

# Tectonique et Karst

De l'origine des phénomènes karstiques à la  
tectonique active

AGBP, Paris,  
16 mars 2011

Sara Vandycke



Goyet



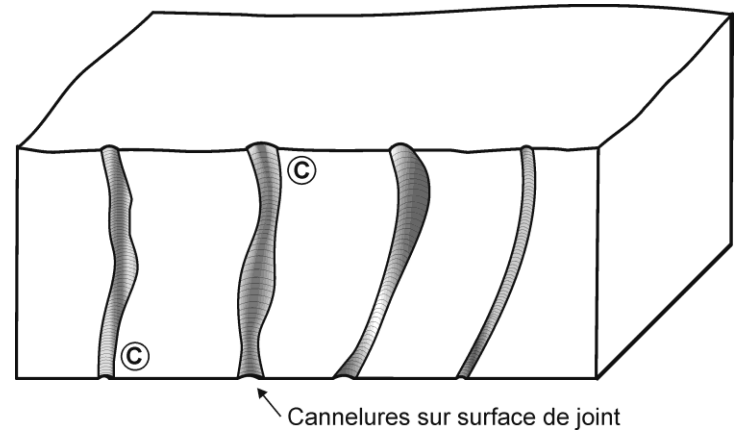
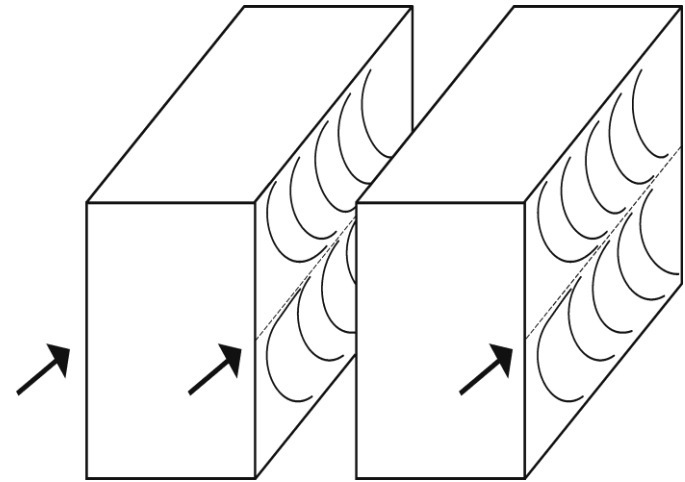
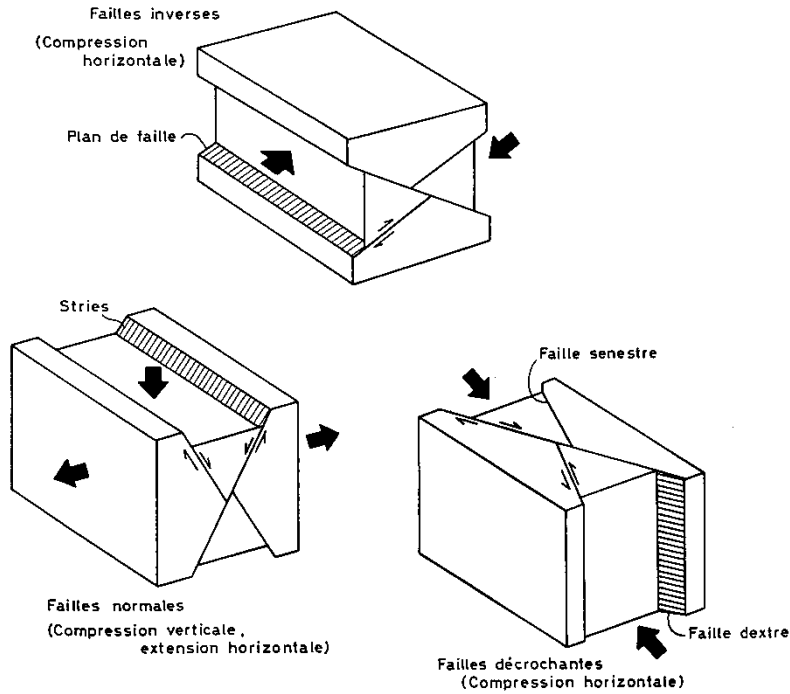
Grotte de Hotton

# Quelques concepts...

- Une fracture, de l'altération et un karst
- Une fracture, une tectonique en extension, une période continentale
- Une tectonique en extension, des joints, une altération, du karst
- De la tectonique ayant une composante extensive, de la fracturation, de l'altération in situ (« fantômes de roche »), de la vidange, des grottes...

# Fracturation

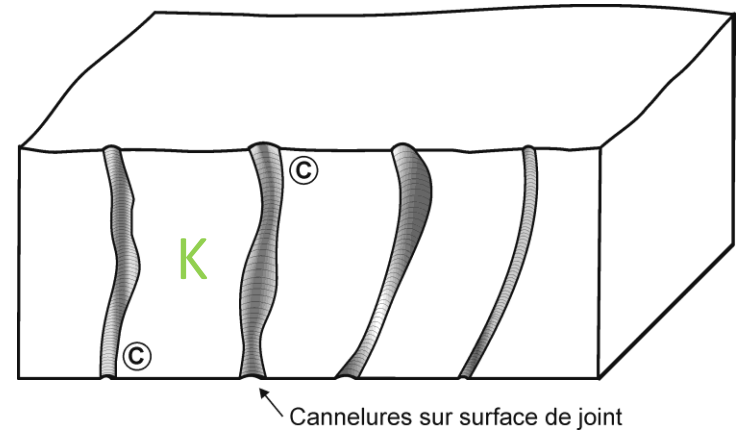
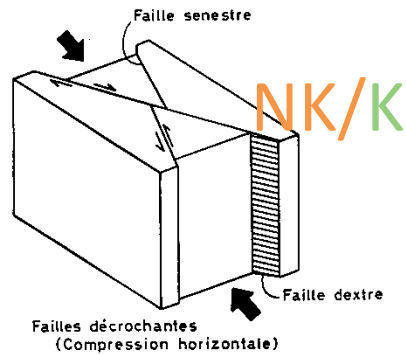
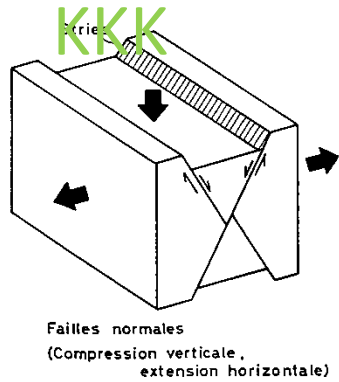
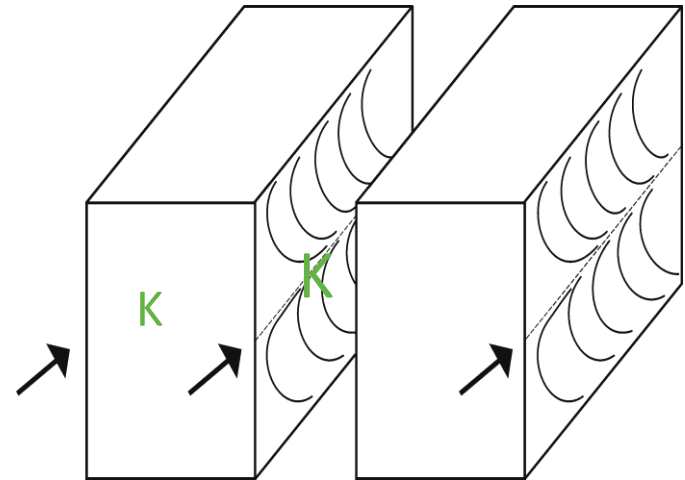
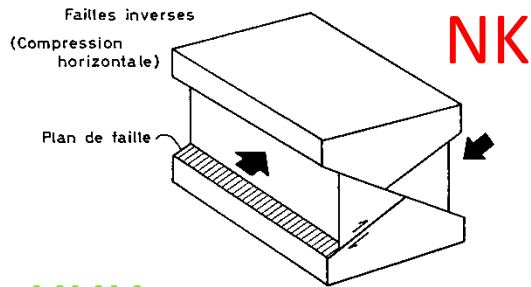
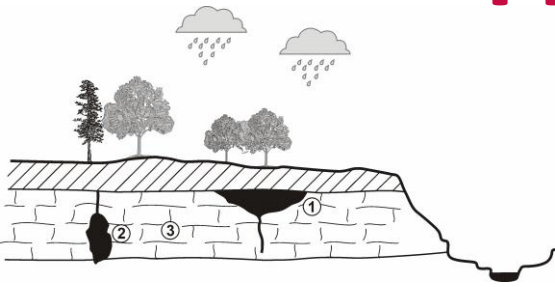
## Joints



