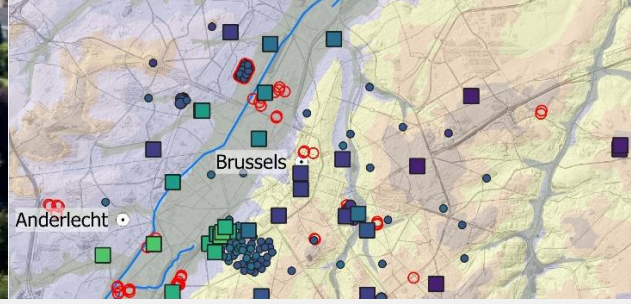




When Federal Scientific Institutes (FSIs) Join Forces

The past

The present

The future

Dr. Koen Van Noten
Royal Observatory of Belgium

With contributions from M. Dusaer, M. Van Camp, K. Gobron, M. DeCeukelaire, K. Piessens, V. Heyvaert,...



125 yrs GSB - 9 June 2022



FPS Science Policy
Thomas Dermine - State secretary

Art Pole
KMKG-MRAH
KMSKB-MRBAB
KIK-IRPA

Nature Pole
RMMA-MRAC
KBIN-IRSNB

Documentation Pole
KBR
RA-AE

Space Pole
BIRA-IASB
KMI-RMI
KSB-ORB

GEOSCIENCES

ROYAL BELGIAN INSTITUTE OF NATURAL SCIENCES
since 1846
GD Patricia Supply



GEOLOGICAL SURVEY OF BELGIUM
since 1896



ROYAL MUSEUM FOR CENTRAL AFRICA
since 1898
GD Guido Gryseels



EARTH SCIENCES

ROYAL OBSERVATORY OF BELGIUM
since 1823
GD Ronald Van der Linden



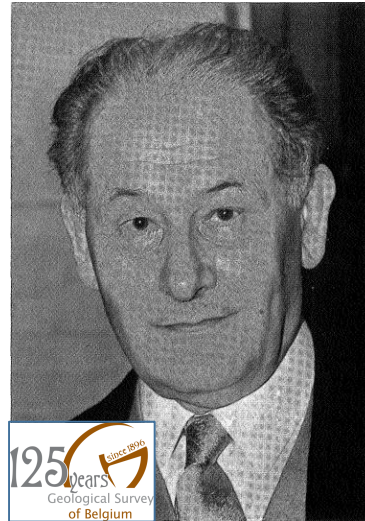
SEISMOLOGY-GRAVIMETRY
since 1904

**&
NATIONAL
GEOGRAPHIC
INSTITUTE**



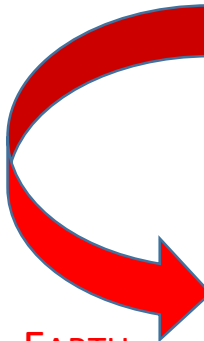


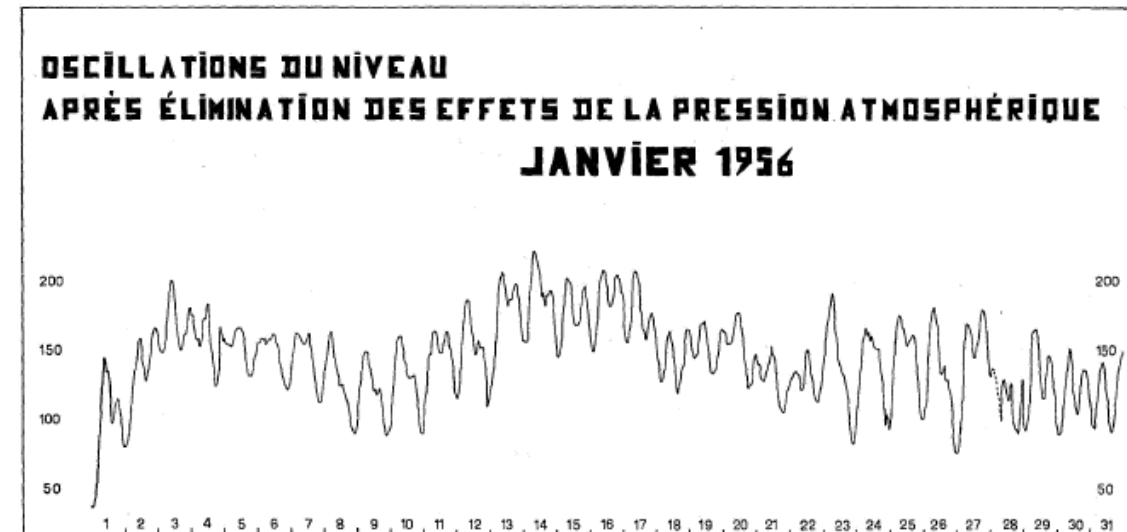
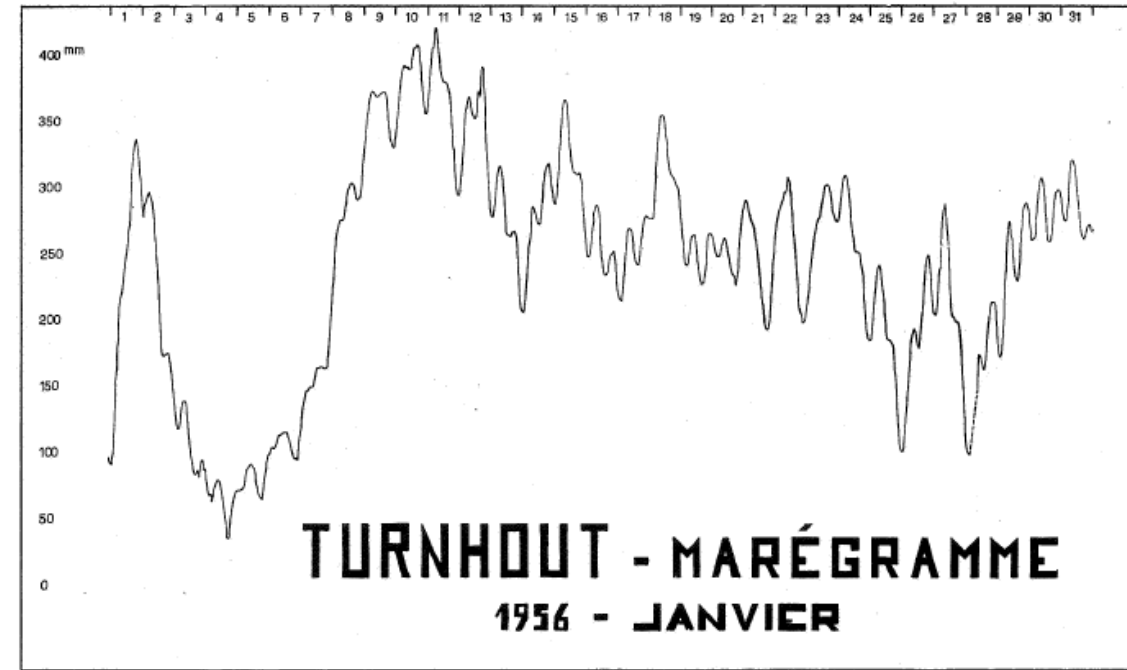
Baron Paul Melchior
Dir. ROB '81 - '90

