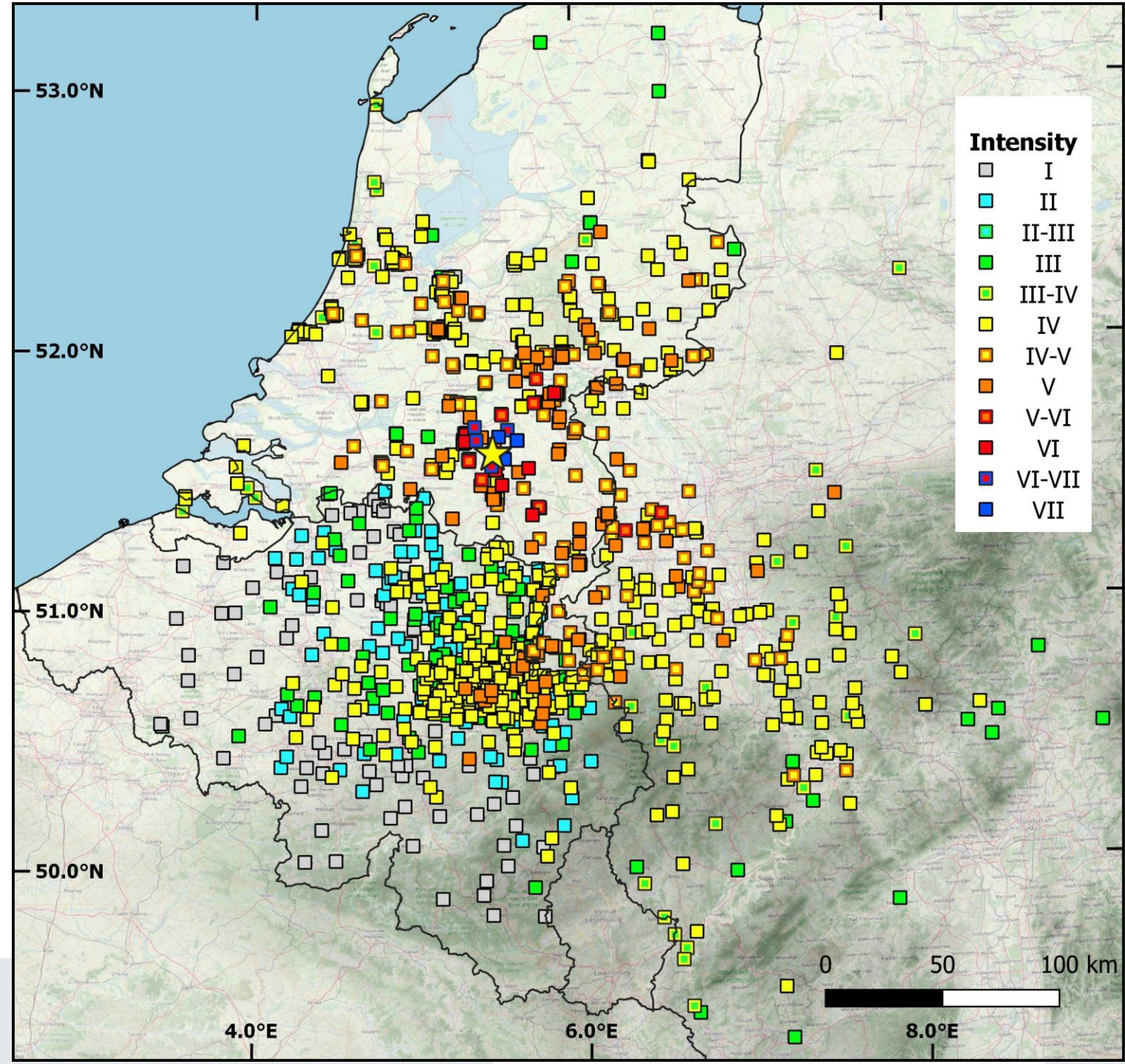
We also estimated intensity as VII in Tienen: « ... a large number of chimneys were overturned, the walls of several houses were cracked [burst] ... »—(La Gazette

Camelbeeck et al. 2021

1932 Uden (NL) Aardbeving ML5.0

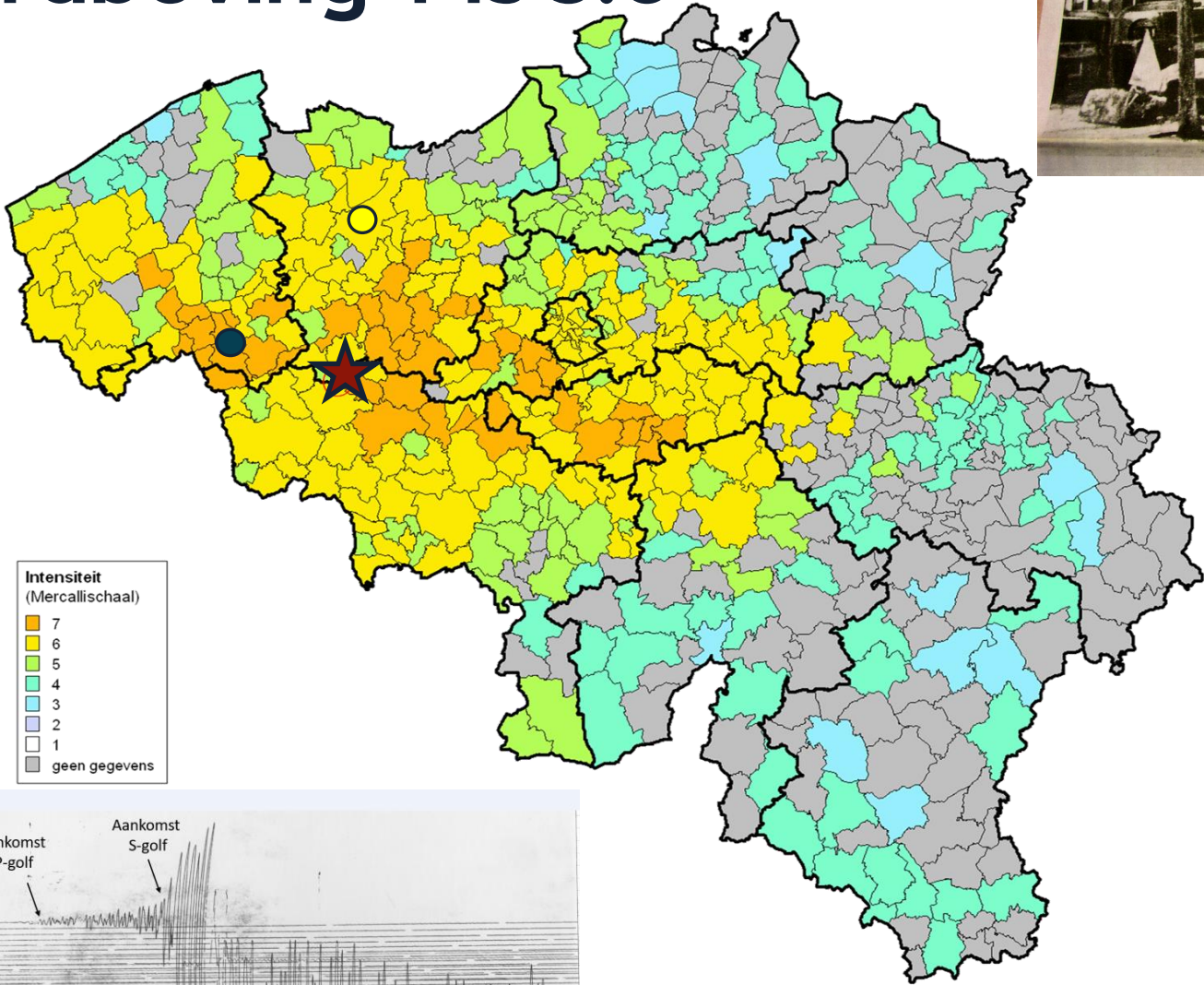
Questionnaire.

1. A small number of residents, especially those on the upper floors, noticed shaking and rumbling like that caused by a speeding truck.
2. A large number of people noticed a shaking of furniture, a collision of close together glasses or other kitchen utensils, the vibration of windows and doors, the creaking of wooden floors and ceilings. A rather violent dull rumbling accompanied the shock. A certain number of people were awakened.
3. The shock was felt by people, who were outside their homes. Inside, everyone sensed it, due to the shaking of the entire building. People had the impression that a heavy speeding car had hit the house, or that a heavy object had fallen over in one of the places. People rocked on chairs or in bed, etc. Free hanging objects started swaying; light objects were moved; objects fell off furniture. Doors and windows slammed; windows were broken. All the people were awakened from their sleep. Some startled persons ran from their homes.
4. Frames fell from the walls; kitchen utensils were broken; furniture was moved; small furniture was knocked over. Small chunks of plaster fell from ceilings and walls. A large number of people hurriedly left their homes; some of them felt they were going to fall.
5. In the houses, heavy pieces of furniture were knocked over; the plaster fell from the ceilings. Chimneys collapsed; walls cracked; landslides occurred along slopes or embankments.



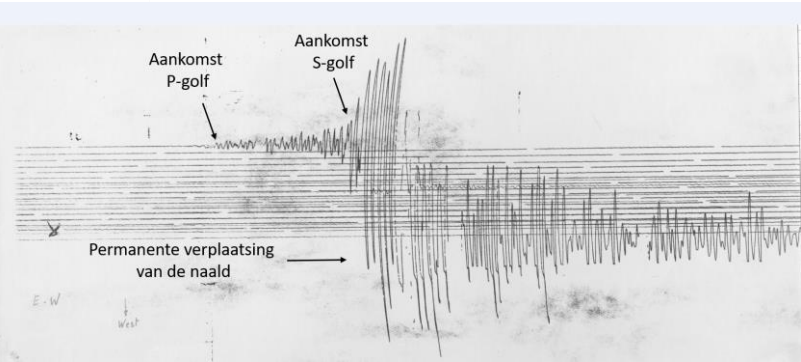
1938 Zulzeke-Nukerke Aardbeving-Ms 5.0

- I – Niet gevoeld
- II – Nauwelijks gevoeld
- III – Zwak
- IV – Algemeen waargenomen
- V – Sterk
- VI – Lichte schade veroorzakend
- VII – Schade veroorzakend
- VIII – Zware schade veroorzakend
- IX – Destructief
- X – Zeer destructief
- XI – Verwoestend
- XII – Totaal verwoestend



TABEL I. — LIJST DER GEMEENTEN WAAR DE SCHADE HET AANZIENLIJKST WAS.

Plaatsen	Getal der beschadigde schoorsteenen	% t. o. v. het getal huizen	Plaatsen	Getal der beschadigde schoorsteenen	% t. o. v. het getal huizen
West-Vlaanderen			Oost-Vlaanderen		
Aalbeke	55	13,1	Aalst	200	2,8
Diksmuide	50	5,3	Berlare	50	5,0
Gullegem	250	24,5	Denderhoutem	60	6,2
Harelbeke	100	6,0	Denderleeuw	57	6,0
Herzeew	50	4,3	Eine	100	14,7
Heule	300	26,0	Erembodegem	75	5,8
Kortrijk	3000	40,0	Gent	900	2,4
Kuurne	150	12,8	Geeraardsbergen	250	8,3
Lauwe	55	5,8	Hemelveerdegem	20	23,5
Ledege	86	12,3	Idderge	50	18,0
Moeskroen	847	16,2	Kerksken	200	44,4
Moorsele	120	12,2	Ledeberg	66	1,9
Moorlede	200	13,3	Leeuwergem	25	18,0
Oostnieuwkerke	70	12,0	Mere	55	7,1
Outrijve	80	32,0	Mullem	20	15,0
Rekkem	167	48,0	Oostakker	55	5,1
Roeselare	153	3,0	Oudenaarde	130	10,0
Rollege	73	13,7	Overboelare	50	8,2
Sint-Eloois-Vijve	50	15,1	Parike	28	18,7
Sint-Eloois-Winkel	50	9,4	Sint-Lievens-Essche	50	10,2
Waregem	70	3,8	Smeerebbe-Vloegem	18	16,0
Westroozebeke	47	10,4	Wetteren	118	3,4
Wevelgem	225	13,5			
Zwevege	233	19,4			



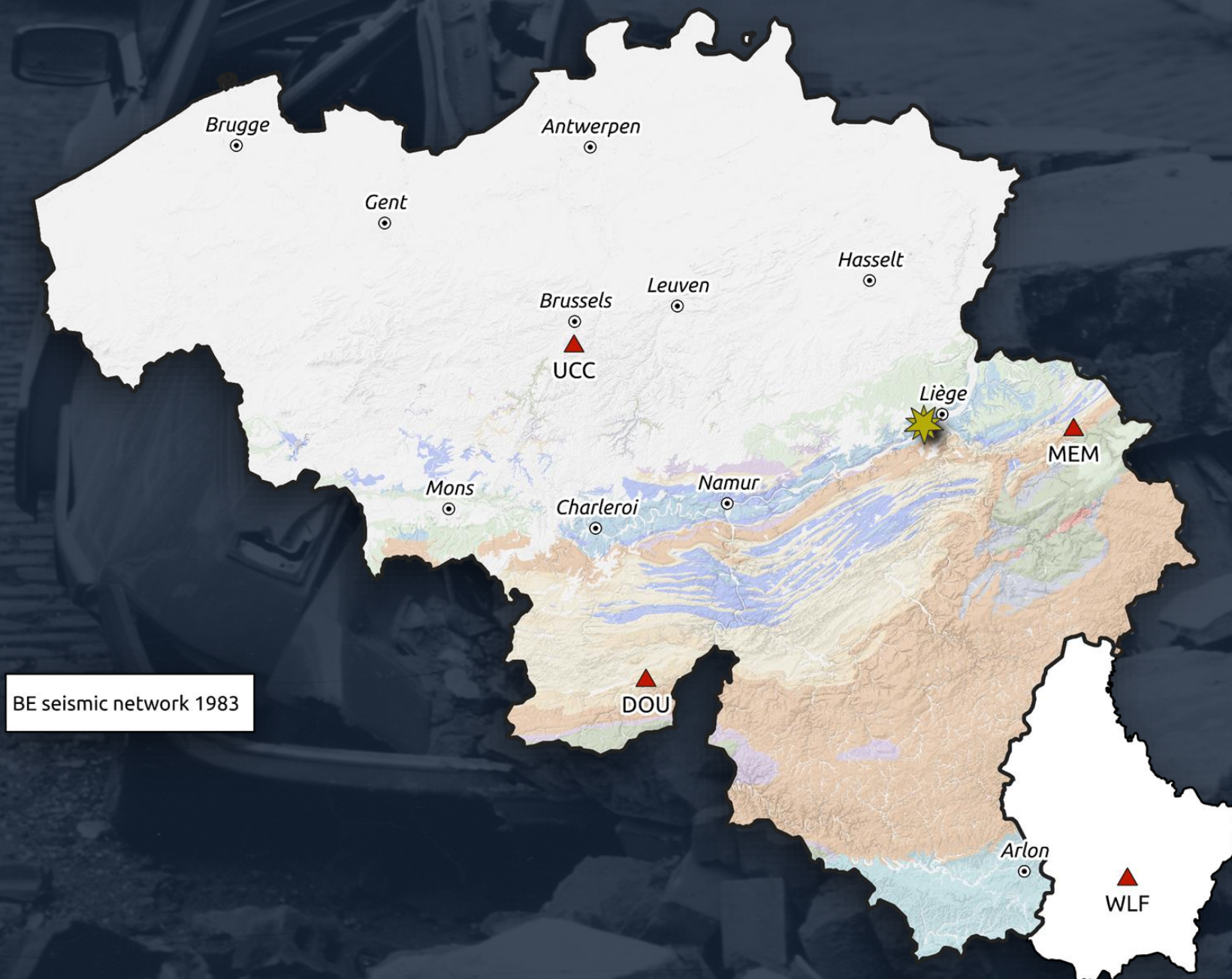
40
YEAR
COMMEMORATION

LIÈGE 83

8 November 1983

8 November 2023

BE seismic network 1983



Telegramm

Deutsche Bundespost

Verzögerungsvermerke

Datum 8.11.1983	Uhrzeit 0815	TSt Bergisch Gladbach 1	Leitvermerk 1. Vermerk 815 2. Vermerk 820 825 835	Datum	Uhrzeit
Empfangen	Empfangen von			Gesendet	Namenszeichen
Platz	Namenszeichen			Platz	

ZCZC 001 2/5986 BRUXELLES TLXN44/41-8 0733 AMPLIATION

QUS

Dienstliche Vermerke/Rückfragen

URGENT TEL(02204)81343

ERDBABENSTATION

VINZENZ PAPLOTTI FTRASSE 26

5060BENSBERG

VERY URGENT BELGIAN EARTHQUAKE (LIEGE) NOVEMBER 8 1983 OH 49M 32S
(ORIGIN TIME) DATA UCC PG OH 49M 48.1S D (+2 AFTERSHOKS)

HL = 4.9 PLEASE SEND DATA VERY URGENT

TH CAMELBEECK ORB

COL URGENT TEL(02204)81343-26 5060BENSBERG-8 1983 OH 49M 32S OH 49M

48.1S D (+2 4.9 ERSTE UEBERMITTLUNG AN8849A BGB1 D

NNNN

4.81/654

2205

937 210 099 J. C. C. Bruns
TO April 11 A5, KL 36 from

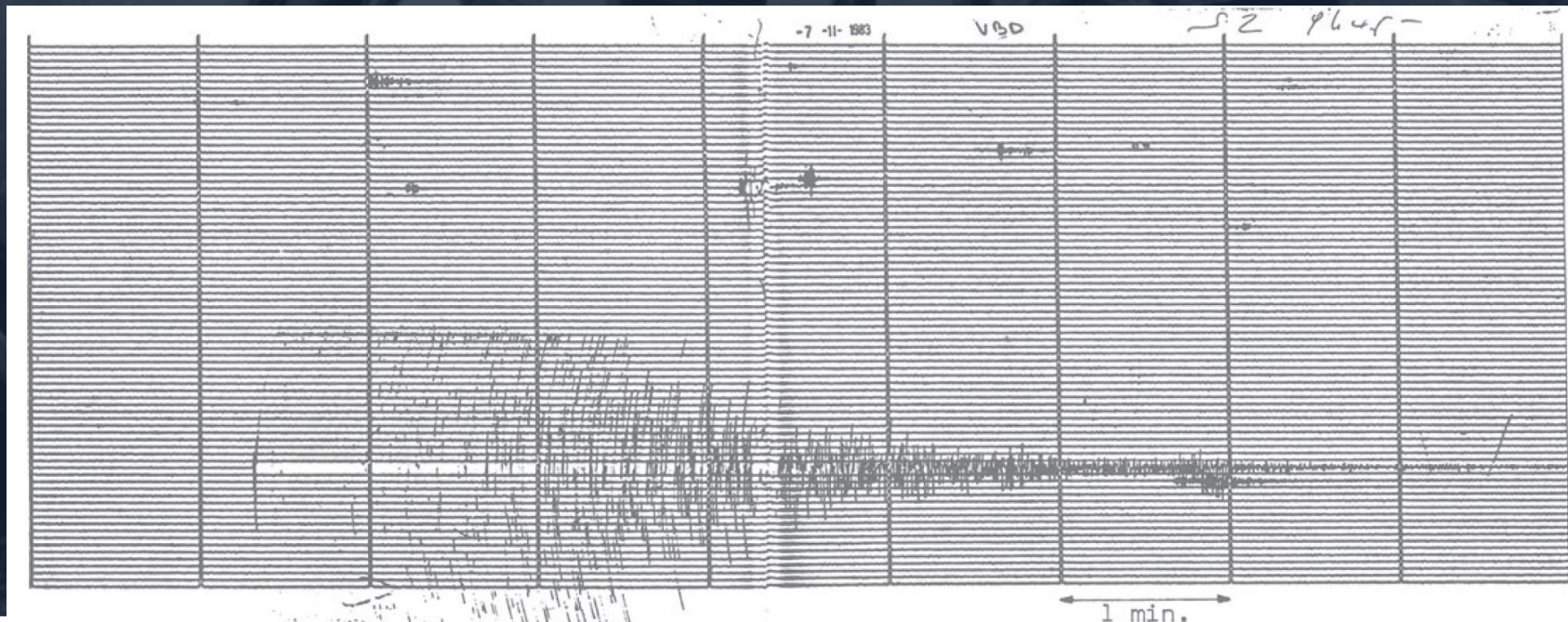
40
YEAR
COMMEMORATION
LIÈGE 83

PHASE 1 - EMERGENCY

- **NO ALERT SYSTEM:** Awakened around **4 a.m.** by the Observatory Director, Paul Melchior, who was contacted by the Liège authorities
 - **Present** at the Observatory **20 minutes later**
 - **NO POSSIBILITY TO LOCATE, ONLY MAGNITUDE EVALUATION**
1. Necessity to confirm that the event is an EARTHQUAKE
 2. Provide first location and magnitude (Bensberg and CSEM)
 3. Liaison with local, provincial and national authorities by the ROB Director, with support from the ROB administration

PHASE 2 - ORGANIZING DATA COLLECTION

- Collection of seismograms at **DOU**, **MEM** and **WLF**: carried out by ROB staff from outside the seismology group



PHASE 2 - ORGANIZING DATA COLLECTION

Intensity data !



