



SBGIMR-BVIGRM  
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# Seismic activity in and around Belgium

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# " What is your research field ? "

I'm studying  
earthquake activity in  
Belgium...





# RISK = HAZARD \* VULNERABILITY

Liège 8/11/1983 M = 4.6

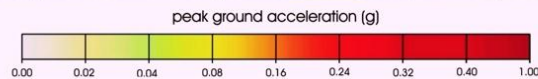
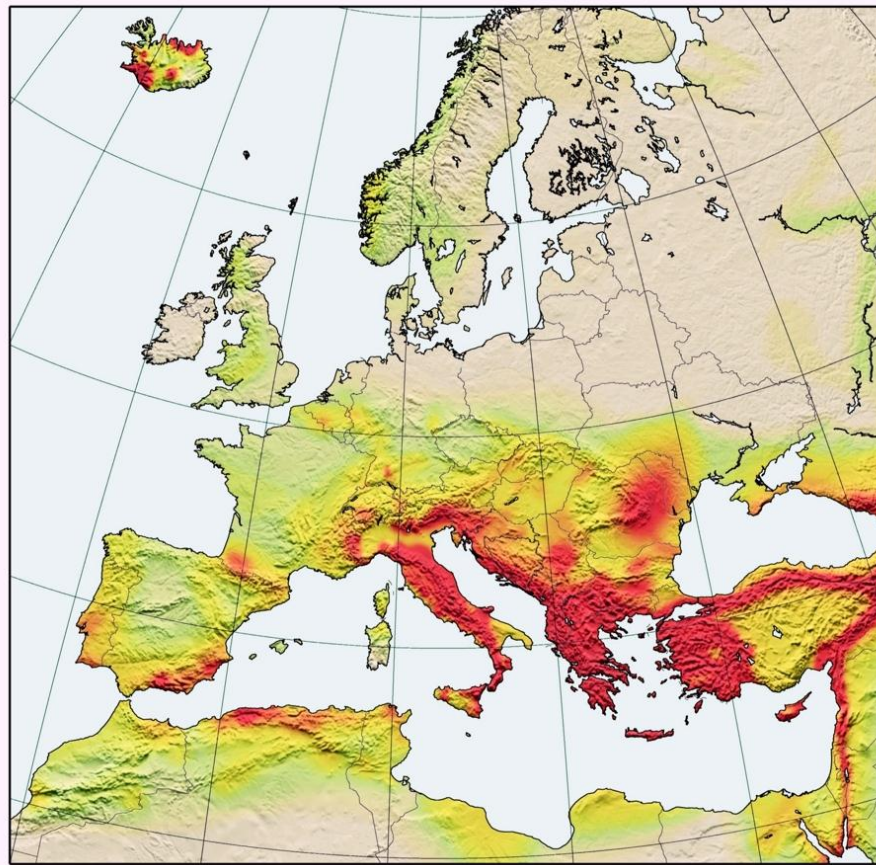
Destruction partielle ou totale de cheminées