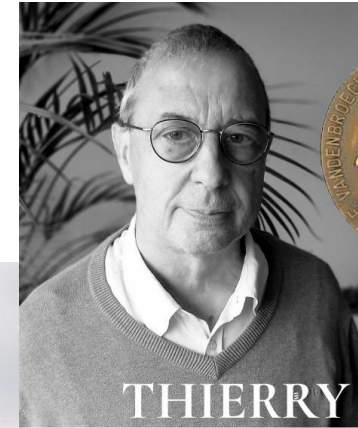


André Grosjean
1943 - 1961

EFFECT OF EARTH TIDES ON GROUNDWATER


 EARTH
TIDE
CORRECTION





Early '90s: Onset of Paleoseismology



Footwall

Hangingwall



Fault trace

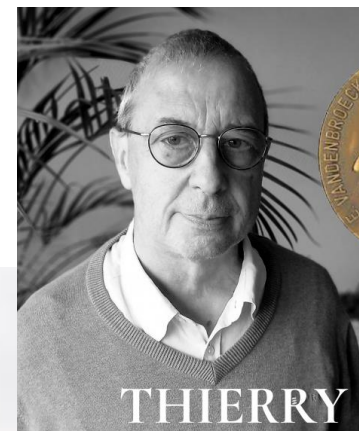
Bree Fault scarp



P. Pâquet
Dir. ROB
'90-'02



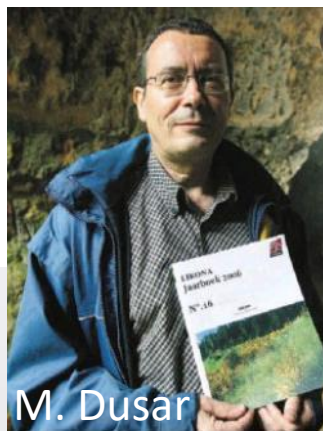
R. Paepe
Dir. GSB
'93-'99



THIERRY



M. Meghraoui

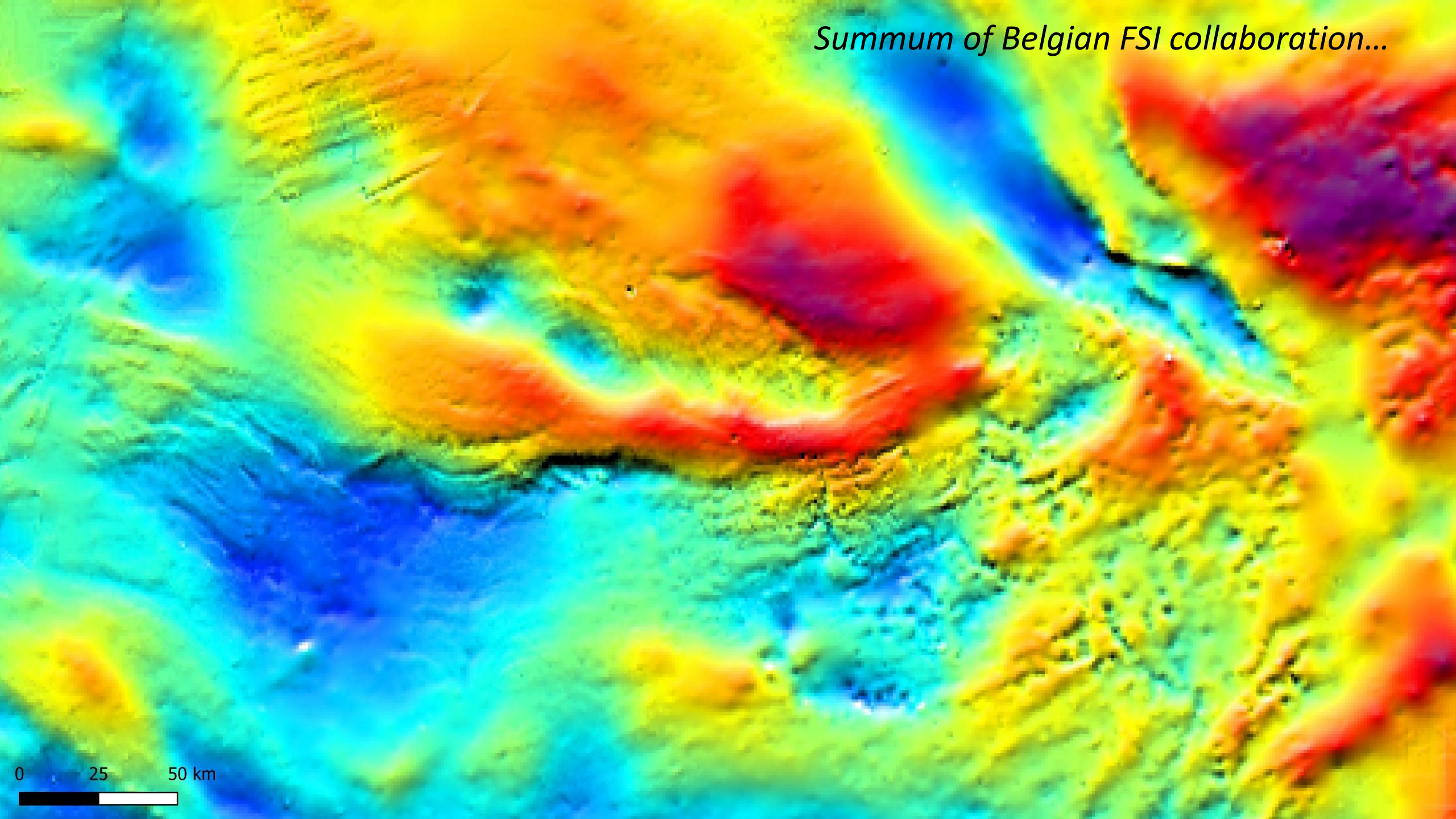


M. Dusaer

Early '90s: Onset of Paleoseismology



Summum of Belgian FSI collaboration...