OBSERVATOIRE ROYAL DE BELGIQUE

COMMUNE : Liège Tremblement de Terre du 8-11-1963
PROVINCE : Liège 3h13m

QUESTIONNAIRE

SF-MD-II-VI
A₁(H), B, D, E, F₁

- 1.- Quelques habitants ont-ils perçu :
des vibrations légères Oui
un bruit caractéristique : grondement ou roulement Oui
- 2.- De nombreux habitants ont-ils perçu :
un ébranlement net de l'immeuble Oui
un fort grondement Oui
- 3.- A-t-on observé :
l'oscillation de lustres ou d'objets suspendus librement Oui
l'oscillation de chaises ou de lits Oui
le craquement des plafonds Oui
le réveil de dormeurs Oui
- 4.- A-t-on observé ou constaté :
le frémissement de vitres et de portes Oui
le tremblement d'objets mobiliers (tables, vases, bibelots...) Oui
- 5.- le choc de verres, de vaisselle dans les buffets Oui
l'oscillation de cadres suspendus au mur Oui
le craquement des planchers Oui
la chute de petits fragments de crépis des plafonds Oui
un émoi des habitants (des personnes sortent des habitations) Oui
- 6.- A-t-on constaté :
le déplacement de bibelots Oui
le déplacement d'objets légers, lesquels ? Oui
la chute de cadres pendus au mur Oui
la chute d'objets légers posés sur des meubles polis ou un marbre Oui
des vitres fêlées ou brisées Oui
des objets de vaisselle brisés. Oui
- 7.- Des objets légers (vases, pots de fleurs,...) se sont-ils renversés Oui
Des meubles légers se sont-ils déplacés Oui
Des meubles lourds (bahuts, poêles,...) ont-ils vibré Oui
Des cloches ont-elles tinté Oui
- 8.- Des meubles lourds se sont-ils déplacés Oui
Des meubles légers se sont-ils renversés Oui
Des portes ont-elles été déplacées sur leurs gonds Oui
- 9.- A-t-on constaté :
la chute de morceaux de plâtres des plafonds Oui
des fissures dans les plâtres des murs Oui
une chute exceptionnelle d'une cheminée en mauvais état Oui
une chute exceptionnelle de quelques briques Oui
- 10.- Y a-t-il eu plusieurs cheminées endommagées, combien ?
plusieurs cheminées renversées, combien ? % pour la commune ?
des chutes d'ornements de façades, de quelle importance ?
des lézardes profondes dans les murs (brique ? béton ?)
des glissements le long des berges ou des talus, impor-

OBSERVATIONS COMPLEMENTAIRES :

N.B.- Si l'on n'a rien observé dans la commune, veuillez renvoyer ce questionnaire avec la mention "NEANT"; ces renseignements sont indispensables pour délimiter les zones de silence et la limite d'extinction.

VILLE DE LIÈGE



LE BOURGEMESTRE

AVEC MES COMPLIMENTS

EDOUARD CLOSE

HÔTEL DE VILLE

4000 LIÈGE

The background of the slide is a dark, blue-tinted photograph of a multi-story building. The entire facade of the building is covered in a dense, complex network of white wooden scaffolding, suggesting a major renovation or reconstruction project. The scaffolding consists of numerous vertical and diagonal beams, creating a grid-like pattern over the building's structure.

40 YEAR
COMMEMORATION
LIÈGE 83

Social Reactions & Damage

LIÈGE
8 novembre 1983

LUIK
8 november 1983



Hundreds of fallen chimneys 2 direct casualties

Damages





Fall of decoration stones



Cinema Palace at Pont d'Avroy



Fall of decoration stones

Quai de Rome



Liege - Rue de la Régence



House
in Montegnée



St Gilles Church

Separation of façade wall from interior walls and floors, Affects hundreds of houses

Damages - In-plane action effect in masonry walls



Montegnée
&
Rue du Laveu



Separation of façade wall from interior walls and floors, Affects hundreds of houses

Damages - Out of plane action effect in masonry houses



Separation of façade walls $\Rightarrow$ Roof losing support

Damages - Out of plane action effect in masonry houses



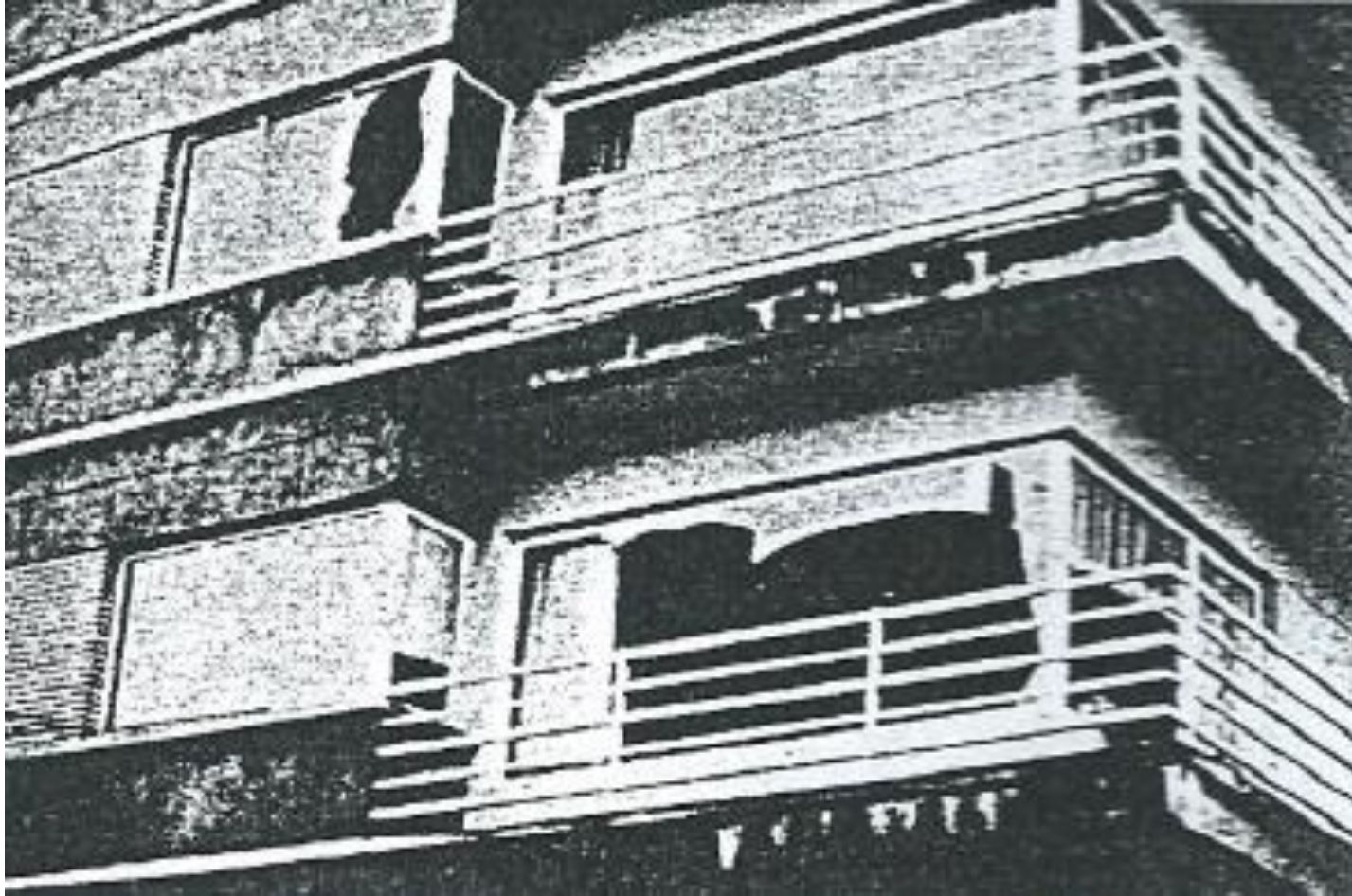
Rue du Laveu



Montegnée

Shear cracks with inclination at $\approx 45^\circ$

Damages - In-plane action effect in masonry walls



Quai de Rome, Liège

Glass failure

Damages - In-plane action effect in windows



40
YEAR
COMMEMORATION

LIÈGE 83

Post Earthquake Actions



Immediate action

Stabilization of façade walls

Post Earthquake Actions

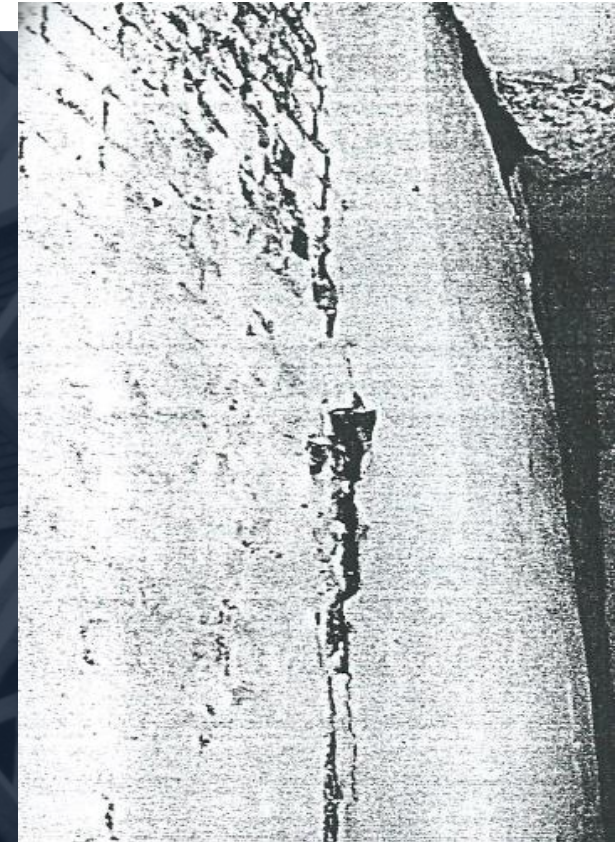
Separation of
chimney masonry
ducts from wall

Life safety

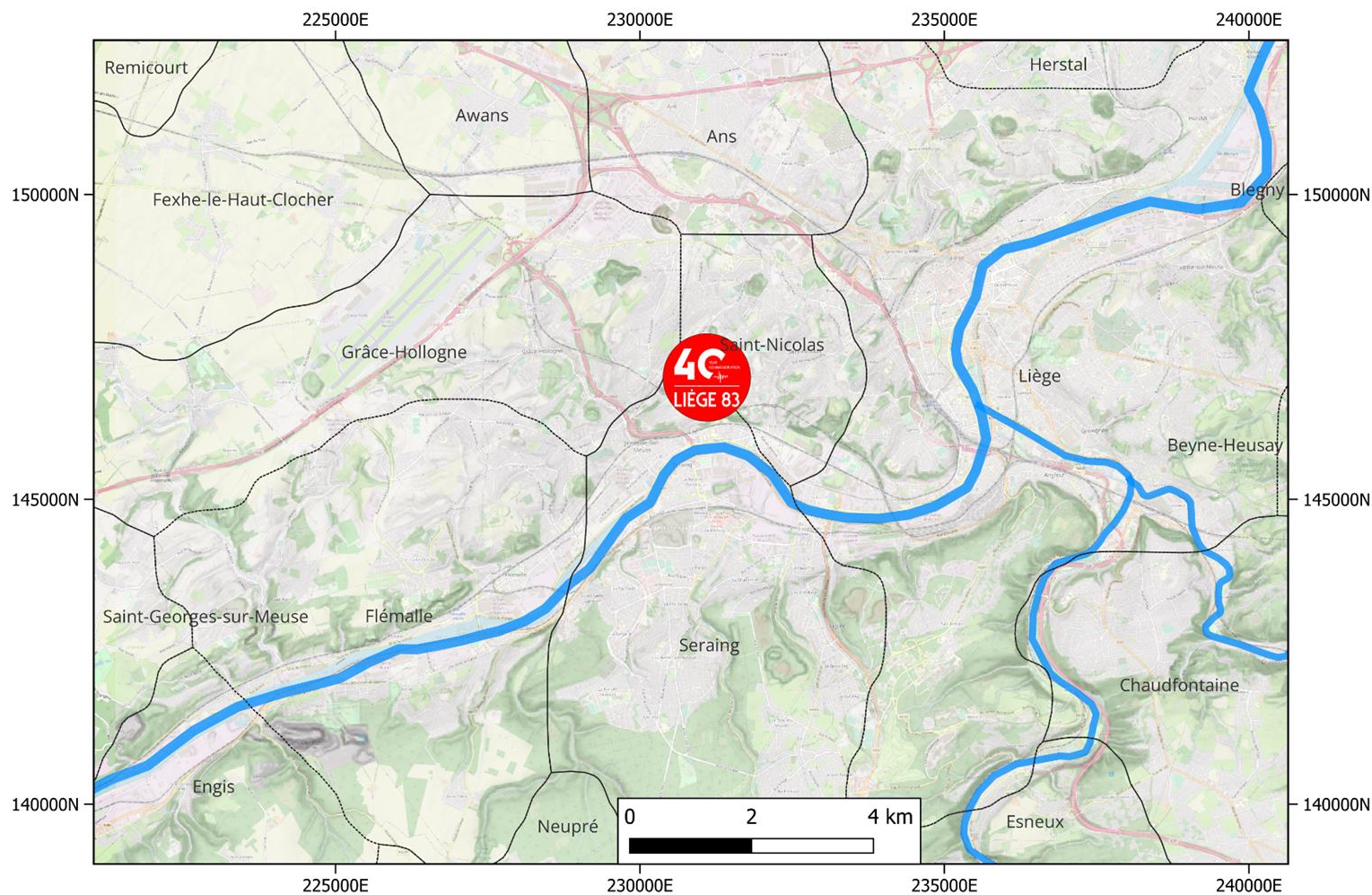
- Detection of CO – CO₂ leaks at masonry chimneys by the Fire Brigade
- Checks of stability by Service Sécurité Salubrité Ville de Liège

Repairs

- On private basis for housing
- Evaluation of damages and repair costs
- Financial Interventions of Insurance Companies & Calamity Fund