## Failles

# Fracturation- Karsts

Joints



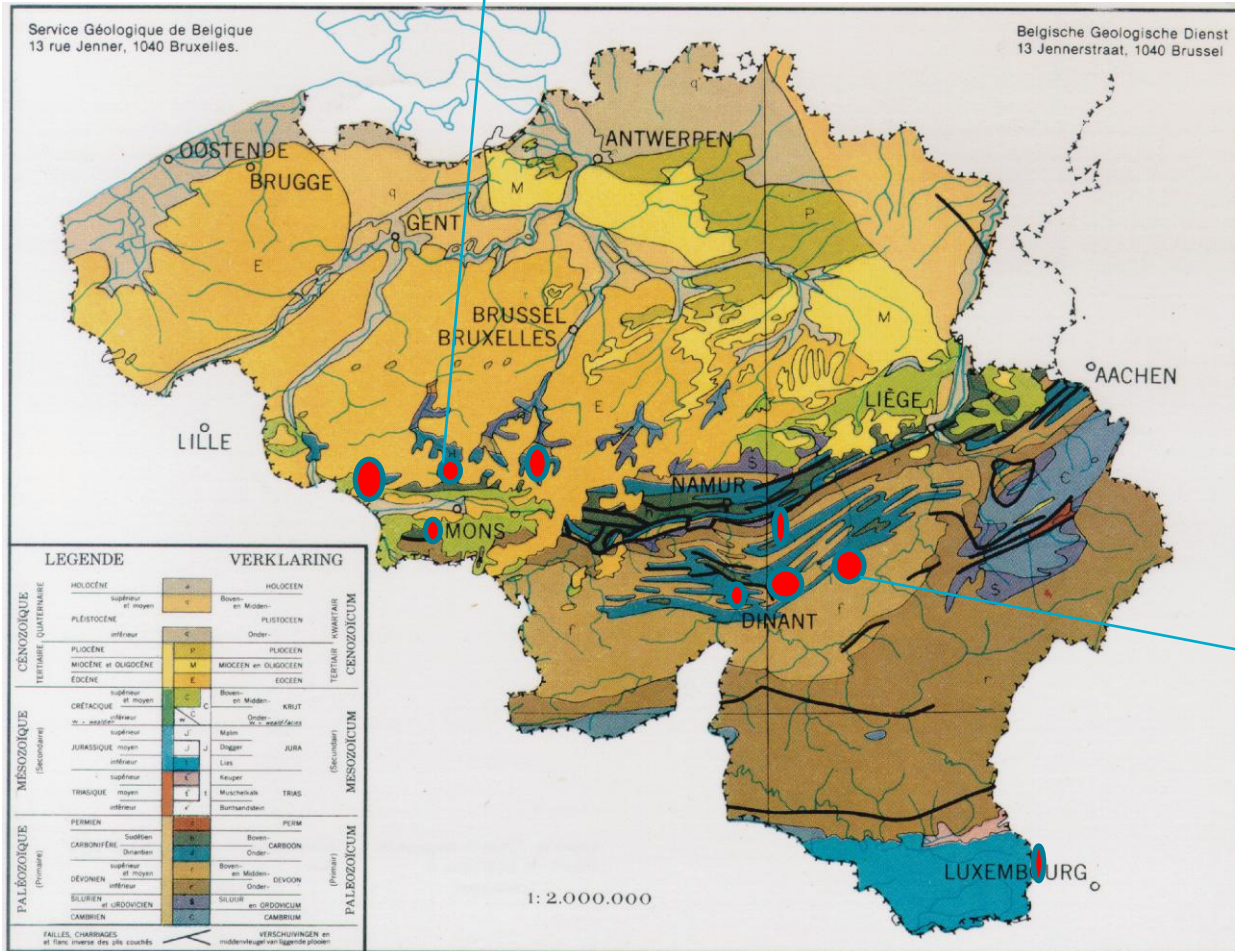
Failles



# Cas d'étude

- Relations tectonique cassante-karstification
  - Le Petit-Granit à Soignies
- Chronologie, morphologie et enregistrement
  - Le Réseau de grottes de Han-sur-Lesse
- Karst et tectonique active
  - Le Laboratoire de la Grotte de Rochefort