0 25 50 km

The BE gravity database

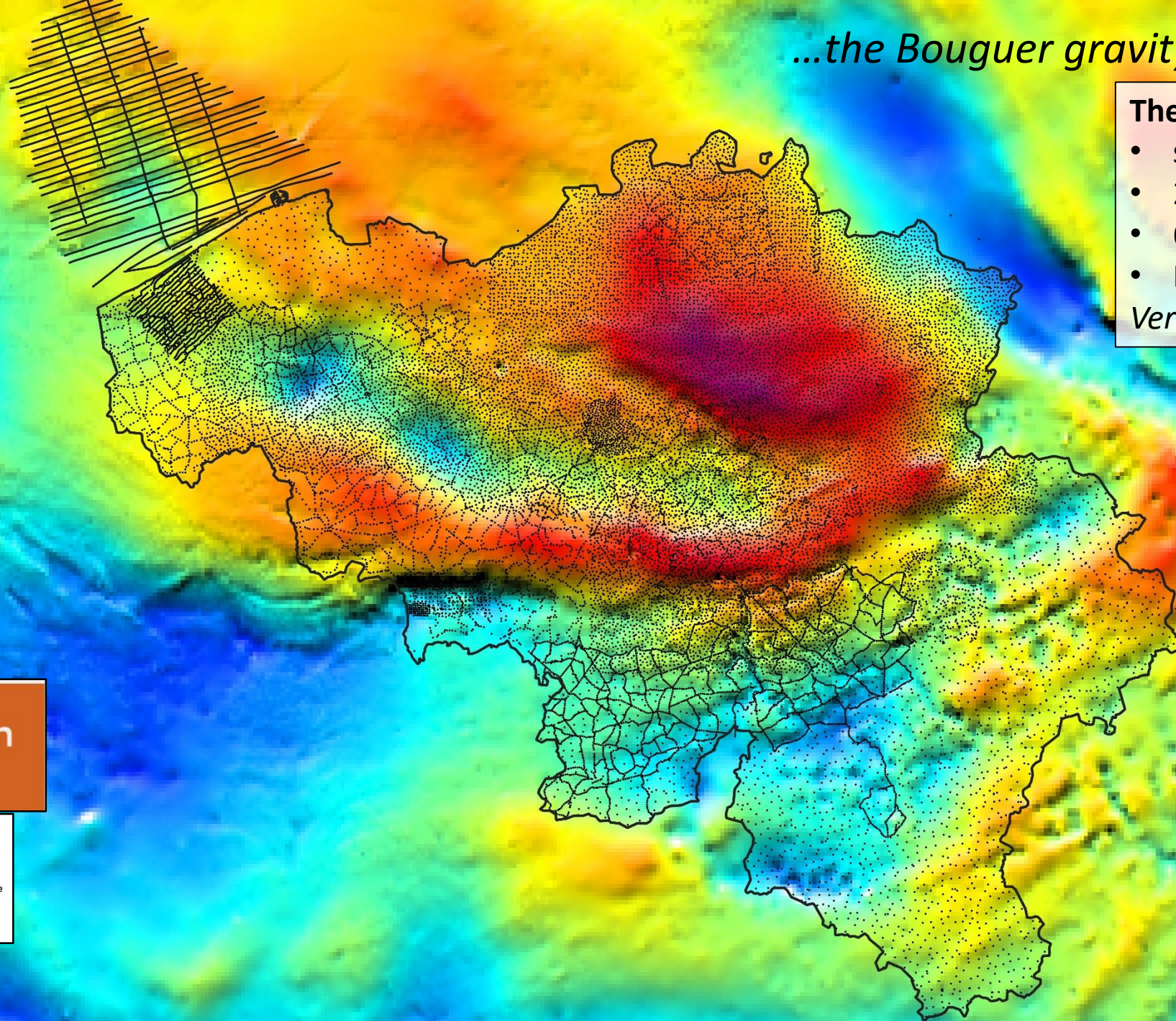
- since 1892
- 28 projects
- 68 147 stations
- Relative gravimeters

Verbeurgt et al. 2019

Christian Poitevin
Michel Everaerts



0 25 50 km

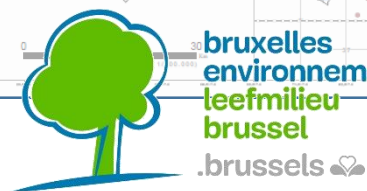
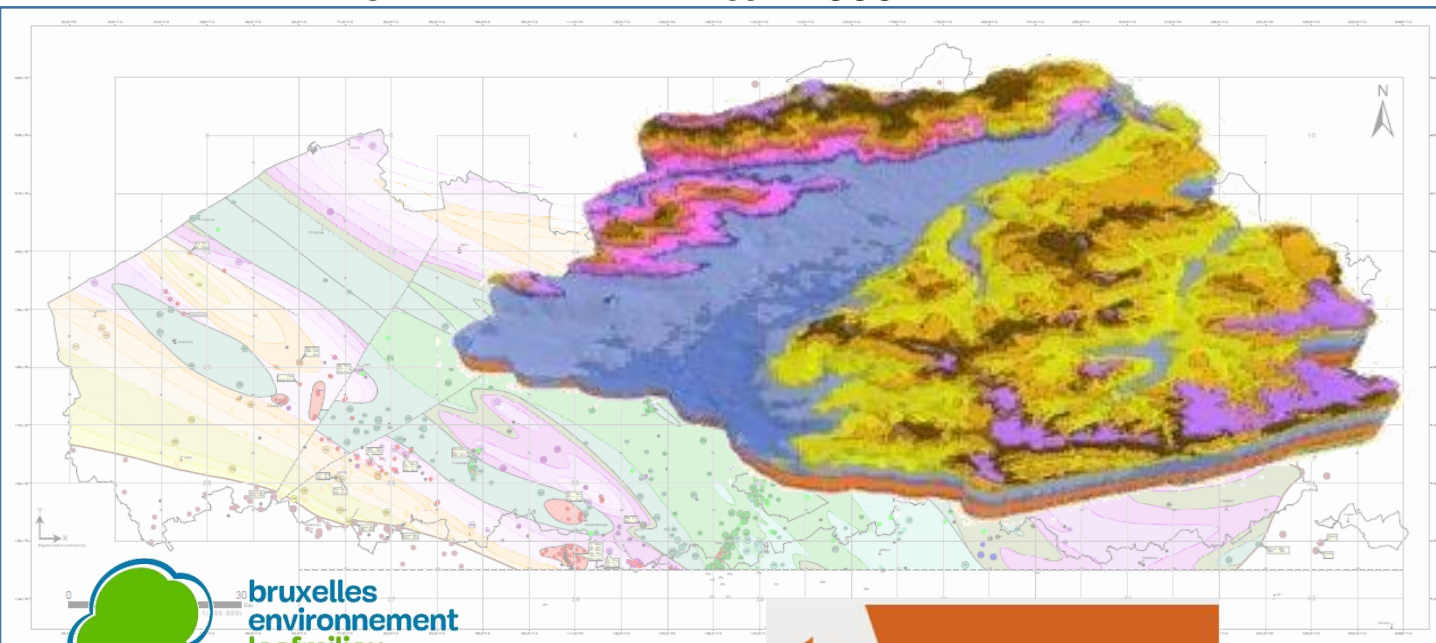




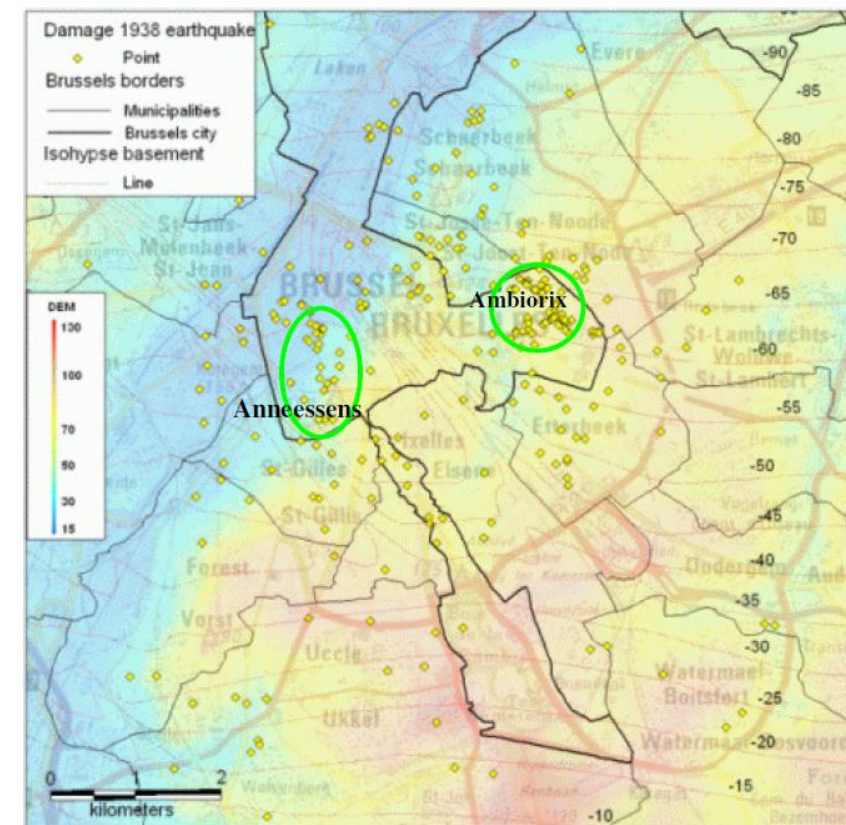
BUG: BRUSSELS URBAN PROJECT 2002
BRUSTRATI3D: BRUSSELS GEOLOGICAL MODEL 2017
NEW MAP OF THE BRABANT MASSIF 2006