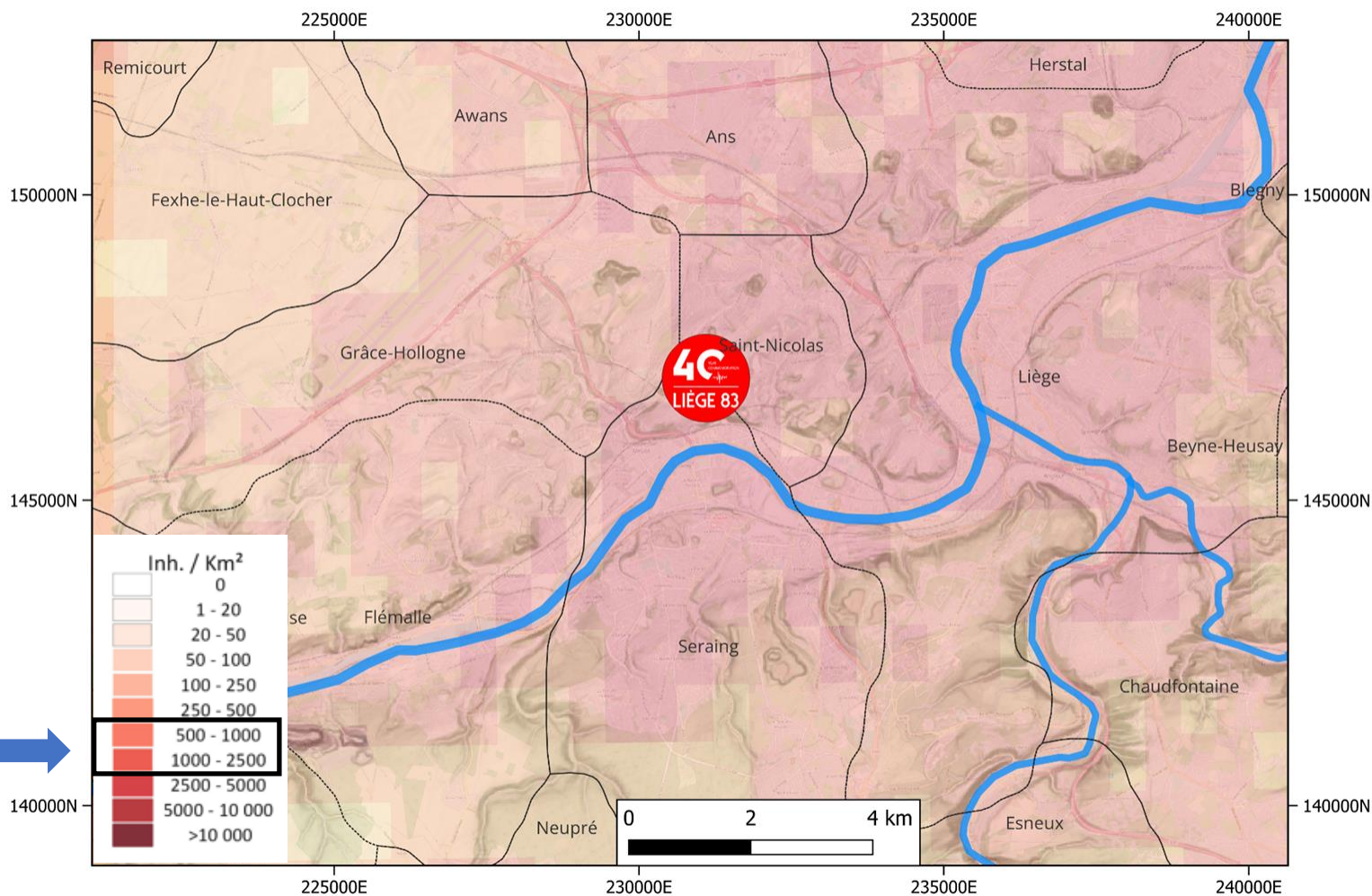


Liège

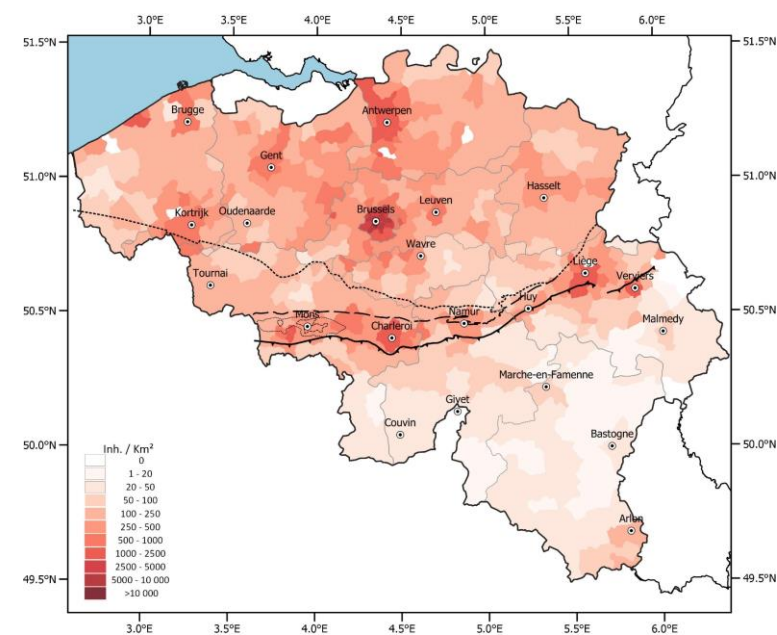


- Communes
- Epicenter in Saint-Nicolas

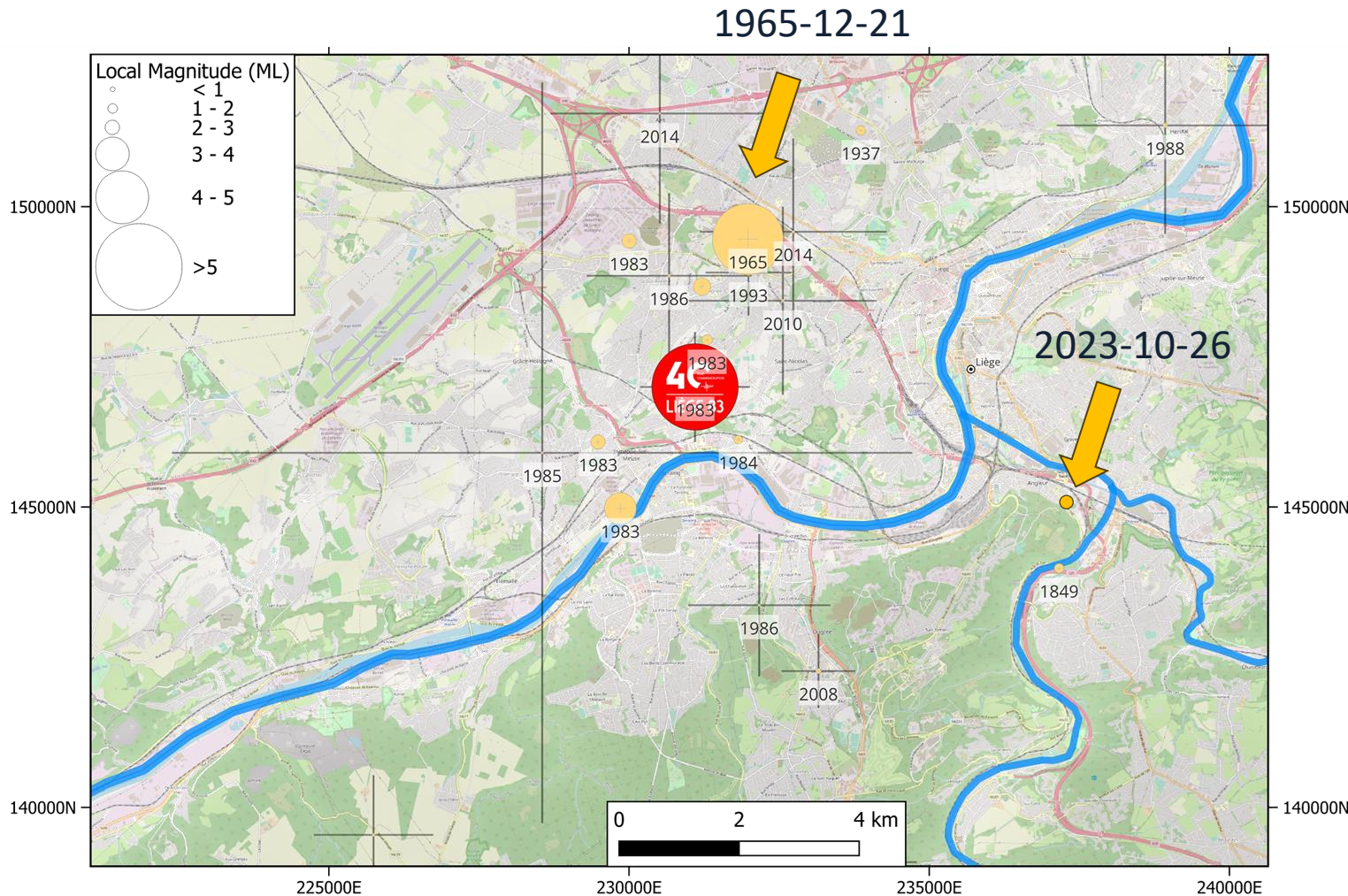
Liège



- Communes
- Epicenter in Saint-Nicolas
- Densely populated
~500 – 2500 inh./km²



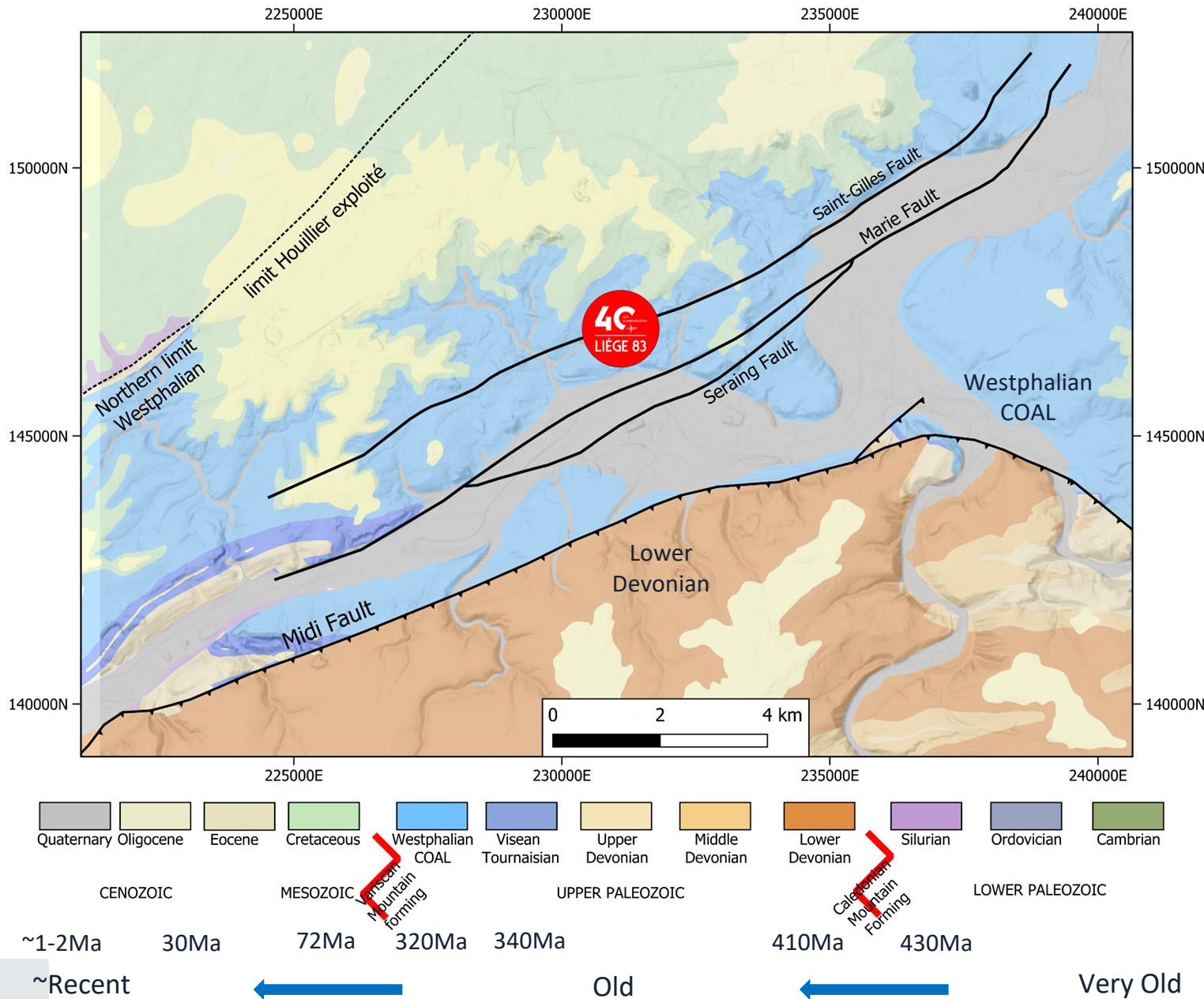
Earthquakes



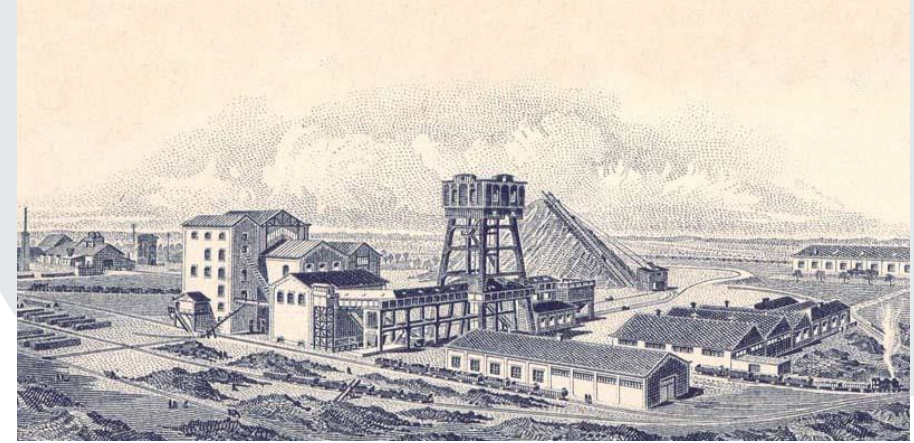
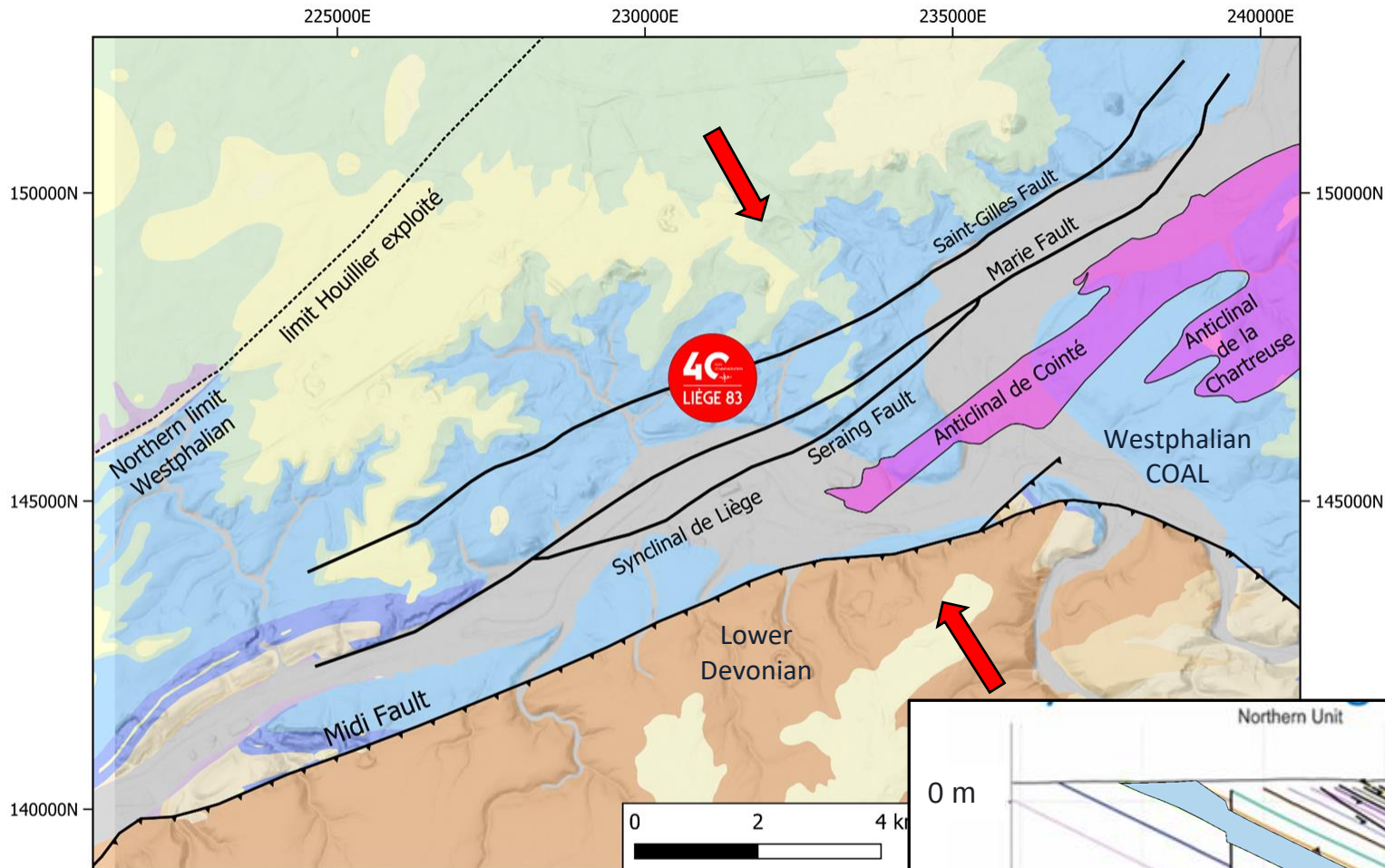
- Communes
- Epicenter in Saint-Nicolas
- Densely populated
- One other **earthquake** near Liège before 1983
ML4.3
1965-12-21
7 km depth
- 2 yrs of Aftershocks

At least 12 aftershocks with $ML \geq 1.9$ until January 1985, 7 of which were **felt**

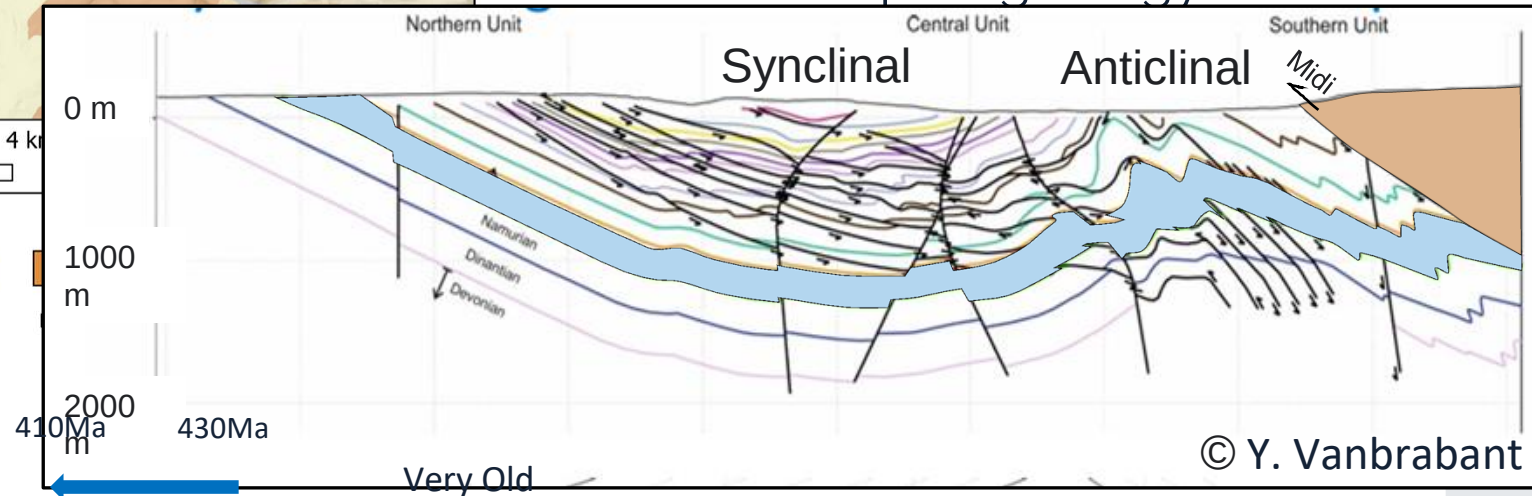
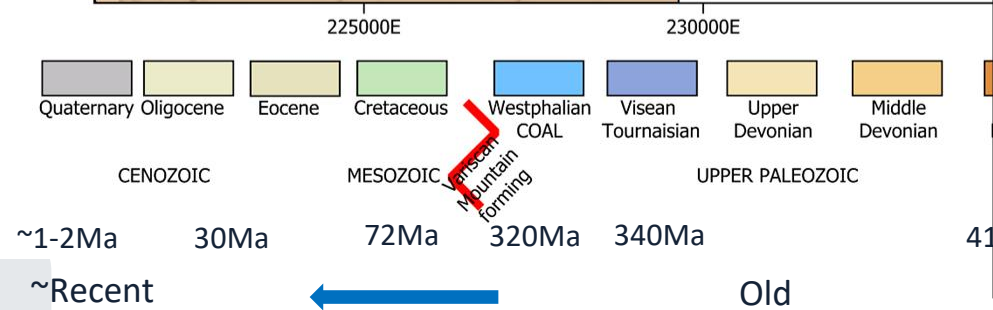
Liège geology



- Communes
- Epicenter in Saint-Nicolas
- Densely populated
- One other earthquake near Liège before 1983
- Complex geology
- **Faults** in Westphalian known from coal mining until 2-3 km



