

Analyse spatiale des Arbres du POSL

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March 16, 2022

Abstract

Représentations spatiales du jeu de données et dbmss.

Ce code crée des cartes en 2D et 3D du Parc Omnisport Suzanne Lenglen.

1 Données

```
load("data/POSL.RData")
```

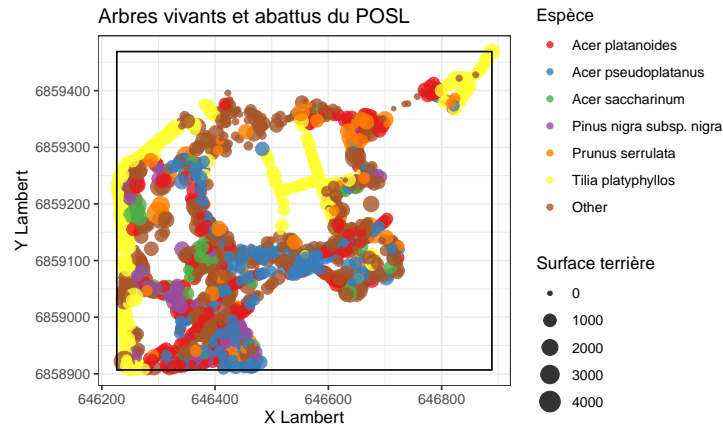
2 Jeux de points

2.1 Genre-Espèce

```
library("dbmss")
BDD_Vivants_et_Abattus_renseignes_POSL %>%
  # Le poids est la surface terrière
  mutate(PointWeight = Circonference^2/4/pi) %>%
  rename(PointType = GenrEsp) %>%
  as.wmppp(unitname = c("meter", "meters")) ->
  POSL_VA_wmppp
```

2.1.1 Carte

```
POSL_VA_wmppp %>%
  autoplot(alpha = 0.8, xlab = "X Lambert", ylab = "Y Lambert") +
  labs(title = "Arbres vivants et abattus du POSL") +
  labs(color = "Espèce", size = "Surface terrière")
```

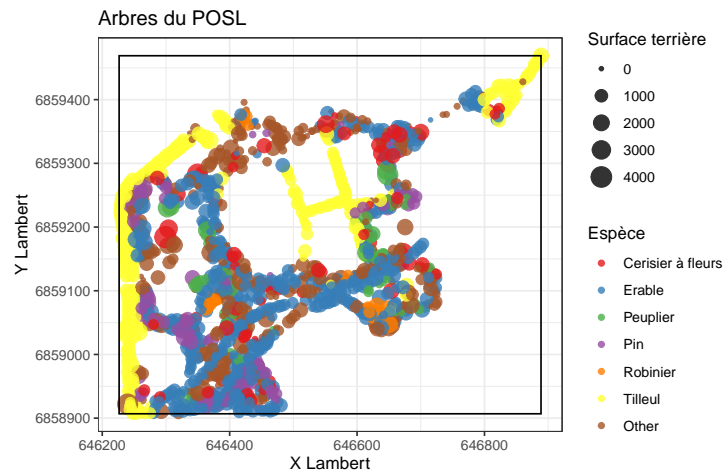


2.2 Nom vernaculaire des espèces

```
BDD_Vivants_et_Abattus_renseignes_POSL %>%
  # Le poids est la surface terrière
  mutate(PointWeight = Circonference^2/4/pi) %>%
  rename(PointType = EspeceFrancais) %>%
  as.wmppp(unitname = c("meter", "meters")) ->
  POSL_Esp_wmppp
```

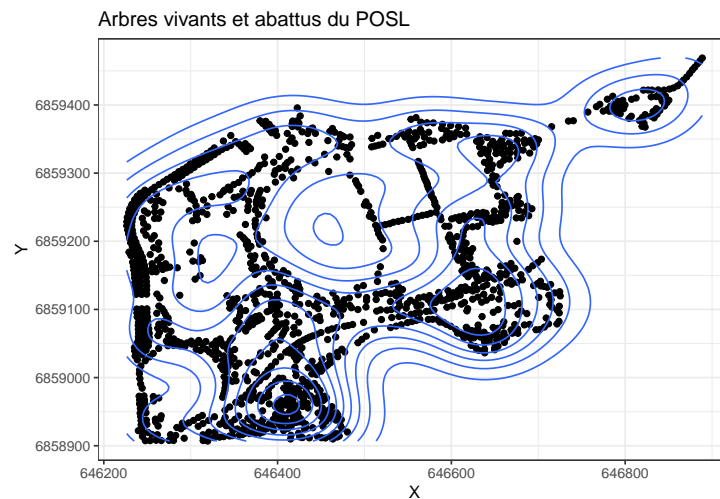
2.2.1 Carte

```
POSL_Esp_wmppp %>%
  autoplot(alpha = 0.8, xlab = "X Lambert", ylab = "Y Lambert") +
  labs(title = "Arbres du POSL") + labs(color = "Espèce",
    size = "Surface terrière")
```



2.2.2 Vue en 2D

```
BDD_Vivants_et_Abattus_renseignes_POSL %>%
  ggplot(aes(x = X, y = Y)) + geom_point() + geom_density_2d() +
  ggtitle("Arbres vivants et abattus du POSL")
```

