Het belang en het beheer van microklimaten in winterverblijfplaatsen

L'importance et la gestion des microclimats dans des sites d'hivernage

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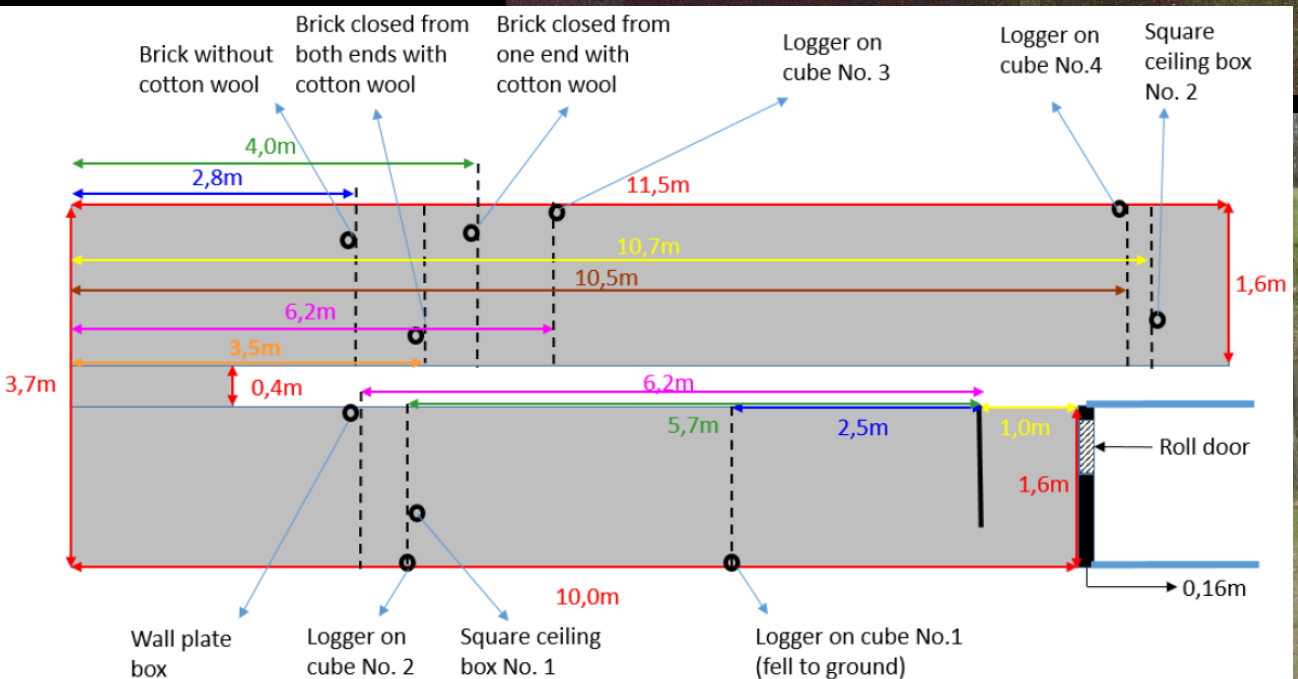
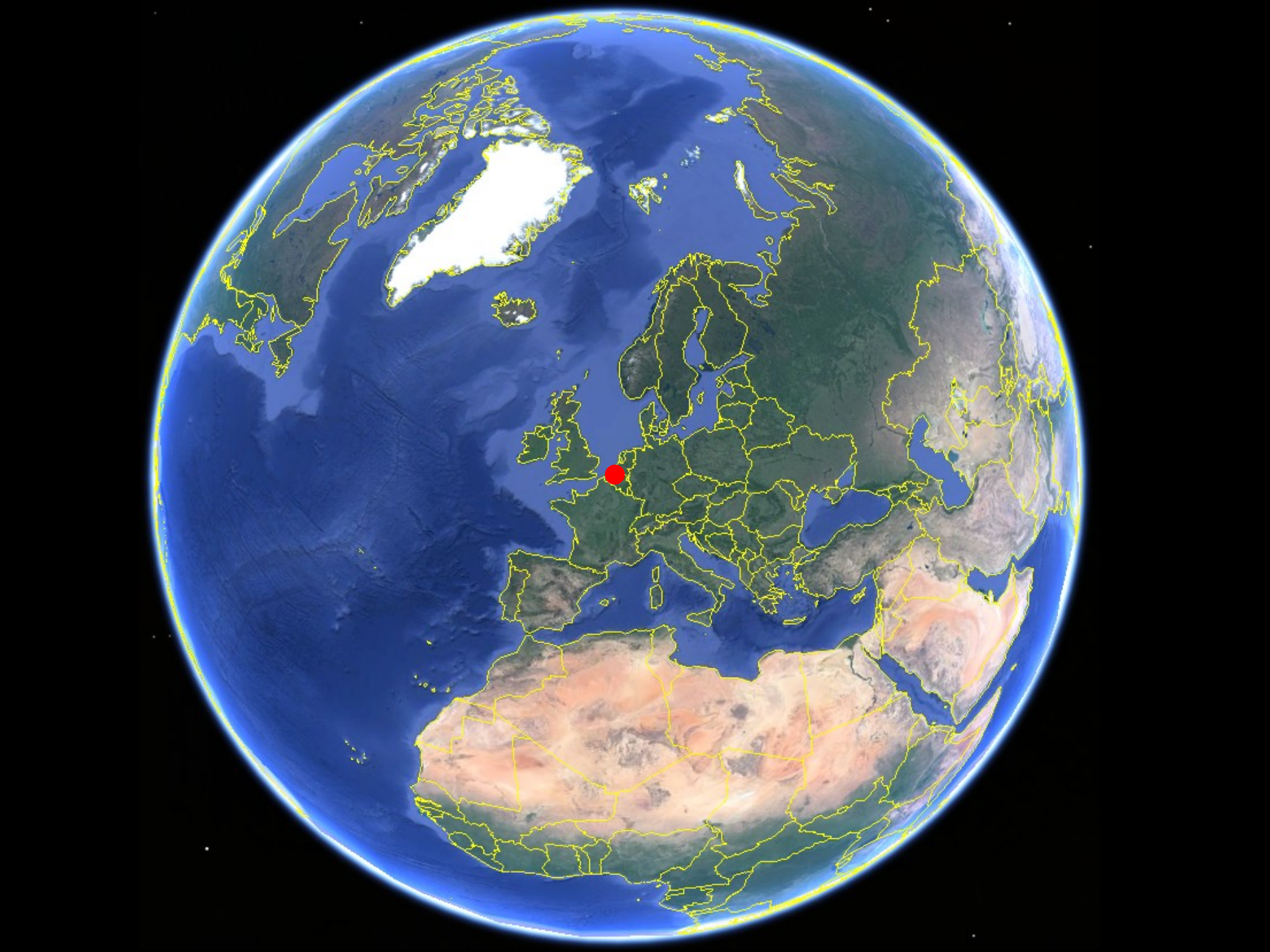
Introduction

Vleermuizenreservaat Fort Oelegem


Brick without cotton wool
Brick closed from both ends with cotton wool
Brick closed from one end with cotton wool
Logger on cube No. 3
Logger on cube No.4
Square ceiling box No. 2
4,0m
2,8m
11,5m
10,7m
10,5m
6,2m
3,5m
1,6m
3,7m
0,4m
6,2m
5,7m
2,5m
1,0m
Roll door
1,6m
0,16m
10,0m
Wall plate box
Logger on cube No. 2
Square ceiling box No. 1
Logger on cube No.1 (fell to ground)