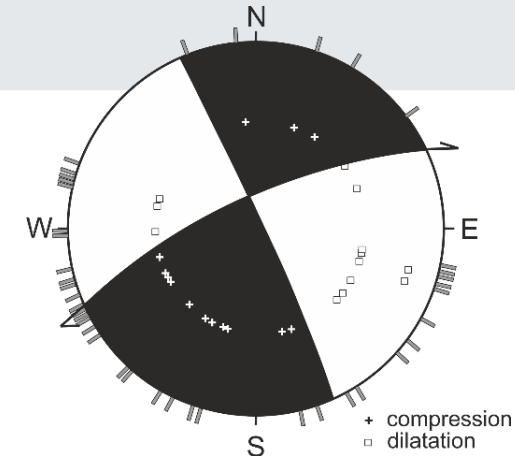
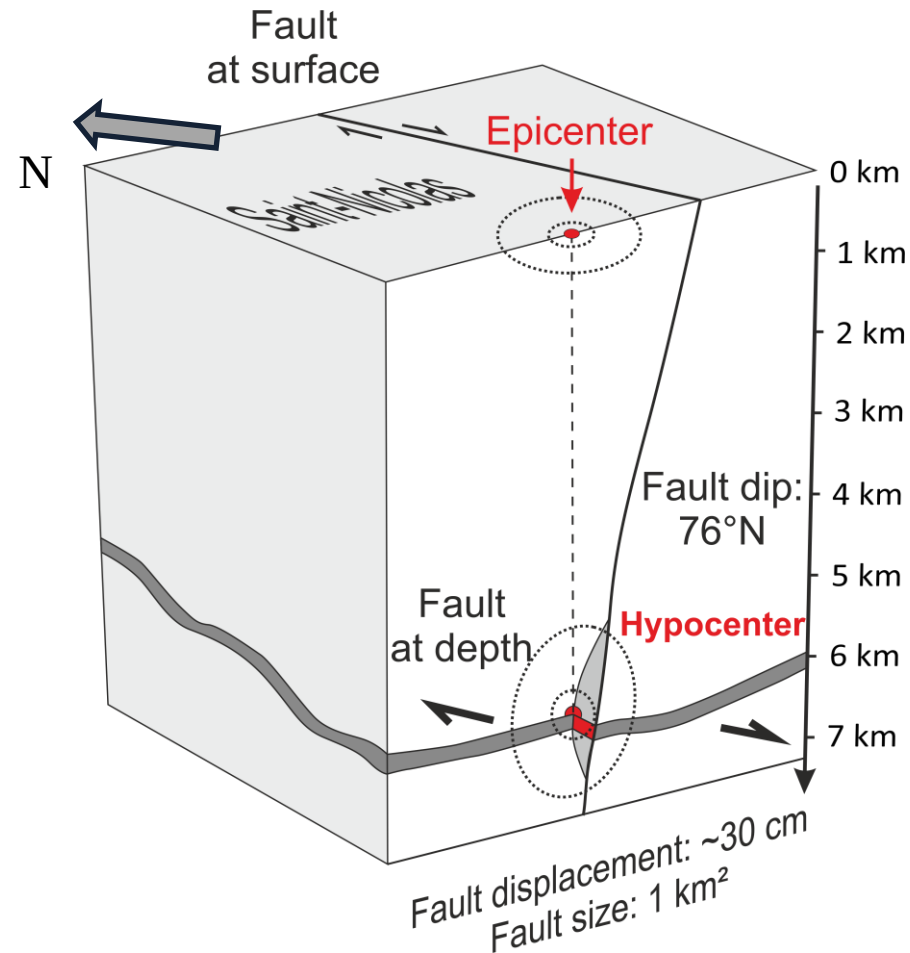
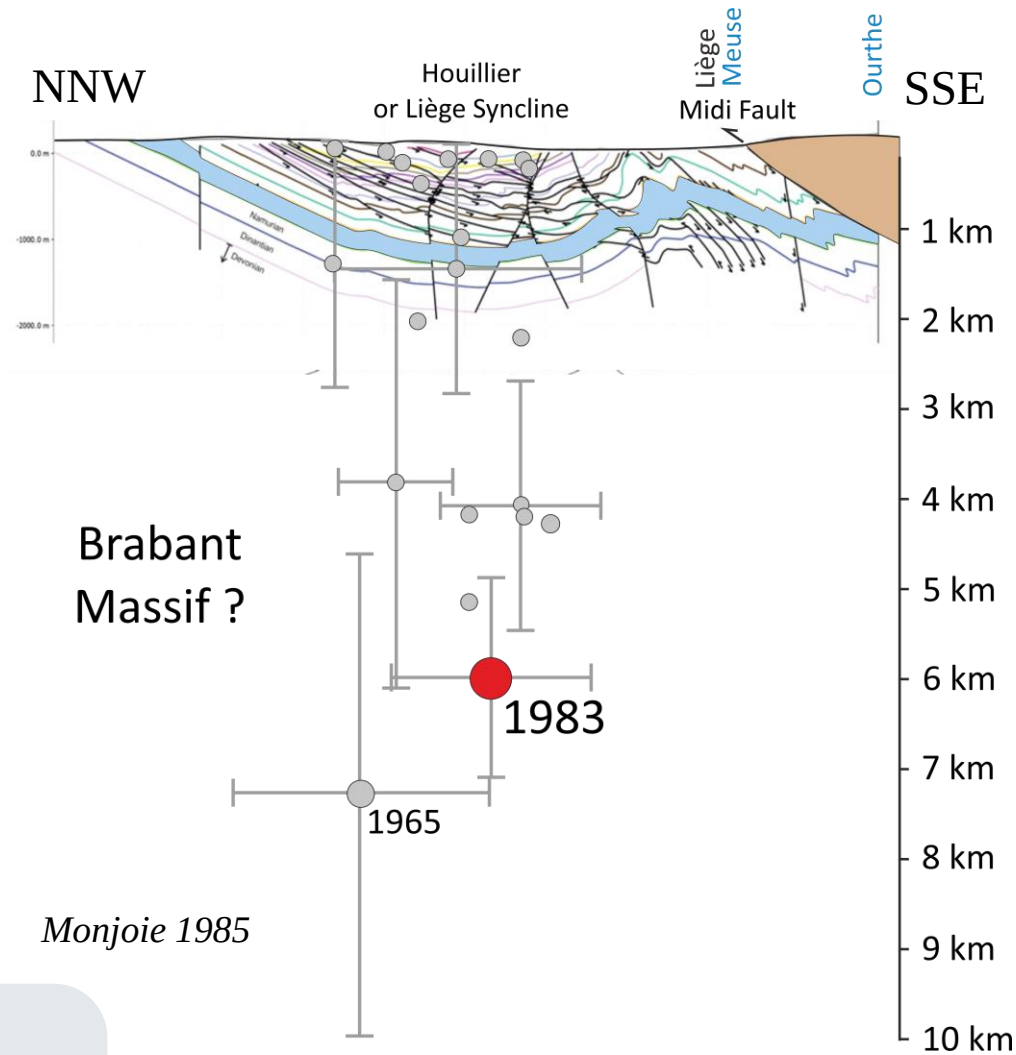
- Communes
- Epicenter in Saint-Nicolas
- Densely populated
- One other earthquake near Liège before 1983
- Complex geology



© Y. Vanbrabant

"Aftershocks and focal mechanism suggest link with NE-SW oriented dextral strike-slip faults "

Earthquake mechanism



Impact & Damage

Logement interdit Pour cause d'INSÉCURITÉ

Par Arrêté du Bourgmestre
en date du 11-01-1984

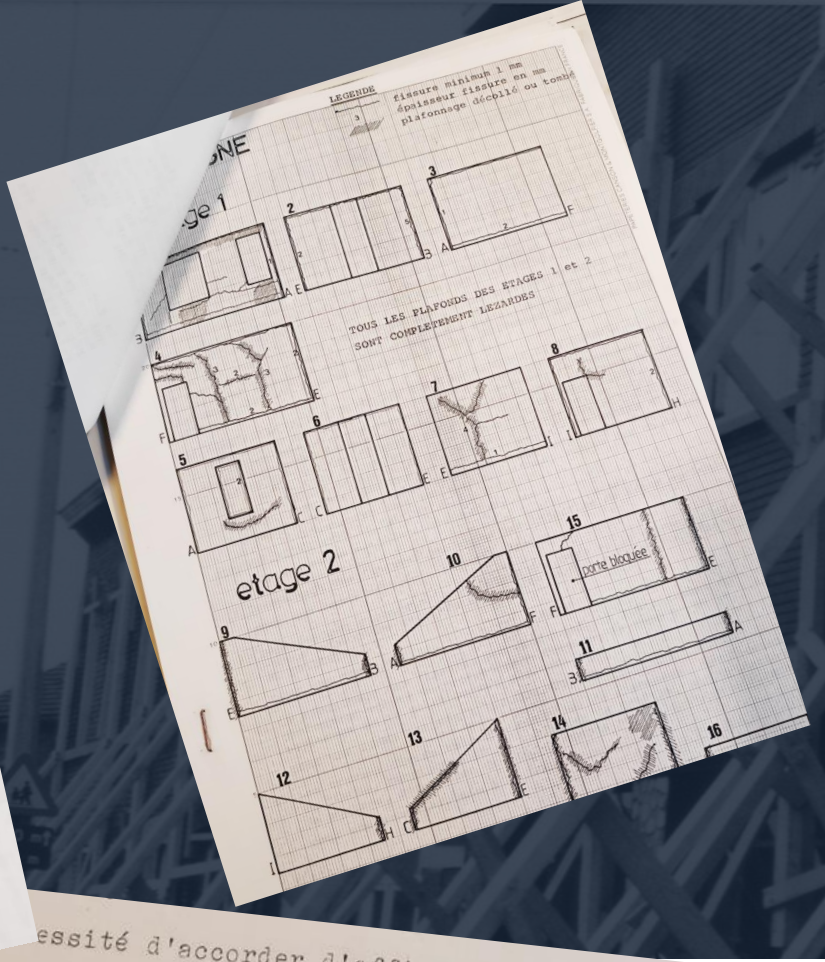


nécessité d'accorder d'office une avance;

considérant qu'il résulte d'un examen sommaire que les dommages suivants
peuvent être pris en considération en vue de l'octroi d'une avance :

Montant du dommage par catégorie : A. 700.000 Frs
C. 2.000.000 Frs
Remploi pour un montant de : A. 8.400 Frs
C. 1.261.673 Frs

Compte tenu des éléments se trouvant momentanément dans le dossier et
données résultant des examens,



COMMUNE : Liège Province : Saint-Nicolas Tremblement de Terre du :

QUESTIONNAIRE

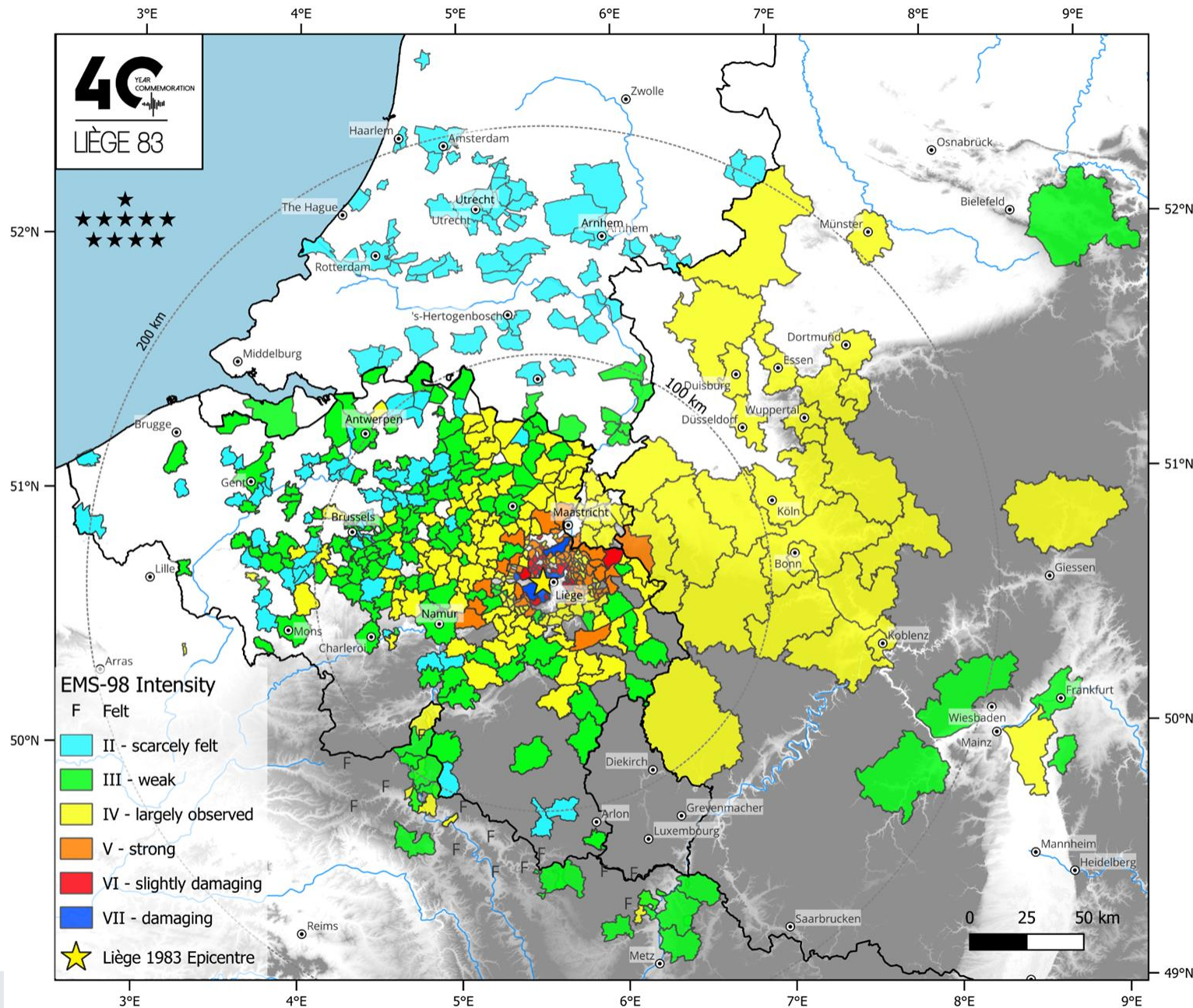
2265 8-11-1983

- 1.- Quelques habitants ont-ils perçu :
 - ☒ des vibrations légères
 - ☒ un bruit caractéristique : grondement ou roulement
- 2.- De nombreux habitants ont-ils perçu :
 - ☒ un ébranlement net de l'immeuble
 - ☒ un fort grondement
- 3.- A-t-on observé :
 - ☒ l'oscillation de lustres ou d'objets suspendus librement
 - ☒ l'oscillation de chaises ou de lits
 - ☒ le craquement des plafonds
 - ☒ le réveil de dormeurs
- 4.- A-t-on observé ou constaté :
 - ☒ le frémissement de vitres et de portes
 - ☒ le tremblement d'objets mobiliers (tables, vases, bibelots...)
- 5.- ☒ le choc de verres, de vaisselle dans les buffets
- ☒ l'oscillation de cadres suspendus au mur
- ☒ le craquement des planchers
- ☒ la chute de petits fragments de crépis des plafonds
- ☒ un émoi des habitants (des personnes sortent des habitations)
- 6.- A-t-on constaté :
 - ☒ le déplacement de bibelots
 - ☒ le déplacement d'objets légers, lesquels ?
 - ☒ la chute de cadres pendus au mur
 - ☒ la chute d'objets légers posés sur des meubles polis ou un marbre
 - ☒ des vitres fêlées ou brisées
 - ☒ des objets de vaisselle brisés.
- 7.- ☒ Des objets légers (vases, pots de fleurs...) se sont-ils renversés
- ☒ Des meubles légers se sont-ils déplacés
- ☒ Des meubles lourds (bahuts, poêles...) ont-ils vibré
- ☒ Des cloches ont-elles tinté
- 8.- ☒ Des meubles lourds se sont-ils déplacés
- ☒ Des meubles légers se sont-ils renversés
- ☒ Des portes ont-elles été déplacées sur leurs gonds
- 9.- A-t-on constaté :
 - ☒ la chute de morceaux de plâtres des plafonds
 - ☒ des fissures dans les plâtres des murs
 - ☒ une chute exceptionnelle d'une cheminée en mauvais état
 - ☒ une chute exceptionnelle de quelques briques
- 10.- Y a-t-il eu plusieurs cheminées endommagées, combien ? ☒ indéterminé
- ☒ plusieurs cheminées renversées, combien ? % pour la commune ?
- ☒ des chutes d'ornements de façades, de quelle importance ?
- ☒ des lézards profonds dans les murs (briques ? béton ?)
- ☒ des glissements le long des berges ou des talus, importance ?

COMPLEMENTAIRES :

Si on n'a rien observé dans la commune, veuillez renvoyer ce questionnaire avec la mention "NEANT"; ces renseignements sont indispensables pour délimiter les zones de silence et la limite d'extinction.

Returned official ROB
letter from Saint-Nicolas



Regional impact

Felt in a radius of > 220 km:

W: Belgian coast

N: Amsterdam

~230 km (Alkmaar)

High rise buildings

S: Metz

~175 km

E: Frankfurt

~270 km (Detmold)

~ Lower Rhine Graben

Felt radius estimated from:

Communal ROB reports

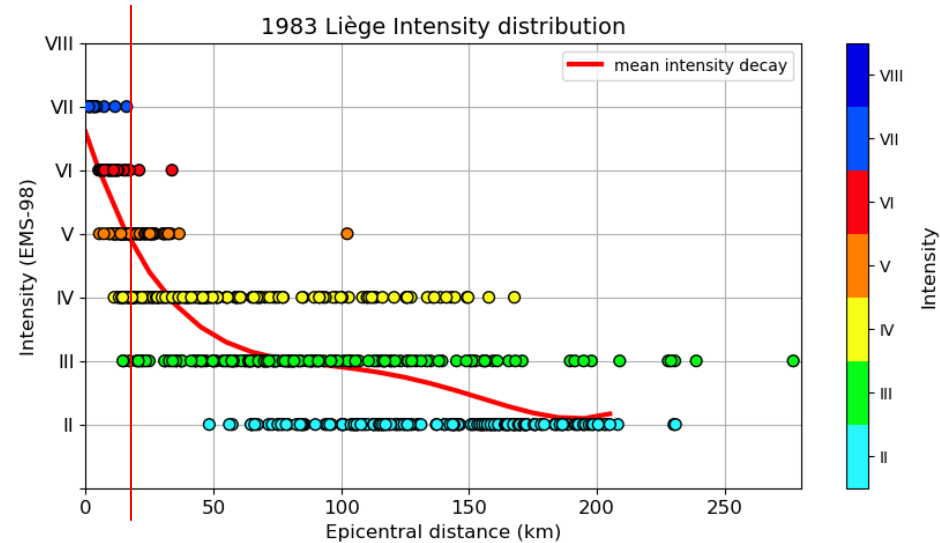
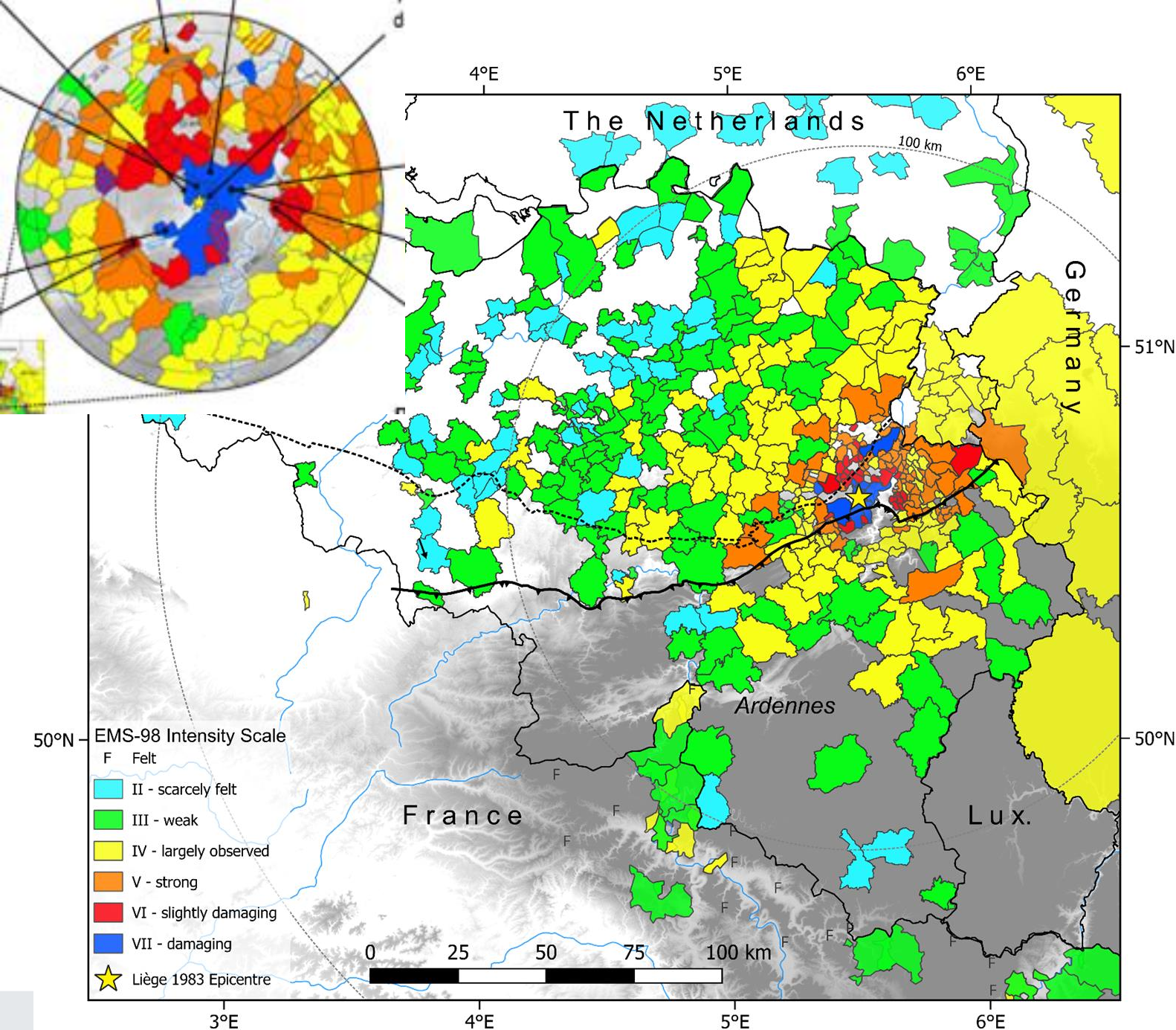
Ahorner (DE, Bensberg)