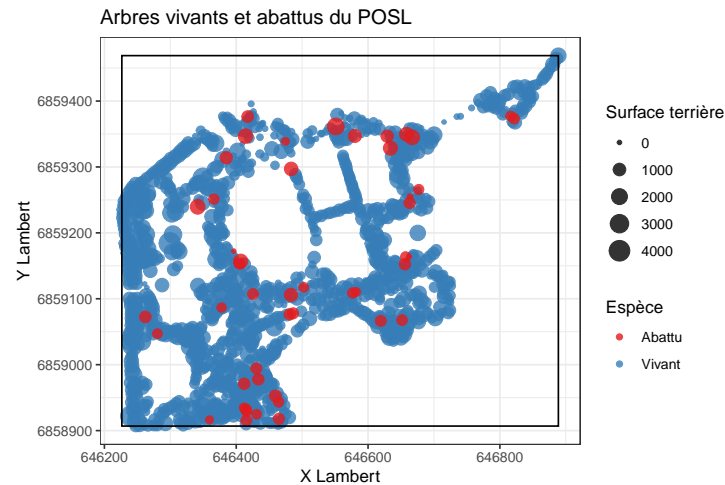


2.3 Abattus-vivants

```
BDD_Vivants_et_Abattus_renseignes_POSL %>%
  # Le poids est la surface terrière
  mutate(PointWeight = Circonference^2/4/pi) %>%
  rename(PointType = Etat) %>%
  as.wmppp(unitname = c("meter", "meters")) ->
  BDD_V2022_A2022_Poids_POSL_wmppp
```

Carte

```
BDD_V2022_A2022_Poids_POSL_wmppp %>%
  autoplot(alpha = 0.8, xlab = "X Lambert", ylab = "Y Lambert") +
  labs(title = "Arbres vivants et abattus du POSL") +
  labs(color = "Espèce", size = "Surface terrière")
```

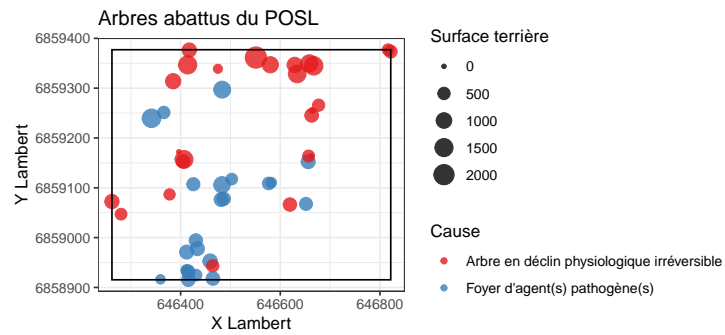


2.4 Cause de l'abattage

```
# Création du jeu de points
BDD_Vivants_et_Abattus_renseignes_POSL %>%
  # Arbres abattus seulement
  filter(Etat == "Abattu") %>%
  # Le poids est la surface terrière
  mutate(PointWeight = Circonference^2/4/pi) %>%
  rename(PointType = MotifAbattage) %>%
  as.wmppp(unitname = c("meter", "meters")) ->
  POSL_A_wmppp
```

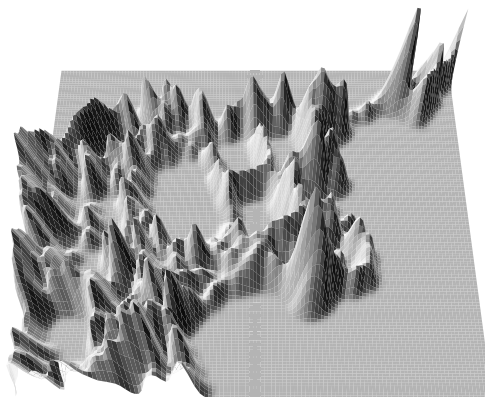
Carte

```
POSL_A_wmppp %>%
  autoplot(alpha = 0.8, xlab = "X Lambert", ylab = "Y Lambert") +
  labs(title = "Arbres abattus du POSL") + labs(color = "Cause",
  size = "Surface terrière")
```



3 Carte 3D densité arbres vivants et abattus à POSL

```
Density_POSL <- density(POSL_VA_wmppp, bw.diggle(POSL_VA_wmppp),
  dimyx = c(128, 128))
par(mar = c(0, 0, 0, 0))
persp.im(Density_POSL, shade = 0.5, scale = FALSE,
  axes = TRUE, border = NA, box = FALSE, phi = 60,
  main = "") -> Projection
```