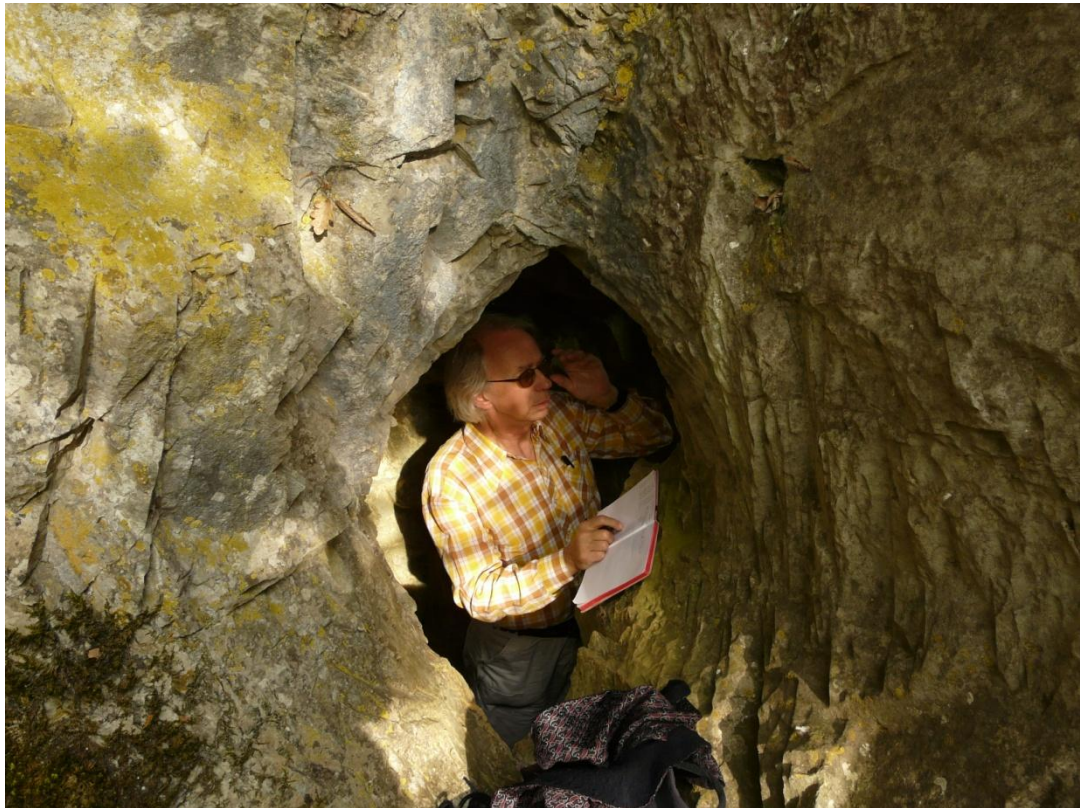
# Soignies



Han-sur-Lesse  
Rochefort







# Tectonique et karstification des calcaires carbonifères du Parautachtone Brabançon (Soignies, Tournai)



Quinif & al., 1997, BSGF



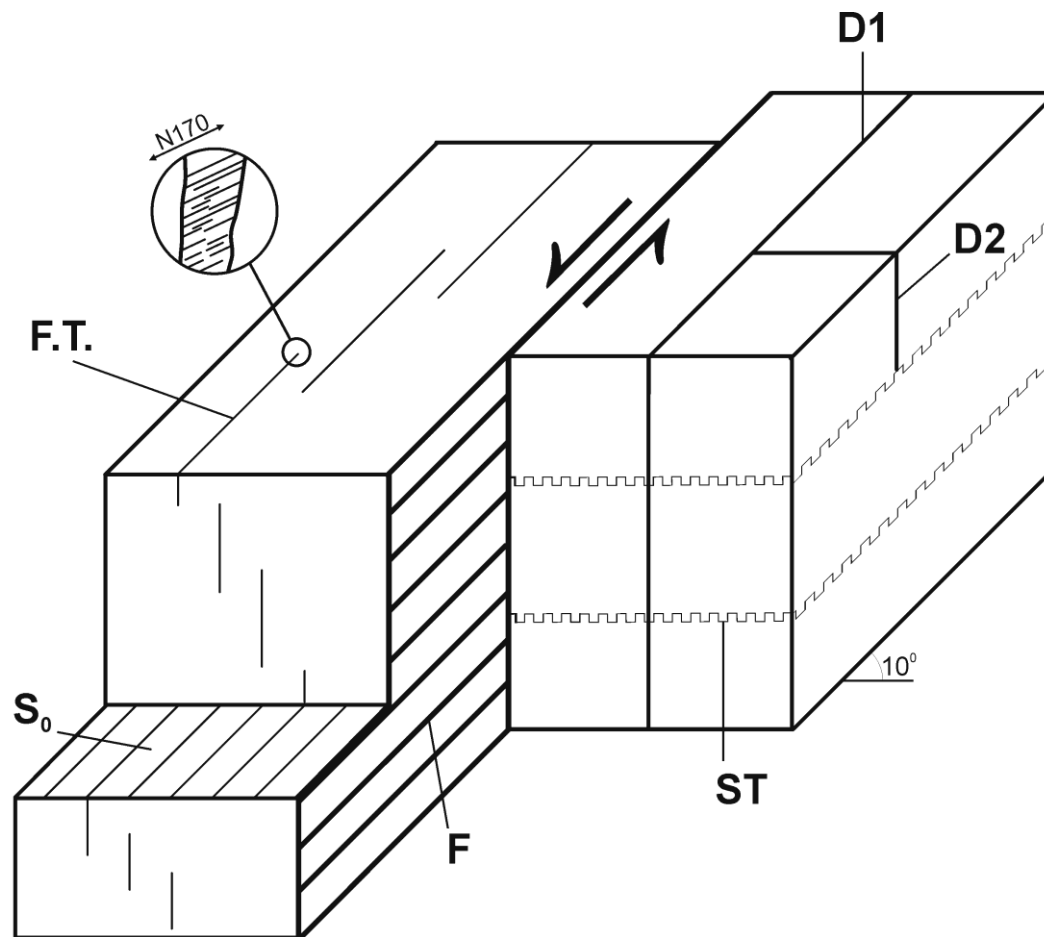
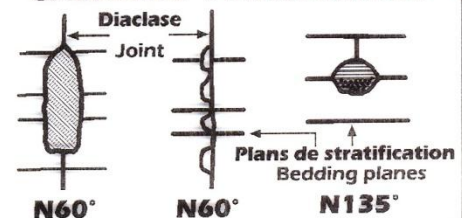
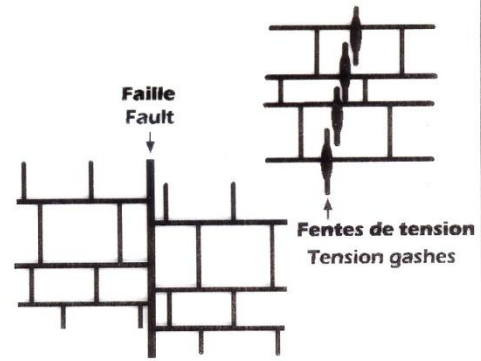
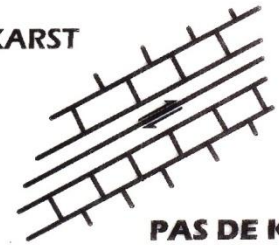


Schéma structural-Soignies

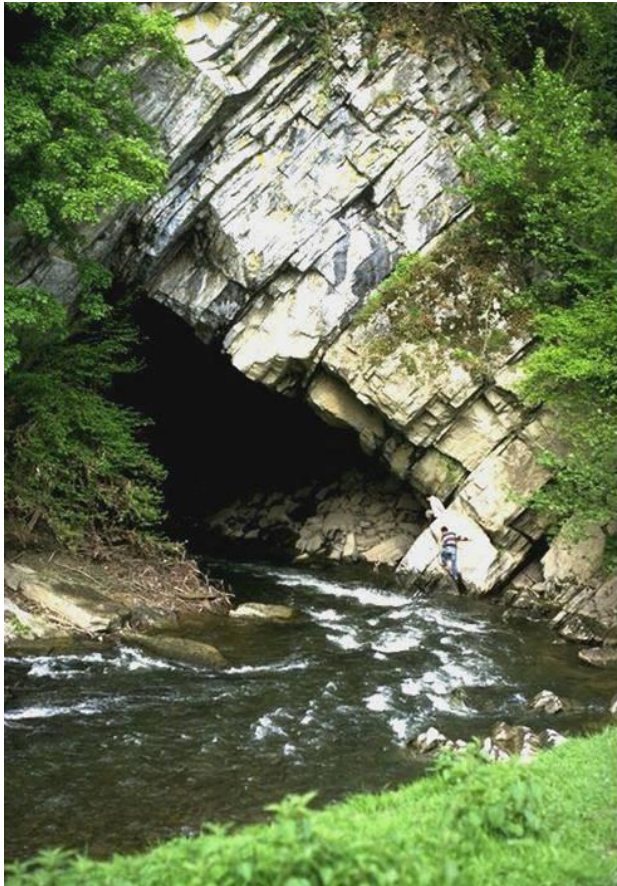
Epoque - Age	Tectonique - Tectonics	Karst
Cénozoïque <i>Cenozoic</i>  Crétacé supérieur <i>Upper Cretaceous</i>	<b>DIACLASES</b> <b>N20°-25° / 100°-105°</b> <b>JOINTS</b>	<b>FRACTURES ELARGIES</b> <b>AQUIFERES</b>  <b>ENLARGED AQUIFER</b> <b>FRACTURES</b>
Crétacé inférieur <i>Lower Cretaceous</i>	<b>DIACLASES</b> <b>N50°-65° / N130°-135°</b>  <b>JOINTS</b>	<b>GALLERIES - ANASTOMOSES</b> <b>GALLERIES - ANASTOMOSIS</b>  
Post-hercynien <i>Late hercynian</i>	<b>FENTES DE TENSION</b> <b>N60°-155° / 130°-135°</b> <b>TENSION GASHES</b>  <b>FAILLES DECROCHANTES</b> <b>N100°-155° / 40°-65° / 50°-75°</b> <b>STRIKE-SLIP FAULTS</b>	 <b>PAS DE KARST - NO KARST</b>
Hercynien <i>Hercynian</i>	<b>FAILLES INVERSES</b> <b>INVERSE FAULTS</b>	<b>NO KARST</b>   <b>PAS DE KARST</b>