Houtgast (NL, KNMI)

Vogt (FR, BRGM)

Belgian impact

Felt on the whole Belgian territory
Damaging within a radius of ~20 km

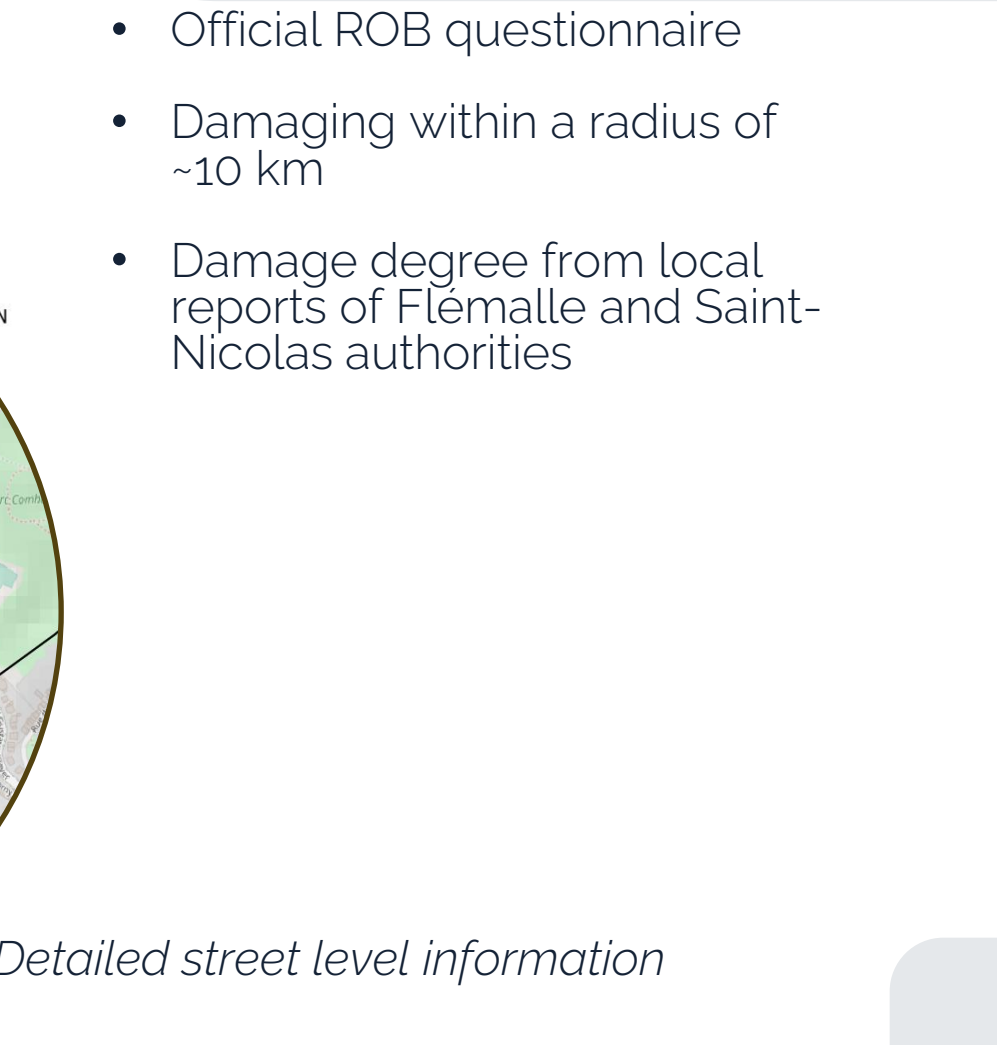


Impact on population and buildings

Recognised as National disaster
& reimbursement by calamity funds
> ~100 M€ (today)

- 1 direct fatality
 - 1 indirect fatality (heart attack)
 - 20 fatalities due to CO poisoning damaged chimneys
 - Tens of people injured
 - > 16,000 buildings damaged
 - > 100 buildings inhabitable
 - > 1000 people homeless
 - “Luckily” occurred in the night...
- **Belgian Calamity Centre:**
 - Reports by 16.000 owners
 - Checked by experts
 - Database not available anymore e.g. by ULiège
 - Information on individual buildings preserved for Saint Nicolas, but lost for Liège
 - Original paper files still available in archives
 - Report of the regional Fire Brigade
 - Report by local authorities of Flémalle

Damage

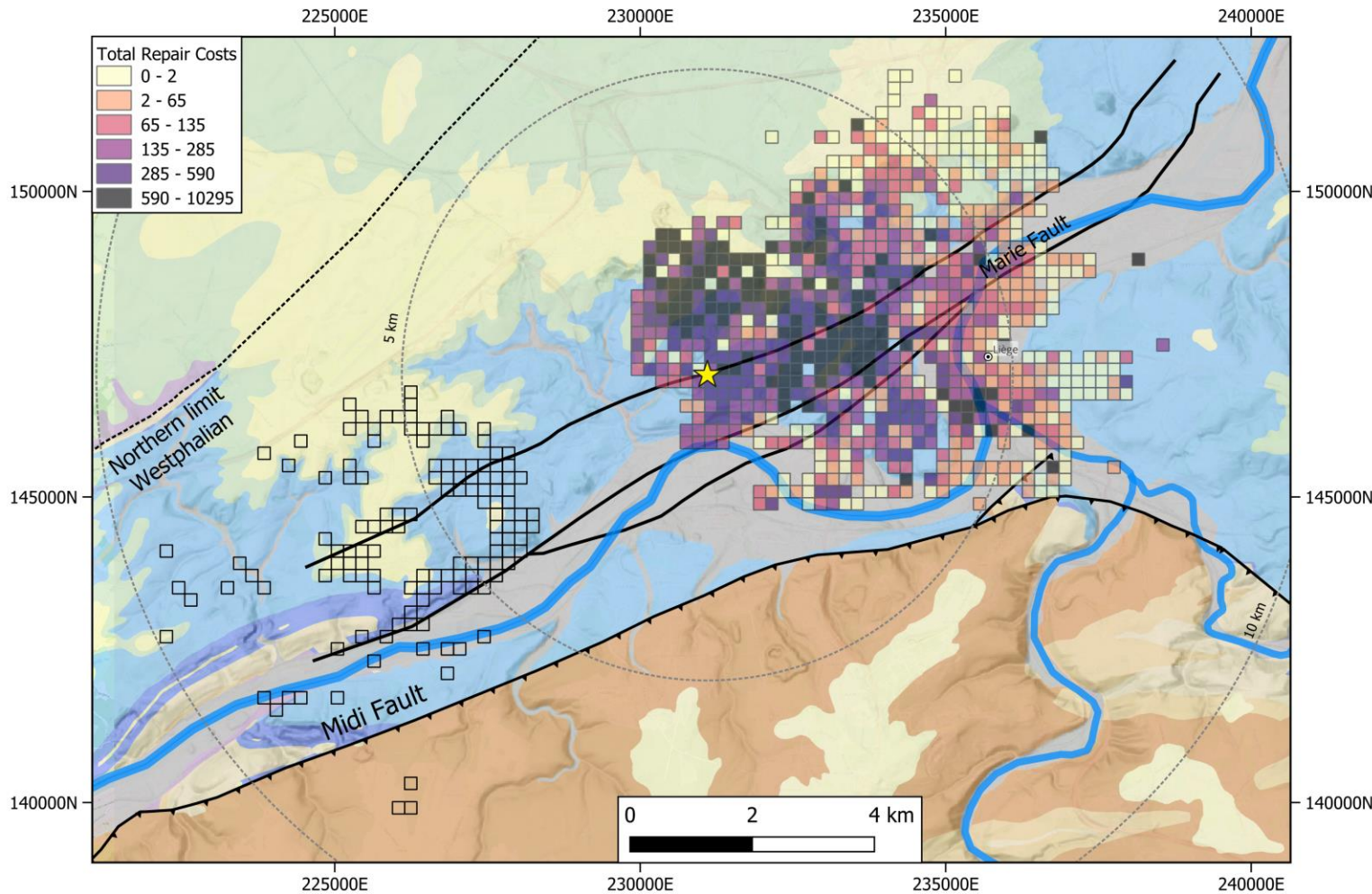


- Official ROB questionnaire
- Damaging within a radius of ~10 km
- Damage degree from local reports of Flémalle and Saint-Nicolas authorities

Data from D. Jongmans (ULiège)

Detailed street level information

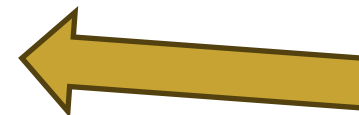
Damage distribution



Data from D. Jongmans (ULiège), Garcia-Moreno & Camelbeeck 2013

"Maximal damage not necessarily above epicenter"

- Official ROB questionnaire
- Damaging within a radius of ~10 km
- Damage degree from local reports of Flémalle and Saint-Nicolas authorities
- National Calamity Funds
- Reparation costs in € (corrected for inflation)
- Total reimbursement costs:
> 100 M€ (today)



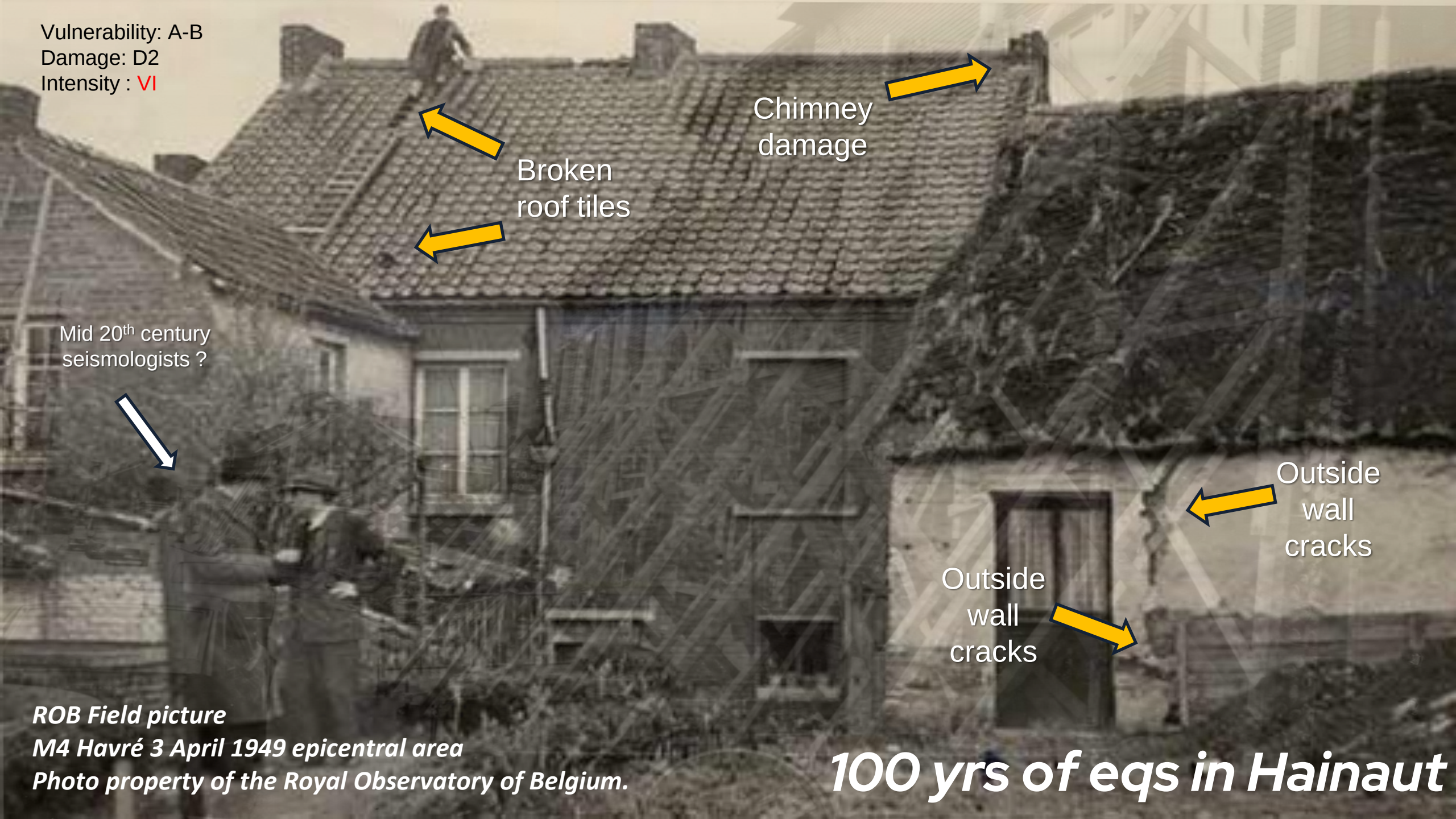


40 YEAR
COMMEMORATION
LIÈGE 83

Natural event?

or related to coal mining ?

Vulnerability: A-B
Damage: D2
Intensity : VI



Broken
roof tiles

Chimney
damage

Mid 20th century
seismologists ?

Outside
wall
cracks

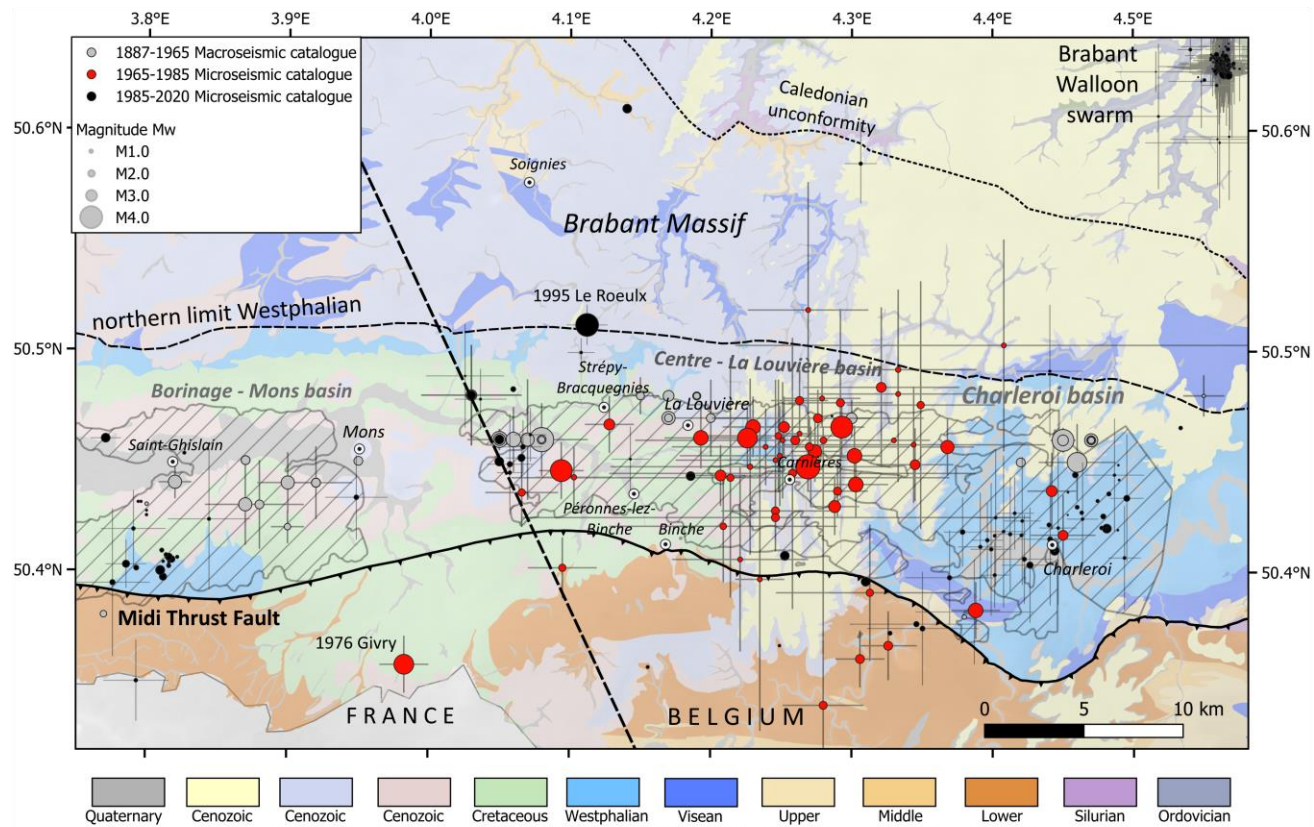
Outside
wall
cracks

ROB Field picture

M4 Havré 3 April 1949 epicentral area

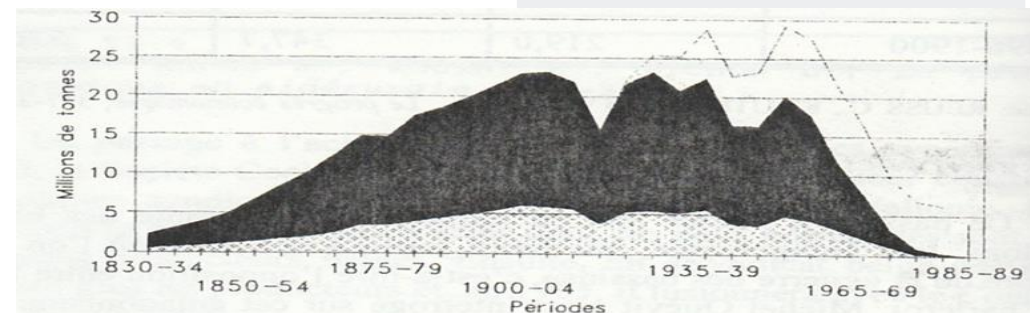
Photo property of the Royal Observatory of Belgium.