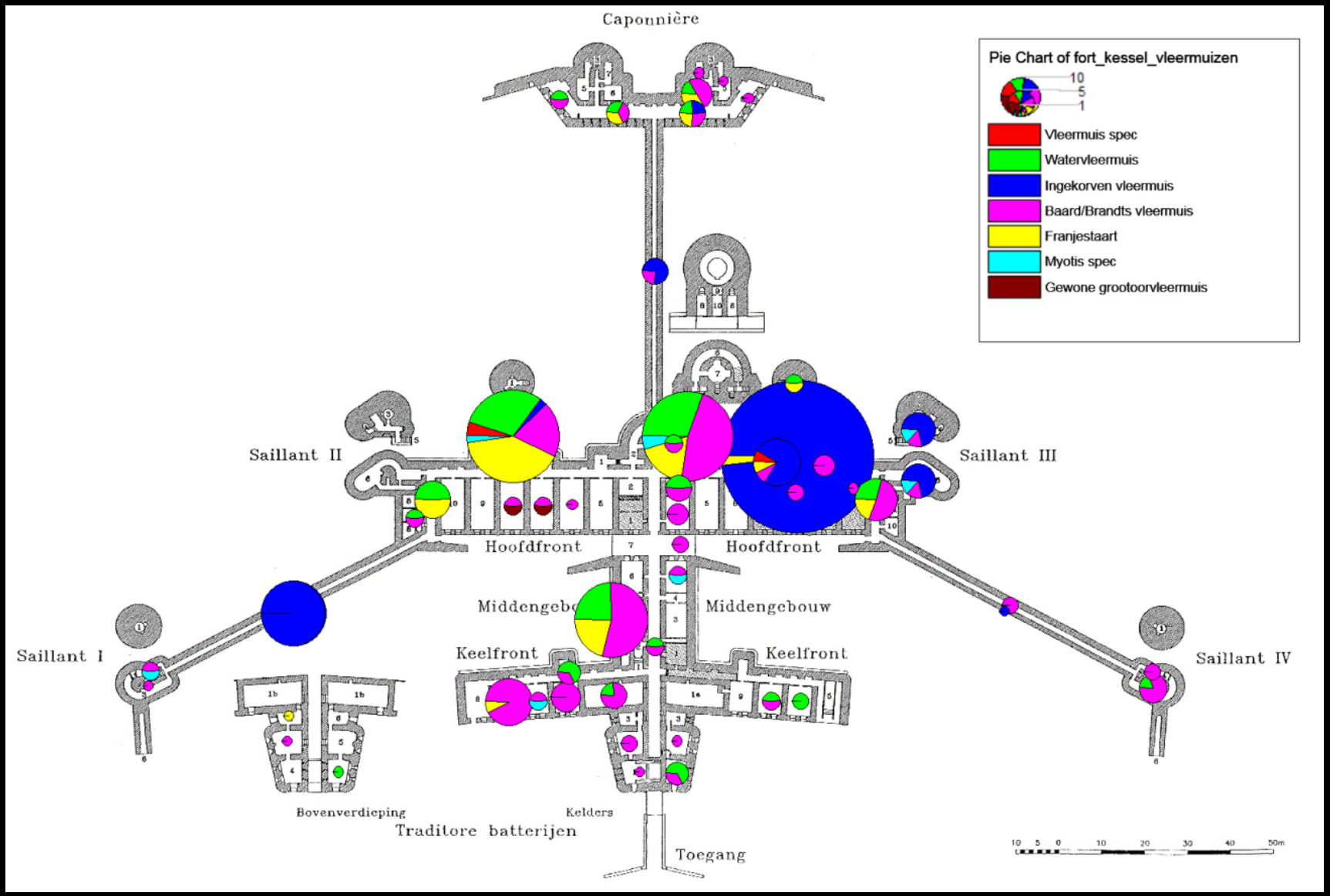
- Forts d'Anvers
- Construire avant
  1ère guerre mondiale

Chauve-souris

Sites d'hivernage importants
chaque année ± 7 000 chauves-souris

Code	Nom scientifique	Nom français
Md	*Myotis daubentonii*	Murin de Daubenton
Mmb	*Myotis mystacinus/brandtii*	Murin à moustaches / de Brandt
Mn	*Myotis nattereri*	Murin de Natterer
Me	*Myotis emarginatus*	Murin à oreilles échancrées
PaA	*Plecotus auritus/austriacus*	Oreillard roux / gris
Ppn	*Pipistrellus pipistrellus/nathusii*	Pipistrelle commune / Nathusius

Certaines espèces dans des chambres "chaudes", souterraines, d'autres dans des chambres "froides", ouvertes vers l'extérieur

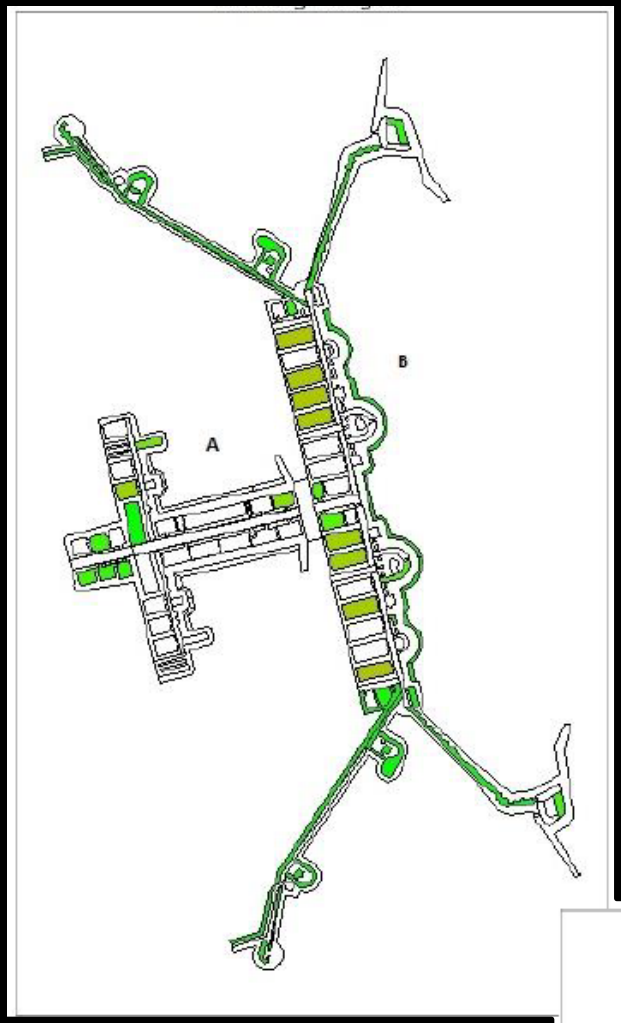



Oorderen
Schoten
Audaan
's Gravenwezel
De Perel
St Filips
Ste Marie
Merksem
Schilde
Schelde
Fort1
Oelegem
ANTWERPEN
Zwijndrecht
F2
Massenhoven
Kruibeke
F3
Broechem
F4
F8
F7
F6
F5
Haasdonk
Kessel
Landmolen
Lauwershoek
Lier
Steendorp
Duffel
Tallaart
Rupel
Nete
Puurs
Koningshooikt
Bosbeek
Liezele
Dorpveld
Letterheide
Breendonk
Walem
St. Kath. Waver
©evb