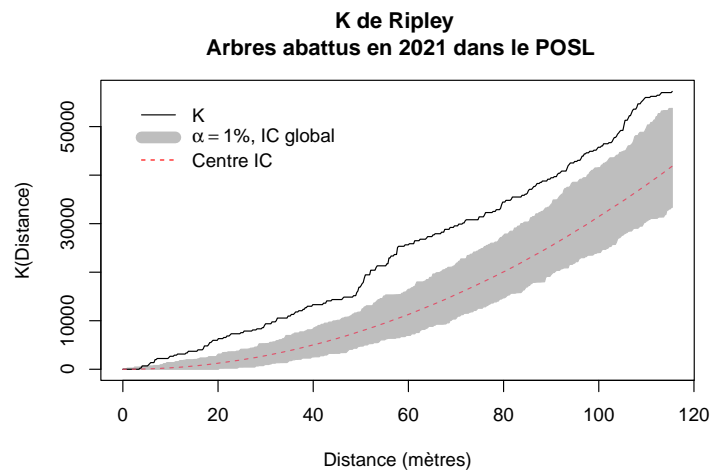
4 Concentration spatiale

4.1 Question 1-a : les arbres abattus du POSL sont-ils plus concentrés qu'une distribution aléatoire ?

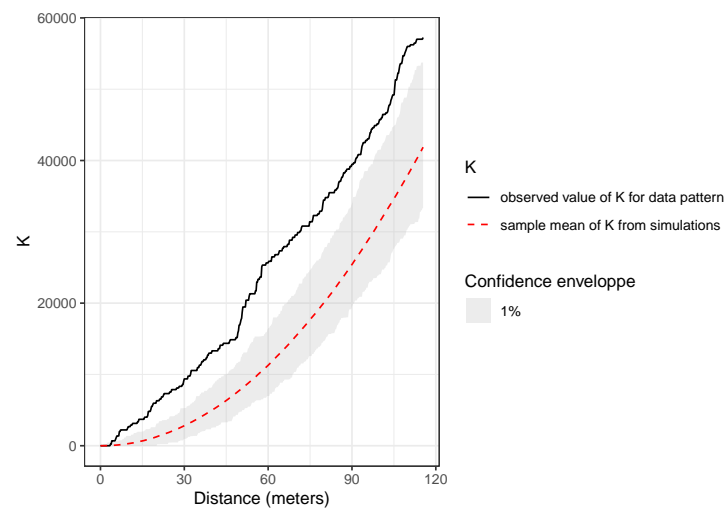
```
K_Abattus <- KEnvelope(POSL_A_wmppp, NumberOfSimulations = 1000,
  Alpha = 0.01, Global = TRUE)

## Generating 1000 simulations by evaluating
## expression ...
## 1, 2, 3, .....10.....20.....30.....40..
## .....50.....60.....70.....80....
## .....90.....100.....110.....120.....
## ...130.....140.....150.....160.....
## .170.....180.....190.....200.....210
## .....220.....230.....240.....250..
## .....260.....270.....280.....290...
## ....300.....310.....320.....330.....
## ..340.....350.....360.....370.....
## .380.....390.....400.....410.....420
## .....430.....440.....450.....460..
## .....470.....480.....490.....500...
## ....510.....520.....530.....540.....
## ..550.....560.....570.....580.....
## .590.....600.....610.....620.....630
## .....640.....650.....660.....670..
## .....680.....690.....700.....710...
## ....720.....730.....740.....750.....
## ..760.....770.....780.....790.....
## .800.....810.....820.....830.....840
## .....850.....860.....870.....880..
## .....890.....900.....910.....920...
## ....930.....940.....950.....960.....
## ..970.....980.....990.....1000.
##
## Done.

plot(K_Abattus, legend = FALSE, xlab = "Distance (mètres)",
  ylab = "K(Distance)", main = "K de Ripley \n Arbres abattus en 2021 dans le POSL")
legend("topleft", c("K", expression(alpha == "1%", IC global")),
  "Centre IC", col = c("black", "grey", "red"),
  lty = c(1, 1, 8), lwd = c(1, 10, 1), bty = "n",
  text.col = "black", horiz = FALSE, inset = 0.04)
```



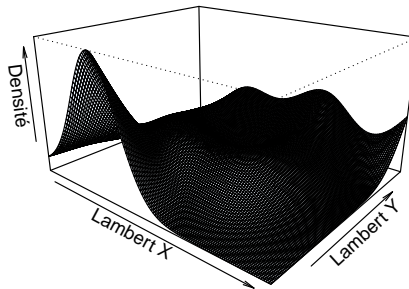
```
autoplot(K_Abattus)
```



Conclusion : interactions détectée entre les arbres abattus : attraction. Les arbres abattus sont plus concentrés qu'une distribution complètement aléatoire.

```
persp(density(POSL_A_wmppp),
      col="aliceblue", # couleur triste = arbres abattus
      theta = 40, phi = 20,
      xlab = "Lambert X", ylab = "Lambert Y", zlab = "Densité",
      main = "Densité arbres abattus en 2021 dans le POSL")
```

Densité arbres abattus en 2021 dans le POSL



4.2 Question 1-b : les arbres vivants du POSL sont-ils plus concentrés qu'une distribution aléatoire ?

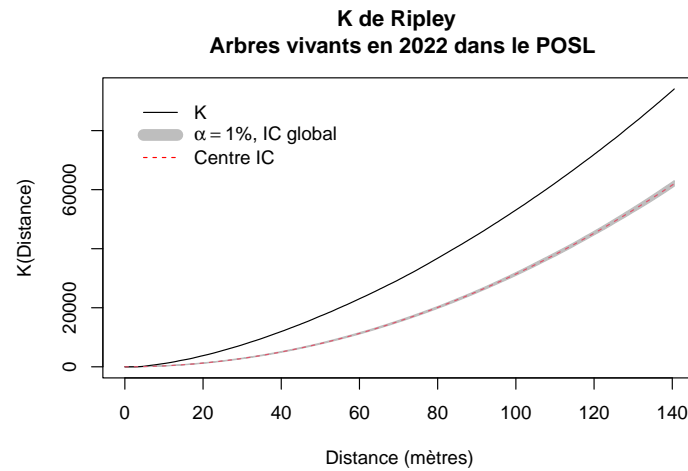
```
K_Vivants <- KEnvelope(POSL_Esp_wmppp, NumberOfSimulations = 1000,
  Alpha = 0.01, Global = TRUE)
```

```
## Generating 1000 simulations by evaluating
## expression ...
## 1, 2, 3, .....10.....20.....30.....40..
## .....50.....60.....70.....80....
## .....90.....100.....110.....120.....
## ...130.....140.....150.....160.....
## ...170.....180.....190.....200.....210
## .....220.....230.....240.....250..
## .....260.....270.....280.....290...
## .....300.....310.....320.....330.....
## ...340.....350.....360.....370.....
## ...380.....390.....400.....410.....420
## .....430.....440.....450.....460..
## .....470.....480.....490.....500...
## ...510.....520.....530.....540.....
## ...550.....560.....570.....580.....
## ...590.....600.....610.....620.....630
## .....640.....650.....660.....670..
## .....680.....690.....700.....710...
## ...720.....730.....740.....750.....
## ...760.....770.....780.....790.....
## ...800.....810.....820.....830.....840
## .....850.....860.....870.....880..
## .....890.....900.....910.....920...
## ...930.....940.....950.....960.....
## ...970.....980.....990.....1000.
##
## Done.
```