100 yrs of eqs in Hainaut

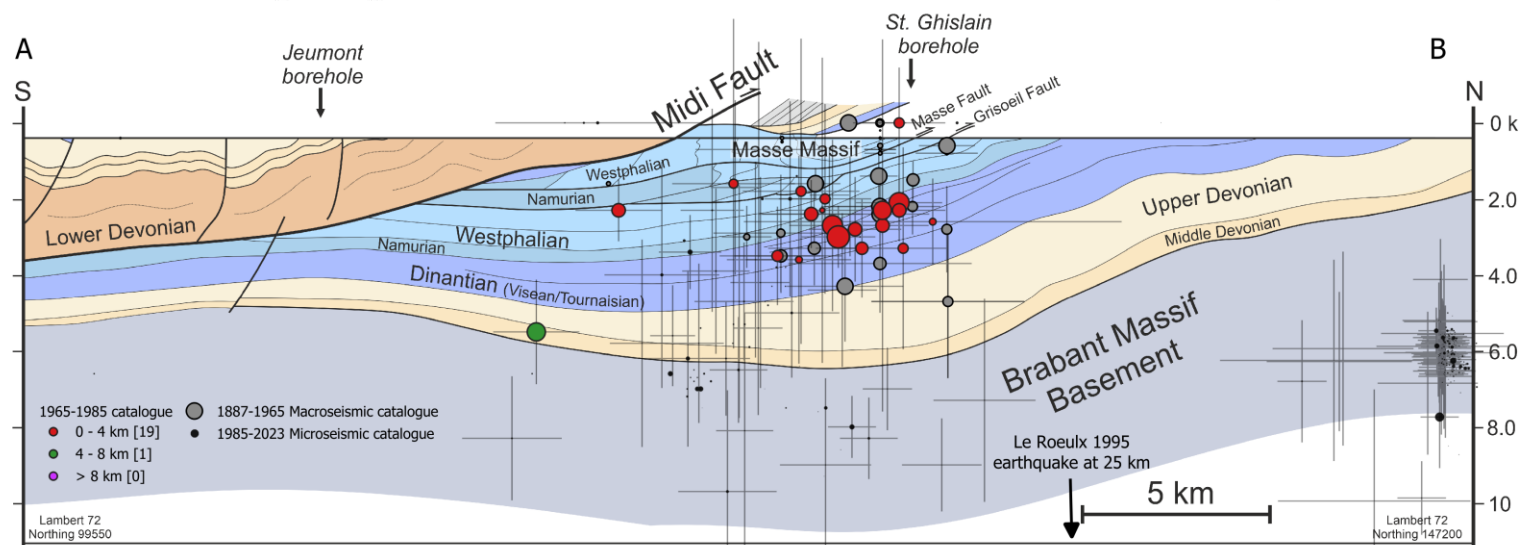
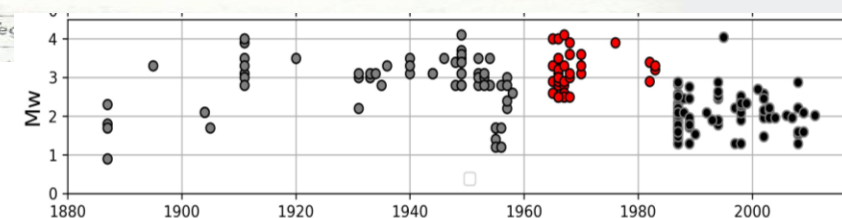


Triggered seismicity ?

40th ANNIVERSARY COMMEMORATION

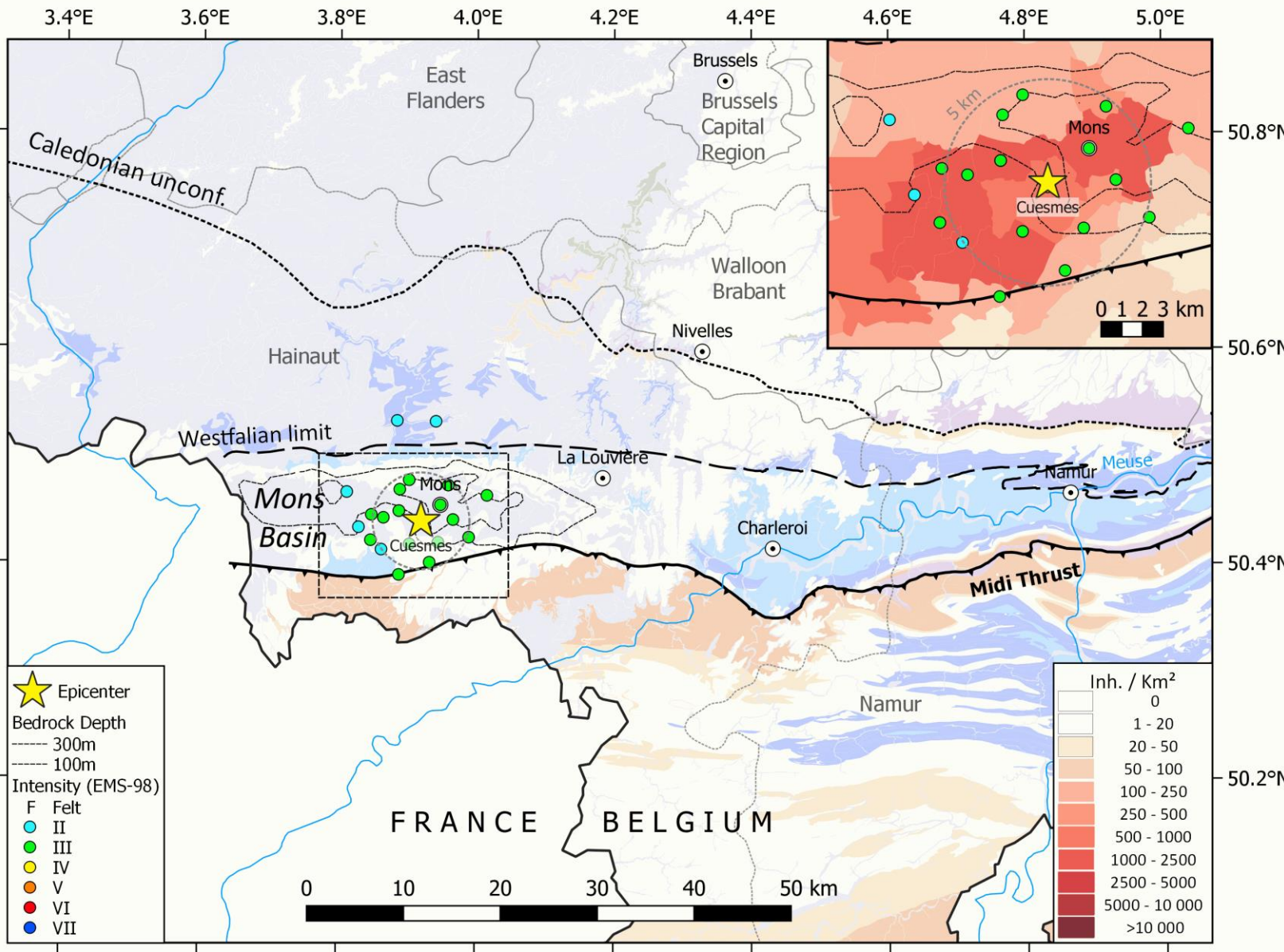


83



*Chère Madame, comme c'est l'habitude chaque année pour
nous inviter à venir toute la famille passer l'après-midi
à la messe à 2 heures.*

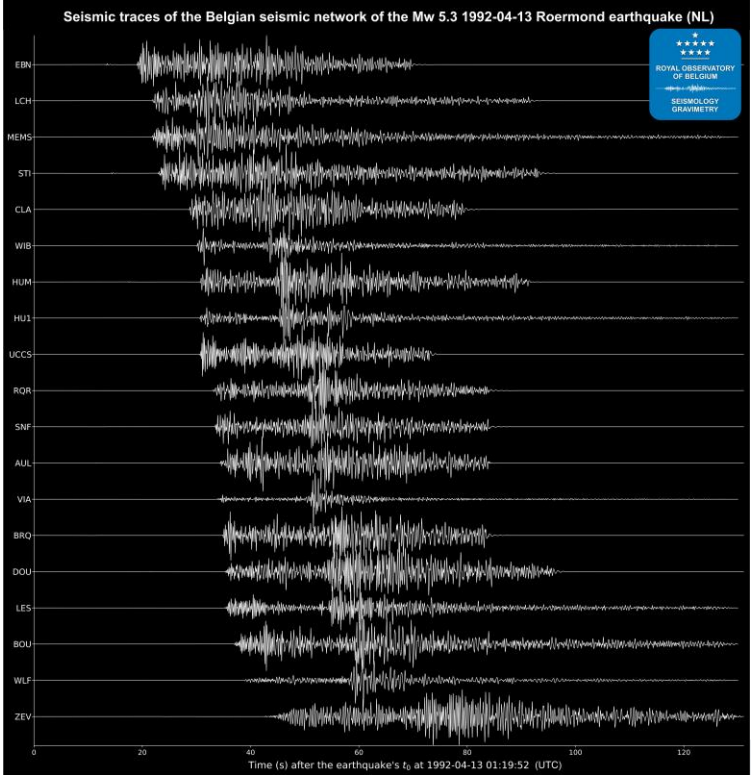
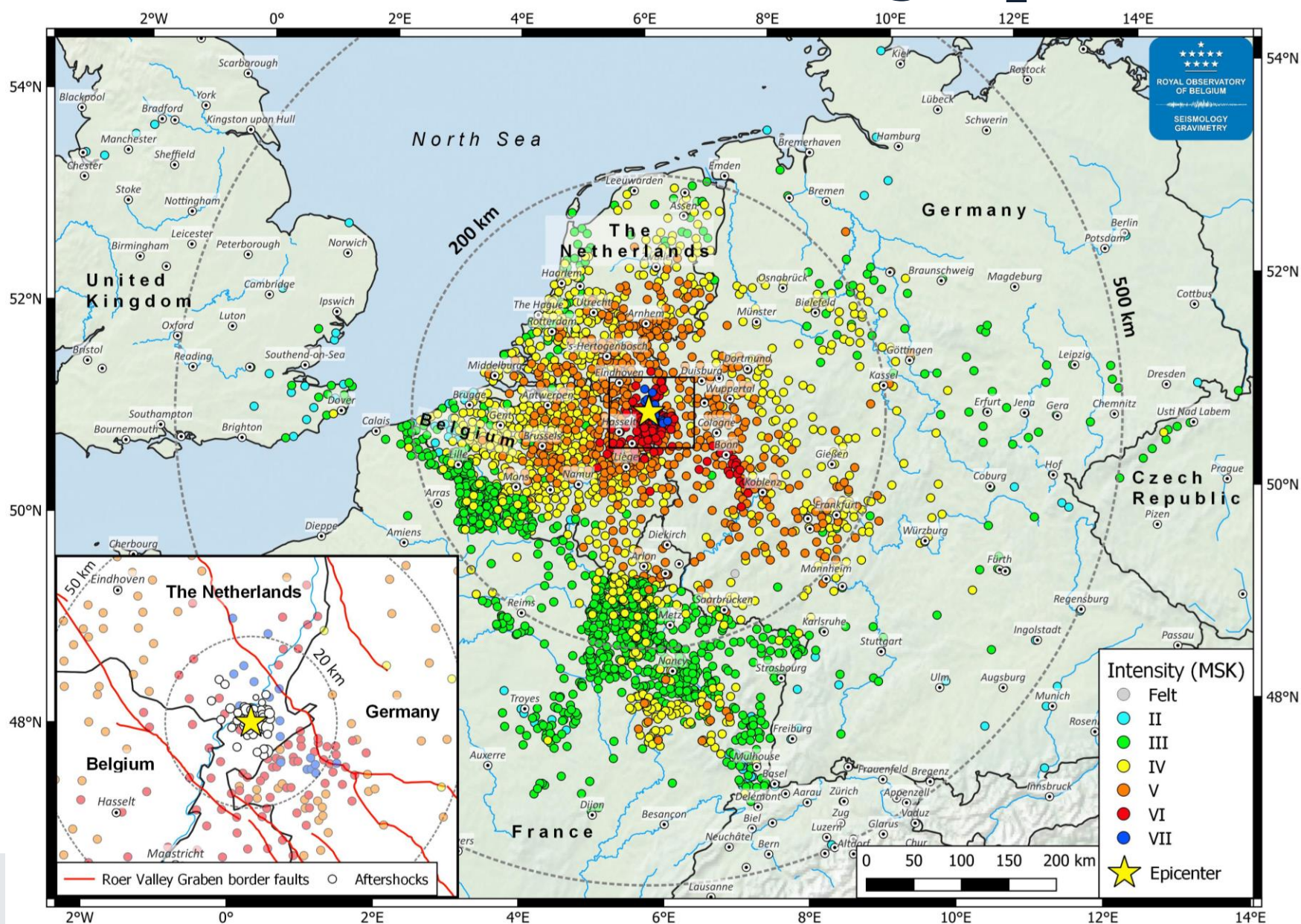
Mw 3.1 Cuesmes 1911-04-12 (16h15)





Modern Earthquakes

1992 Roermond aardbeving M_L 4.5



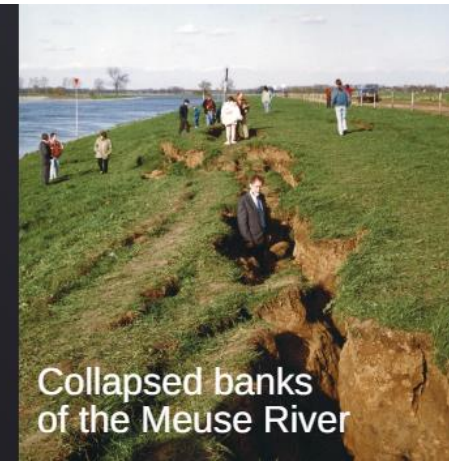
1992 Roermond M_L 4.5



Damage in NL and NE Limburg

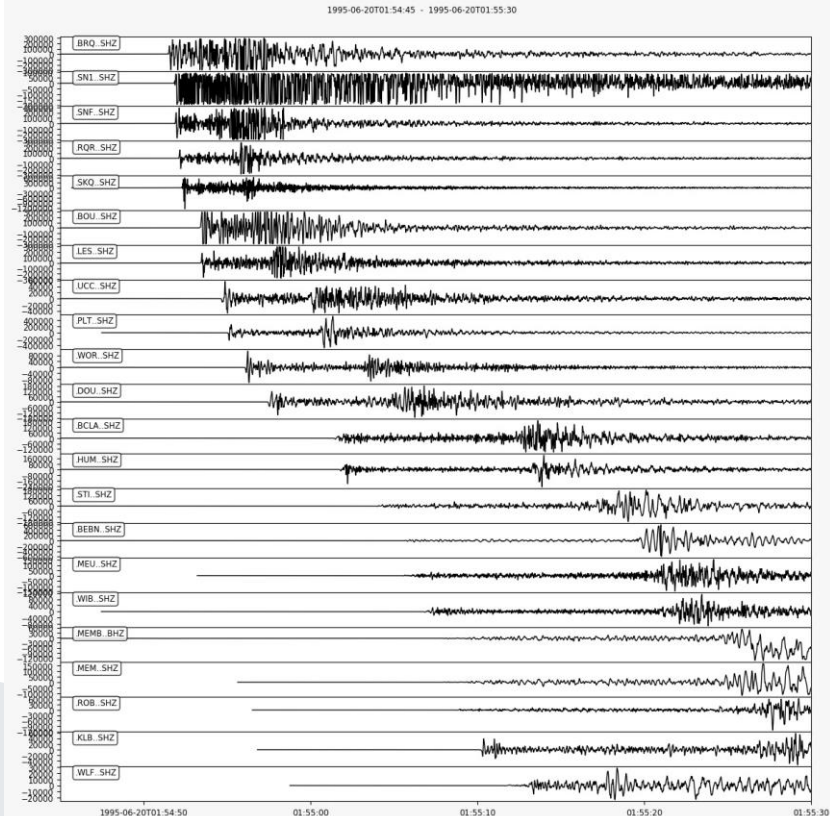
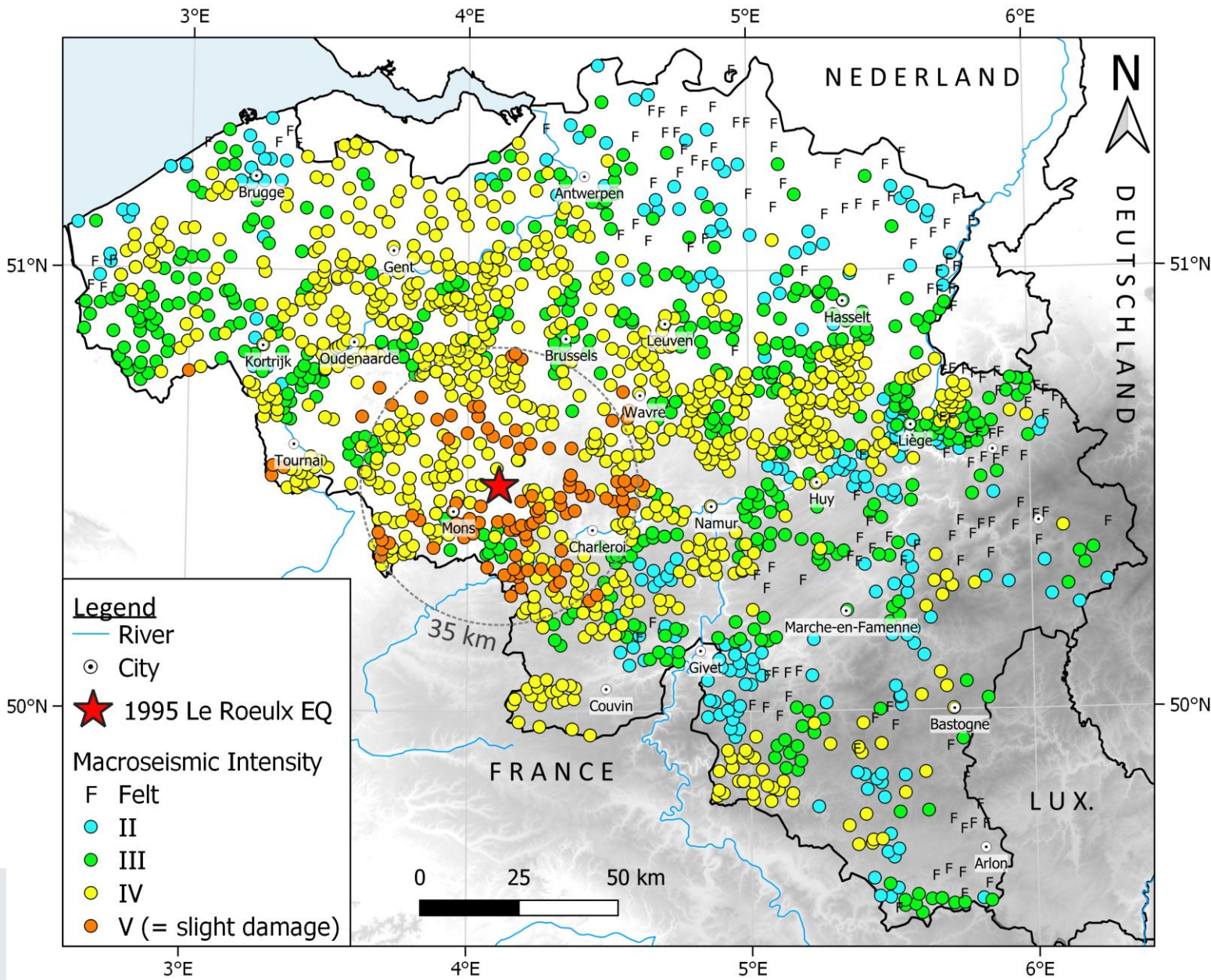


Landslide
Brunssummerheide



Collapsed banks
of the Meuse River

1995 Le Roeulx M_L 4.5



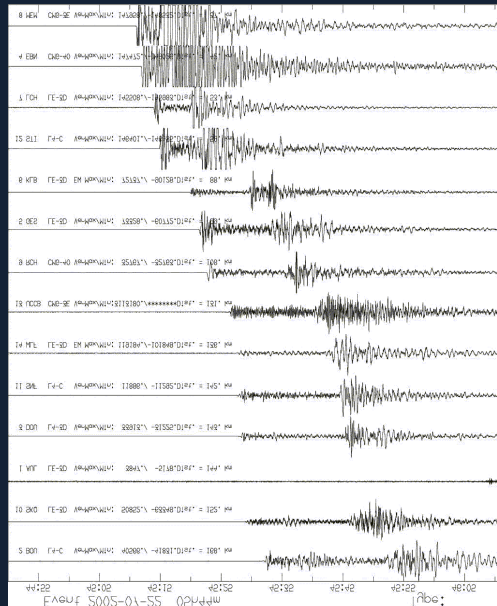
En then the internet came

Heeft u een aardbeving gevoeld?