Chutes nombreuses de frontons et de cheminées sur la voie publique

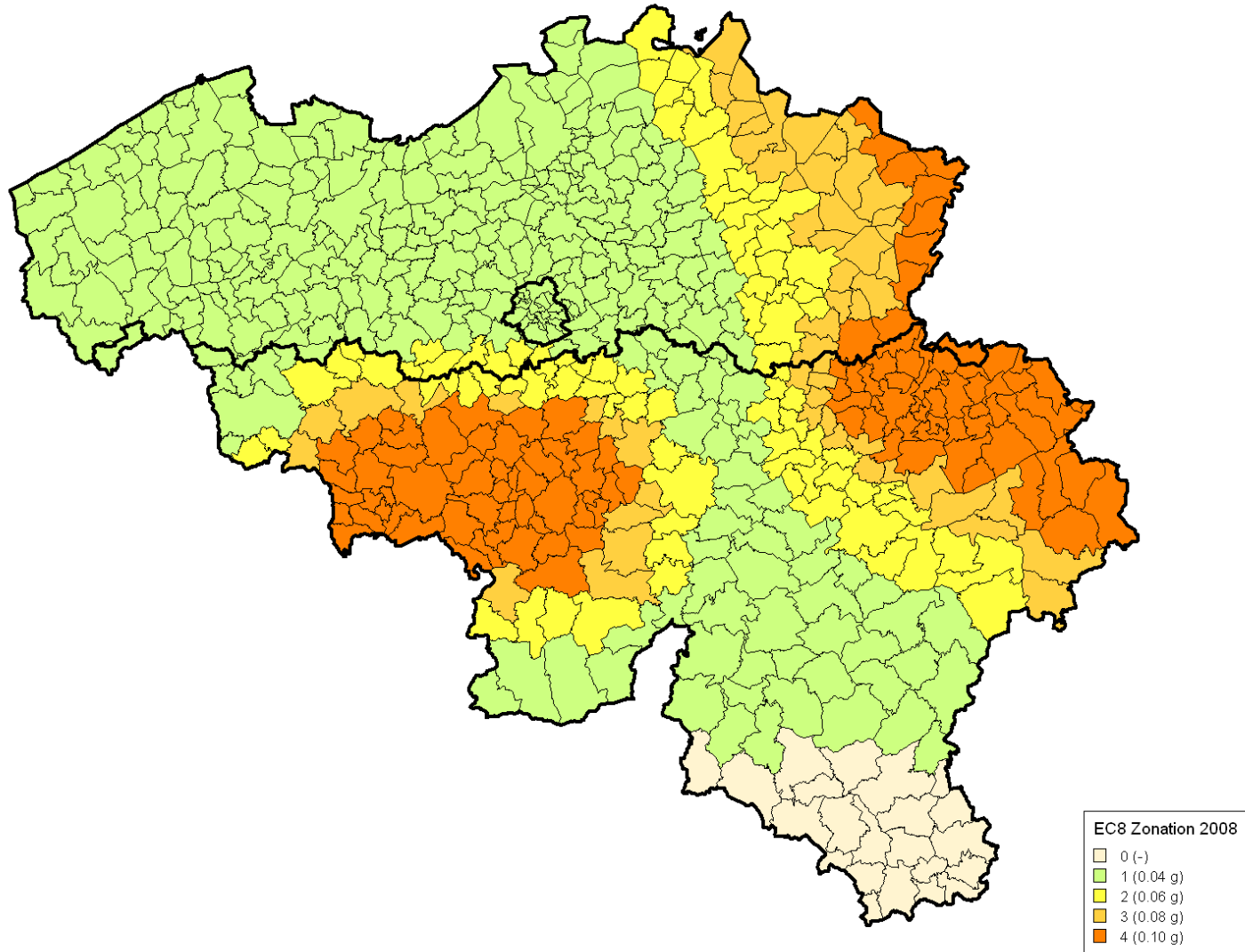


Chute de murs pignons et de façades - effondrement partiel de maisons



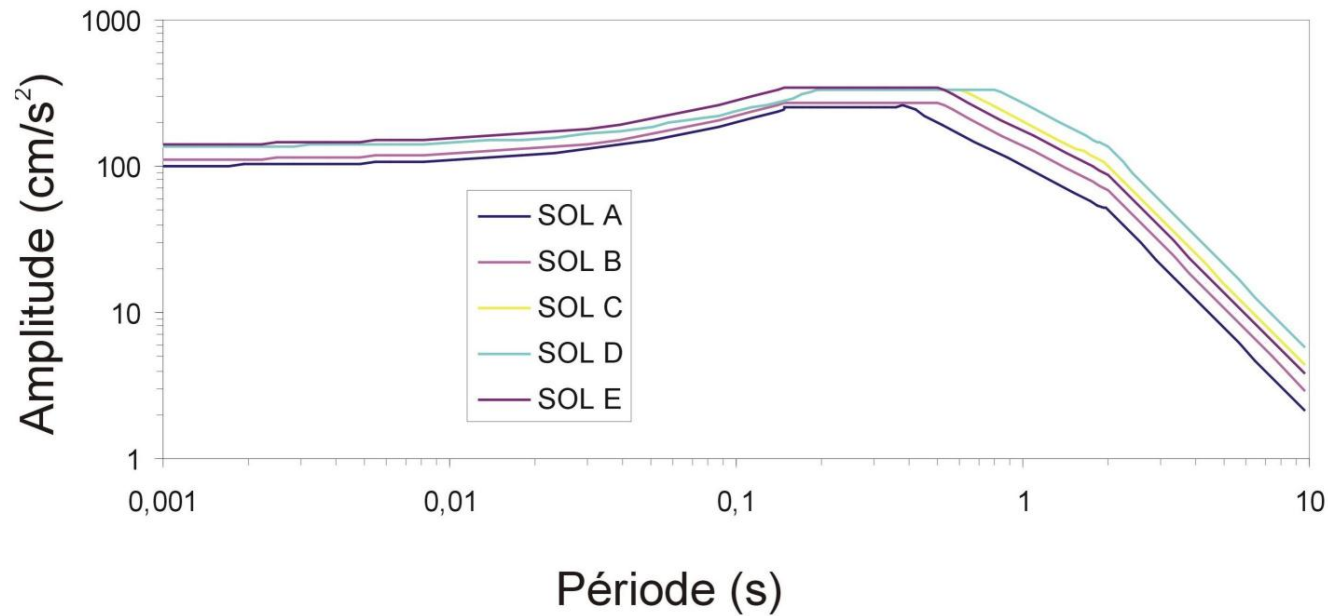


# Eurocode-8: code for new buildings





# EUROCODE 8 SPECTRA

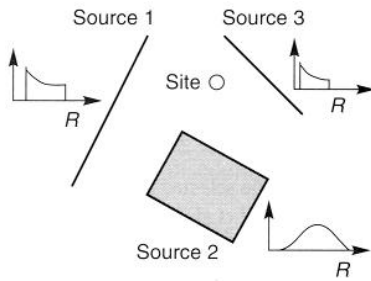


Spectra differentiated by:

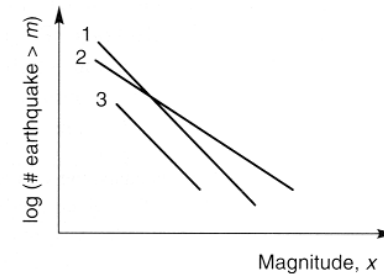
- different types of soils (defined by  $V_S^{30}$ )
- two earthquake types (type 1:  $M > 5.5$   
type 2:  $M < 5.5$ )