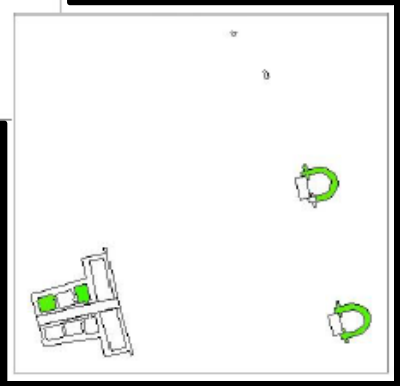
6 Forts

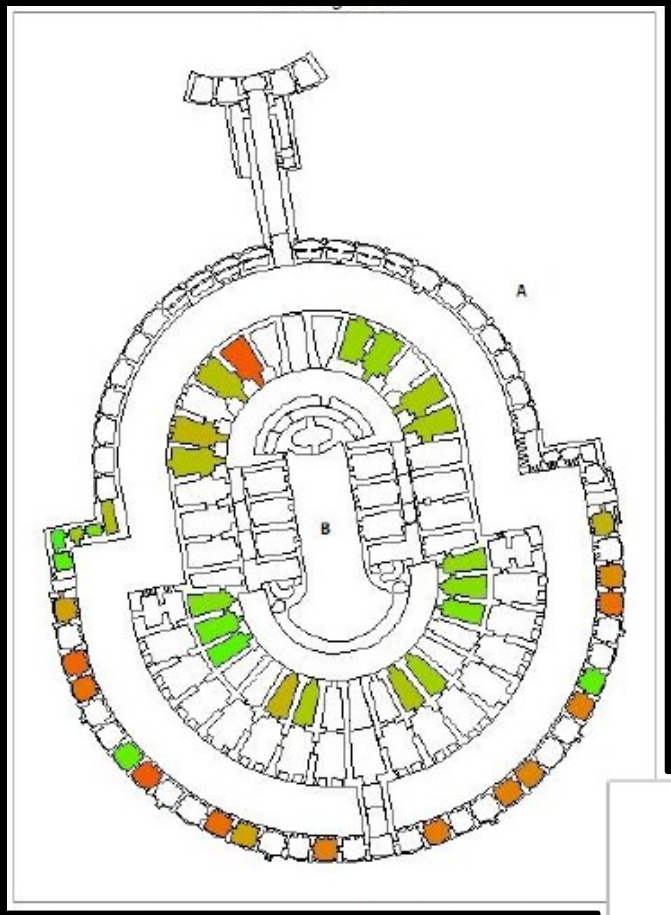
Oelegem

Wilrijk

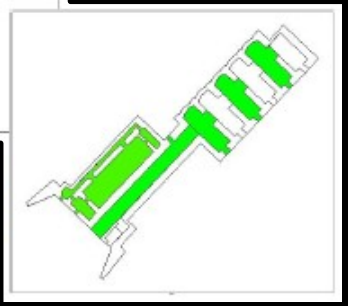


Oelegem





Wilrijk



Ouverture vers l’extérieur

Aucun

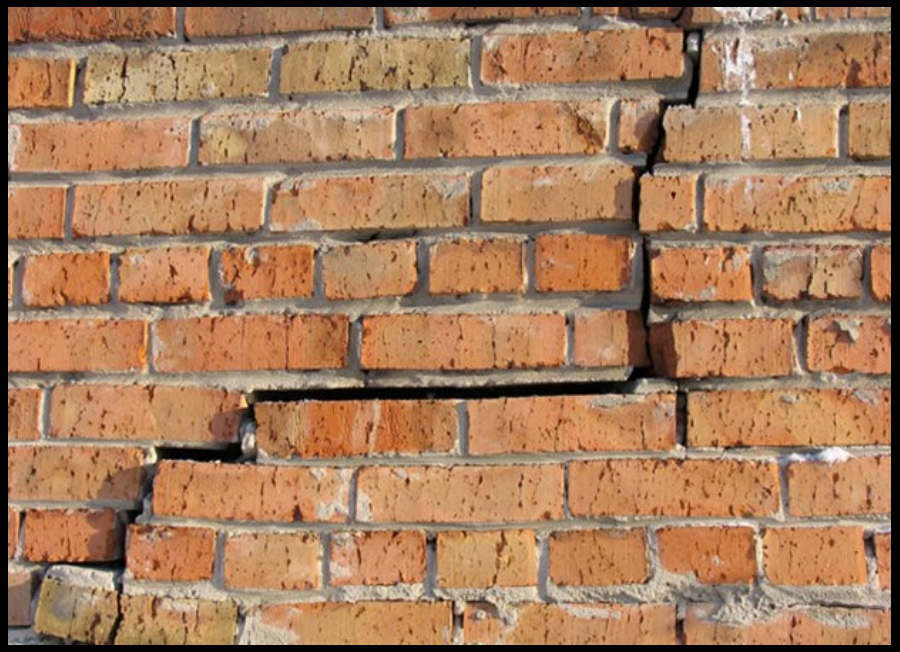
Trou

Fenêtre - fermée

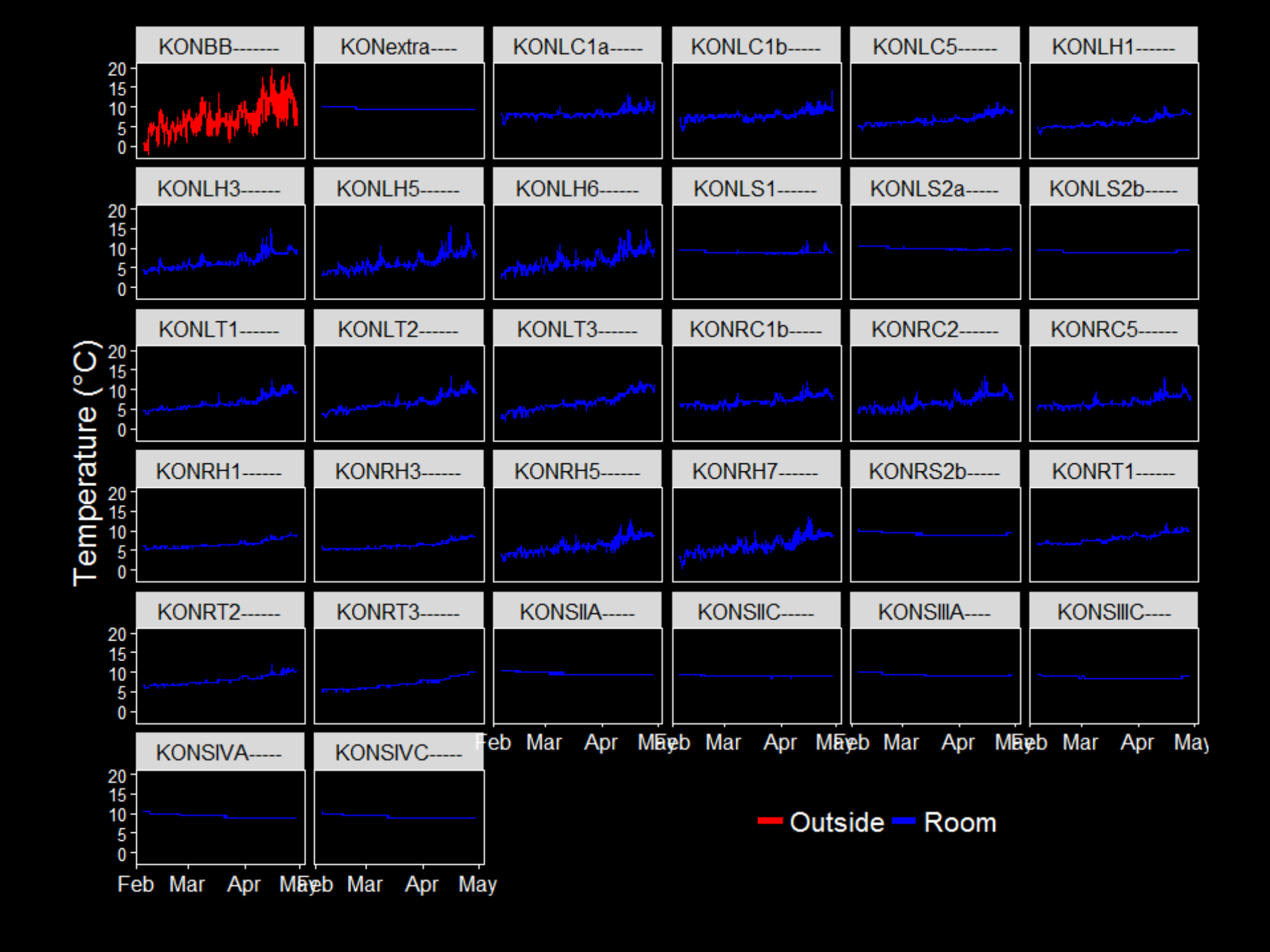
Mur

Enregistreurs de température:
Thermochron iButton, Maxime Integrated

Surveillance annuelle
Groupe de travail Chauve-souris de Natuurpunt (NGO)



Indice de crevasse: 0 - 6

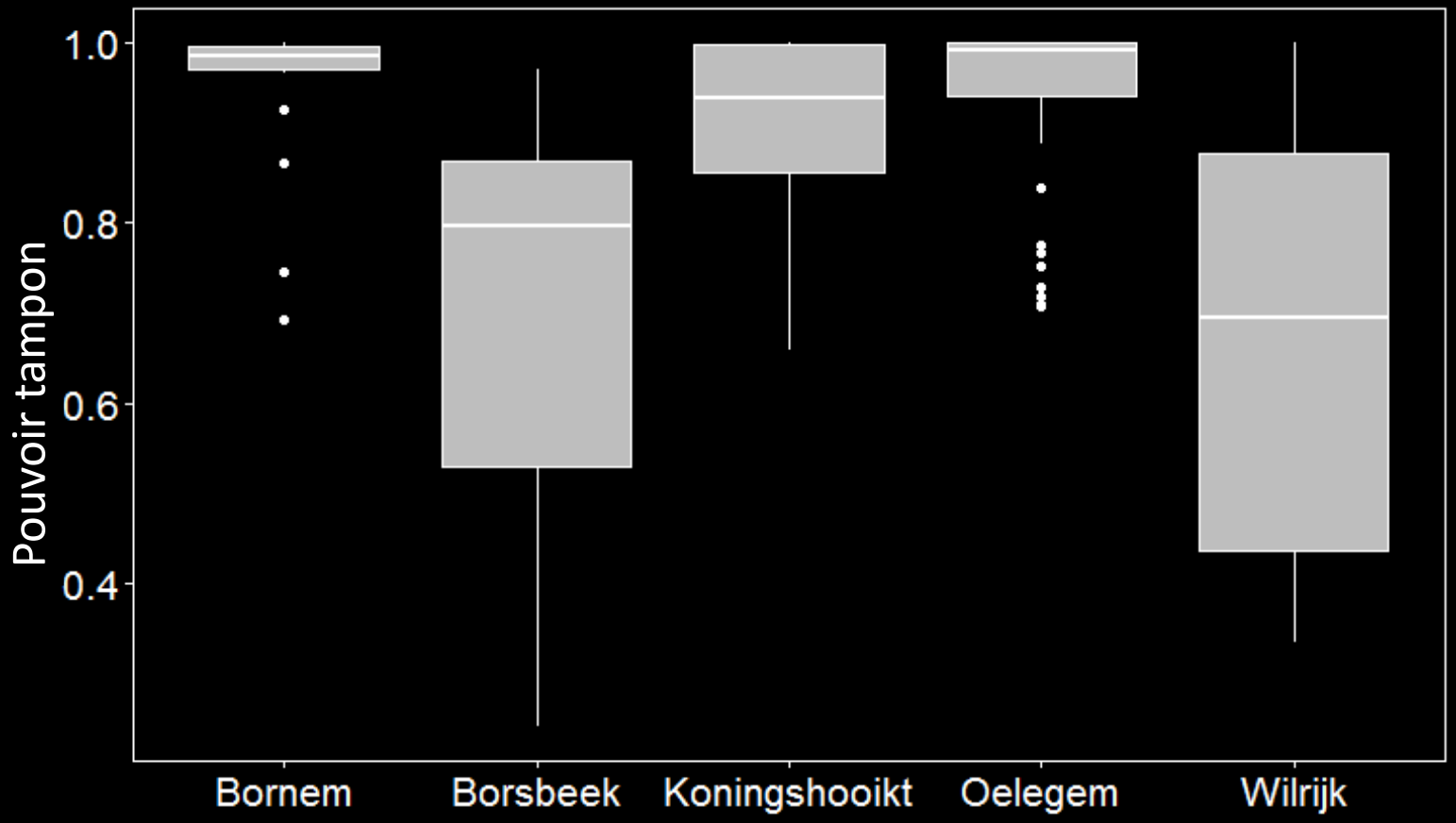

KONBB--------
KONextra----
KONLC1a-----
KONLC1b-----
KONLC5------
KONLH1------
KONLH3------
KONLH5------
KONLH6------
KONLS1------
KONLS2a-----
KONLS2b-----
KONLT1------
KONLT2------
KONLT3------
KONRC1b-----
KONRC2------
KONRC5------
KONRH1------
KONRH3------
KONRH5------
KONRH7------
KONRS2b-----
KONRT1------
KONRT2------
KONRT3------
KONSIIA-----
KONSIIC-----
KONSIIIA----
KONSIIIC----
KONSIVA-----
KONSIVC-----
Temperature (°C)
0
5
10
15
20
Feb
Mar
Apr
May
Outside
Room