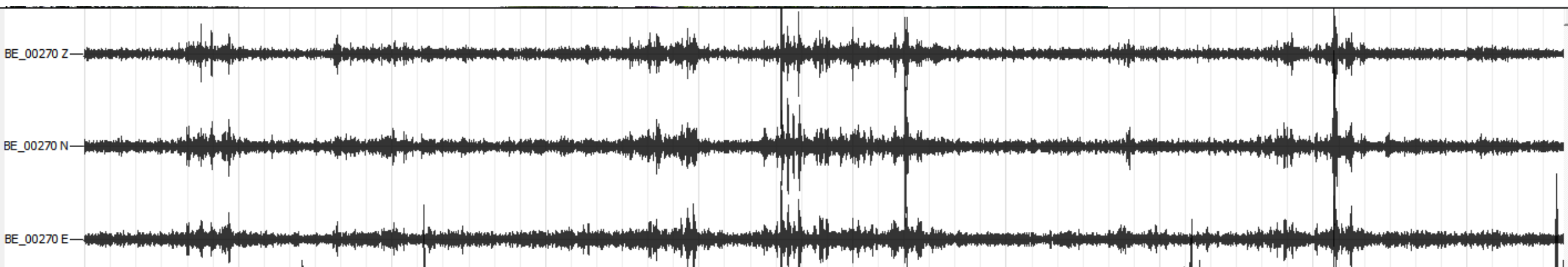


BRUSSELS SITE RESPONSE 2005
2008-2010 BRABANT WALLOON SEISMIC SWARM



Vlaanderen
 is omgeving



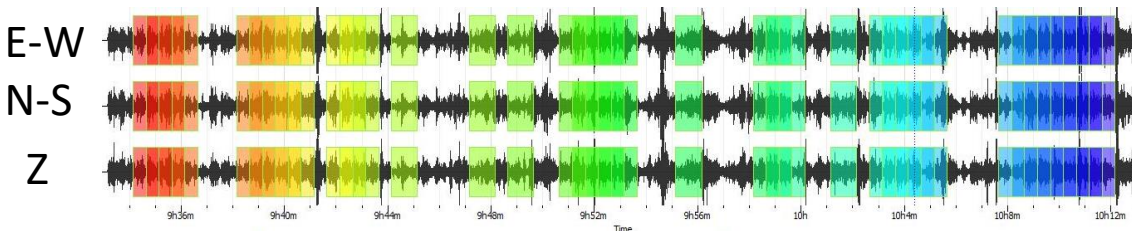


Brussels' bedrock paleorelief from borehole-controlled power laws linking polarised H/V resonance frequencies and sediment thickness

Koen Van Noten · Thomas Lecocq · Céline Goffin · Bruno Meyvis · Justine Molron · Timothy N. Debacker · Xavier Devleeschouwer



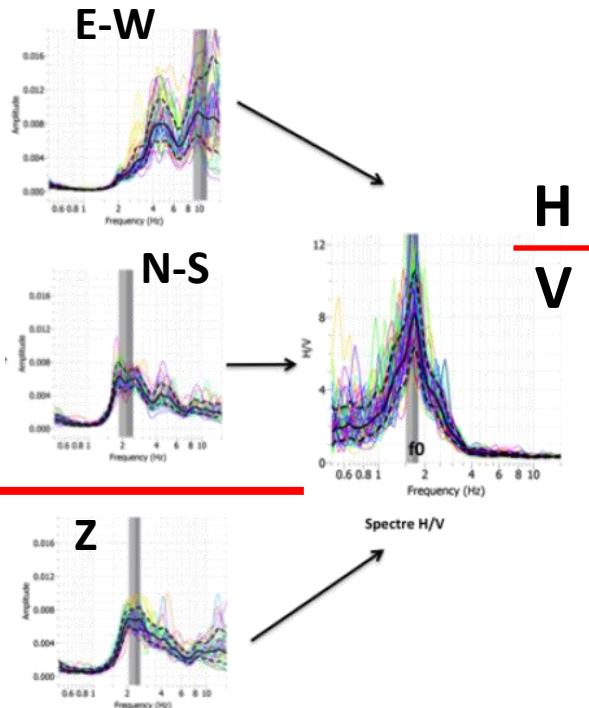
Time domain
30 min record



Virtual Borehole !

Frequency domain

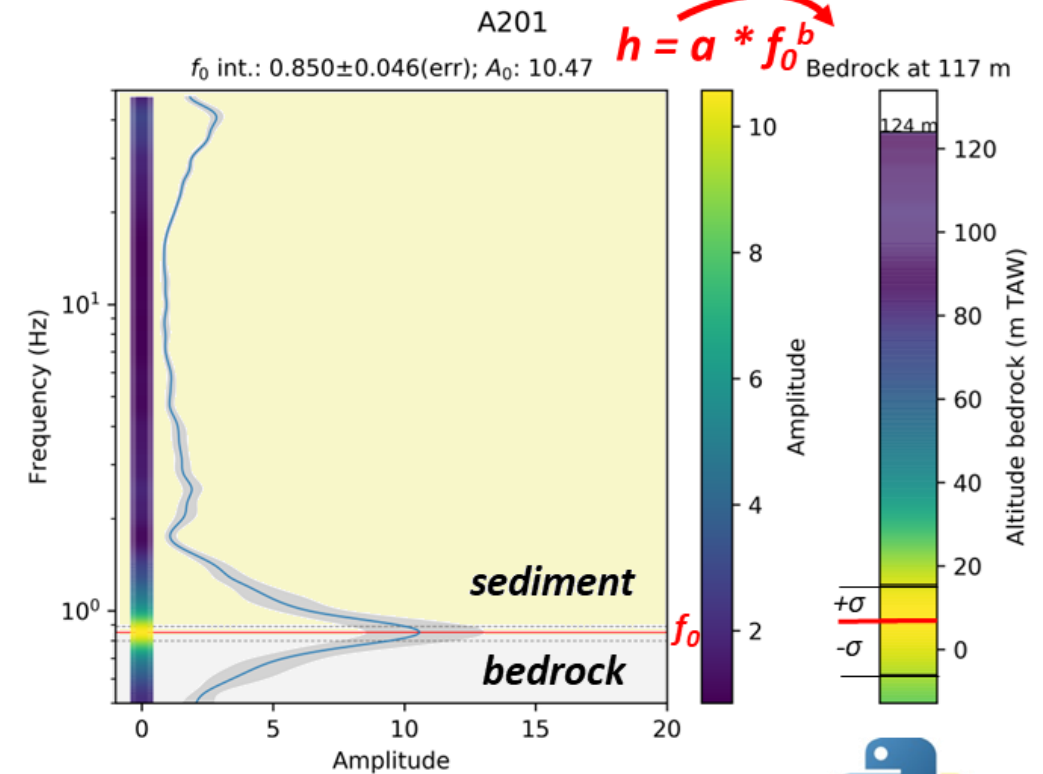
*Fourier
transformation*



**H/V Spectral
Ratio Analysis**



*resonance
frequency (f_0)*



Brussels' bedrock paleorelief from borehole-controlled power laws linking polarised H/V resonance frequencies and sediment thickness

Koen Van Noten · Thomas Lecocq · Céline Goffin · Bruno Meyvis · Justine Molron · Timothy N. Debacker · Xavier Devleeschouwer



Minions Real power: FSI Instrument Pool !