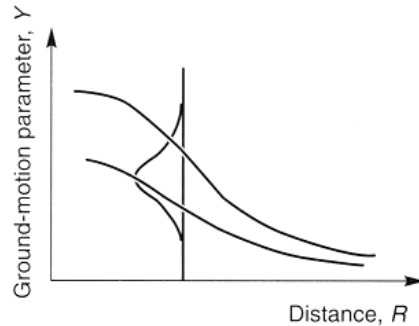
# Seismic hazard assessment



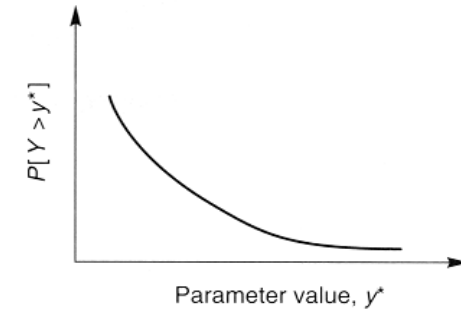
STEP 1 : Definition of Seismic sources



STEP 2: activity rate in the seismic zones



STEP 3 : Definition of the attenuation laws



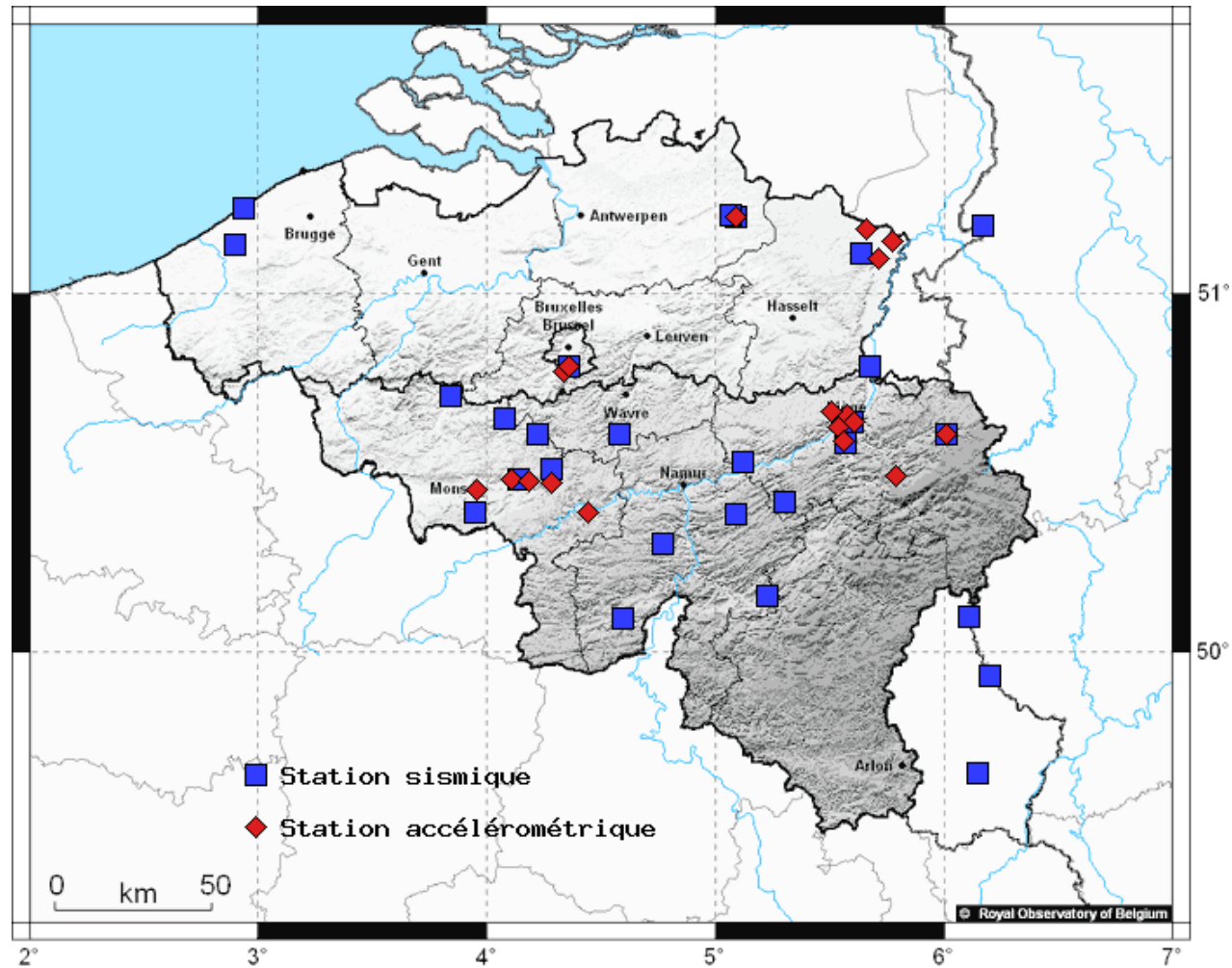
STEP 4 : Calculation of the probability for a given ground-motion