Analyses

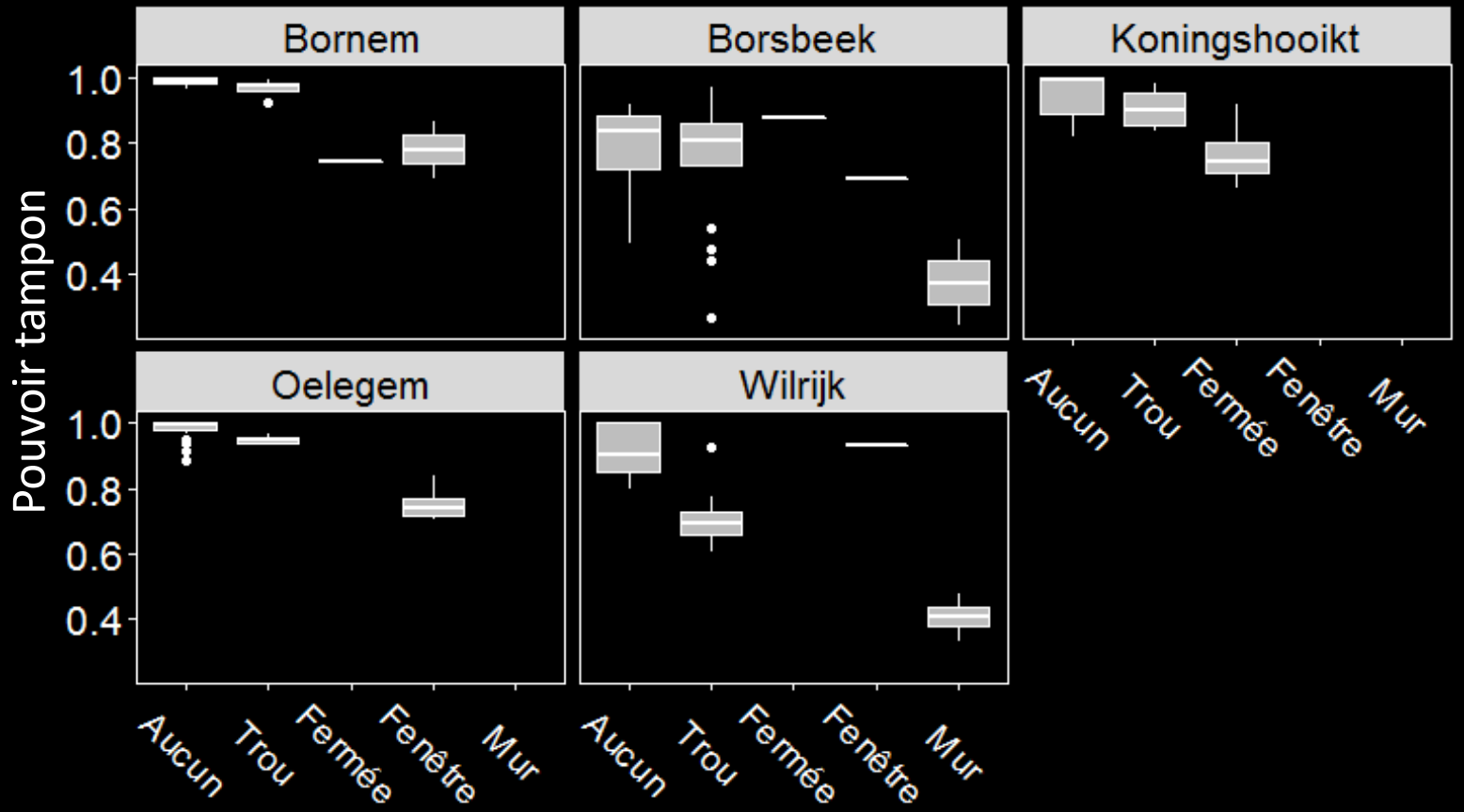
- Caractéristiques de base des séries temporelles
  - (Minimum, maximum, moyenne, variance décroissante)

- Modèles ARIMA (régression pour des séries temporelles):
  - Pouvoir tampon =
    relation température extérieure ➔ intérieure
  - 0 = pas de pouvoir tampon; 1 = pouvoir tampon parfait
- (Generalised) Mixed Models