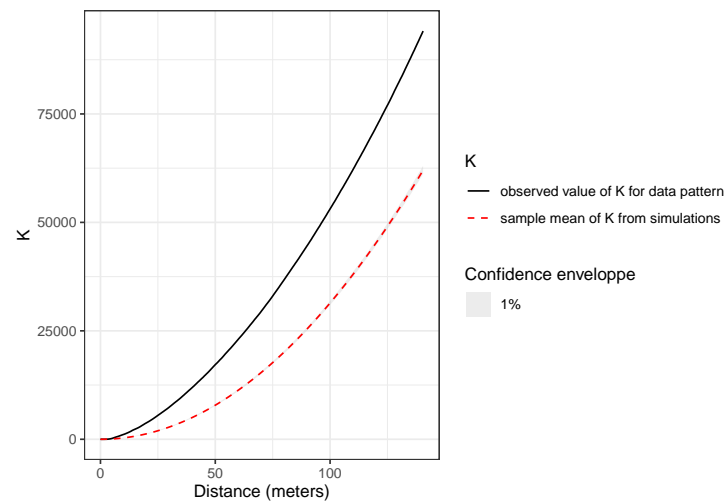
```
plot(K_Vivants, legend = FALSE, xlab = "Distance (mètres)",
  ylab = "K(Distance)", main = "K de Ripley \n Arbres vivants en 2022 dans le POSL")
legend("topleft", c("K", expression(alpha == "1%", IC global"),
  "Centre IC"), col = c("black", "grey", "red"),
```



```
lty = c(1, 1, 8), lwd = c(1, 10, 1), bty = "n",
text.col = "black", horiz = FALSE, inset = 0.04)
```



```
autoplot(K_Vivants)
```



Conclusion : interactions détectée entre les arbres vivants : attraction. Les arbres vivants sont plus concentrés qu'une distribution complètement aléatoire.

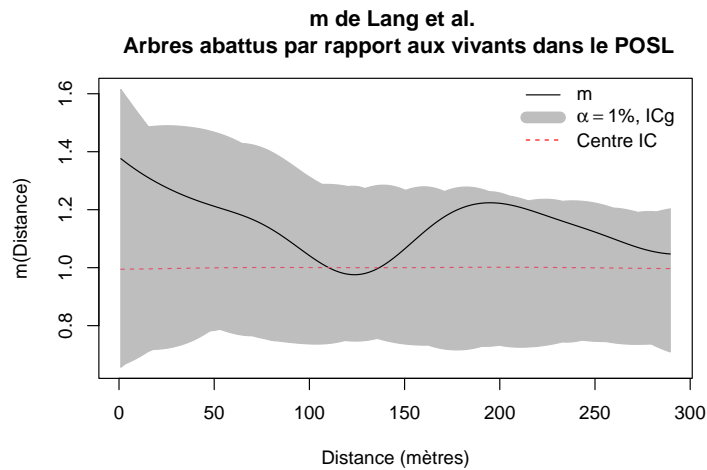
4.3 Question 2 : les arbres abattus du POSL sont-ils plus concentrés que les vivants ?

4.3.1 mCas_contrôles pour les abattus

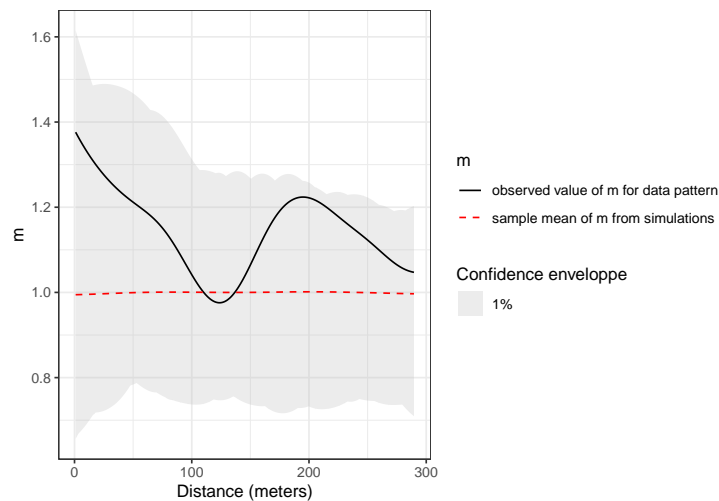
```
m_Abattus <- mEnvelope(BDD_V2022_A2022_Poids_POSL_wmppp,
  NumberOfSimulations = 1000, Alpha = 0.01, ReferenceType = "Abattu",
  SimulationType = "RandomLocation", Global = TRUE)

## Generating 1000 simulations by evaluating
## expression ...
## 1, 2, 3, .....10.....20.....30.....40..
## .....50.....60.....70.....80....
## .....90.....100.....110.....120.....
## ...130.....140.....150.....160.....
## ..170.....180.....190.....200.....210
## .....220.....230.....240.....250..
## .....260.....270.....280.....290....
## ....300.....310.....320.....330.....
## ...340.....350.....360.....370.....
## ..380.....390.....400.....410.....420
## .....430.....440.....450.....460..
## .....470.....480.....490.....500....
## ....510.....520.....530.....540.....
## ..550.....560.....570.....580.....
## .590.....600.....610.....620.....630
## .....640.....650.....660.....670..
## .....680.....690.....700.....710....
## ....720.....730.....740.....750.....
## ..760.....770.....780.....790.....
## .800.....810.....820.....830.....840
## .....850.....860.....870.....880..
## .....890.....900.....910.....920....
## ....930.....940.....950.....960.....
## ..970.....980.....990.....1000.
##
## Done.

plot(m_Abattus, xlab = "Distance (mètres)", ylab = "m(Distance)",
  legend = FALSE, main = "m de Lang et al. \n Arbres abattus par rapport aux vivants dans le POSL")
legend("topright", c("m", expression(alpha == "1%", ICg )),
  "Centre IC"), col = c("black", "grey", "red"),
  lty = c(1, 1, 8), lwd = c(1, 10, 1), bty = "n",
  text.col = "black", horiz = FALSE, inset = -0.02)
```



```
autoplot(m_Abattus)
```



Conclusions :

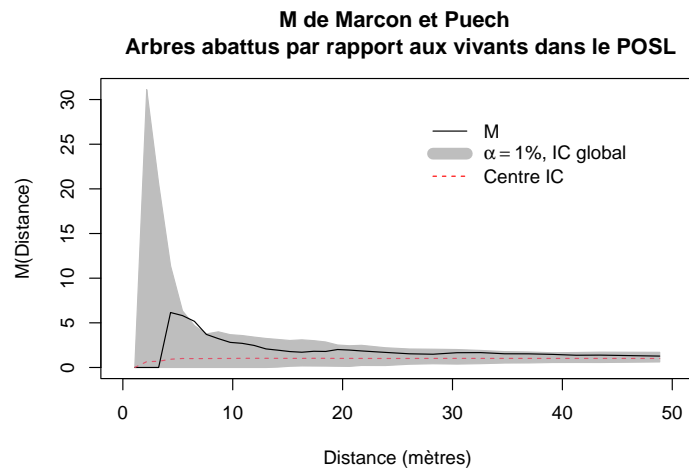
- NS avec alpha 1% et 1000 sim
- avec alpha 10% concentration sign entre 175m et 200m avec 1000 sim, presque plus sign avec 10000 sim.