# Improve the knowledge of the seismic activity



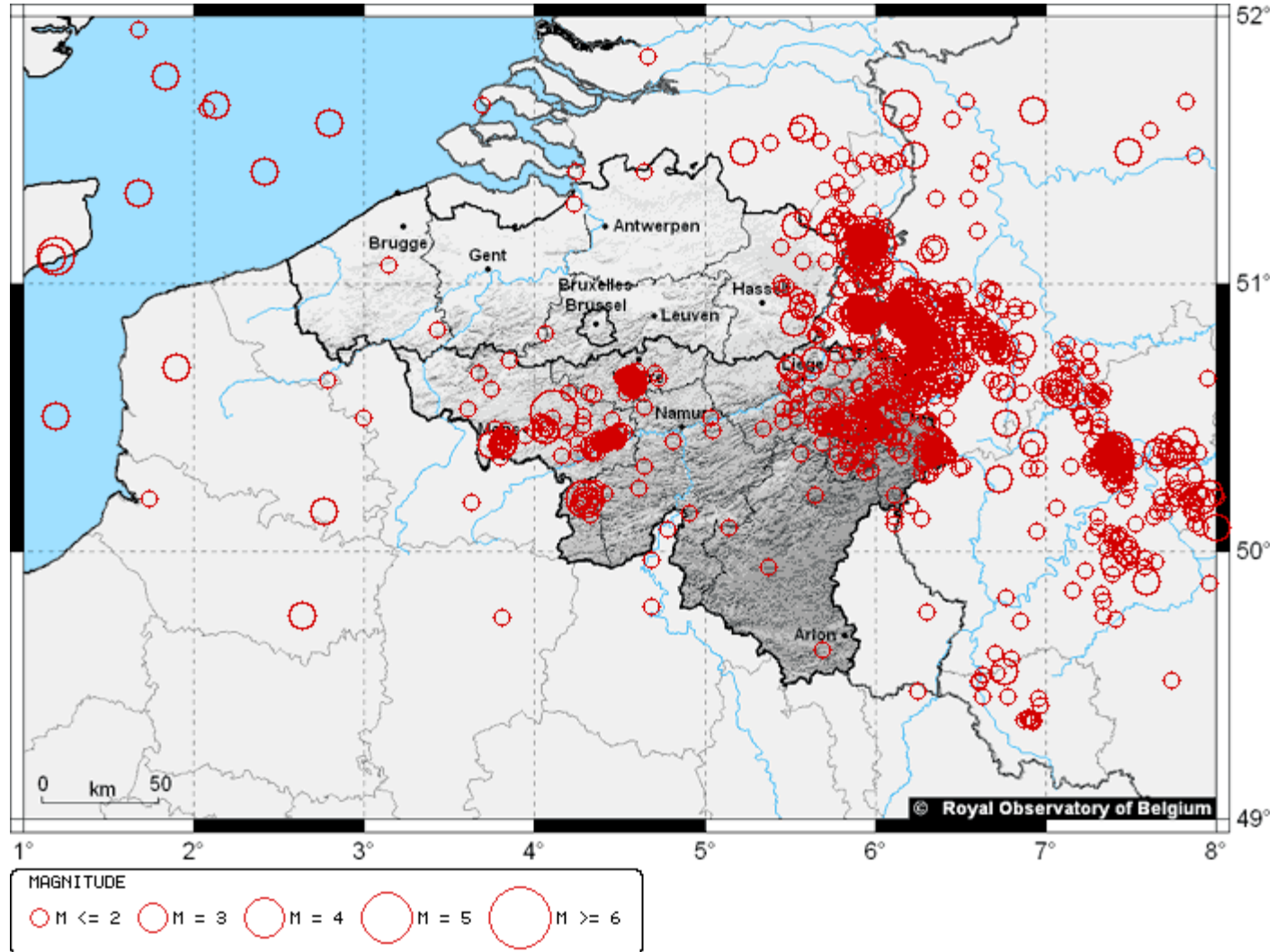
# The Belgian seismic network





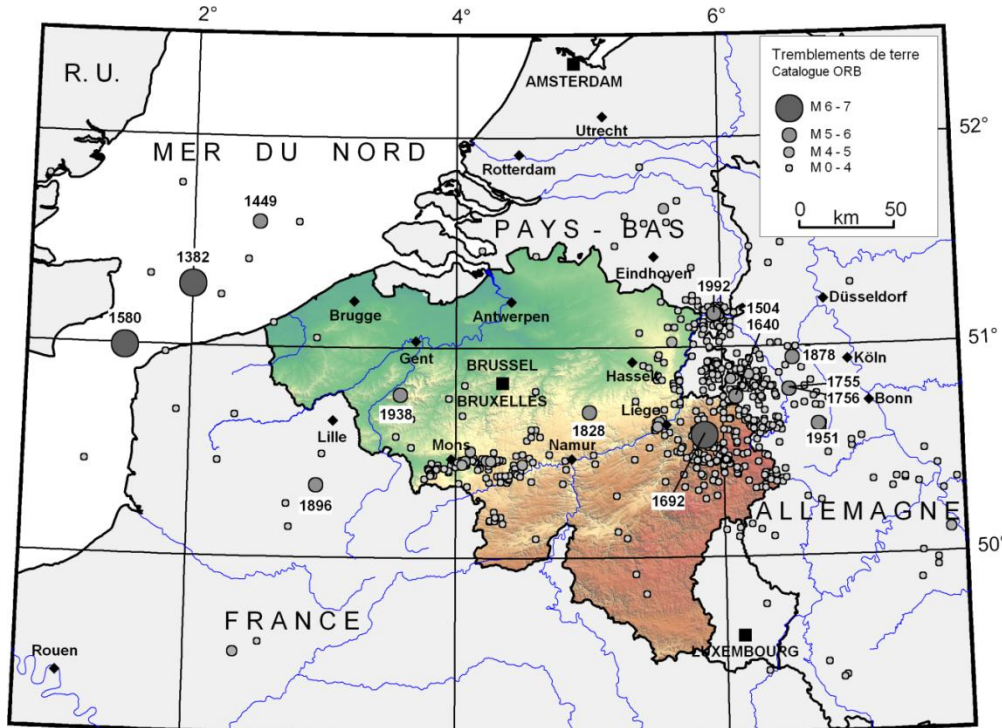


# Seismic activity 1985 - 2012





# Historical seismicity (since 1350)



a	m	j	lat N	lon E	M	region
1382	05	21	51.30	2.00	6	Mer du Nord
1449	04	23	51.60	2.50	5½	Mer du Nord
1504	08	23	50.77	6.10	5	Aachen
1580	04	06	51.00	1.50	6	Pas de Calais
1640	04	04	50.77	6.10	5½	Aachen
1692	09	18	50.59	5.86	6¼	Verviers
1755	12	27	50.77	6.10	5¼	Aachen
1756	02	18	50.80	6.50	5¾	Düren
1828	02	23	50.70	5.00	5	Hesbaye
1878	08	26	50.95	6.53	5½	Tolhausen
1896	09	02	50.35	2.96	5	Lens-Arras
1938	06	11	50.78	3.58	5.0	Nukerke
1951	03	14	50.63	6.72	5.3	Euskirschen
1992	04	13	51.16	5.95	5.4	Roermond