Pouvoir tampon: différences forts

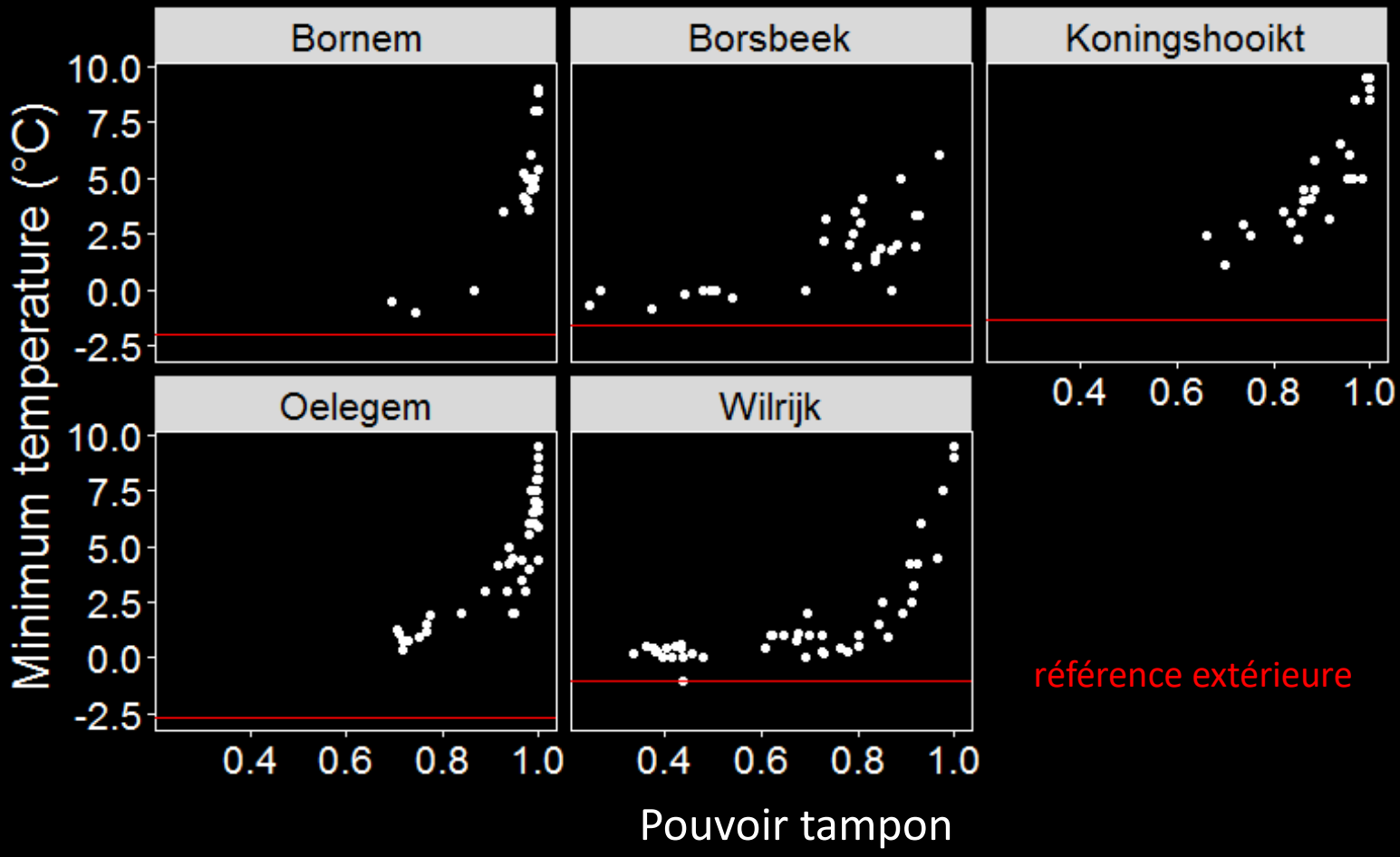


Ouverture des chambres ~ Pouvoir tampon



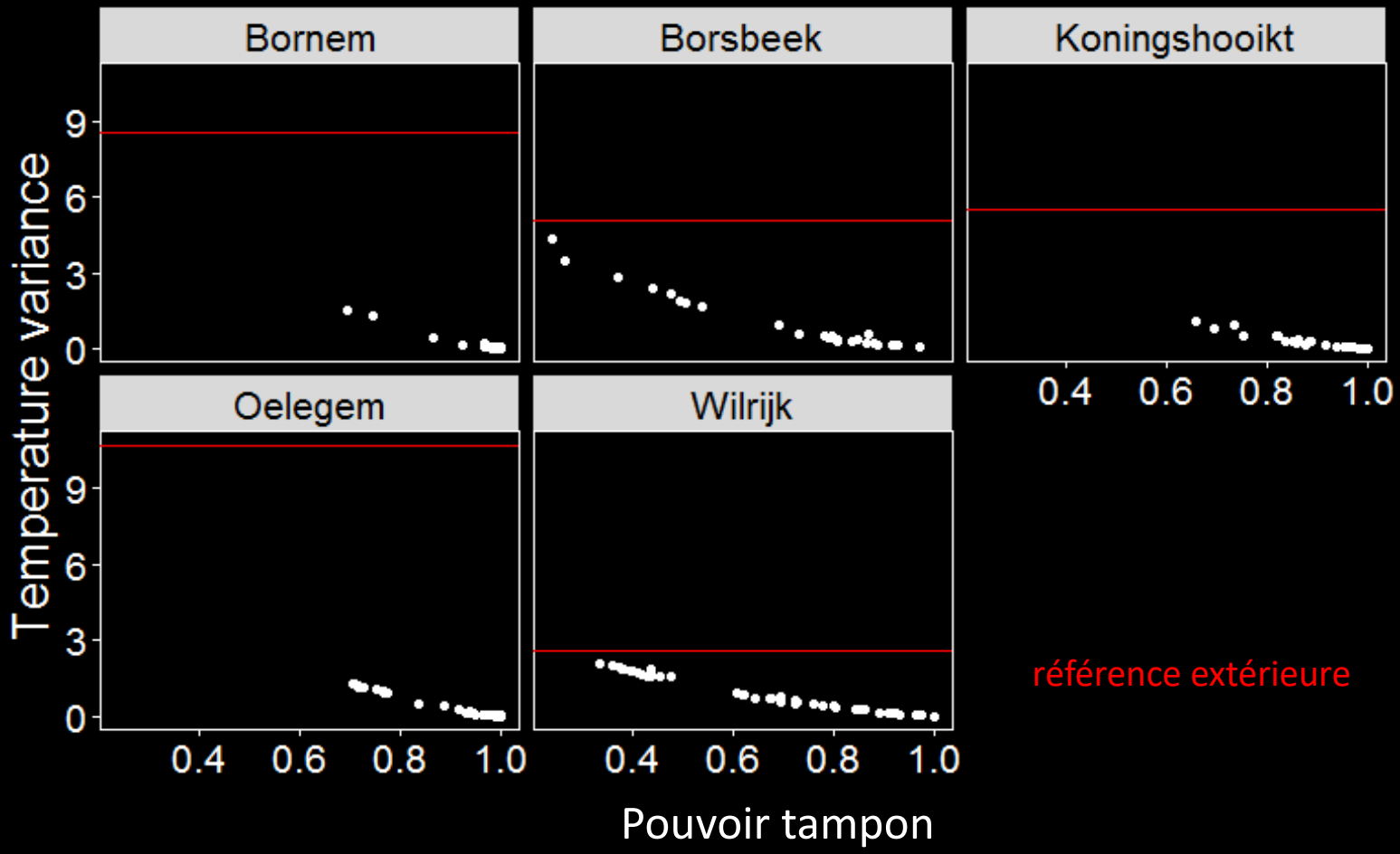
= 14.65, p = 0.005

Pouvoir tampon ~ Températures minimales



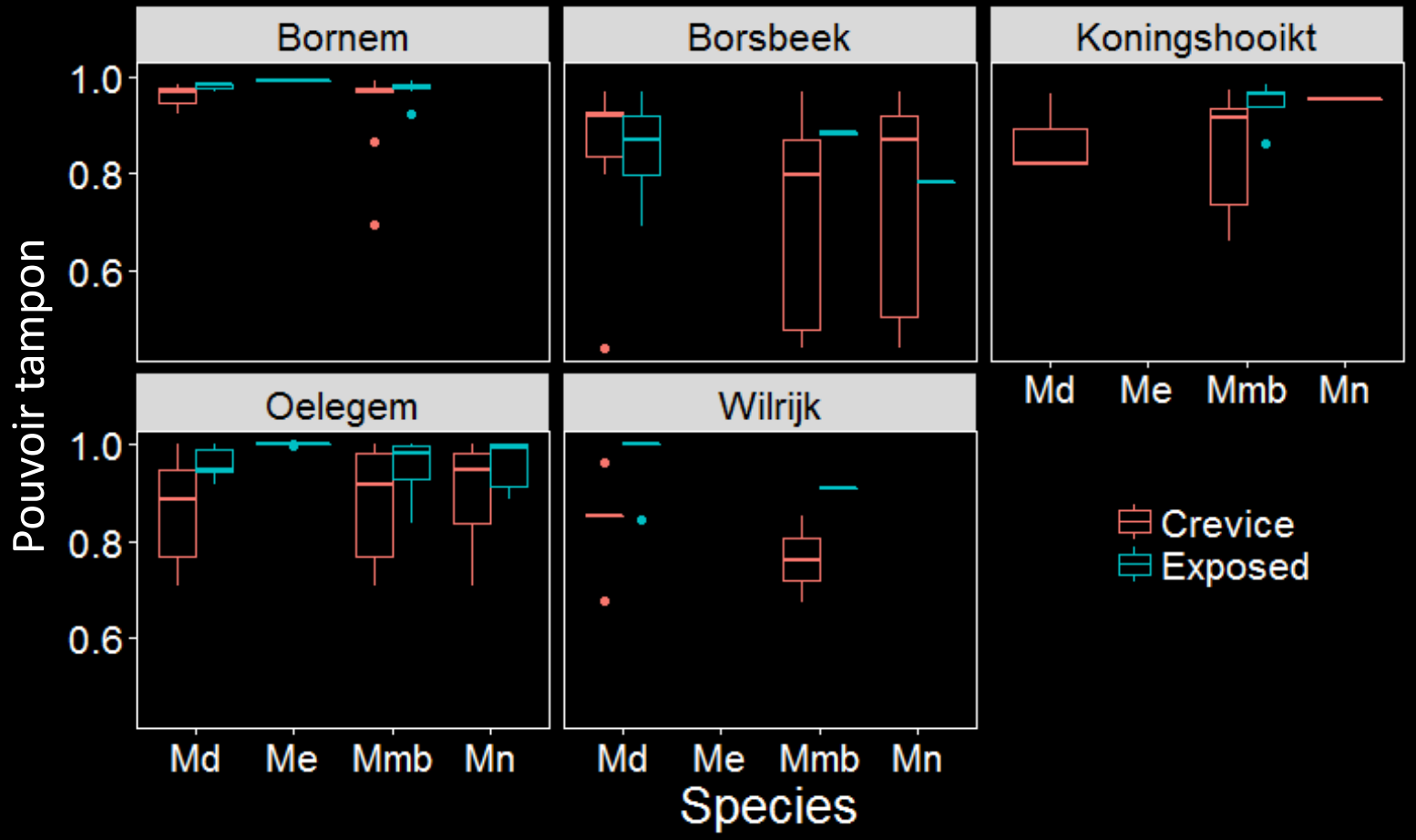
référence extérieure

Pouvoir tampon ~ Variance des températures



référence extérieure

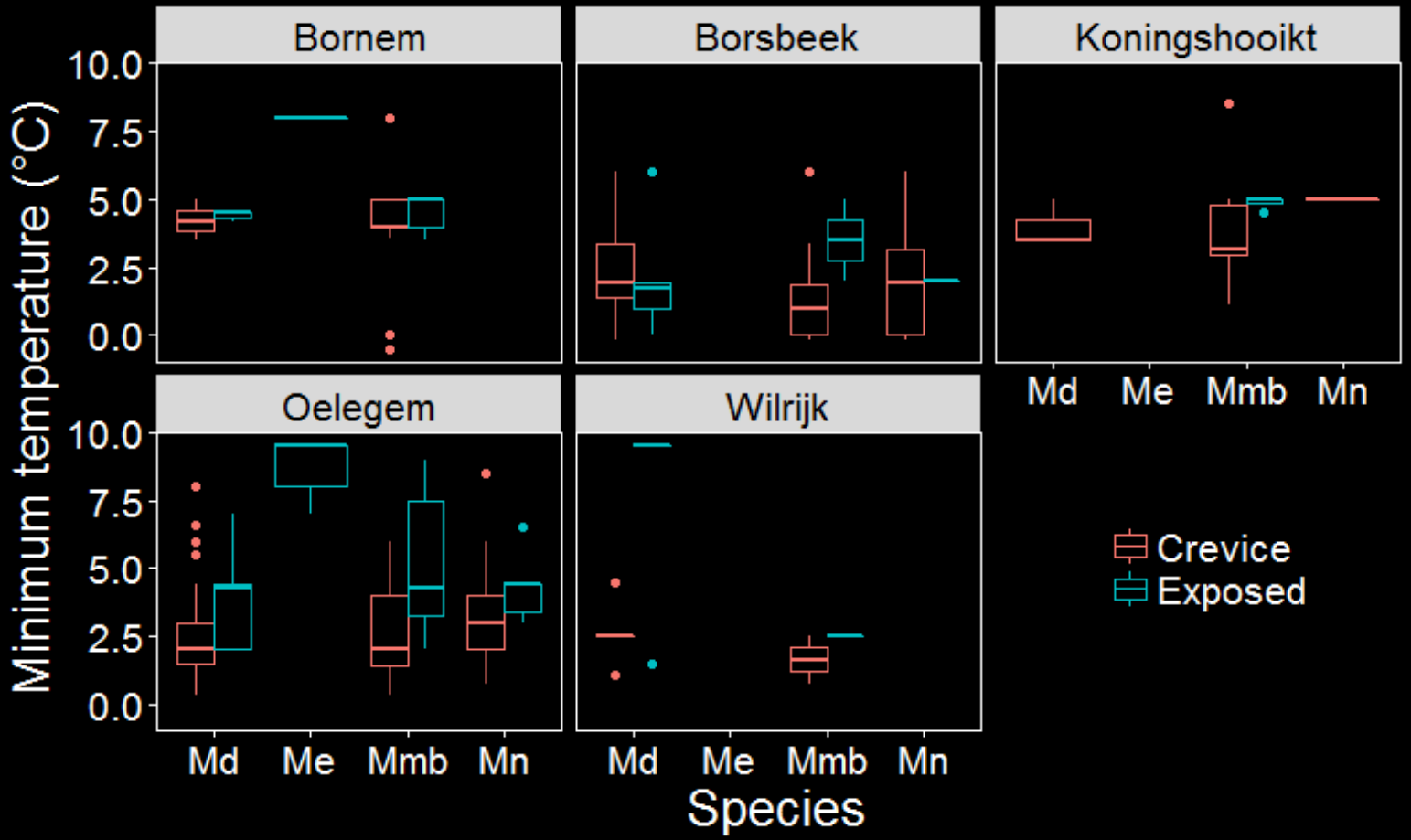