4.3.2 MCas_contrôles pour les abattus

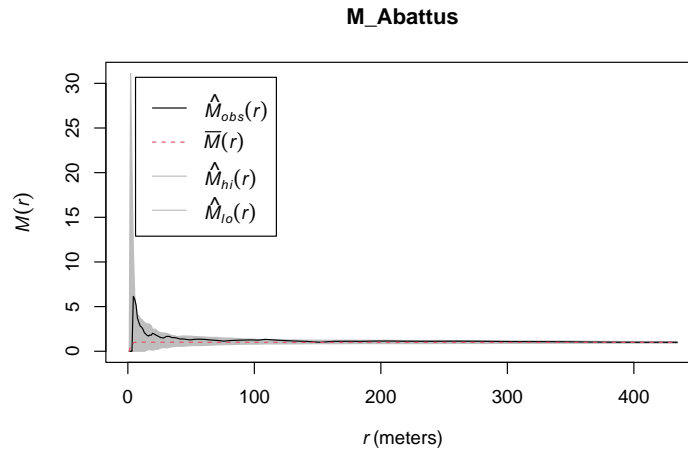
```
M_Abattus <- MEnvelope(BDD_V2022_A2022_Poids_POSL_wmppp,
  NumberOfSimulations = 1000, Alpha = 0.01, ReferenceType = "Abattu",
  SimulationType = "RandomLocation", Global = TRUE)
```

```
## Generating 1000 simulations by evaluating
## expression ...
## 1, 2, 3, .....10.....20.....30.....40..
## .....50.....60.....70.....80....
## .....90.....100.....110.....120.....
## ...130.....140.....150.....160.....
## ...170.....180.....190.....200.....210
## .....220.....230.....240.....250..
## .....260.....270.....280.....290...
## .....300.....310.....320.....330....
## ...340.....350.....360.....370.....
## ...380.....390.....400.....410.....420
## .....430.....440.....450.....460..
## .....470.....480.....490.....500...
## ...510.....520.....530.....540.....
## ...550.....560.....570.....580.....
## ...590.....600.....610.....620.....630
## .....640.....650.....660.....670..
## .....680.....690.....700.....710...
## ...720.....730.....740.....750.....
## ...760.....770.....780.....790.....
## ...800.....810.....820.....830.....840
## .....850.....860.....870.....880...
## .....890.....900.....910.....920...
## ...930.....940.....950.....960.....
## ...970.....980.....990.....1000.
##
## Done.
```

```
plot(M_Abattus, legend = FALSE, xlab = "Distance (mètres)",
     ylab = "M(Distance)", xlim = c(0, 50), main = "M de Marcon et Puech \n Arbres abattus par rapport aux vivants dans le POSL")
legend("topright", c("M", expression(alpha == "1%", IC global),
"Centre IC"), col = c("black", "grey", "red"),
lty = c(1, 1, 8), lwd = c(1, 10, 1), bty = "n",
text.col = "black", horiz = FALSE, inset = 0.1)
```



```
plot(M_Abattus)
```



Conclusion : un peu conc sign autour de 5m.

Attention : attention warning message lors de la compil.

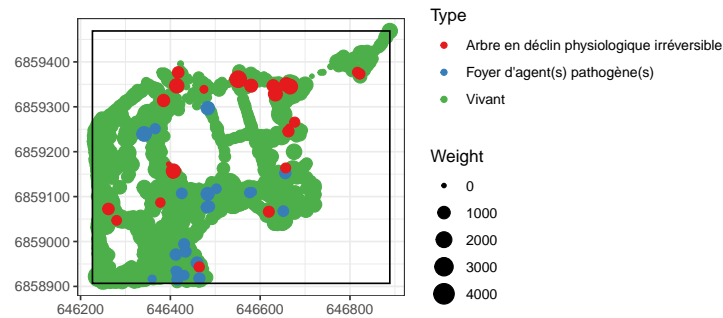
Warning messages: 1: In FUN(newX[, i], ...) :
aucun argument trouvé pour min ; Inf est renvoyé"

4.4 Question 3 : les malades sont-ils plus concentrés ceux en délin par rapport aux vivants ?

4.4.1 Question 3-a : REFERENTIEL : ARBRES VIVANTS et ABATTUS POUR AUTRES MOTIFS

Création de la BDD :

```
BDD_Vivants_et_Abattus_renseignes_POSL %>%
  # Le poids est la surface terrière
  mutate(PointWeight = Circonference^2/4/pi) %>%
  mutate(PointType = ifelse(Etat == "Vivant", "Vivant",
    as.character(MotifAbattage))) %>%
  as.wmppp(unitname = c("meter", "meters")) ->
  BDD_V2022_A2022_Poids_POSL_wmppp2
autoplot(BDD_V2022_A2022_Poids_POSL_wmppp2)
```



```
M_Declin <- MEnvelope(BDD_V2022_A2022_Poids_POSL_wmppp2,
  NumberOfSimulations = 1000, Alpha = 0.01, ReferenceType = "Arbre en déclin physiologique irréversible",
  SimulationType = "RandomLocation", Global = TRUE)
```