## Average recurrence time

$M \geq 6.0$	260 ans
$M \geq 5.0$	30 ans
$M \geq 4.0$	3 ans



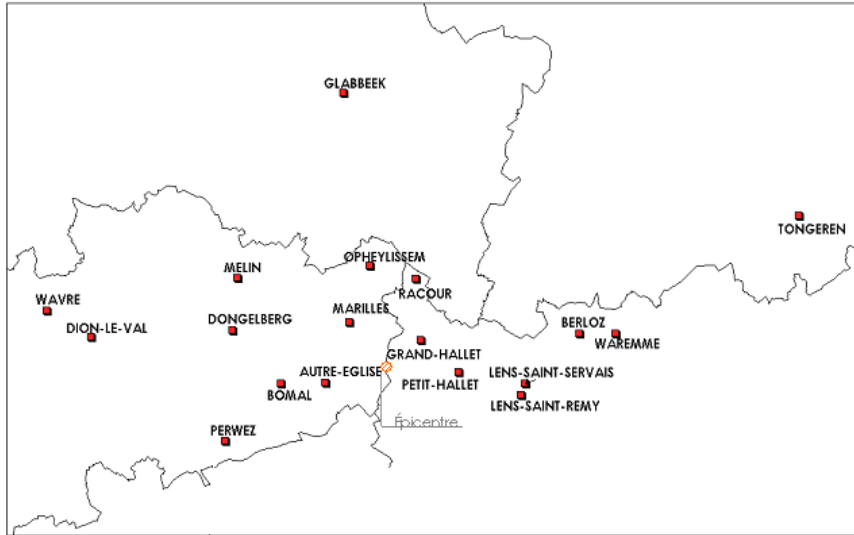
Spatial and temporal variations of earthquake activity in plate interiors