2002 Alsdorf M_L 4.9

Seismograms
Sismogrammes



Traditionele manier: enquête: ~weken
Méthode traditionnelle : enquête : ~semaines

OBSERVATOIRE ROYAL DE BELGIQUE

TREMBLEMENT DE TERRE DU : 22 JUILLET 2002 07 H 45
REGION DE ESCHWEILER

PROVINCE : NAMUR
COMMUNE : CINEY

3

QUESTIONNAIRE.

NOMBRE D'HABITATIONS DANS VOTRE COMMUNE 14.500

1. LE TREMBLEMENT DE TERRE A-T-IL ETE OBSERVE? () OUI () NON

2a. DES VIBRATIONS ONT-ELLES ETE RESSENTIES A L'INTERIEUR DES HABITATIONS?
FORTEMENT () Par tous () Par Beaucoup () Par quelques-uns
FAIBLEMENT () Par tous ☒ Par Beaucoup () Par quelques-uns

2b. DES VIBRATIONS ONT-ELLES ETE RESSENTIES A L'EXTERIEUR DES HABITATIONS?
FORTEMENT () Par tous () Par Beaucoup () Par quelques-uns
FAIBLEMENT () Par tous () Par Beaucoup ☒ Par quelques-uns

3. DES PERSONNES SONT-ELLES SORTIES DES HABITATIONS.
☒ NON () OUI- Quelques-uns () OUI - beaucoup

4. DES OBJETS SUSPENDUS ONT-ILS OSCILLE? () OUI ☒ NON

5. DE PETITS OBJETS ONT-ILS VIBRE?
ONT-ILS ETE DEPLACES? ☒ OUI () NON
SONT-ILS TOMBES DE MEUBLES? () OUI ☒ NON

6. DES PORTES ET VITRES ONT-ELLES VIBRE?
ONT-ELLES CLAQUE? ☒ OUI () NON
DES VITRES SE SONT-ELLES BRISEES? () OUI ☒ NON

7. DU MOBILIER A-T-IL - VIBRE? ☒ OUI () NON
- ETE DEPLACE? () OUI ☒ NON
- ETE RENVERSE? () OUI ☒ NON
SI OUI, LEQUEL?

8. DES MURS ONT-ILS ETE ENDOMMAGES?
() SIMPLES FISSURES () LEZARDES PROFONDES
() RENVERSEES ☒ NEANT

9. DES CHEMINEES ONT-ELLES ETE ABATTUES? () OUI ☒ NON
SI OUI, COMBIEN PARTIELLEMENT :
TOTALLEMENT :

10. SI D'AUTRES CONSTATATIONS ONT ETE FAITES LORS DU TREMBLEMENT DE TERRE, POUVEZ-VOUS NOUS LES DETAILLER.

Allereerste DYFI Internet kaart ! ~ enkele uren
Première carte Internet DYFI ! ~ quelques heures



Also YOU are a
seismometer !

“Solution to have
ground motion
information from
poorly-instrumented
areas “

<http://seismologie.be/en/seismology/internet-macroseismic-inquiries>

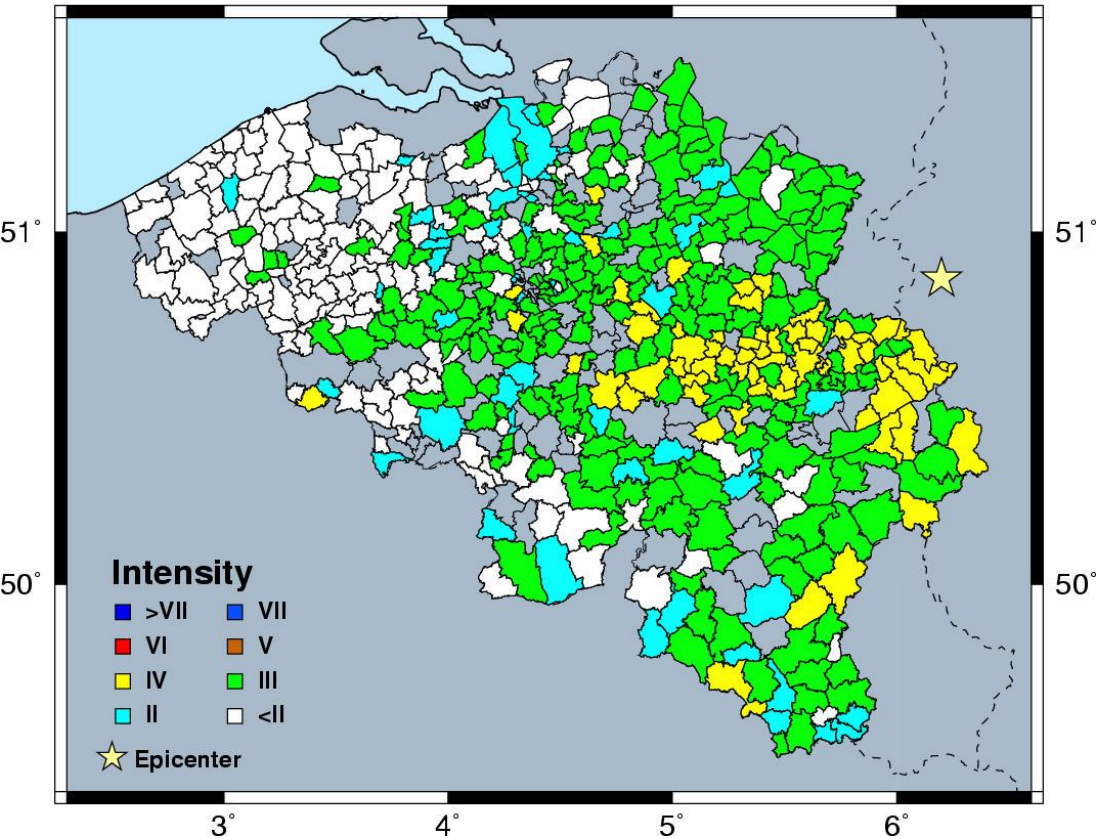
- ✓ Did you feel it? (Yes – No)
- ✓ Situation ?
(outside – building – driving vehicle)
- ✓ If in a building, at what floor where you?

- ✓ Were you asleep?
- ✓ Did others nearby feel it?
- ✓ Describe the shaking? (Not felt – Weak
... - Strong – Violent)

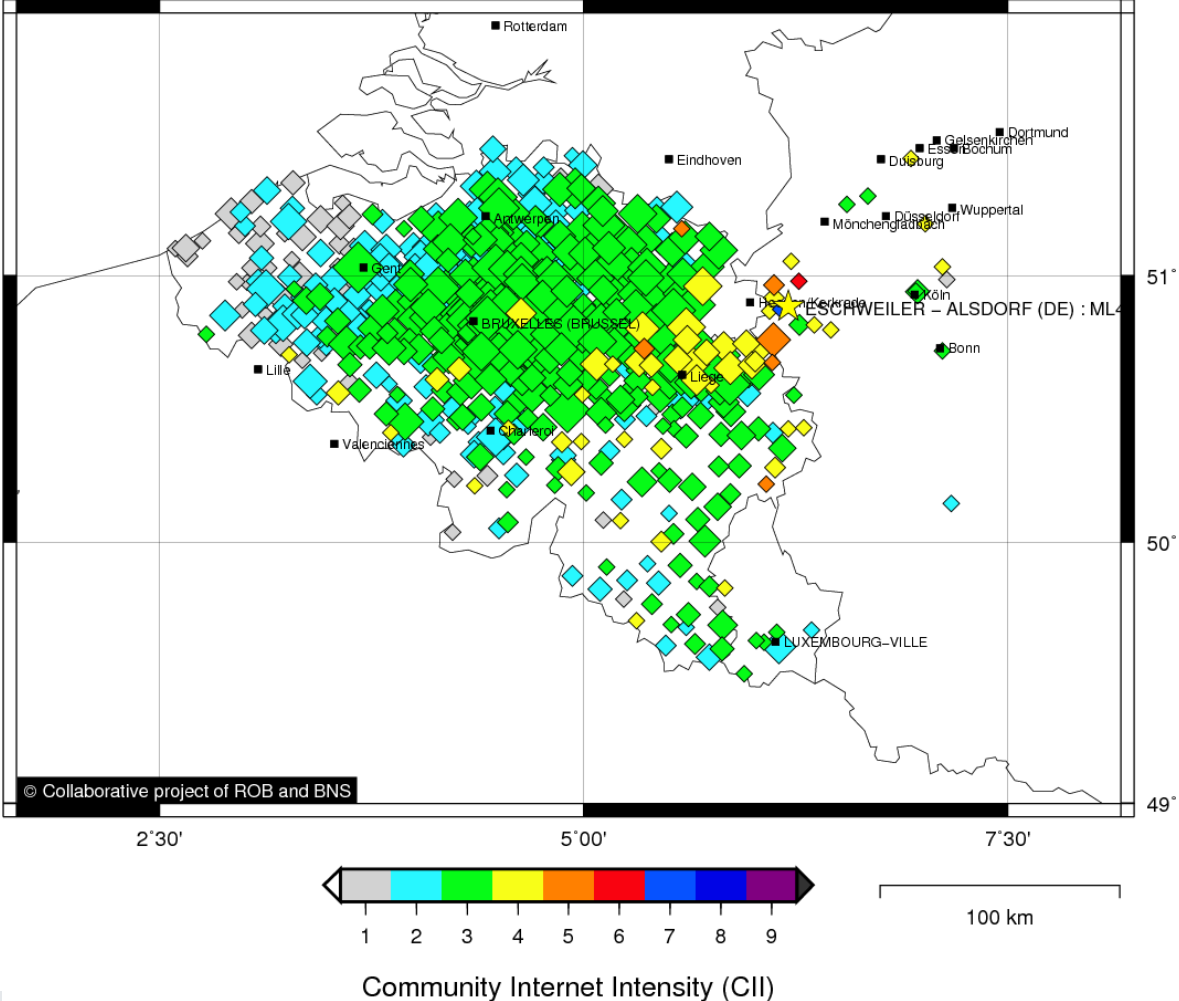
2002 Alsdorf M_L 4.9

Fastly decided this was not a natural crisis!

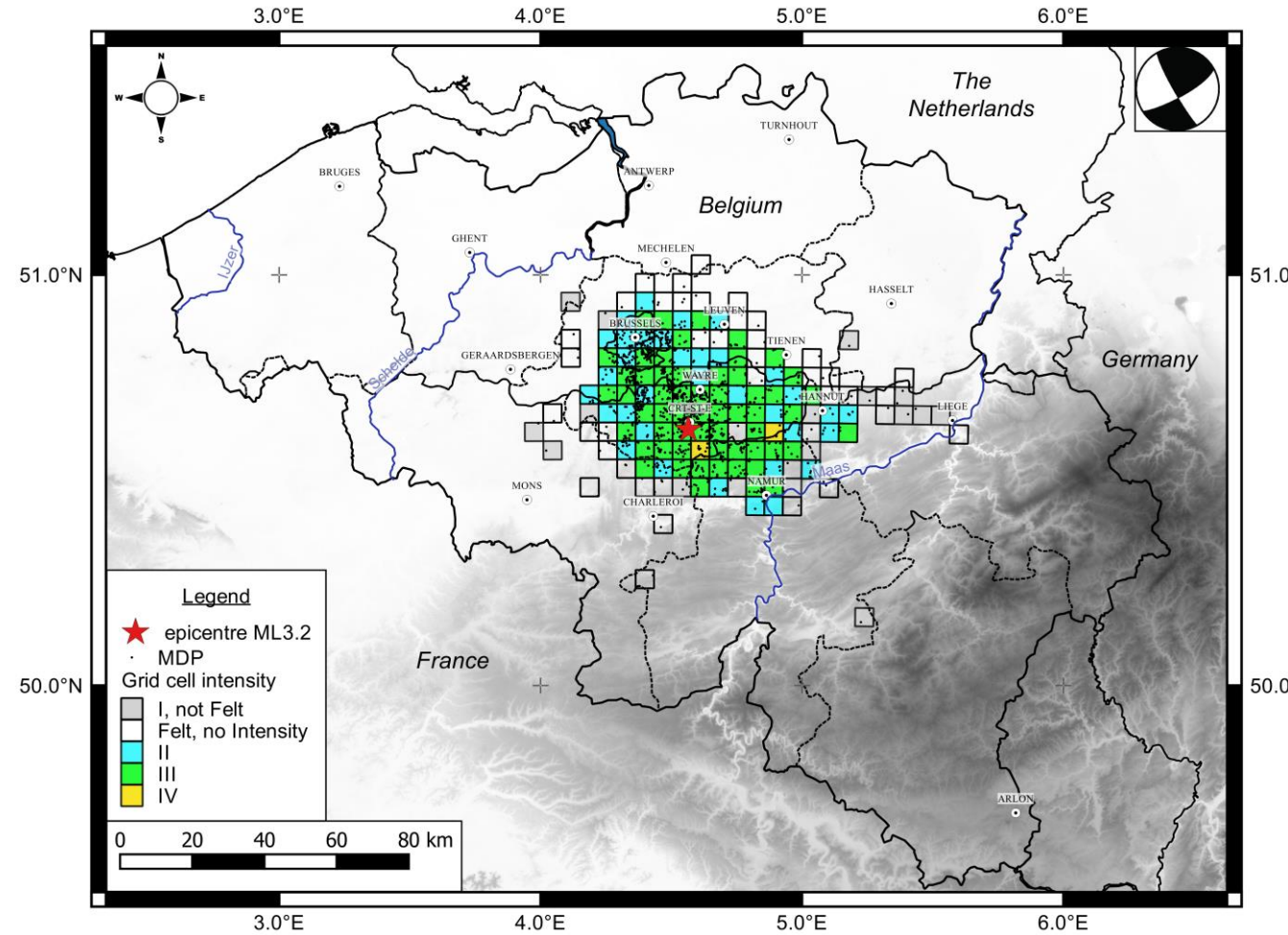
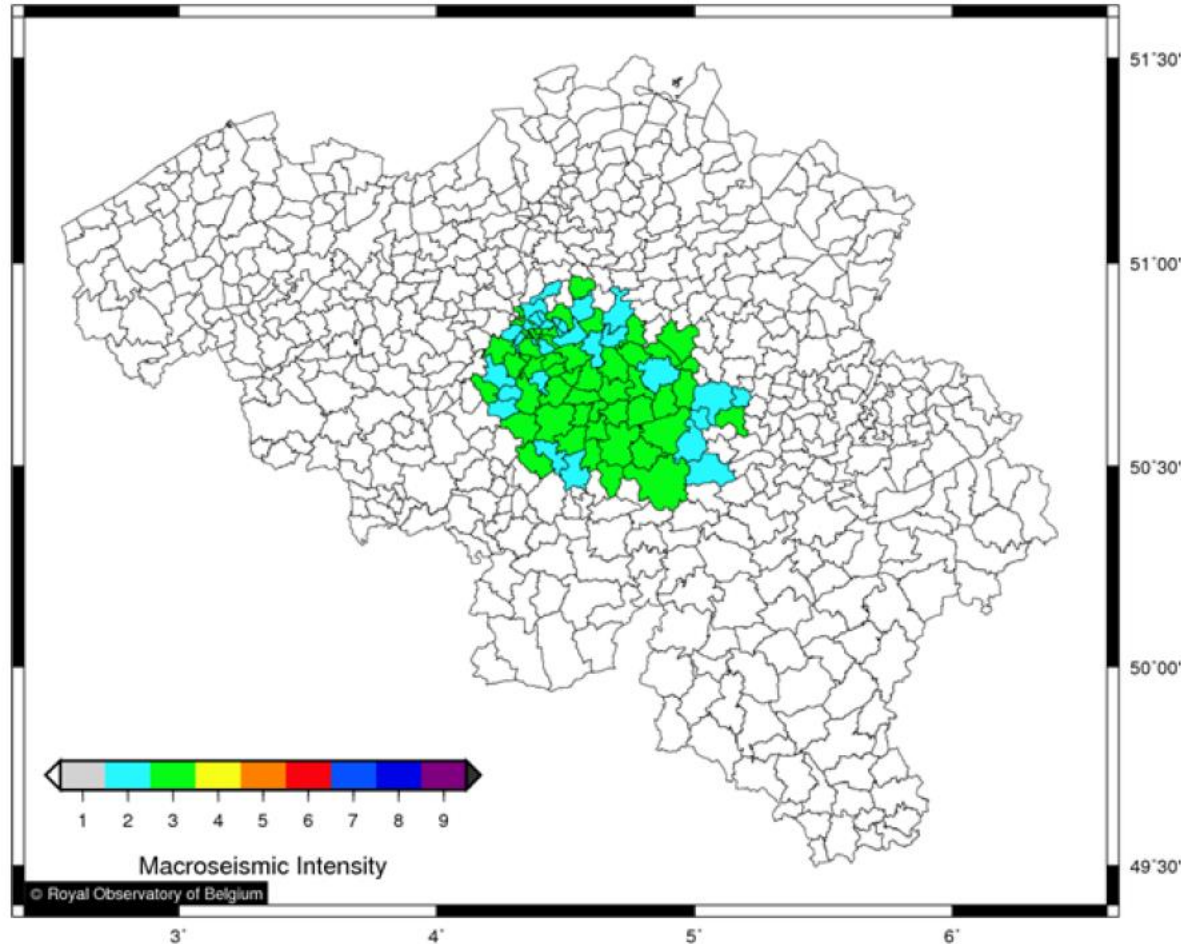
Traditionele manier: enquête: ~weken



Allereerste DYFI Internet kaart ! ~ uren

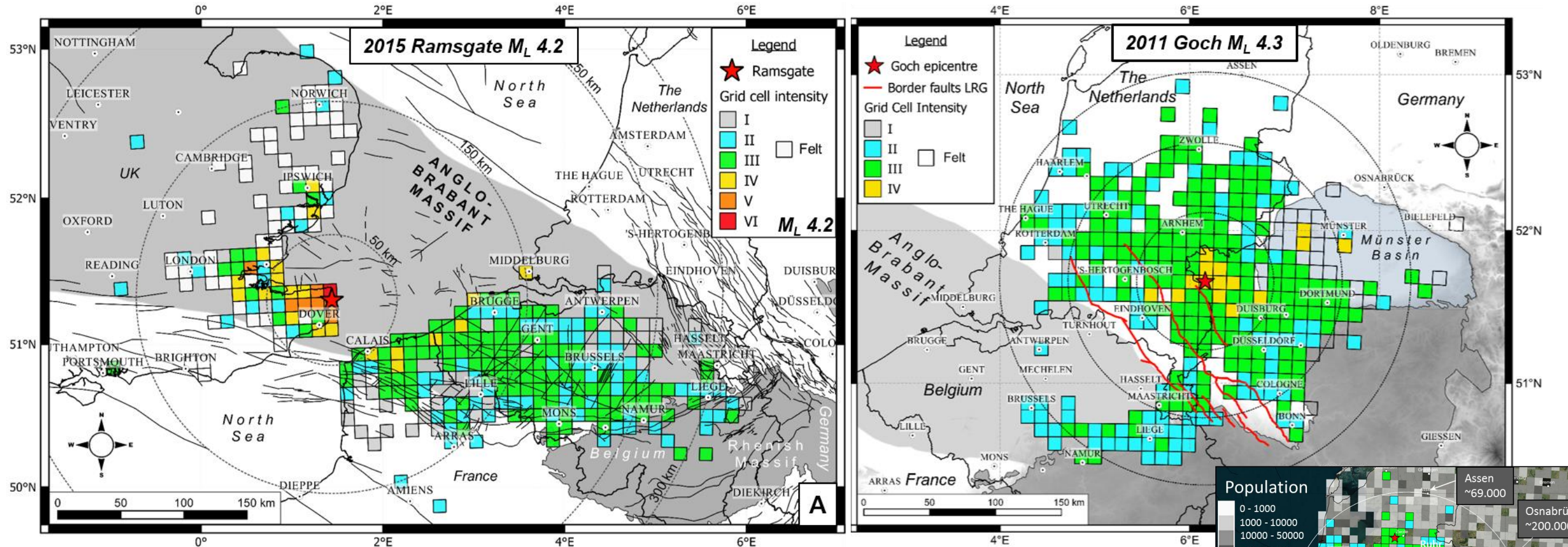


Court-St-Etienne 2008 - ML3.2



Van Noten et al. 2015
Tectonophysics

Goch 2011 & Ramsgate 2015



DYFI:

- Fast response
- Research !
- Attenuation & non-concentric impact

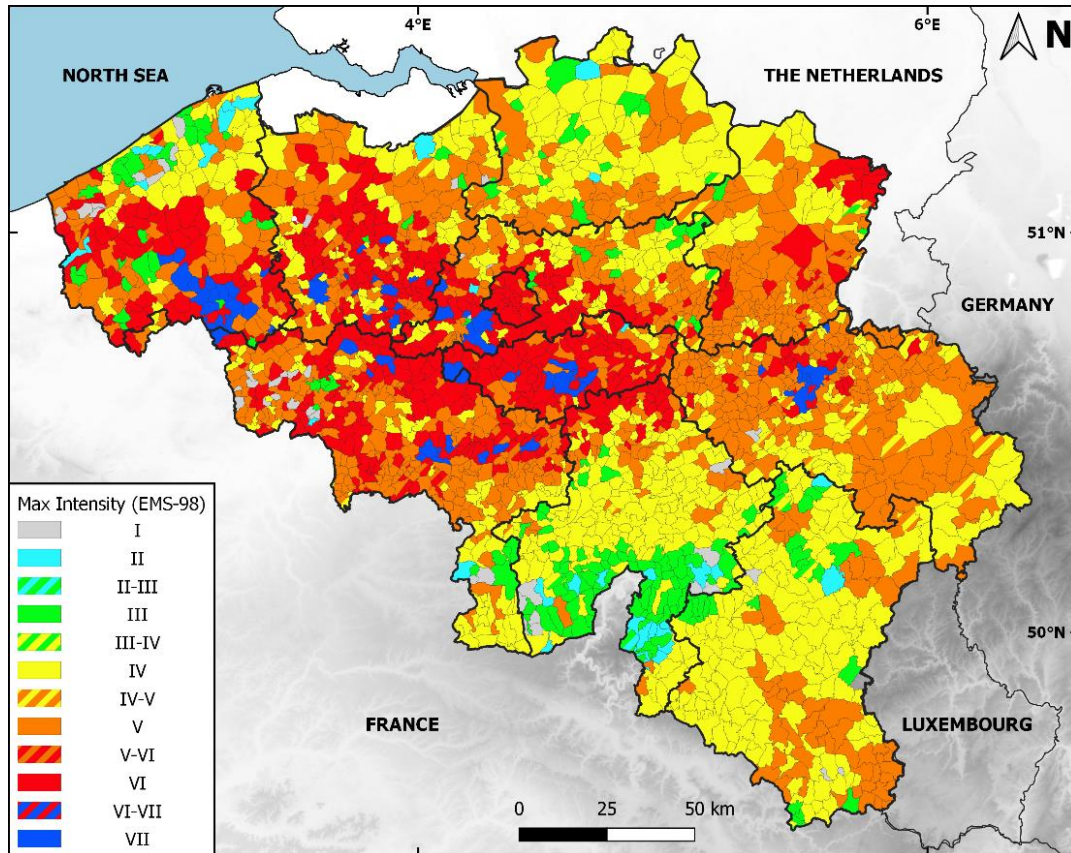


40
YEAR
COMMEMORATION

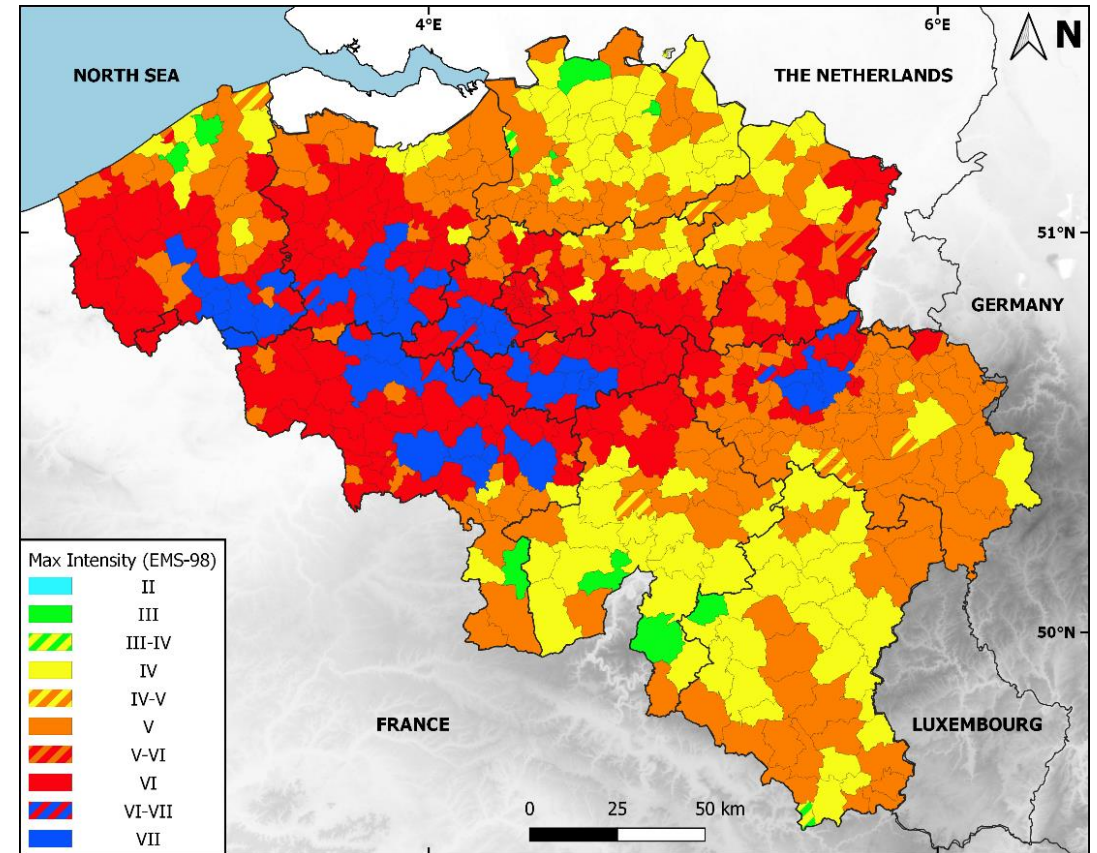
LIÈGE 83

125 yrs of summary

125 years of data on the seismic impact on Belgium



Maximum sub-municipal intensity values



Maximum main municipal intensity values

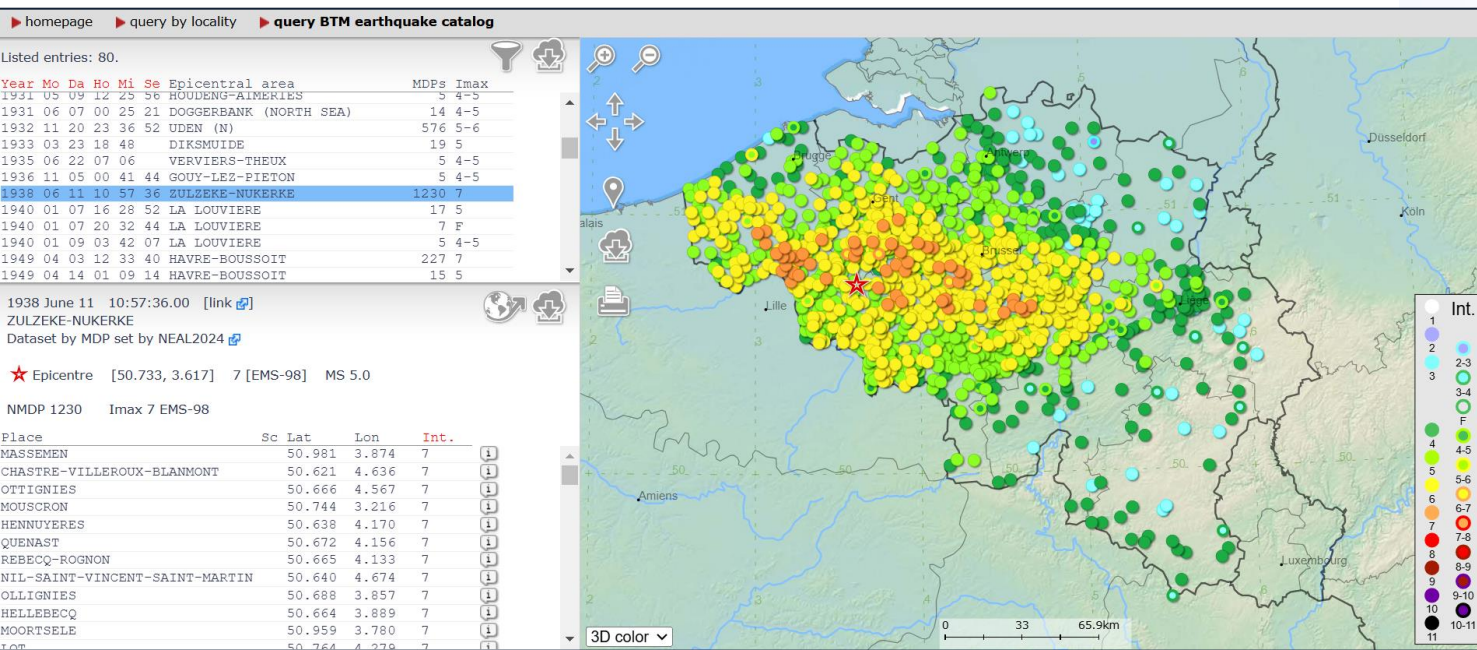
Open database ! Midop

<https://seismologie.be/midop>

BTM database

- 1900 – 2002
- 80 felt events
- 23,950 IDPs
- With sources!

Neefs, B., Van Noten, K., Vanneste, K., Camelbeeck, T. The Belgian traditional macroseismic (BTM) database of the twentieth century. Journal of Seismology (2024).



Belgian Traditional Macroseismic Database of the 20th century

Access macroseismic intensity data for Belgium



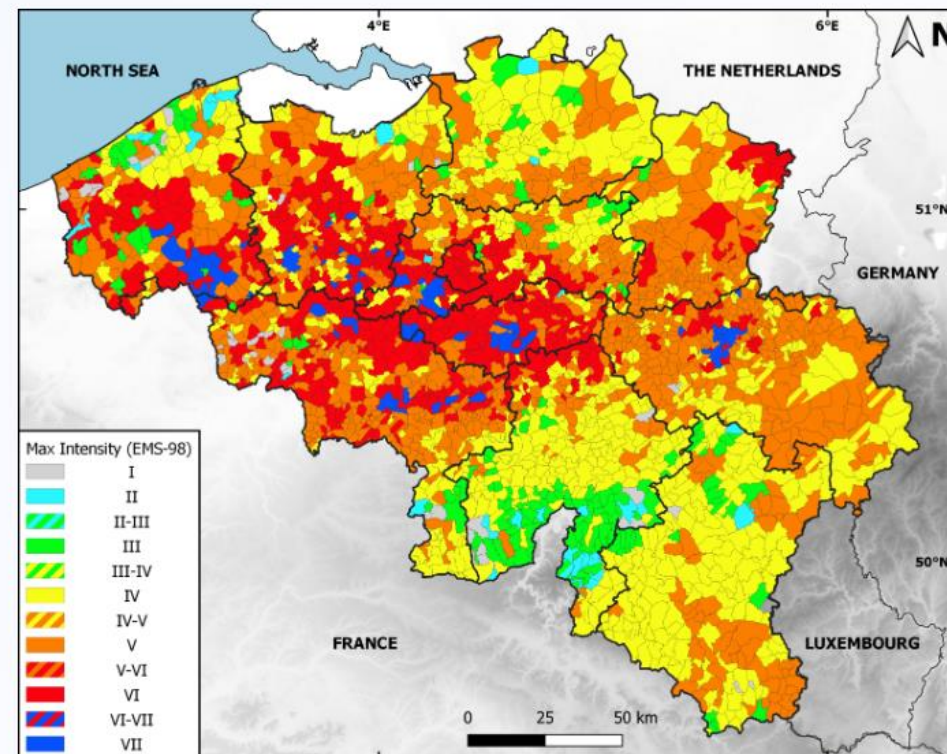
Query by Earthquake

explore the impact of 80
felt earthquakes on Belgium



Query by Place

explore which earthquakes have
affected your municipality



Maximum intensity on the sub-municipal scale for felt earthquakes in and around Belgium presented in the Belgian traditional macroseismic database. The absence of an intensity data point for any particular municipality or earthquake indicates a lack of evidence, not that the event was not felt.



40
YEAR
COMMEMORATION
LIÈGE 83

Modern (Impact) Tools

40 years of developments at the ROB

"Warning Center" clients

De seismo@oma.be
Pour Thomas Lecocq
Sujet **New event recorded by the Belgian seismic network**

New seismic event

Region: CHAUDFONTAINE (BE)
Time UTC: 2023-10-26 21:51:15
Local time: 2023-10-26 23:51:15
ML: 1.6 ± 0.3
Type: Earthquake
Lon: 5.609E, Lat: 50.599N
Depth: 15 km
ID: 20305
Operator: Koen

This event was verified by a seismologist.
The reported parameters are subject to change, however.
Please consult our website for the most up-to-date information:
<http://seismology.be/en/seismology/earthquakes-in-belgium/gmdwrjw2q>

OD Seismology & Gravimetry
Royal Observatory of Belgium

← ROB SMS SERVER

New seismic event

Region: CHAUDFONTAINE (BE)
Local time: 2023-10-26 23:51:15
ML: 1.6 +/- 0.3
Type: ke
Lon: 5.609E, Lat: 50.599N
Depth: 15 km
ID: 20305
Operator: Koen
<https://tinyurl.com/yvxyora4>

Revision of seismic event

Region: ANGLEUR (BE)
Local time: 2023-10-26 23:51:15
ML: 1.3 +/- 0.3
Lon: 5.607E, Lat: 50.609N
Depth: 16 km
ID: 20305
<https://tinyurl.com/yvxyora4>

- NCCN
- FANC
- NIRAS/ONDRAF
- SCK/CEN
- VITO
- Communes of Mol, Dessel
- Meterological Wing Defence
- SPW – Direction des barrages



Regional calamity

Calamity

DEPARTEMENT
KANSELARIJ &
BUITENLANDSE ZAKEN

Vlaamse overheid
Havenlaan 88 bus 100
1000 BRUSSEL

adviesverlening aardbevingen op het grondgebied van het
Vlaamse Gewest (BVR van 30 oktober 2020 tot uitvoering van
het decreet van 5 april 2019 houdende de tegemoetkoming in
de schade die aangericht is door rampen in het Vlaamse
Gewest)

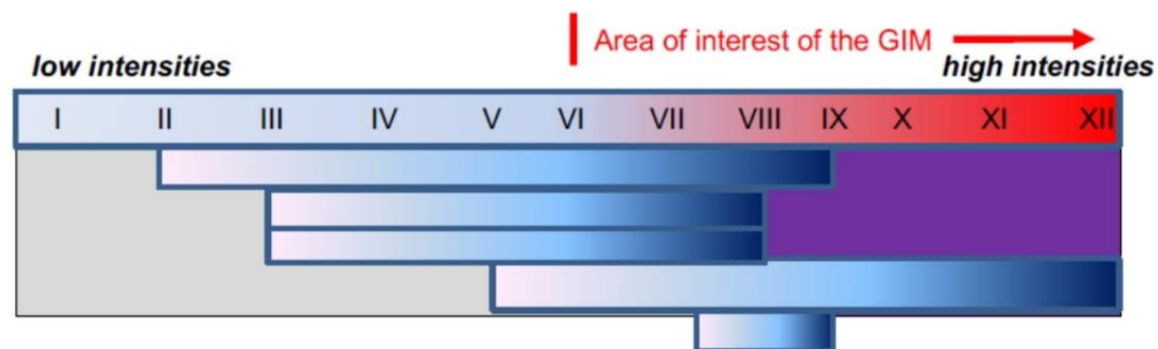
BEVOEGDHEID / COMPÉTENCE	MAGNITUDE		EN/OF	INTENSITEIT / INTENSITÉ		EENHEID / UNICITÉ
VLAAMS GEWEST	Belgische lokale magnitude	$\geq 5,0$	-	Decreet aanpassing gaande ML 4.8 +- 0.2, Intensiteit (VI)-VII		72 u
BRUSSELS HOOFDST. GEWEST / RÉGION BRUXELLES CAPITALE	Magnitude de/van Richter	$\geq 4,0$	EN/ET	Europese macroseismische schaal / Échelle macrosismique européenne	$\geq VII$	72 u/h
RÉGION WALLONNE	Magnitude locale sur l'échelle de Richter	$> 4,0$	ET	Échelle macrosismique européenne et/ou échelle d'intensité EMS98	$> VII$	168 h
FÉDÉRAL / FEDERAAL LOI ASSURANCES / WET VERZEKERINGEN	Échelle de/ Schaal van Richter	$\geq 4,0$	OU/OF	Bien endommagé dans les 10 km / Beschadigd goed binnen de 10 km		72 h/u

Macroseismic Intervention Group



Macro-seismic indicators taken into account (EMS98)

people
Objects
Furniture
Buildings
seismogeology





Conclusion

Roles of ROB during crisis

Roles of ROB

- Fast automatic detection system
- Manual controlled processing, but no 24/7
- When potentially felt
 - > Warn NCCN (phone) & updates on website
 - > Start DYFI
- Manual improvement of earthquake parameters
- When magnitude, depth, epicentral info suggest damage
 - > Organise macroseismic enquête (majors)
 - > Organise field survey (epicentral area)
- Report to media
- Evaluate if national crisis (need DYFI + enquête + field visit info), takes days

*Macroseismic
Intervention
Group*

Time





Conclusion

What can you do?

- 

ROYAL OBSERVATORY
OF BELGIUM

Seismology-Gravimetry

[🏠 ROB](#)
[Downloads](#)
[F.A.Q.](#)
[Projects](#)
[Links](#)
[Sitemap](#)

[EN](#)
[FR](#)
[NL](#)
[DE](#)

[THE SERVICE ▾](#)
[SEISMOLOGY ▾](#)
[GRAVIMETRY ▾](#)
[RESEARCH ▾](#)
[PUBLICATIONS](#)

[!\[\]\(b71552d33dbf62adf5e5199a70ee02bf_img.jpg\)](#)
[!\[\]\(03134b765d1473836ff001925b1b0550_img.jpg\)](#)
[!\[\]\(aed6947356668967079310026052edc0_img.jpg\)](#)



Did you feel an earthquake?

Homepage



& know what to do !



BUK SCHUIL HOU
VAST



Aardbevingen in België: een vergeten risico ?

Koen Van Noten
Koninklijke Sterrenwacht van België

*Postgraduaat rampenmanagement, module nationaal
crisisbeheer - 01.04.2023*

*Copyright: Please use following reference when using slides
Van Noten, Koen. 2025. Aardbevingen in België: een vergeten risico? Postgraduaat rampenmanagement,
module nationaal crisisbeheer. Koninklijke Sterrenwacht van België*

koen.vannoten@seismology.be
<https://www.linkedin.com/koenvannoten>
<https://sites.google.com/site/koenvannoten/>

Seismo.info@oma.be
<https://www.astro.oma.be/nl/>
<https://seismologie.be/nl>