Sélection des chambres ~ Pouvoir tampon



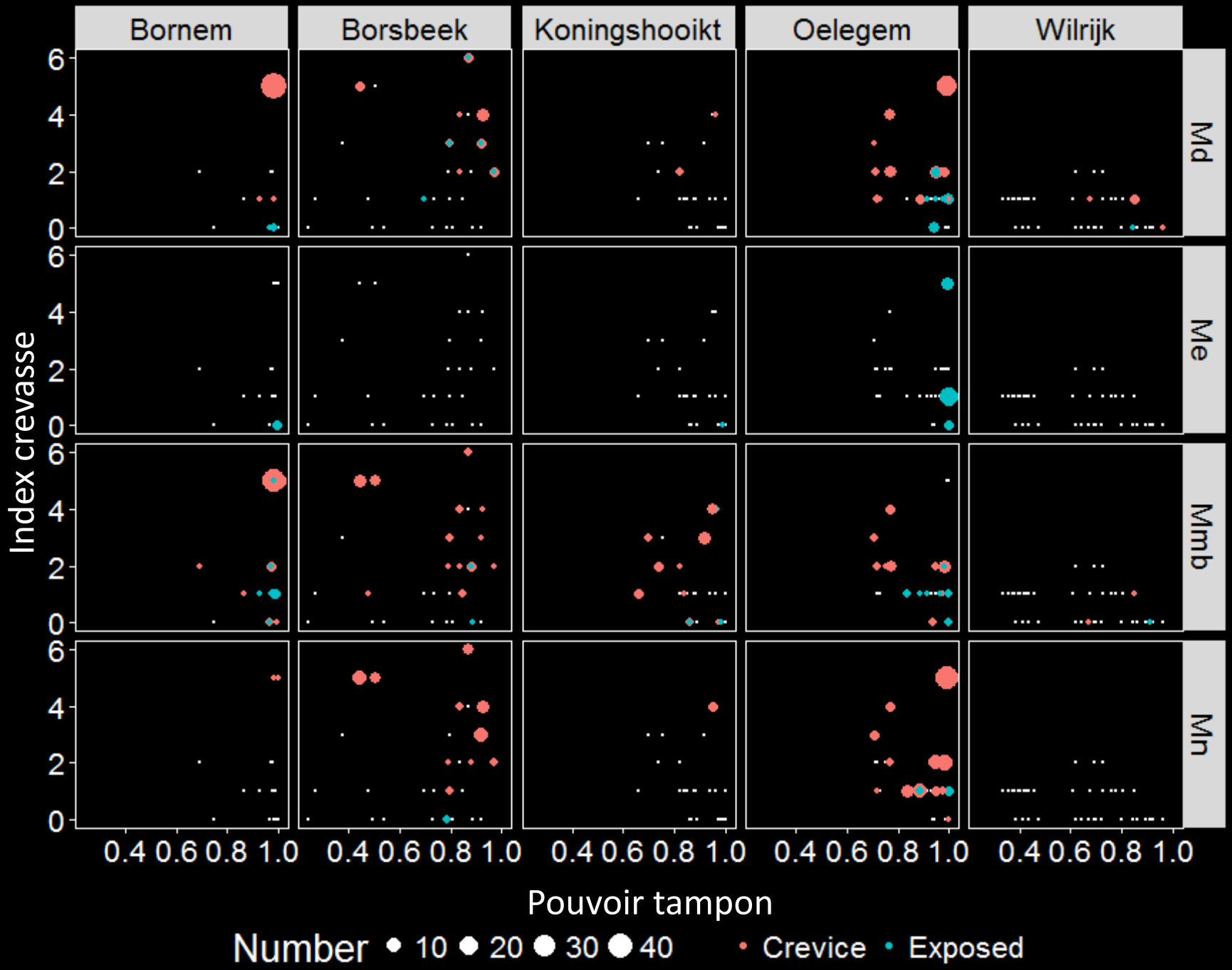
Espèce: = 10.14, p = 0.017

Position: = 5.73, p = 0.016

Sélection des chambres ~ températures minimales



Espèce x Position: = 16.03, p = 0.001

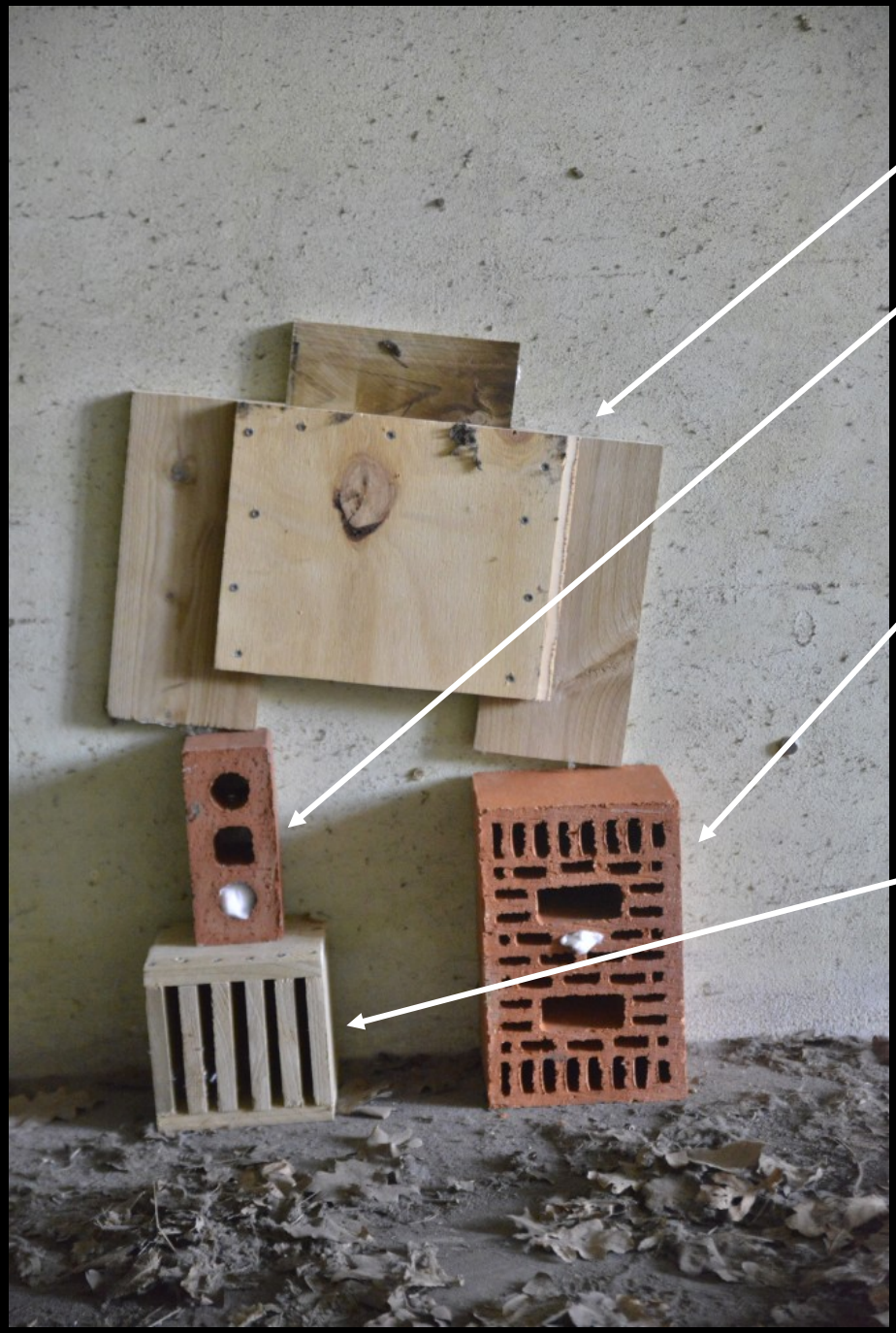

Bornem
Borsbeek
Koningshooikt
Oelegem
Wilrijk
Md
Me
Mmb
Mn
Index crevasse
0
2
4
6
0.4 0.6 0.8 1.0
Pouvoir tampon
Number
10
20
30
40
Crevice
Exposed