# Importance and quality of the information on historical earthquakes



# 23 February 1828 – M=5.0



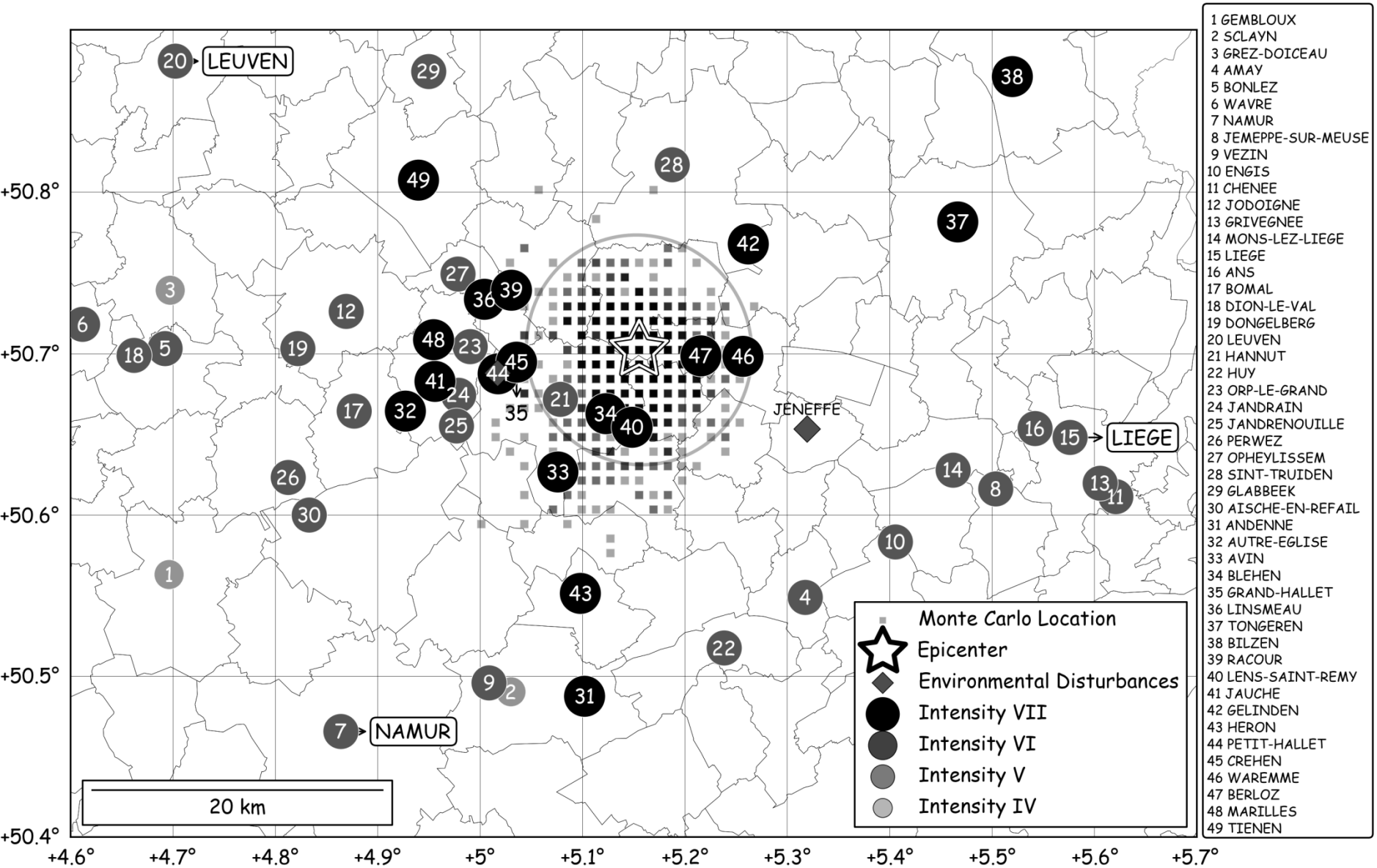
## PETIT-HALLET



Lettre du Bourgmestre au commissaire du gouvernement

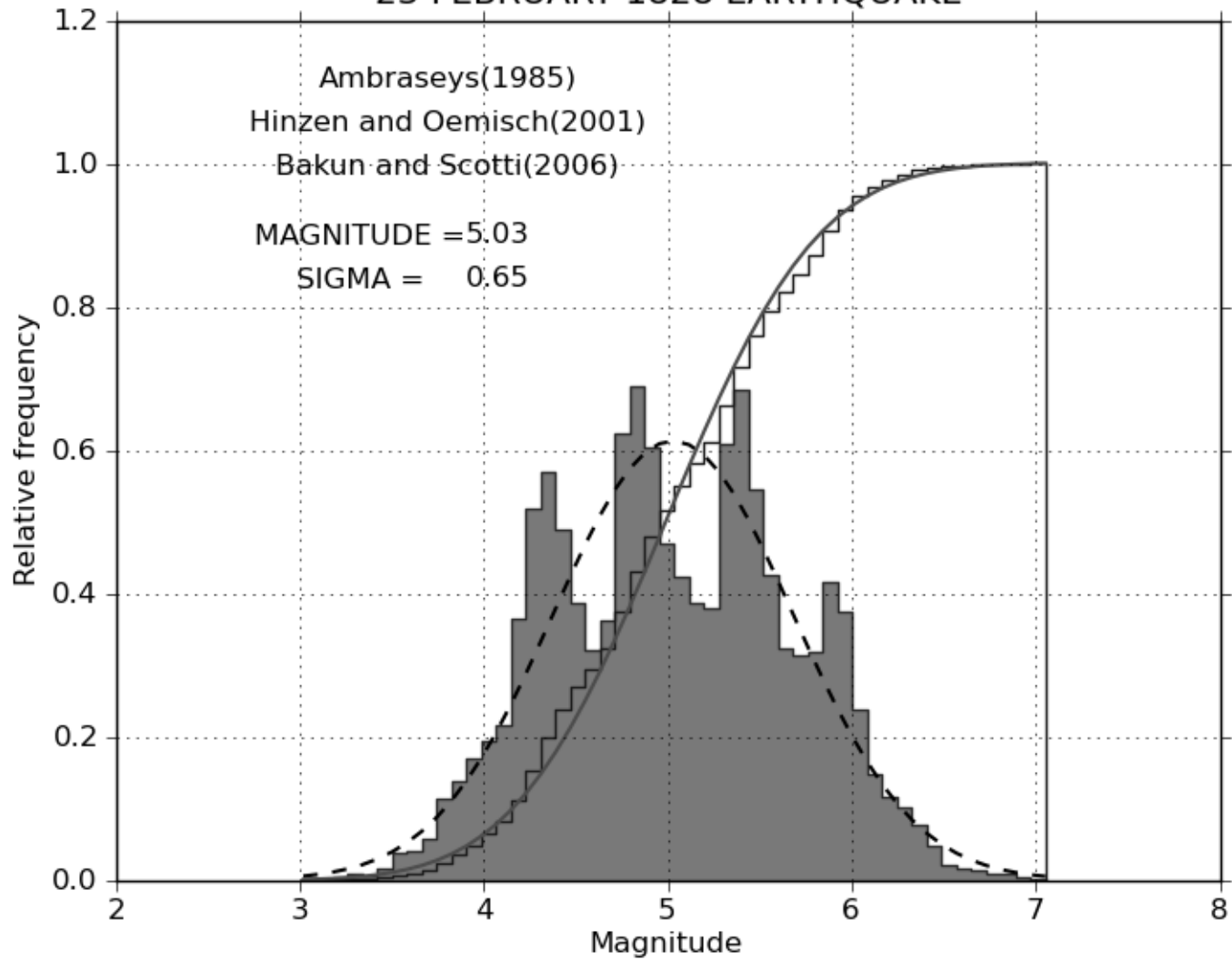
*« ... nous avons ressenti une secousse de tremblement de terre qui a renversé une partie des cheminées au dessus des toits et fait de fende dans la plupart de muraille des habitations de la commune dont quelques devront être rebaties a neuf. L'église n'a pas été exempt de cet evenement la voute est eboulee, dans plusieurs endroits, plusieurs chandeliers qui se trouvèrent sur l'autel se trouvait versé par terre cependant ... ».*