Quinif & al.,  
1997, BSGF



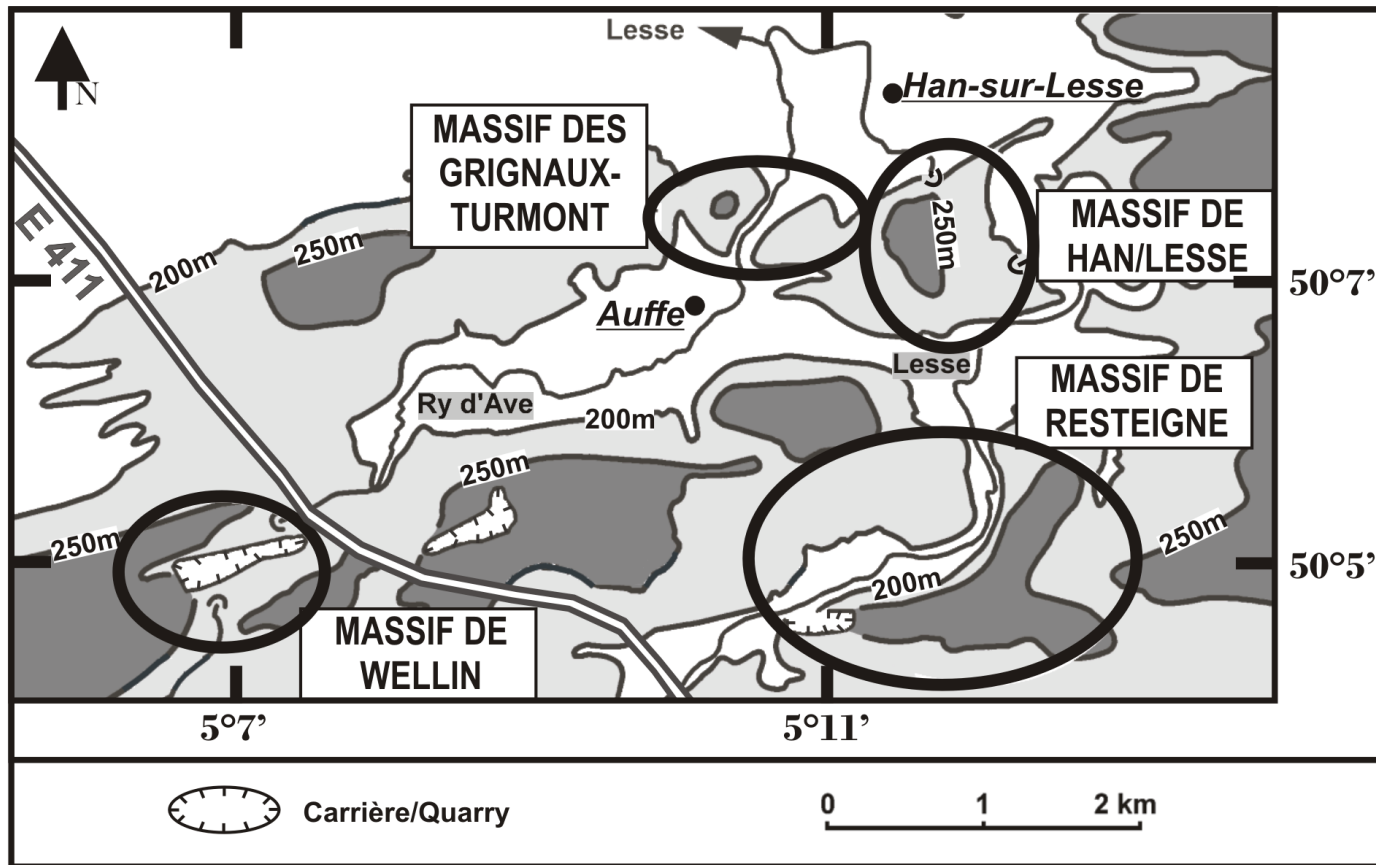
Quinif & al., 1997, BSGF

# Tectonique, géomorphologie, fantômisation et grottes. Le cas des grottes de Han-sur-Lesse

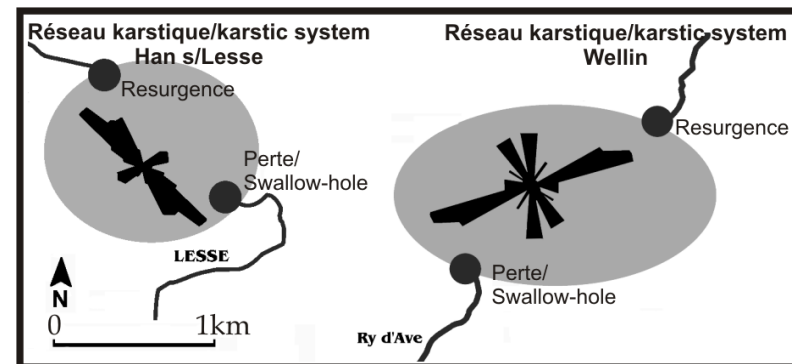


Le Gouffre de Belvaux, Han-sur-Lesse





**Cadre morphologique.** Localisation des massifs étudiés. Les courbes fermées délimitant les reliefs de plus de 250 m se calquent sur les collines calcaires. Les vallées sont creusées dans les formations schisteuses. Le Ry d'Ave et la Lesse traversent les massifs, Havron & al, 2007, Geologica Belgica



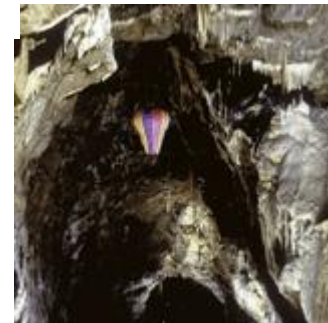
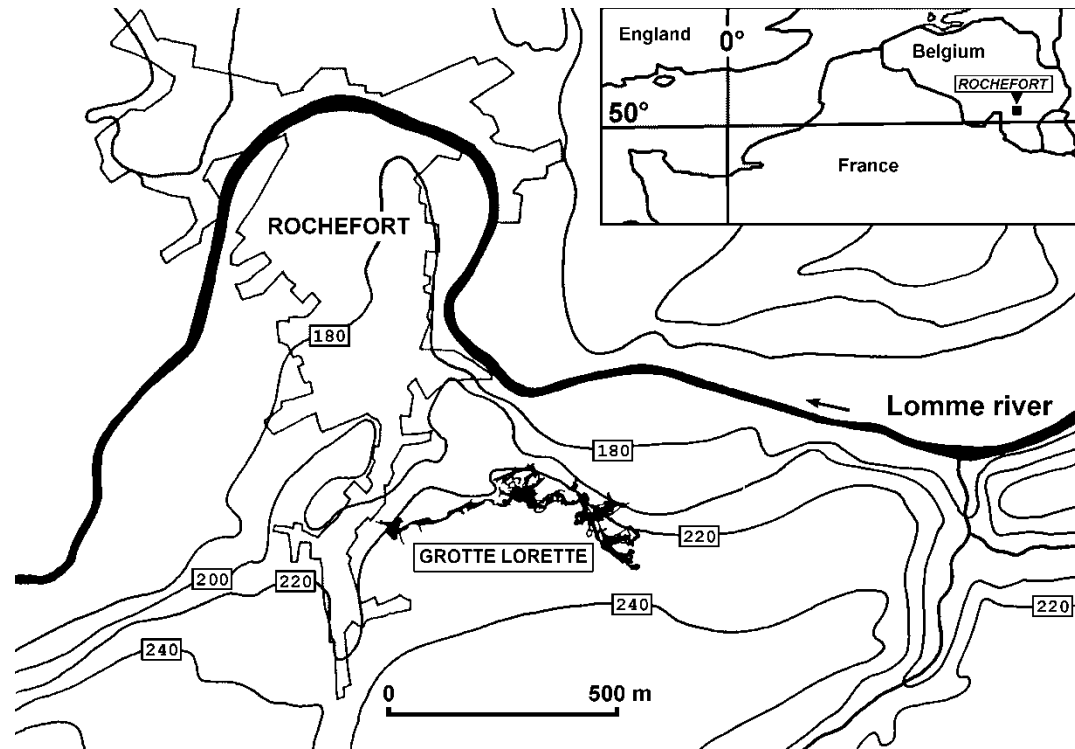