Geophone

Battery



Geophysical characterisation of the Bruniquel cave floor infill (FR)

Van Noten, K., Burlet, C., Delaby, S., Jaubert, J.,
Lecocq, T., Verheyden, S. & the Bruniquel Speleo Team

May 2019, Bruniquel (FR)



Service régional
d'Archéologie
occitanie (France)

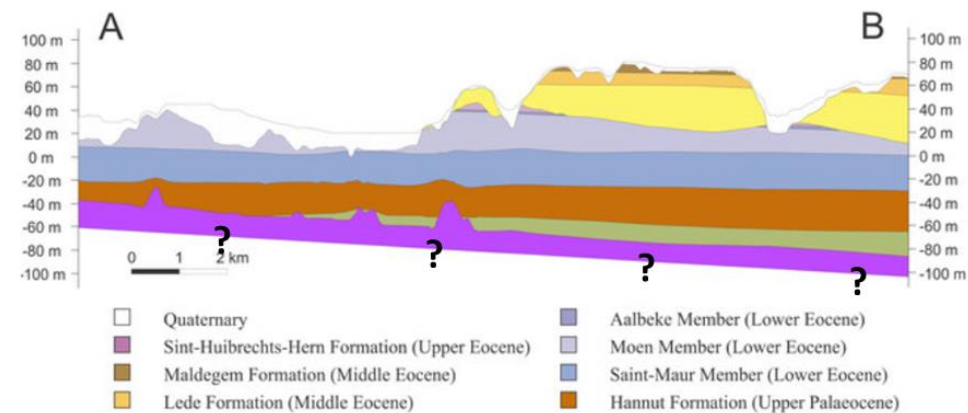
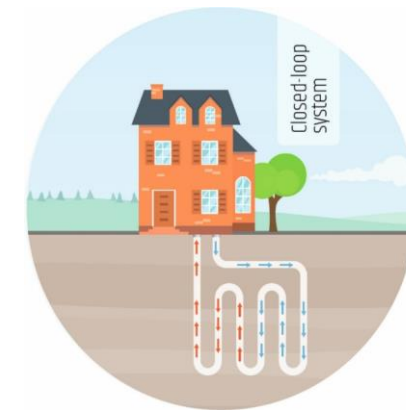
HVSR analysis

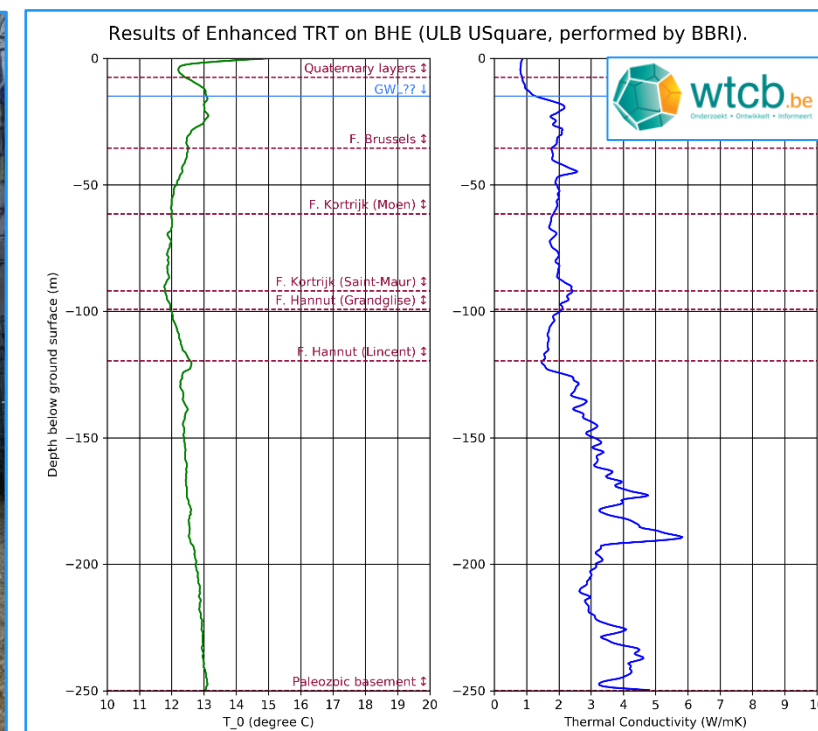
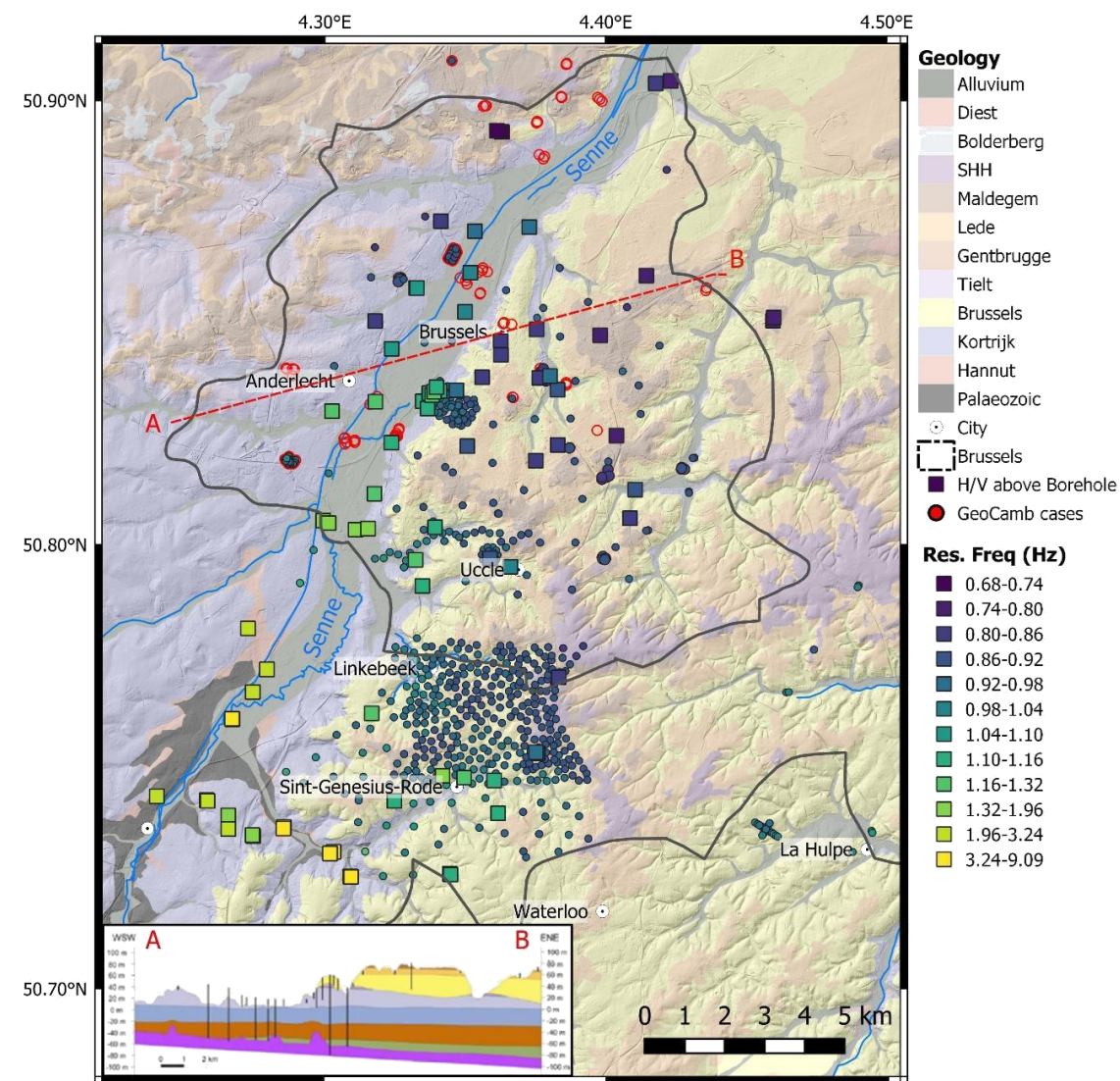