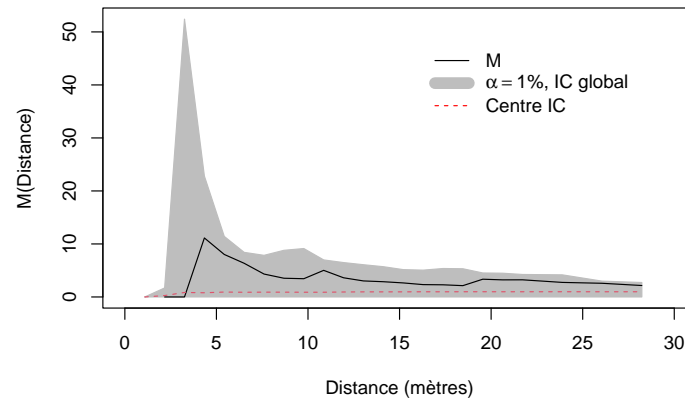
M déclin

```
## Generating 1000 simulations by evaluating
## expression ...
## 1, 2, 3, .....10.....20.....30.....40..
## .....50.....60.....70.....80....
## .....90.....100.....110.....120.....
## ..130.....140.....150.....160.....
## ..170.....180.....190.....200.....210
## .....220.....230.....240.....250..
## .....260.....270.....280.....290....
## ....300.....310.....320.....330.....
## ...340.....350.....360.....370.....
## ..380.....390.....400.....410.....420
## .....430.....440.....450.....460..
## .....470.....480.....490.....500....
## ....510.....520.....530.....540.....
## ..550.....560.....570.....580.....
## ..590.....600.....610.....620.....630
## .....640.....650.....660.....670..
## .....680.....690.....700.....710....
## ....720.....730.....740.....750.....
## ..760.....770.....780.....790.....
## ..800.....810.....820.....830.....840
## .....850.....860.....870.....880..
## .....890.....900.....910.....920....
## ....930.....940.....950.....960.....
## ...970.....980.....990.....1000.
##
## Done.
```

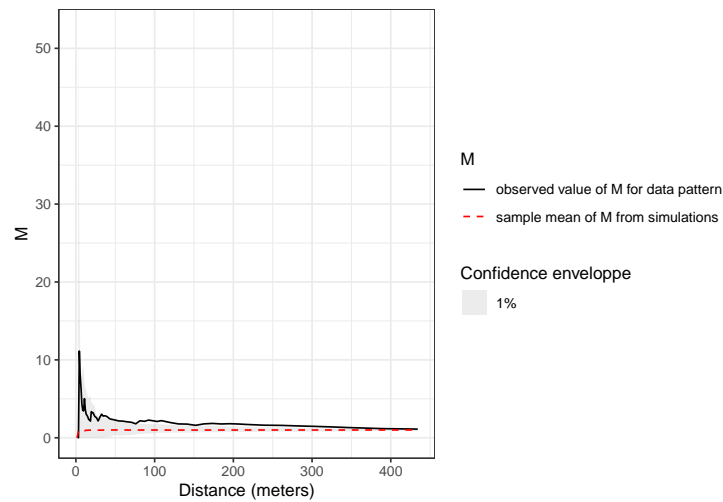
```
plot(M_Declin, legend = FALSE, xlim = c(0, 30), xlab = "Distance (mètres)",
  ylab = "M(Distance)", main = "M de Marcon et Puech \n Arbres en déclin par rapport aux vivants et malades dans le POSL")
legend("topright", c("M", expression(alpha == "1%", IC global"),
  "Centre IC"), col = c("black", "grey", "red"),
```

```
lty = c(1, 1, 8), lwd = c(1, 10, 1), bty = "n",
text.col = "black", horiz = FALSE, inset = 0.1)
```

M de Marcon et Puech Arbres en déclin par rapport aux vivants et malades dans le POSL



```
autoplot(M_Declin)
```



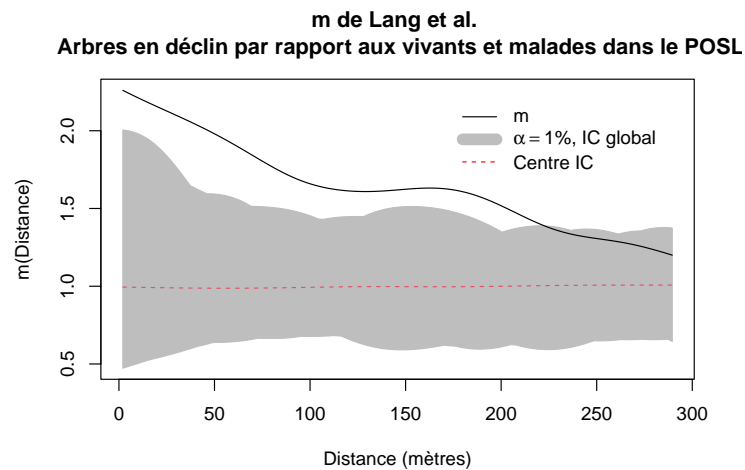
Conclusion : NS.

```
m_Declin <- mEnvelope(BDD_V2022_A2022_Poids_POSL_wmppp2,
  NumberOfSimulations = 1000, Alpha = 0.01, ReferenceType = "Arbre en déclin physiologique irréversible",
  SimulationType = "RandomLocation", Global = TRUE)
```