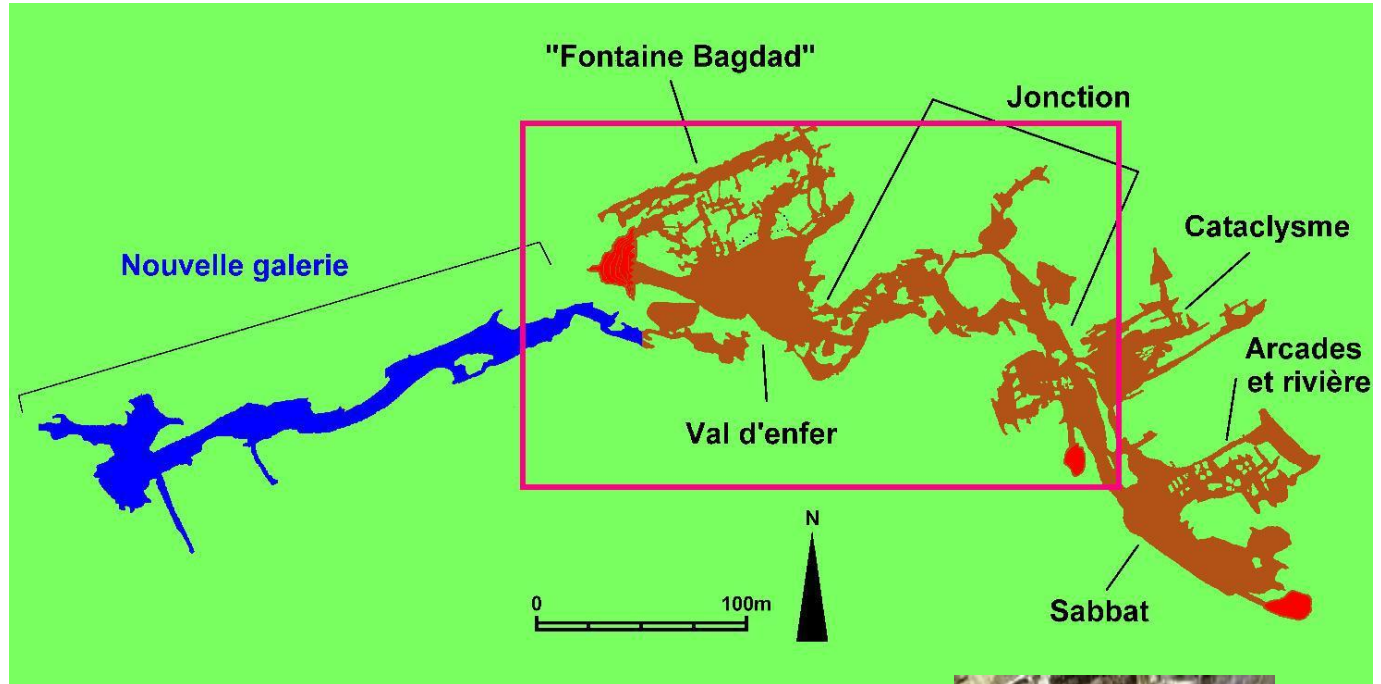
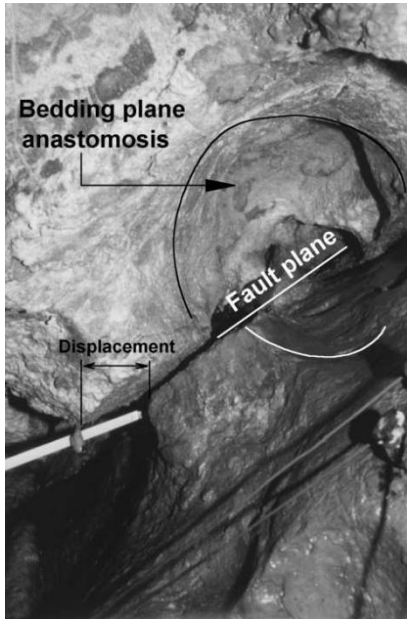
Carrière des Fonds-des Vaux à Wellin

	<b>TECTONIQUE ET STRUCTURES</b>	<b>EAU</b>	<b>KARSTOGENESE ET GEOMETRIE DES RESEAUX</b>
<b>CENOZOÏQUE</b>	<p><i>Extension NE-SW</i></p> <p>Han/Lesse      Wellin</p> <p><b>Joints NW-SE en extension</b></p> <p>Restéigne      Grignaux-Turmont</p>	Gradient hydraulique	<p>Joints NW-SE exprimés</p> <p><b>Karstification</b></p>
	<p><i>Extension NW-SE ?</i></p> <p>Etablie dans les régions voisines</p>		Pas de gradient hydraulique
<b>HERCYNIE</b>	<p><i>Tectonique hercynienne</i></p> <p>TA      TC      TD</p> <p><b>Compression</b>      <b>Décrochement</b></p> <p>W →      ← E</p> <p>Plis - Failles      Fentes de tension</p>		<p><b>Pas de karstification</b></p>

# Enregistrement de la Tectonique Active par le karst. La grotte expérimentale de Rochefort



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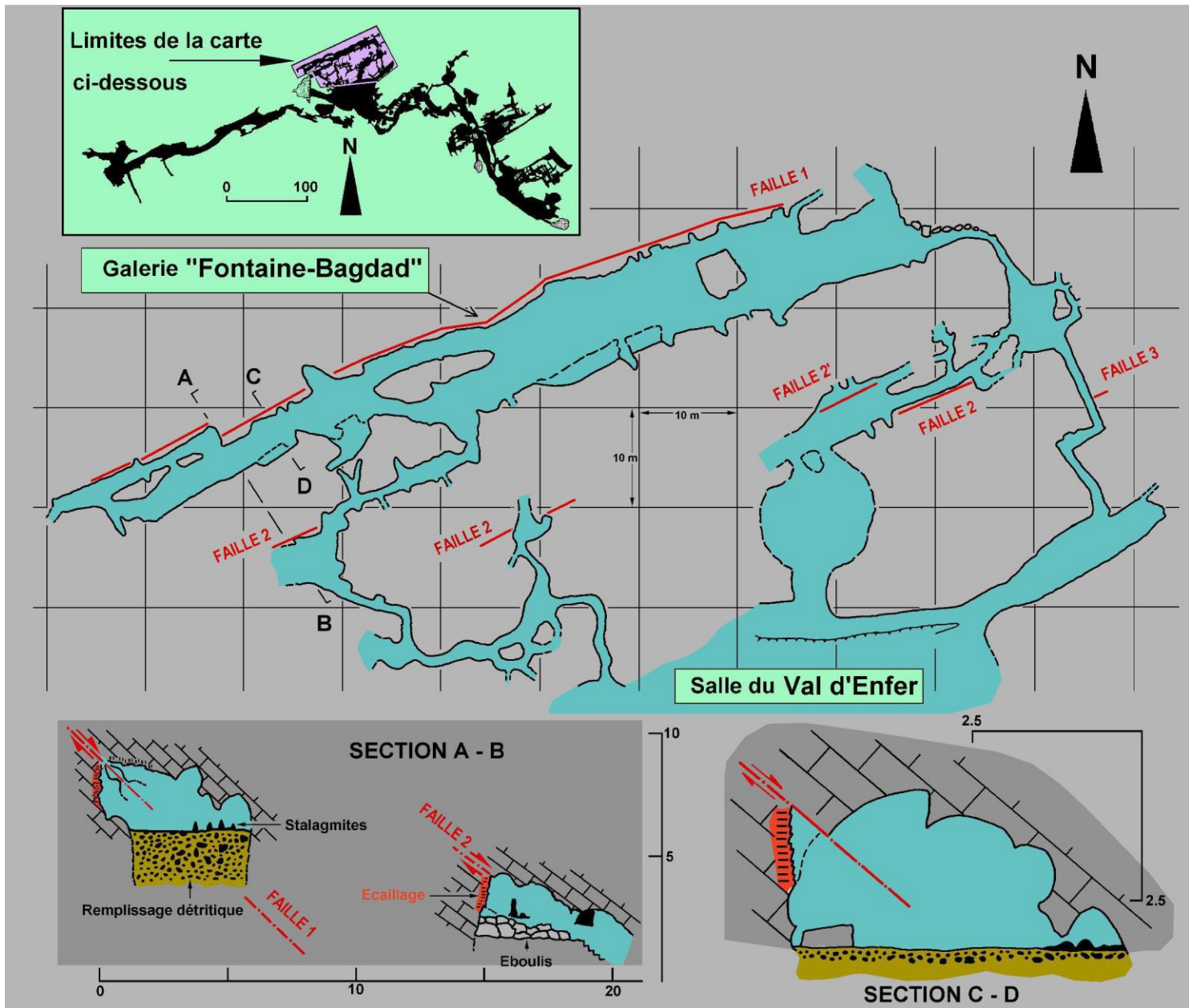