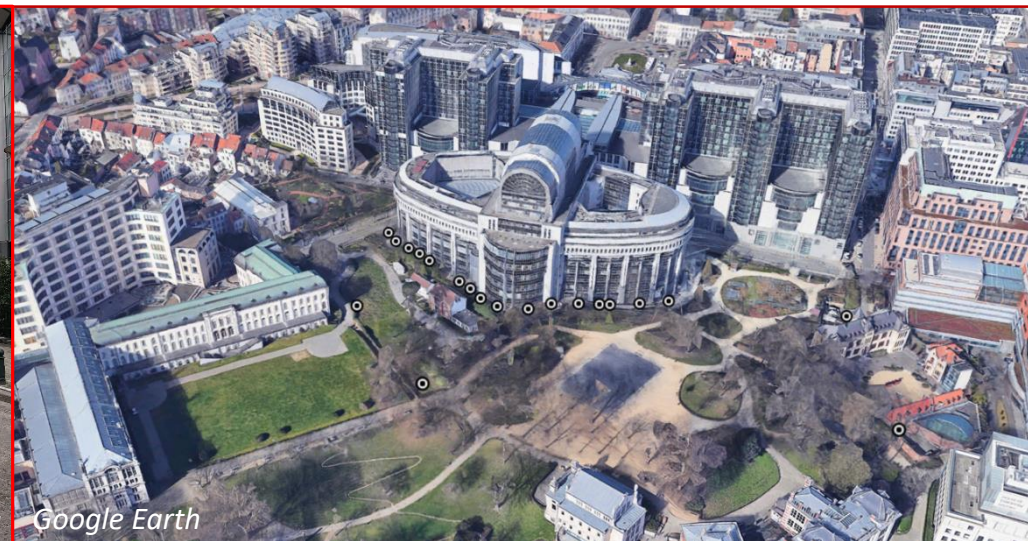
Geothermal potential of the Brabant Massif

Large uncertainty about top/thickness, lithology, hydrogeology, geothermal potential...





The Belgian HVSR database → virtual boreholes





Royal Observatory

INPUT DATA / OBSERVATIONS

Hydrogeology
GW extraction

Geomechanical
parameters

SAR data

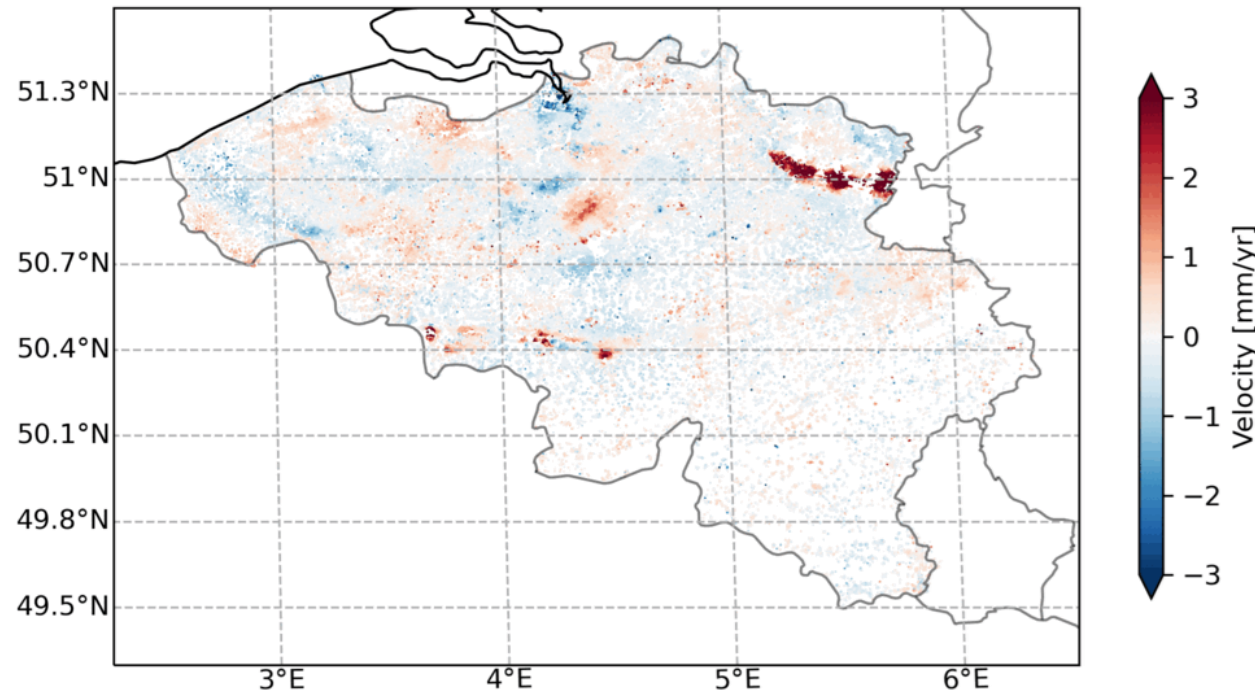
gravimetric data

Monitoring **Land Subsidence** caused by Groundwater exploitation through **Geodetic** measurements