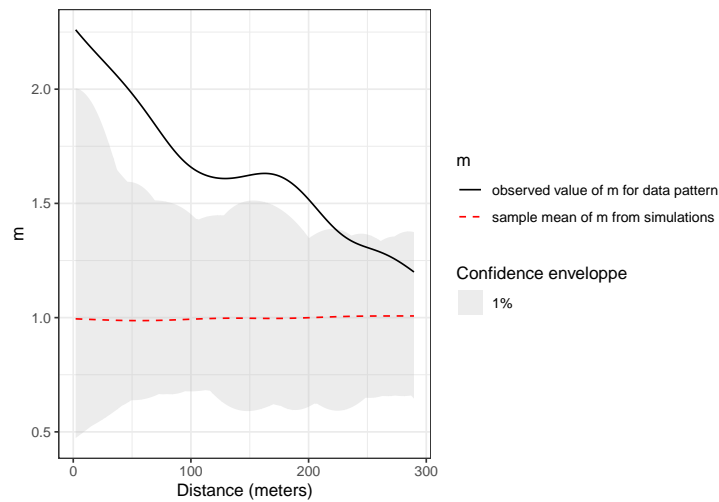
m déclin

```
## Generating 1000 simulations by evaluating
## expression ...
## 1, 2, 3, .....10.....20.....30.....40..
## .....50.....60.....70.....80....
## .....90.....100.....110.....120.....
## ...130.....140.....150.....160.....
## ...170.....180.....190.....200.....210
## .....220.....230.....240.....250..
## .....260.....270.....280.....290...
## .....300.....310.....320.....330.....
## ...340.....350.....360.....370.....
## ...380.....390.....400.....410.....420
## .....430.....440.....450.....460..
## .....470.....480.....490.....500...
## ...510.....520.....530.....540.....
## ...550.....560.....570.....580.....
## ...590.....600.....610.....620.....630
## .....640.....650.....660.....670..
## .....680.....690.....700.....710...
## ...720.....730.....740.....750.....
## ...760.....770.....780.....790.....
## ...800.....810.....820.....830.....840
## .....850.....860.....870.....880...
## .....890.....900.....910.....920...
## ...930.....940.....950.....960.....
## ...970.....980.....990.....1000.
##
## Done.
```

```
plot(m_Declin, legend = FALSE, xlab = "Distance (mètres)",
     ylab = "m(Distance)", main = "m de Lang et al. \n Arbres en déclin par rapport aux vivants et malades dans le POSL")
legend("topright", c("m", expression(alpha == "1%", IC global"),
"Centre IC"), col = c("black", "grey", "red"),
      lty = c(1, 1, 8), lwd = c(1, 10, 1), bty = "n",
      text.col = "black", horiz = FALSE, inset = 0.05)
```



```
autoplot(m_Declin)
```

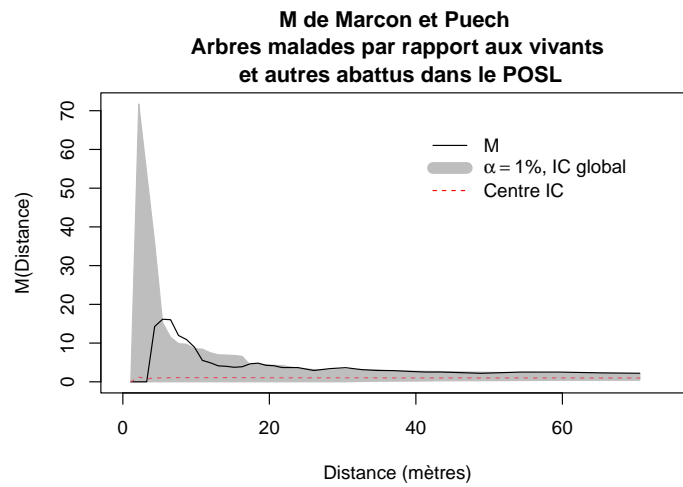
Conclusion : conc sign jusqu'à 100m puis jusqu'à 250m.

```
M_Malades <- MEnvelope(BDD_V2022_A2022_Poids_POSL_wmppp2,
  NumberOfSimulations = 1000, Alpha = 0.01, ReferenceType = "Foyer d'agent(s) pathogène(s)",
  SimulationType = "RandomLocation", Global = TRUE)
```

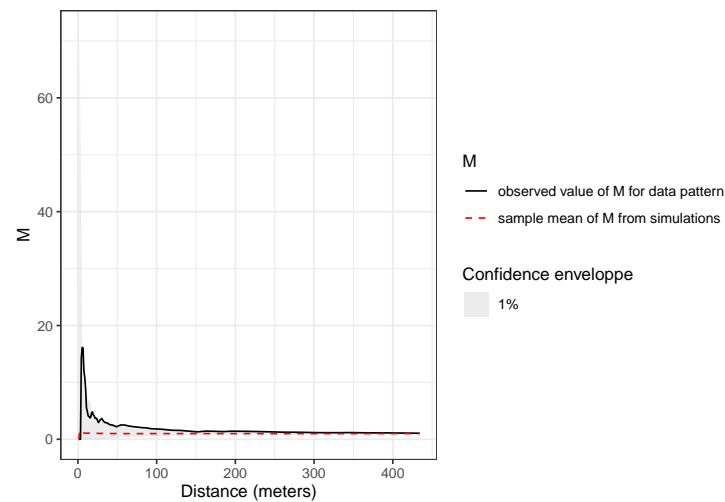
M malade

```
## Generating 1000 simulations by evaluating
## expression ...
## 1, 2, 3, .....10.....20.....30.....40..
## .....50.....60.....70.....80....
## .....90.....100.....110.....120.....
## .....130.....140.....150.....160.....
## .....170.....180.....190.....200.....210
## .....220.....230.....240.....250..
## .....260.....270.....280.....290....
## .....300.....310.....320.....330.....
## .....340.....350.....360.....370.....
## .....380.....390.....400.....410.....420
## .....430.....440.....450.....460..
## .....470.....480.....490.....500....
## .....510.....520.....530.....540.....
## .....550.....560.....570.....580.....
## .....590.....600.....610.....620.....630
## .....640.....650.....660.....670..
## .....680.....690.....700.....710....
## .....720.....730.....740.....750.....
## .....760.....770.....780.....790.....
## .....800.....810.....820.....830.....840
## .....850.....860.....870.....880..
## .....890.....900.....910.....920....
## .....930.....940.....950.....960.....
## .....970.....980.....990.....1000.
##
## Done.
```

```
plot(M_Malades, legend = FALSE, xlim = c(0, 75), xlab = "Distance (mètres)",
     ylab = "M(Distance)", main = "M de Marcon et Puech \n Arbres malades par rapport aux vivants \n et autres abattus dans le POSL",
     legend("topright", c("M", expression(alpha == "1%", IC global"),
                           "Centre IC"), col = c("black", "grey", "red"),
     lty = c(1, 1, 8), lwd = c(1, 10, 1), bty = "n",
     text.col = "black", horiz = FALSE, inset = 0.1)
```



```
autoplot(M_Malades)
```