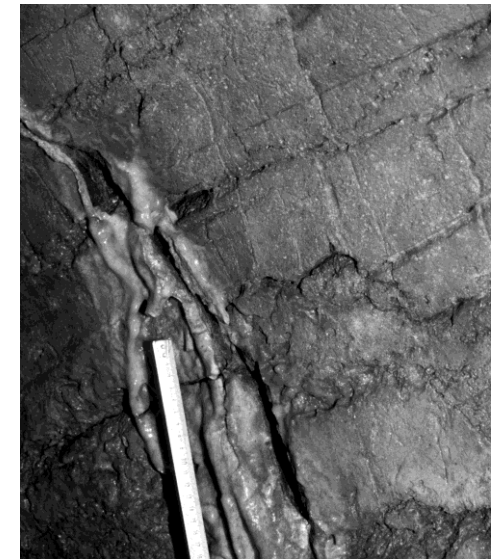
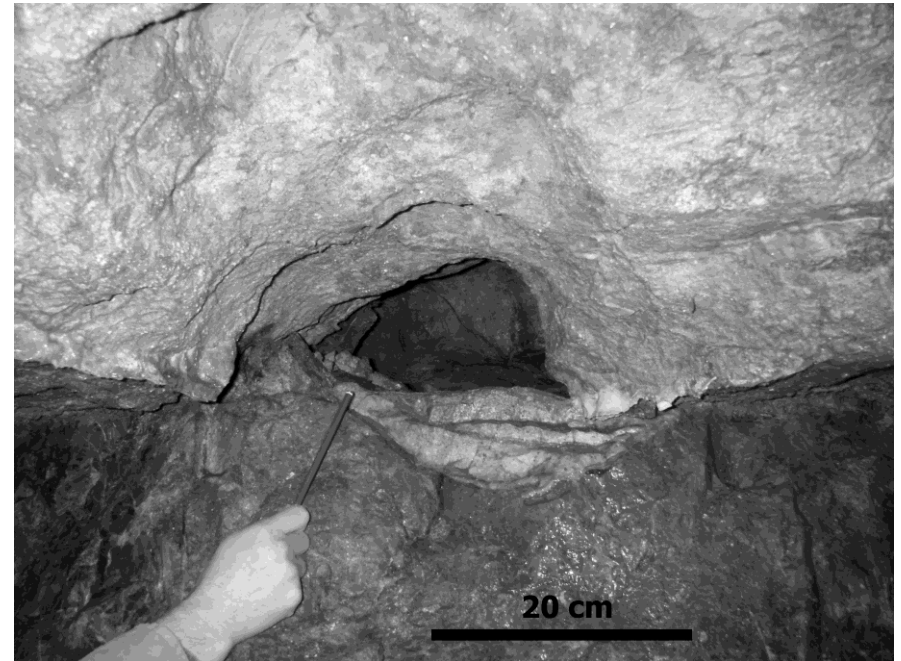


**Sara contemplant la faille de  
Fontaine Bagdad à Rochefort**

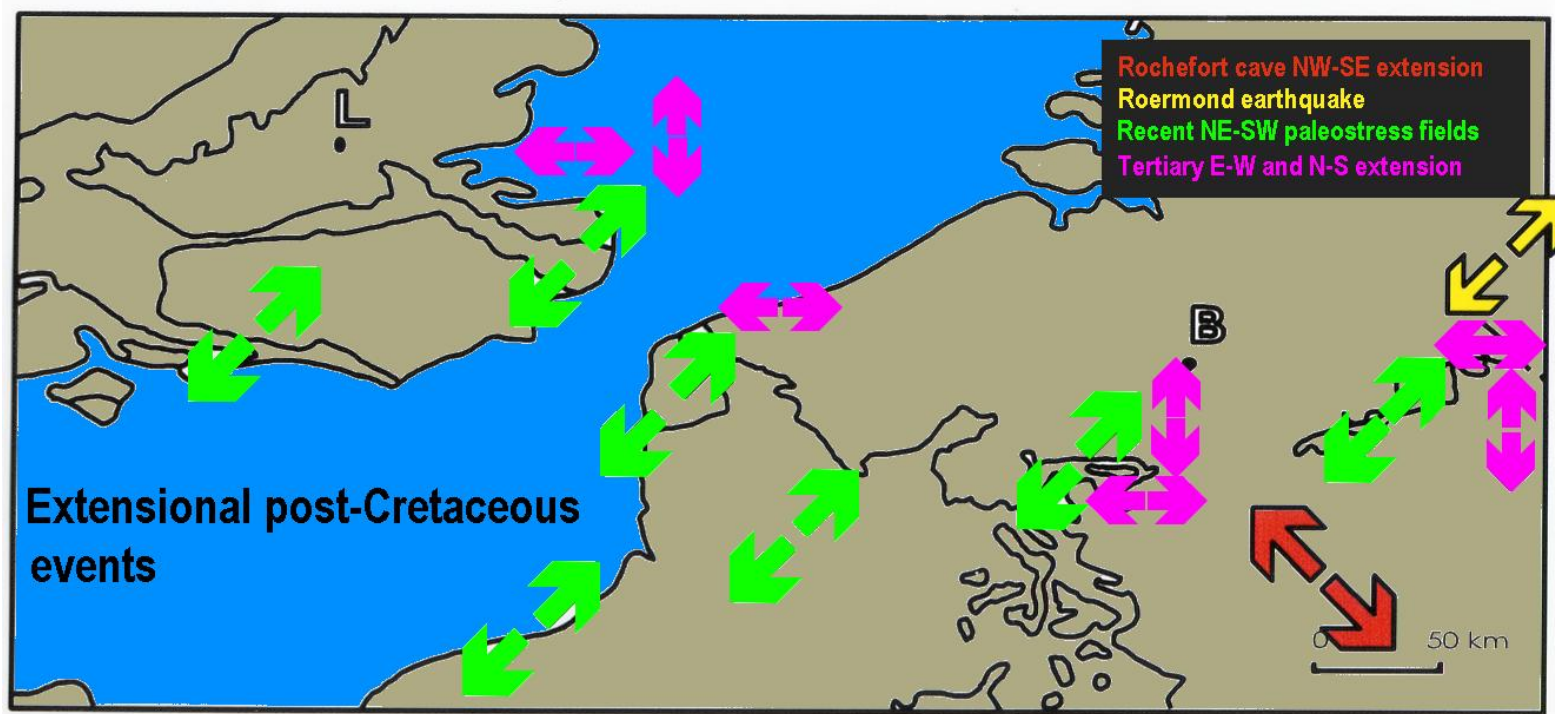
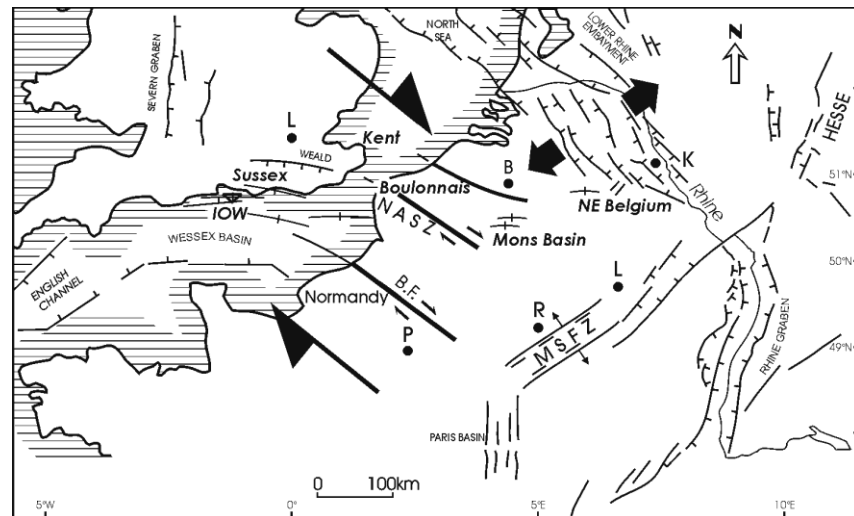
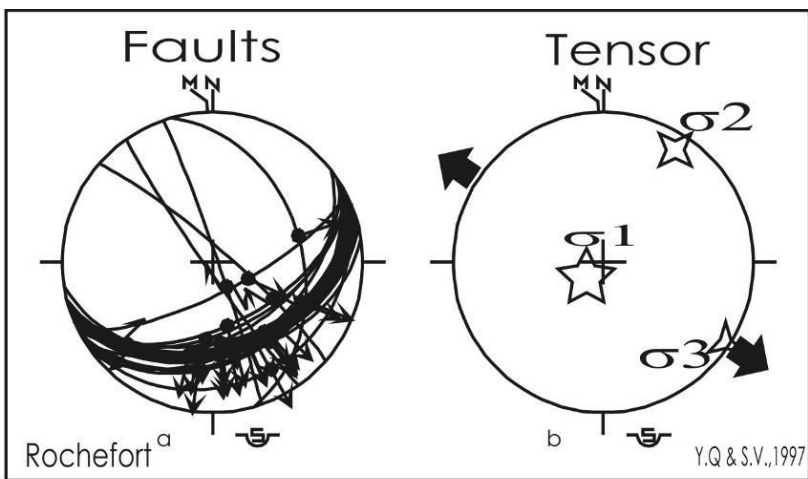