Animaux dans des crevasses

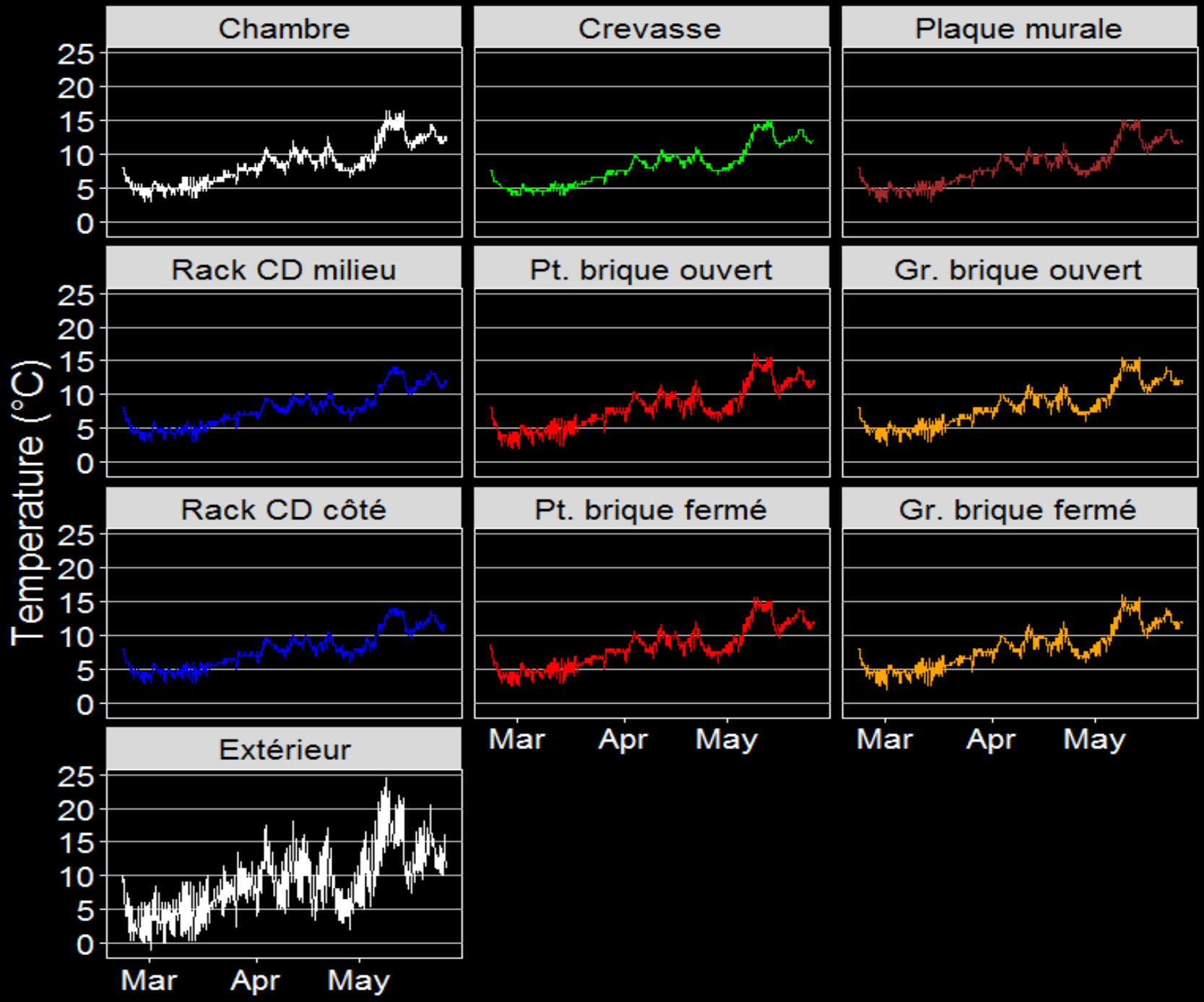
- Pouvoir tampon: χ_1^2 = 2.37, p = 0.123
- Indice de crevasse: χ_1^2 = 134.43, p << 0.001
- Espèce: χ_2^2 = 1.35, p = 0.510