# 28 February 1828 earthquake - HANNUT





## 23 FEBRUARY 1828 EARTHQUAKE

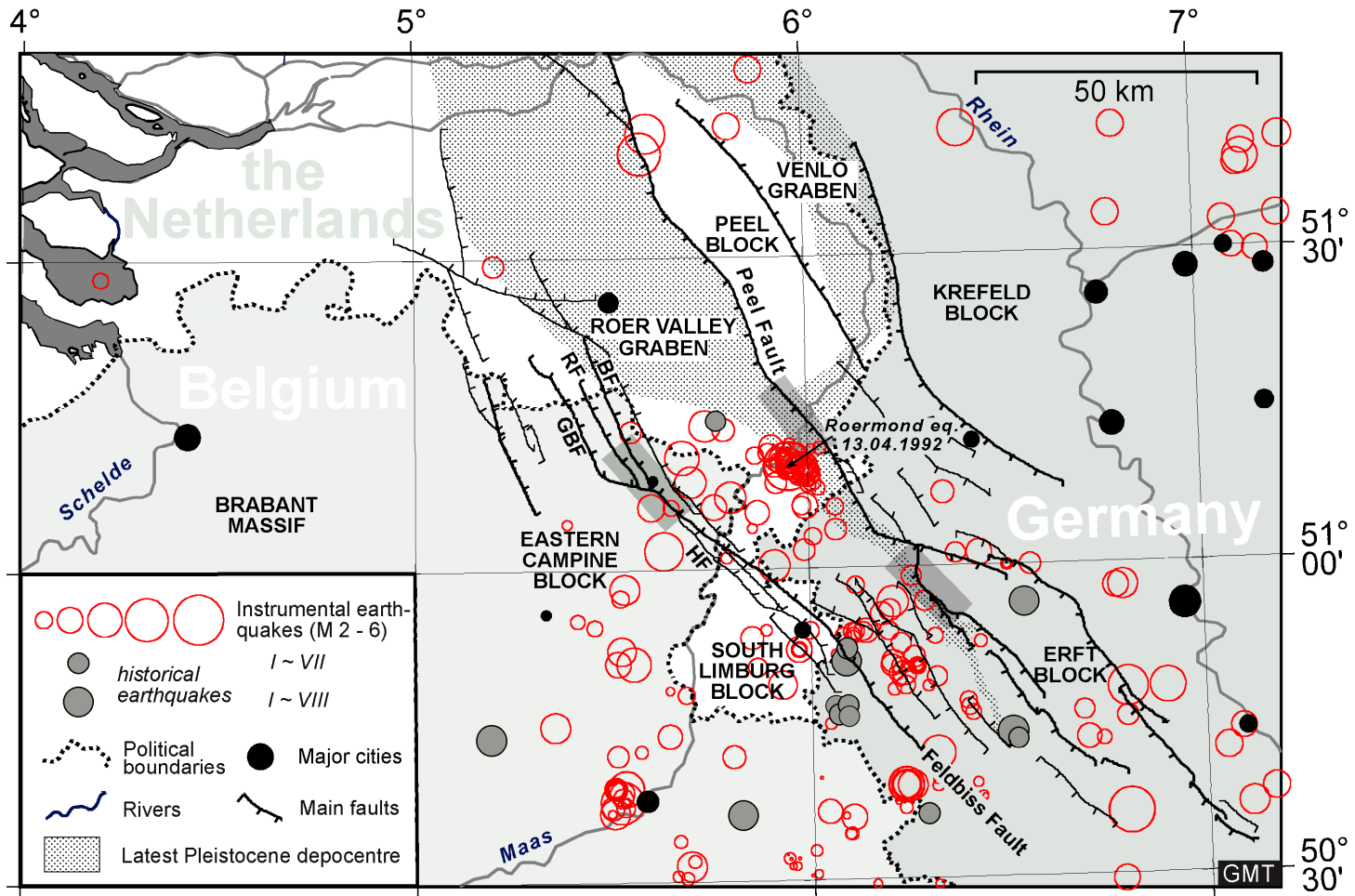




# Past large earthquakes in the geological records



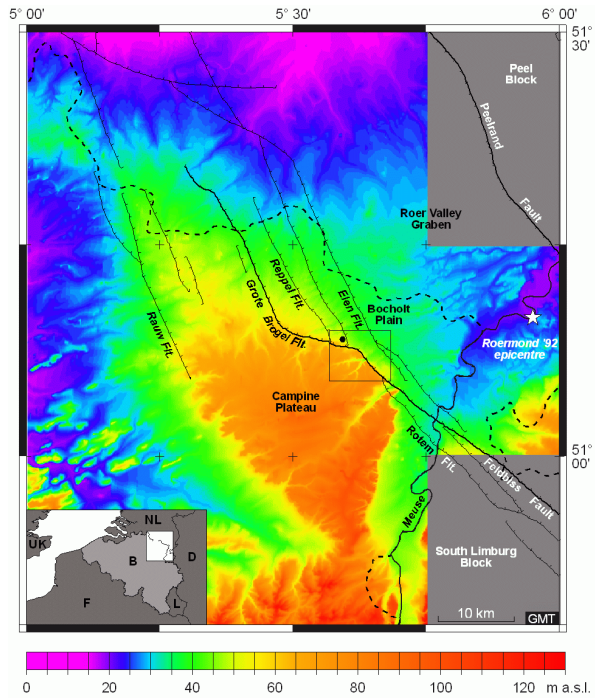
# Seismic activity and active faults in the Lower Rhine Embayment