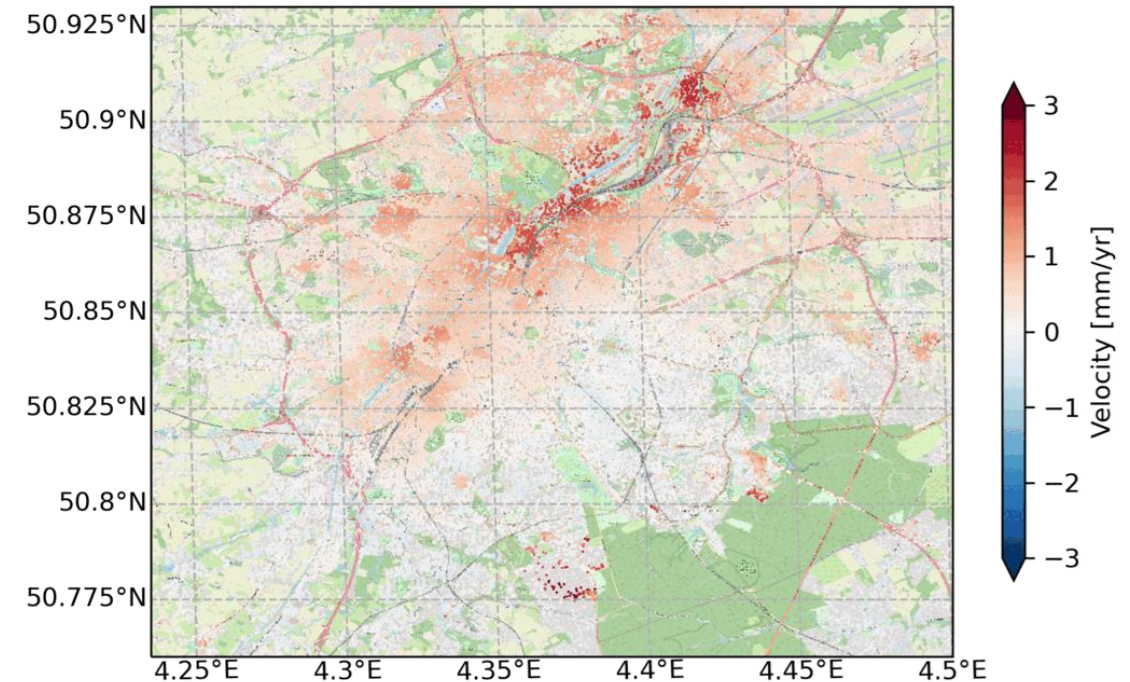
Envi satellite
data



LOS velocity at time: 2004.0000

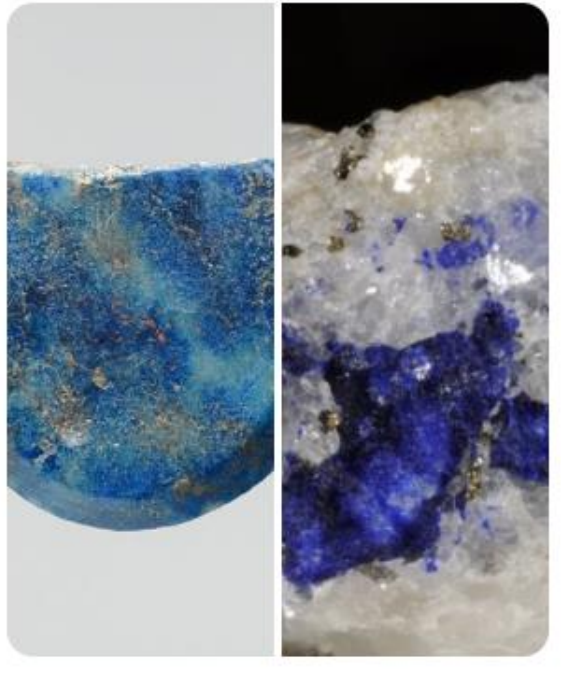


LOS velocity at time: 2004.0000



Geological Survey BE
 @GSBBelgium

#GSB125GeoFacts ♦ Azure is a deep blue color. The name of the color is derived from the gem lapis lazuli, which unlike other gems it is not a mineral but a metamorphic rock rich in the blue mineral lazurite.



Geological Survey BE @GSB... May 28
#GSB125GeoFacts 🇳🇱 The deepest cave in the world is Veryovkina Cave which is a little more than 2.2km deep. It is situated in Abkhazia, Georgia. In Belgium the deepest cave is approximately 120m deep, the Bernard cave In Mont-Godinne.



Geological Survey BE @GSB... May 17
#GSB125GeoFacts One of the "smallest" geologists to have worked at the Geological Survey of Belgium was named Robert Legrand (Robert The Great), here next to the more sturdy Eric Groessens. Legrand published the first complete map of the largely concealed Brabant Massif.



Geological Survey BE @GSB... May 25
#GSB125GeoFacts 🇺🇸 The age of rocks is determined by radiometric dating. Some rocks have radioactive elements that break down into new elements. When the ratio of the original element to the new element is measured, geologists can calculate how much time has passed.



Daughter (or element)	Dating Range	Minerals
uran-14	100 - 75,000 years	Uranium, Zircon, Thorium, Gadolinium
pot-40	10 - 4,000 million years	Decay, Uranium, Zircon
uran-235	1,000 to 4,000 million years	Uranium, Zircon
uran-238	10 - 4,000 million years	Uranium, Zircon, Thorium, Gadolinium

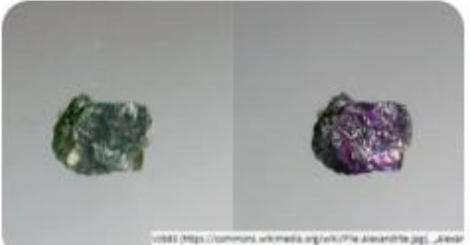
Geological Survey BE @GSB... May 24
#GSB125GeoFacts The world's largest recorded earthquake is the Valdivia earthquake (Chile). It occurred on 22 May 1960 and was assigned a magnitude of 9.5. The earthquake generated tsunamis across the Pacific Ocean. Waves up to 5.5m high hit Japan 22 hours after the earthquake.



Geological Survey BE @GSB... May 20
#GSB125GeoFacts 🇧🇪 Brussels sprouts, a known Belgian specialty, thrived thanks to the geology/geomorphology of Brussels. The marshy, silt & clay-rich soils between the meanders of the Senne river, notably in Saint-Gilles, were ideal for its cultivation, which boomed in the 1600s.



Geological Survey BE @GSB... May 13
#GSB125GeoFacts 💎 Alexandrite is a gem variety of the mineral chrysoberyl that can change color. In daylight it appears as green while in artificial light it appears to be red. The gem was named in 1842 after Alexander II, who then became Czar of Russia.



General public is interested in (Geo-)science !