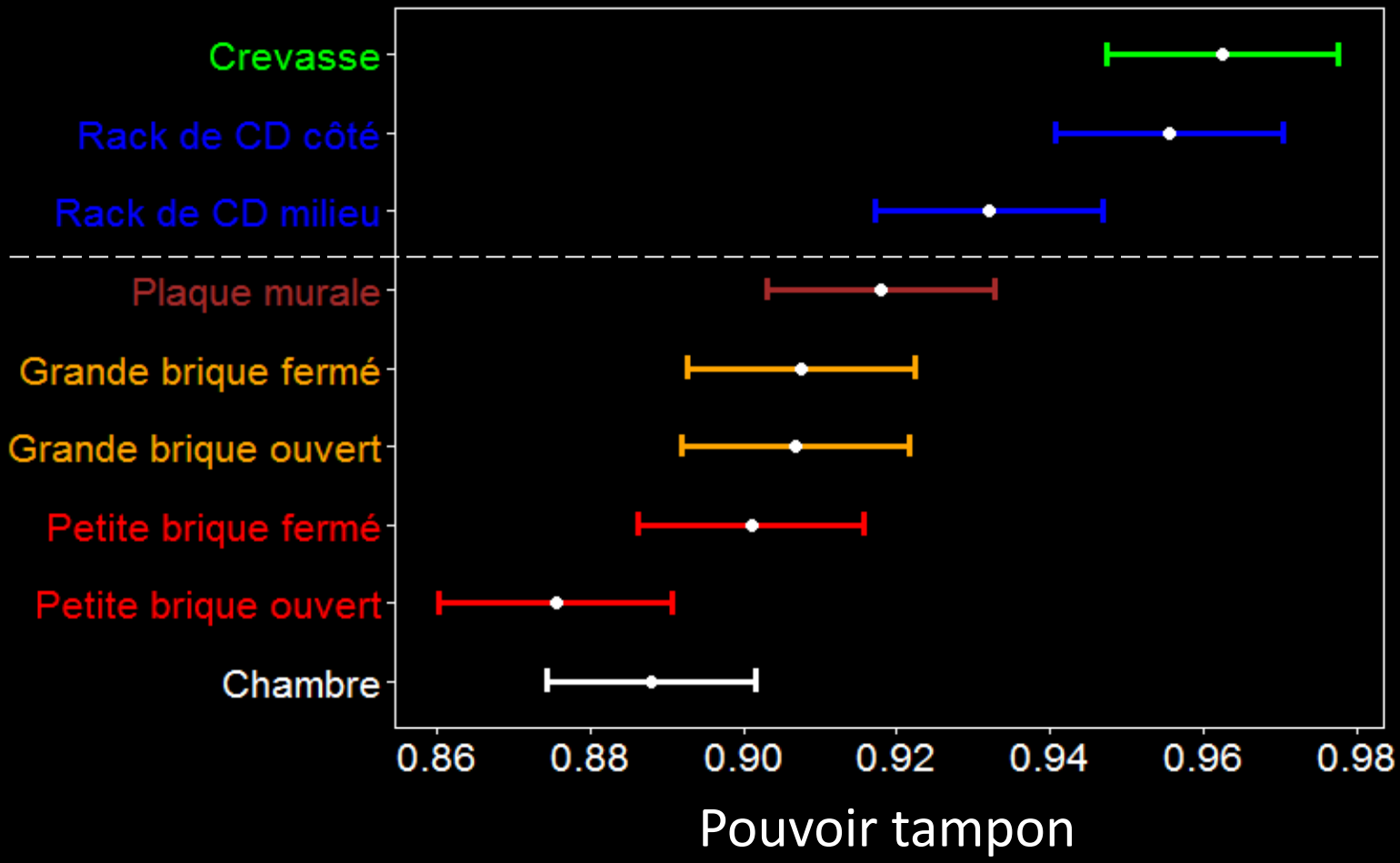
Animaux exposés

- Pouvoir tampon: χ_1^2 = 12.58, p << 0.001
- Espèce: χ_2^2 = 13.42, p << 0.001

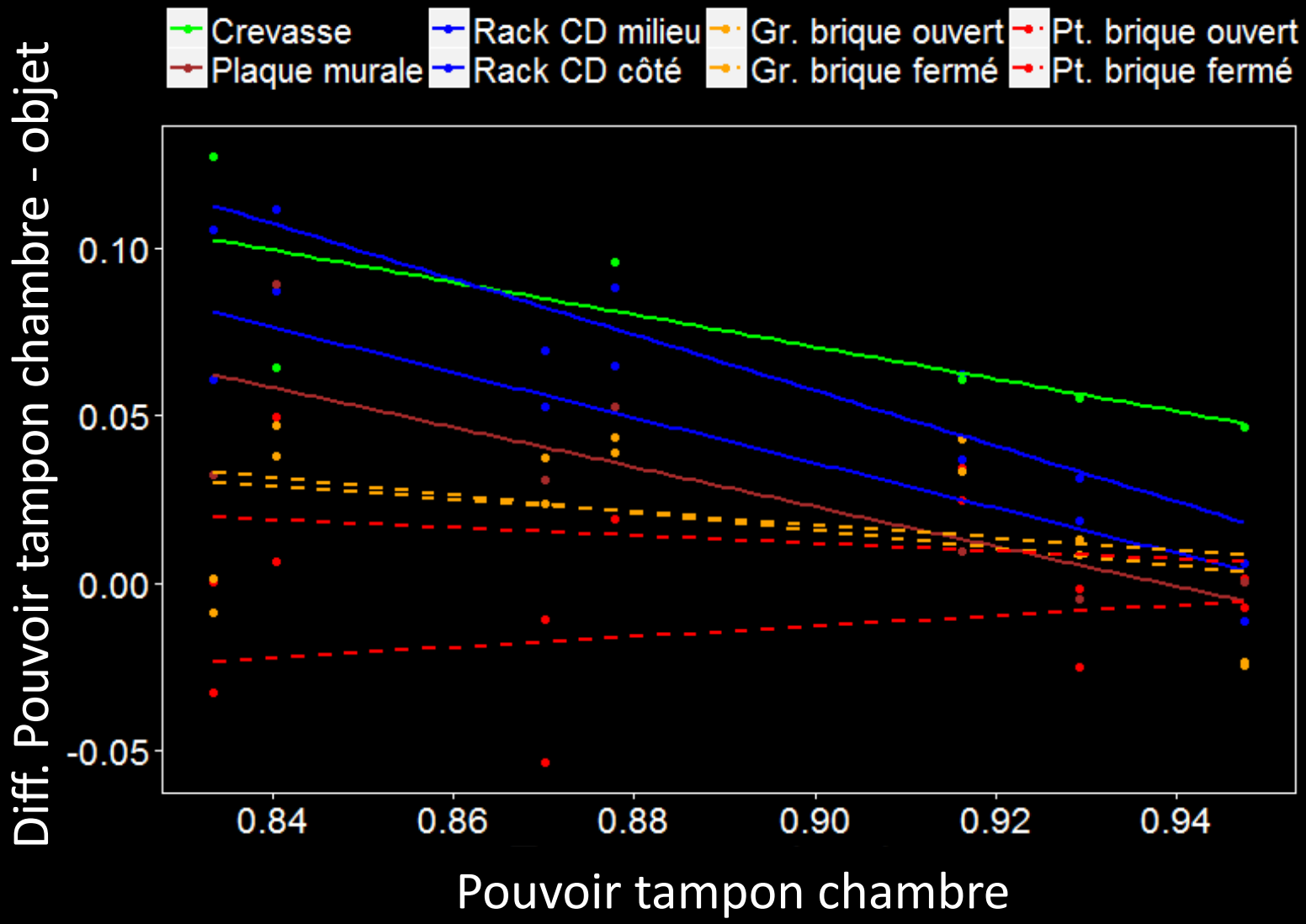


- Plaque murale
- Petite brique
  - Ouvert
  - Fermé
- Grande brique
  - Ouvert
  - Fermé
- Rack de CD
  - Milieu
  - Côté


Chambre
Crevasse
Plaque murale
Rack CD milieu
Pt. brique ouvert
Gr. brique ouvert
Rack CD côté
Pt. brique fermé
Gr. brique fermé
Extérieur
Temperature (°C)
0
5
10
15
20
25
Mar
Apr
May



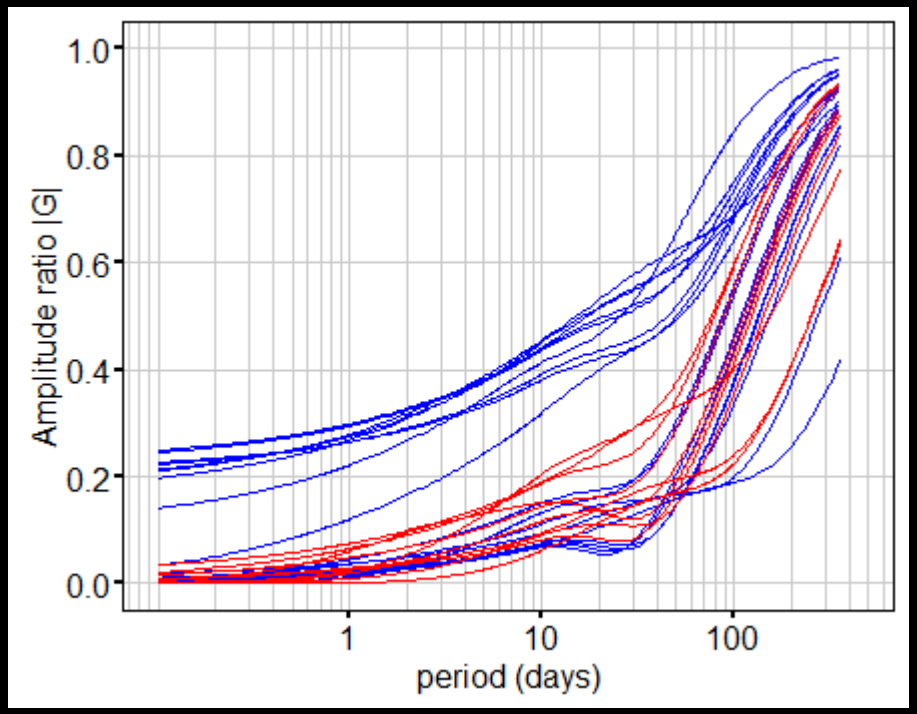
Objet: = 63.82, p << 0.001



Objet x Pouvoir tampon: = 27.43, p << 0.001

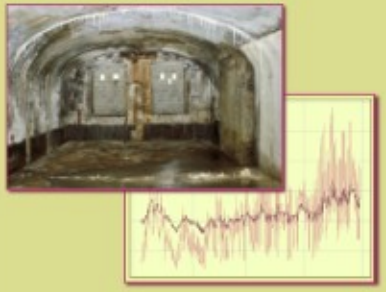
Le futur

Le futur



M. daubentonii exposé

M. daubentonii crevasse



A novel approach for analysing temperature time series in bat hibernacula

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1 Research Institute for Nature and Forest, Flemish Geovernement, Brussels , Belgium – 2 Evolutionary Ecology Group, Departement of Biology, University of Antwerp, Antwerp, Belgium – 3 Bat Working Group, Natuurpunt, Mechelen, Belgium – 4 Gotham Nature and Chiropterological Research, Kalmthout, Belgium

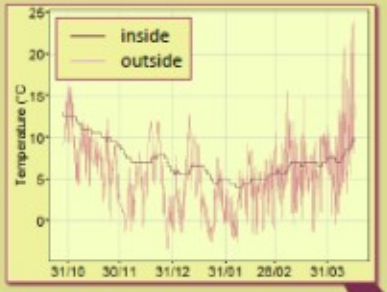
Introduction

A good management of a bat hibernation site requires knowledge of the available temperature regimes. To manage or improve the conditions in a hibernation site, a good understanding of the factors that influence the temperature regime is important as well. We developed a transfer function model that relates temperature in a hibernaculum to the outside temperature and the hibernaculum properties. The model allows to distinguish between the effects of heat conduction through the wall and air flow. It can be used to estimate the effects of changes to the hibernaculum.

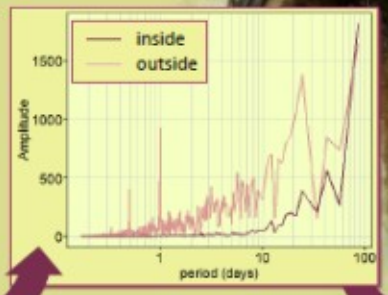
Data collection

Measurements: Temperatures were measured with i-buttons in different rooms and corridors of bat hibernacula with a measuring frequency of once in two hours. The i-button for the outside temperature was placed at the outer wall of the hibernaculum or at a nearby tree, always pointing north to avoid direct irradiation.

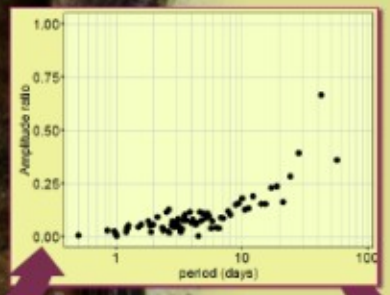
Sites: Measurements were carried out in two forts around Antwerp, Belgium: Oelegem and Duffel. Additionally measurements were also carried out in a newly built artificial hibernaculum near the fort of Duffel.



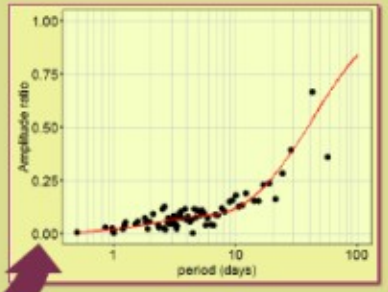
Fourier transform



Ratio



Fit transfer function



Mathematics

1. System theory

$$T\,outside(t) \rightarrow g(t, system\ properties) \rightarrow T\,inside(t)$$

System theory states that the relationship between an input time series and an output

Properties of the transfer function

The transfer function contains four system parameters that are estimated during the fitting process. One parameter determines the resistance to heat conduction through the wall, the other parameters deal with the influence of the air flow: convective heat exchange between the air and the wall, prebuffering of the air temperature through parts of the system it already passed and direct contact of the bulk air flow with the measuring device. The

Remerciements

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Cité d'Anvers

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