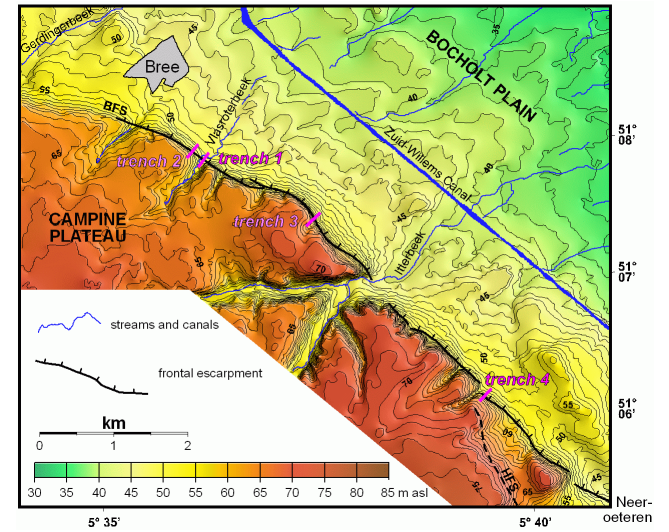




# Landscape morphology

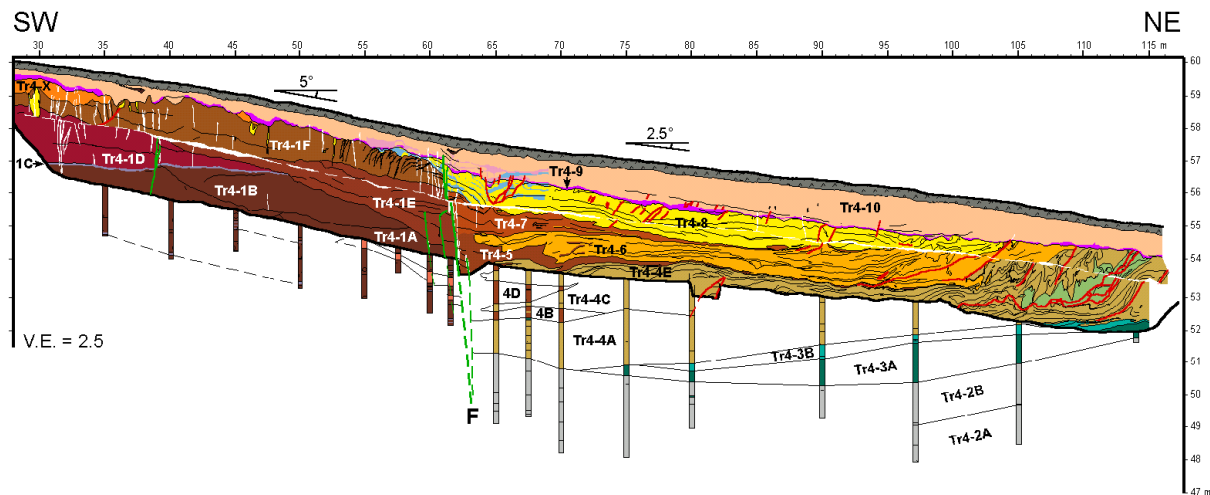


## Bree fault scarp



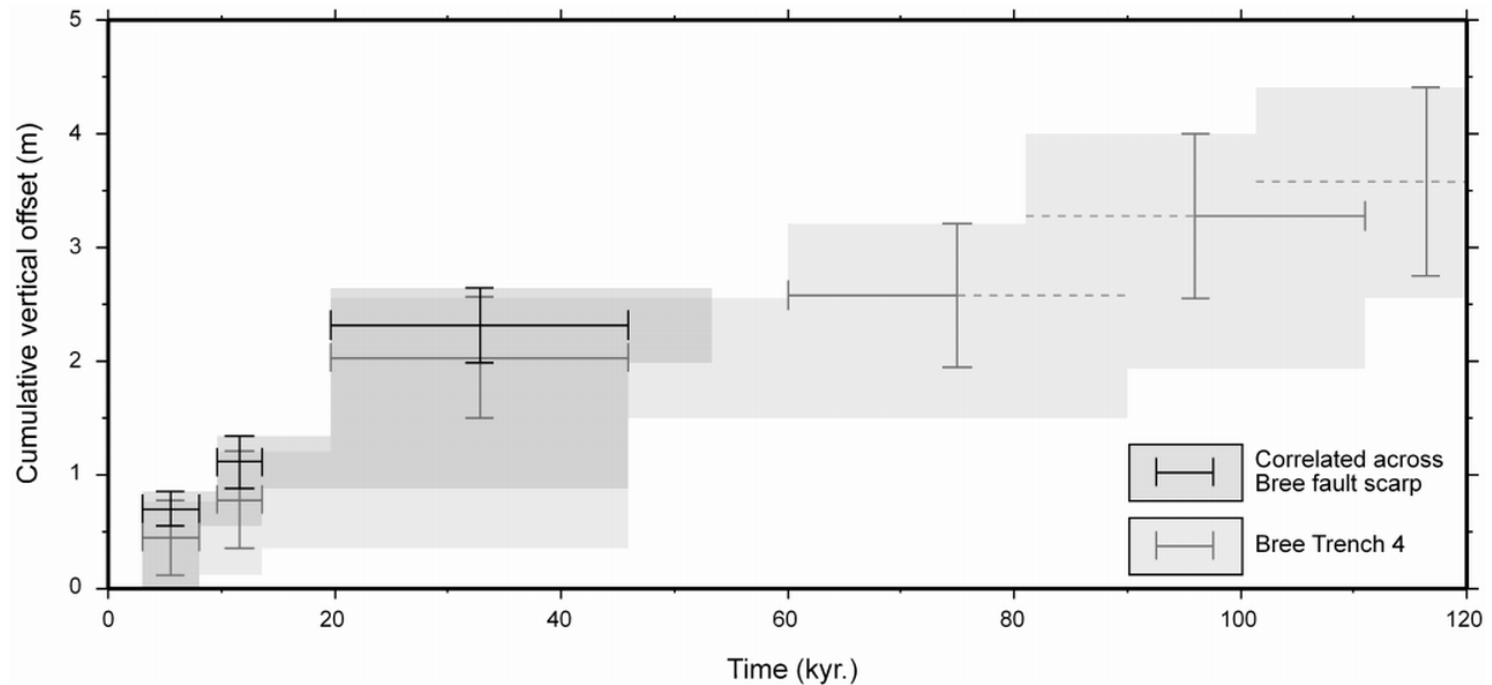


# Bree fault scarp - trench 4





# Large earthquakes along the Bree fault scarp



M between 6.2 to 6.8

Average recurrence time  $13.7 \pm 7.8$  kyr

[T. Camelbeeck, K. Vanneste, P. Alexandre, K. Verbeeck, T. Petermans, P. Rosset, M. Everaerts, R. Warnant and M. Van Camp (2007)]



DOIT-ON CRAINDRE UN SÉISME CHEZ NOUS ?