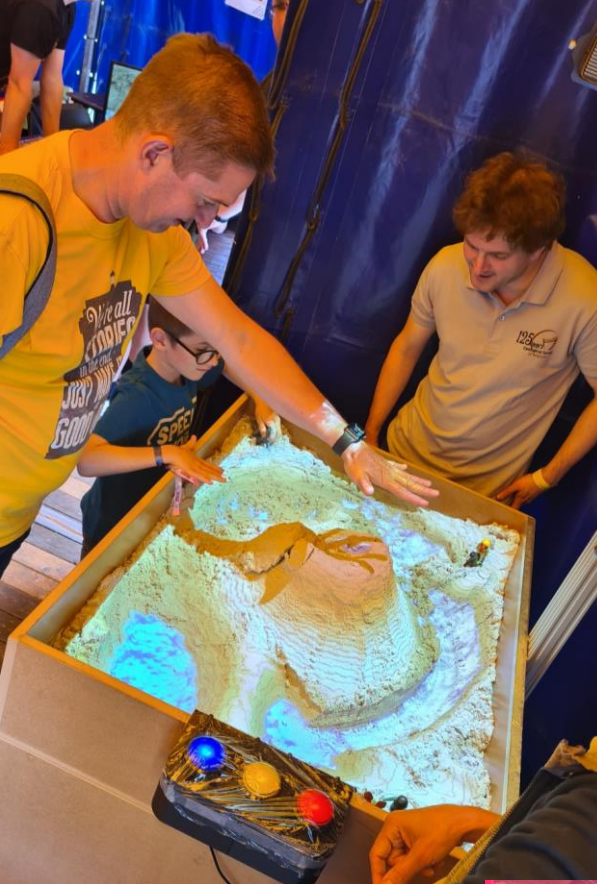
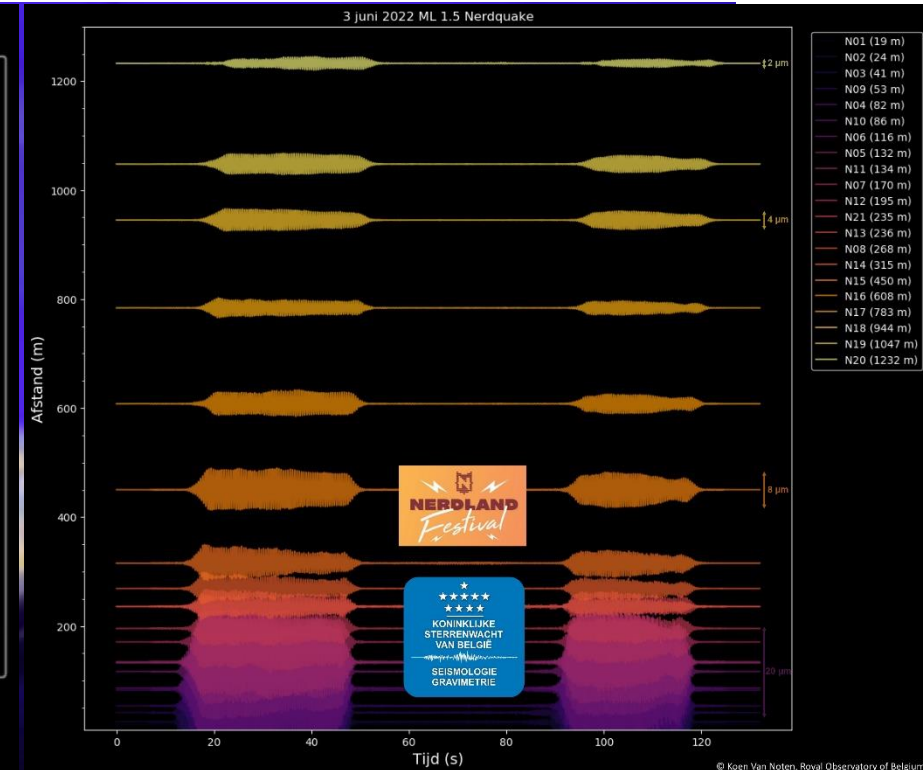
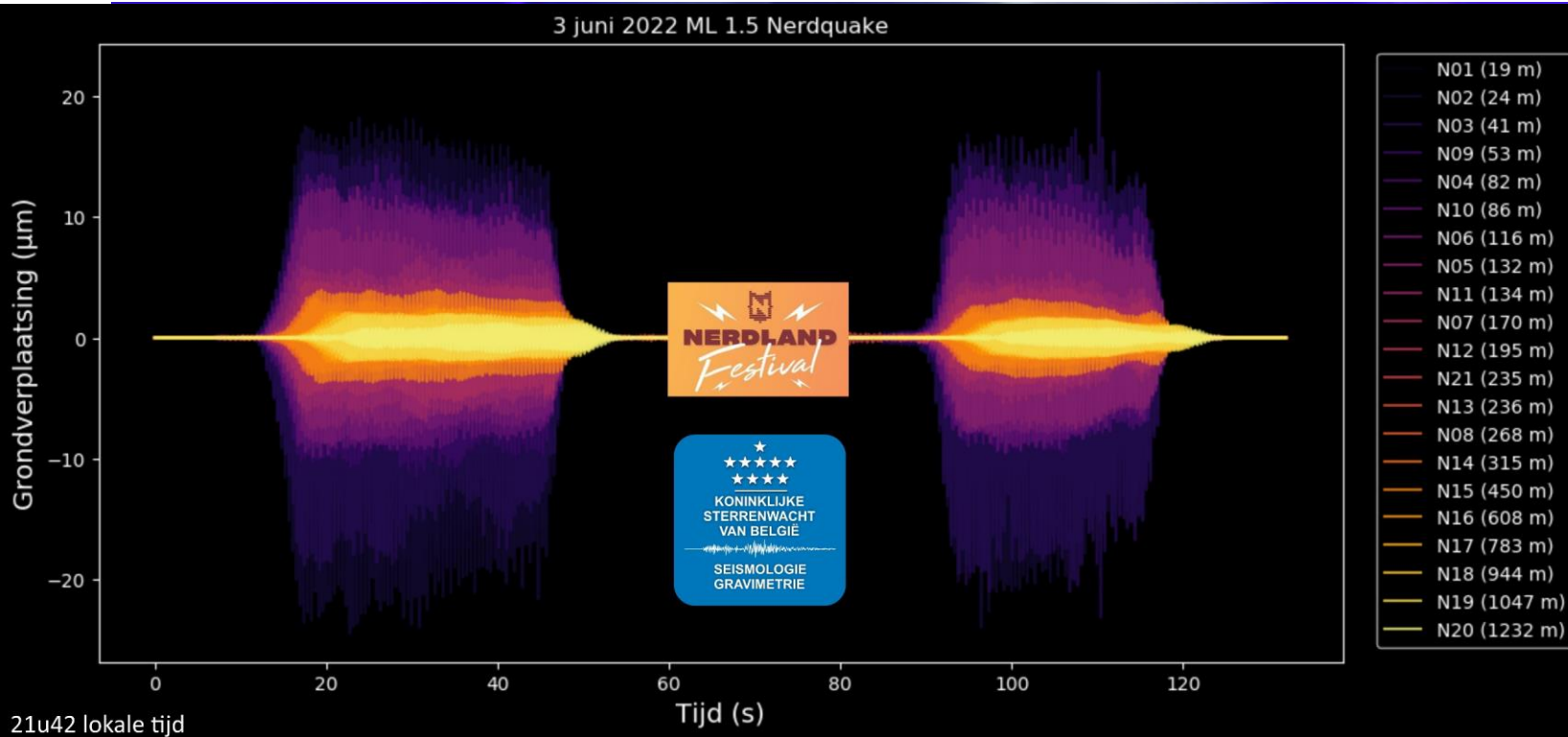


Photo: J. VB



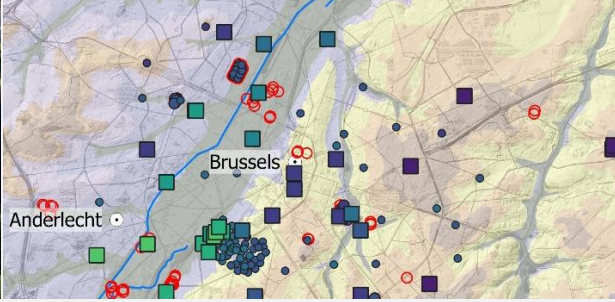
Maar het Gobiwoestijnzand is oranje-gelig en dan worden de botten ook oranje-geel.





Participation to Science – Citizen Science





When Federal Scientific Institutes (FSIs) Join Forces

The past

The present

The future

*Early collaborations
Long term strategy: Bouguer!*

*BRAIN & networks
Virtual boreholes*

*Instrument & knowledge pool
SciComm & Citizen Science*



125 yrs GSB - 9 June 2022