**Une tectonique actuelle  
active existe!**



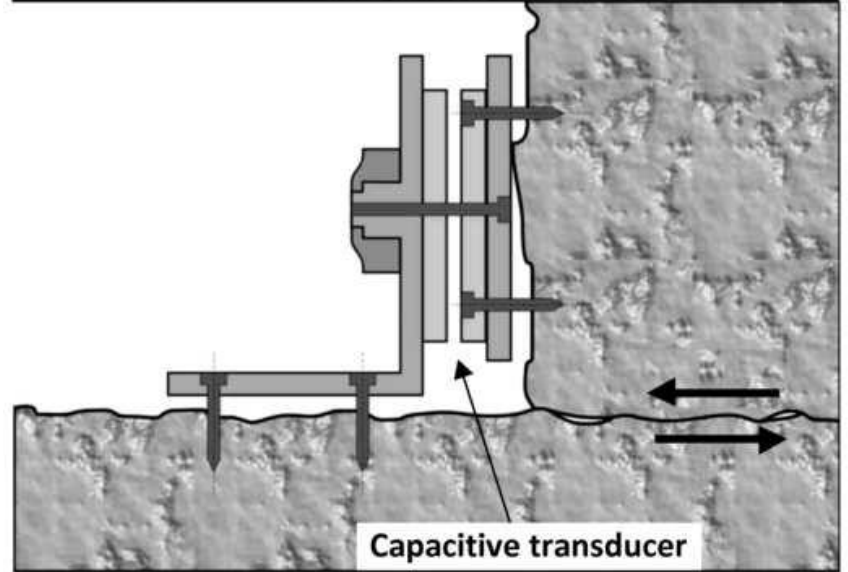


Grotte Lorette  
à Rochefort

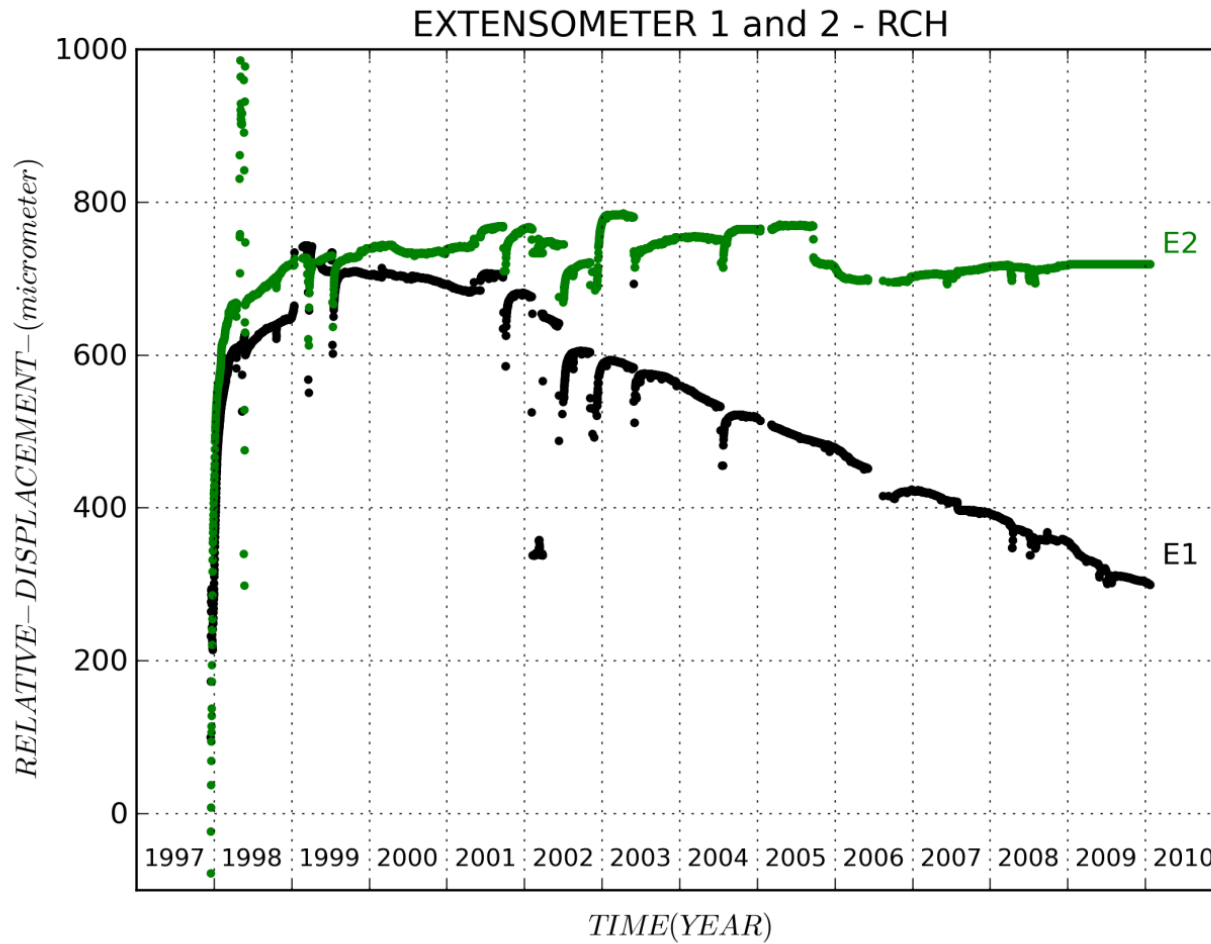


Vandycke & Quinif, 2001, Geologie in Mijnbouwn



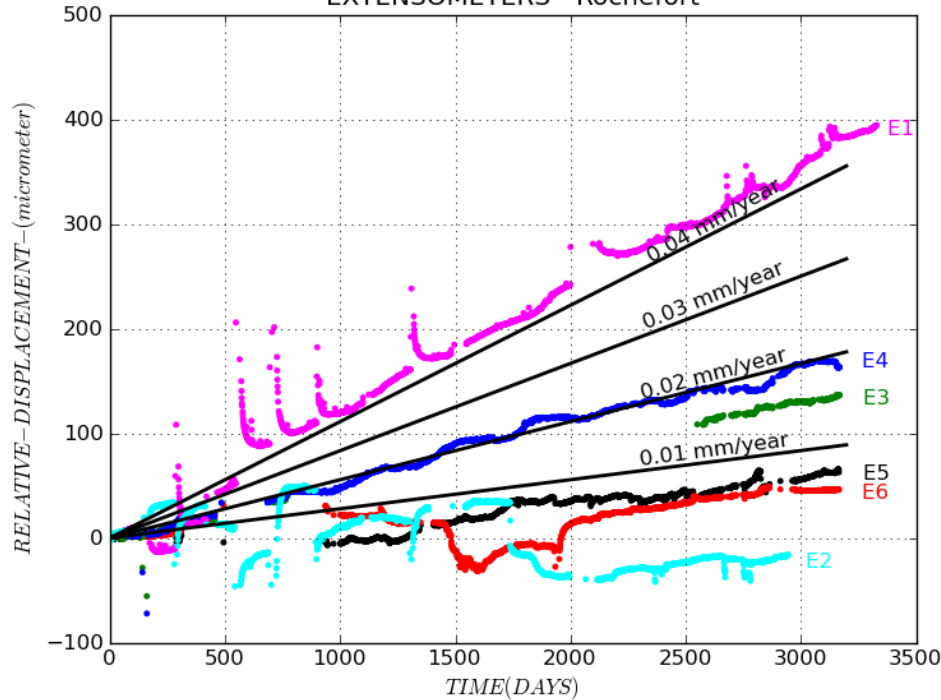


Camelbeeck & al., tectonophysics, 2011, soumis



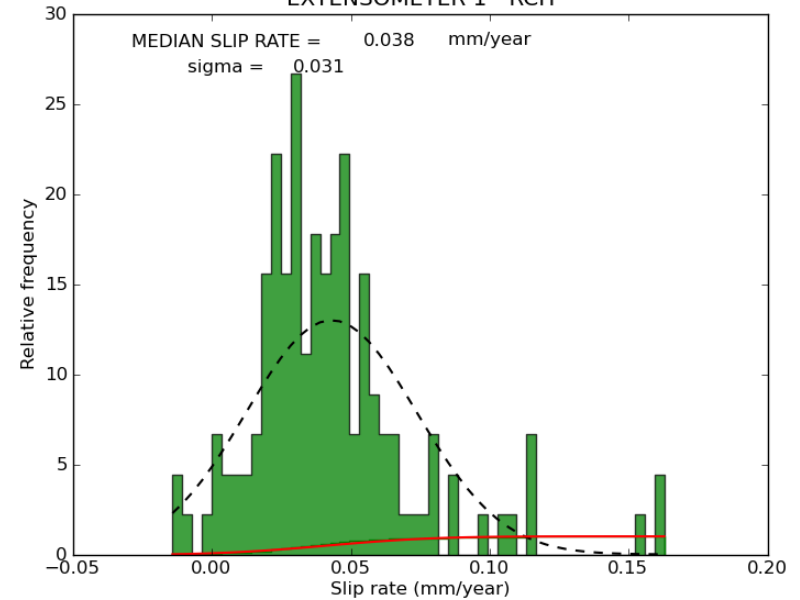
Camelbeeck & al., Tectonophysics, 2011, soumis

### EXTENSOMETERS - Rochefort



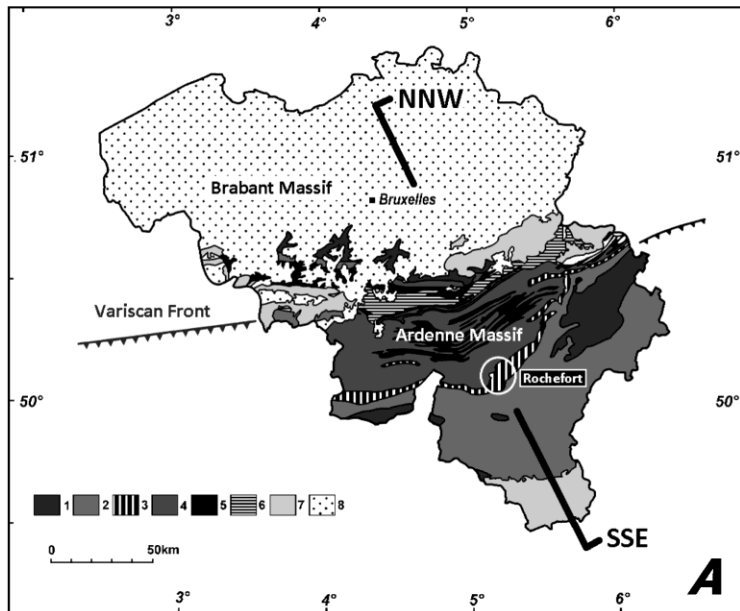
Relative displacements measured by extensometer E1 to E6. The displacement is initialized to 0 at the time of the different extensometers have been considered as stabilized. The time scale is expressed in days, originating also at this time. We superimposed curves corresponding to relative displacement rates of 0.01, 0.02, 0.03 and 0.04 mm/year.

### EXTENSOMETER 1 - RCH

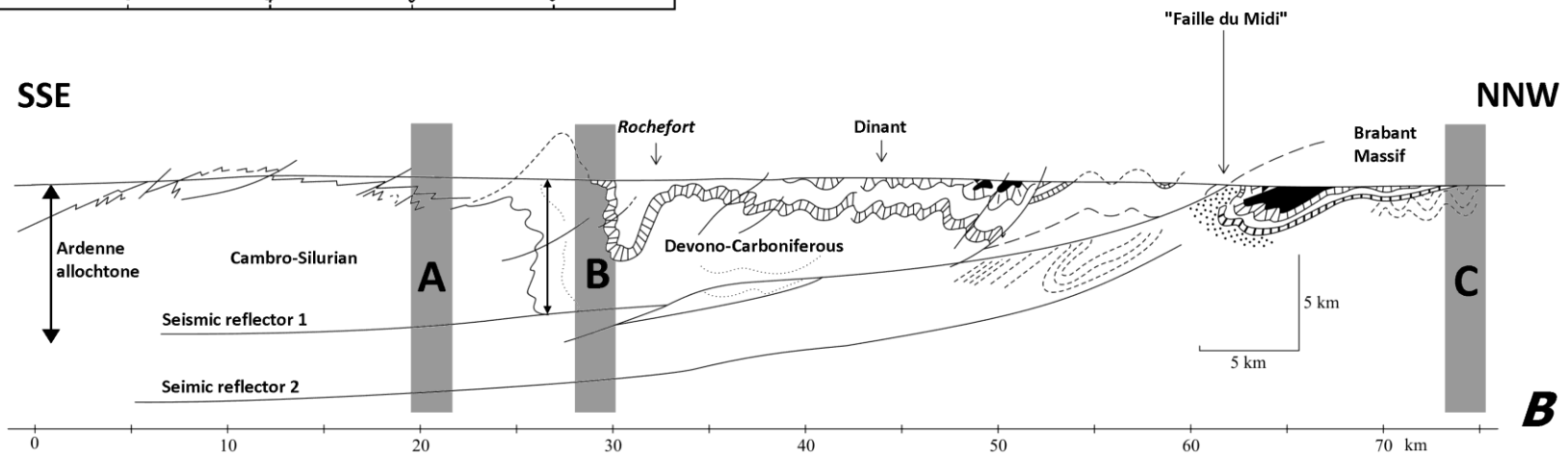
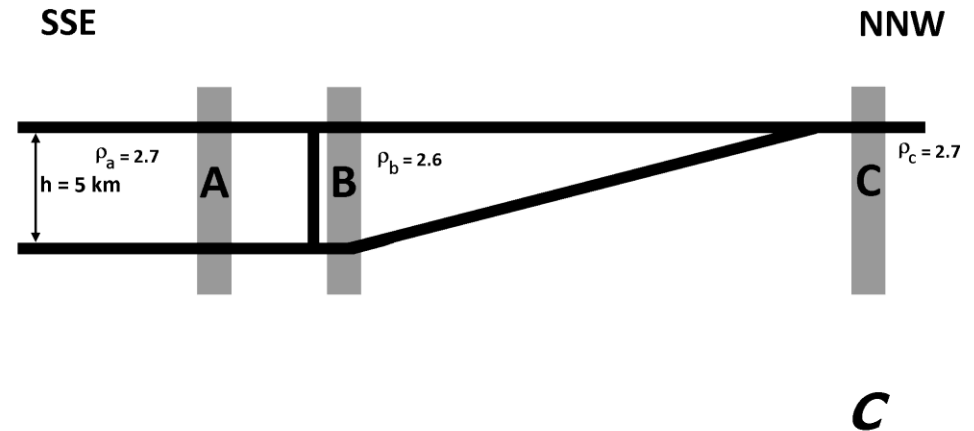


Statistical distribution of the Slip rate averaged on 10 days periods for extensometer 1. Only the stabilized parts of the signal have been considered in the analysis

Camelbeek & al., Tectonophysics, 2011, soumis



## Modeling horizontal forces acting in the Rochefort area due to density differences in the upper crust



Camelbeek & al., tectonophysics, 2011, soumis

# Conclusion

En domaine carbonaté, les relations entre tectonique et karstogénèse donnent des informations sur la géodynamique **Continentale**.

Il existe un lien génétique **Intime** entre le développement des structures karstiques et la tectonique (en extension)

L'enregistrement karstique permet un calage **temporel** de certaines phases tectoniques, notamment peut être imprimée en domaine de bassins, en zone périphérique ou de transition entre domaine marin et continental

Des informations **insolites** significatives apparaissent lors d'études pluridisciplinaires complètes

Le karst est un lieu de conservation de manifestations de la géodynamique récente, et en particulier de la « **Tectonique Active** »