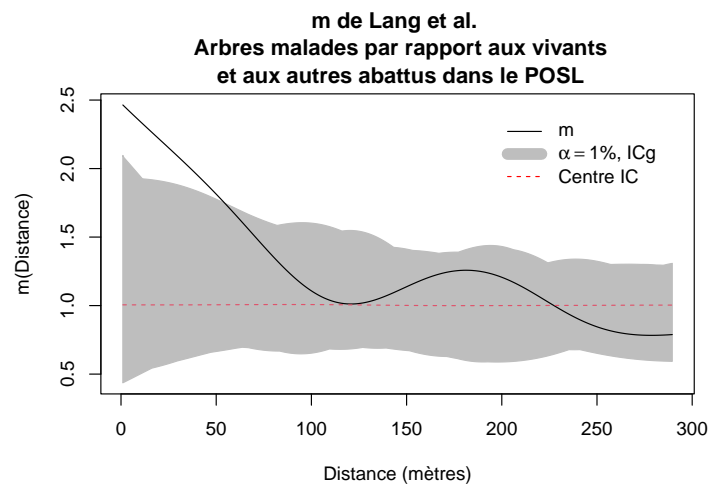
Conclusion : conc à petites distances (environ 10m) Attention : warnings
 FUN

```
m_Malades <- mEnvelope(BDD_V2022_A2022_Poids_POSL_wmppp2,
  NumberOfSimulations = 1000, Alpha = 0.01, ReferenceType = "Foyer d'agent(s) pathogène(s)",
  SimulationType = "RandomLocation", Global = TRUE)
```

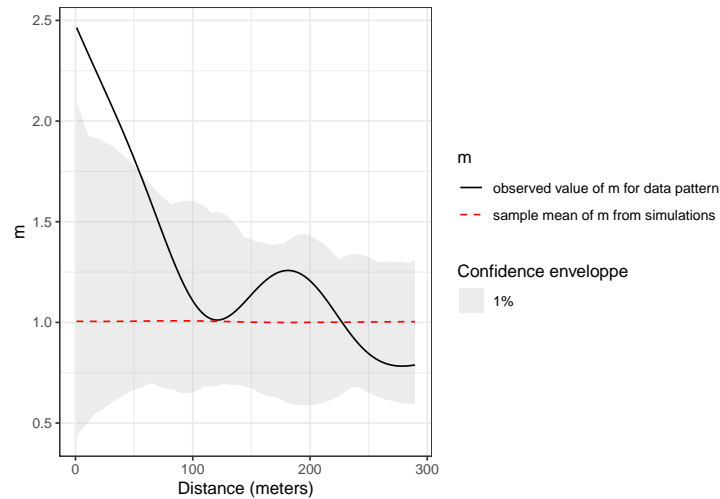
m malade

```
## Generating 1000 simulations by evaluating
## expression ...
## 1, 2, 3, .....10.....20.....30.....40..
## .....50.....60.....70.....80....
## .....90.....100.....110.....120.....
## .....130.....140.....150.....160.....
## .....170.....180.....190.....200.....210
## .....220.....230.....240.....250..
## .....260.....270.....280.....290....
## .....300.....310.....320.....330.....
## .....340.....350.....360.....370.....
## .....380.....390.....400.....410.....420
## .....430.....440.....450.....460....
## .....470.....480.....490.....500....
## .....510.....520.....530.....540.....
## .....550.....560.....570.....580.....
## .....590.....600.....610.....620.....630
## .....640.....650.....660.....670....
## .....680.....690.....700.....710....
## .....720.....730.....740.....750.....
## .....760.....770.....780.....790.....
## .....800.....810.....820.....830.....840
## .....850.....860.....870.....880....
## .....890.....900.....910.....920....
## .....930.....940.....950.....960.....
## .....970.....980.....990.....1000.
##
## Done.
```

```
plot(m_Malades, legend = FALSE, xlab = "Distance (mètres)",
  ylab = "m(Distance)", main = "m de Lang et al. \n Arbres malades par rapport aux vivants\n et aux autres abattus dans le POSL",
  legend("topright", c("m", expression(alpha == "1%", ICg),
    "Centre IC"), col = c("black", "grey", "red"),
  lty = c(1, 1, 8), lwd = c(1, 10, 1), bty = "n",
  text.col = "black", horiz = FALSE, inset = 0.05)
```



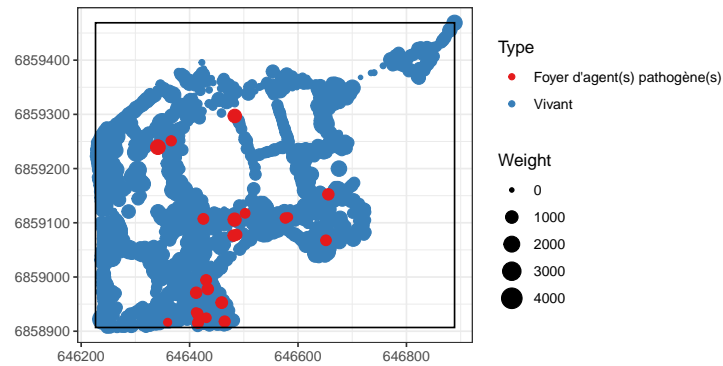
```
autoplot(m_Malades)
```



4.4.2 Question 3-b : REFERENTIEL : UNIQUEMENT LES ARBRES VIVANTS

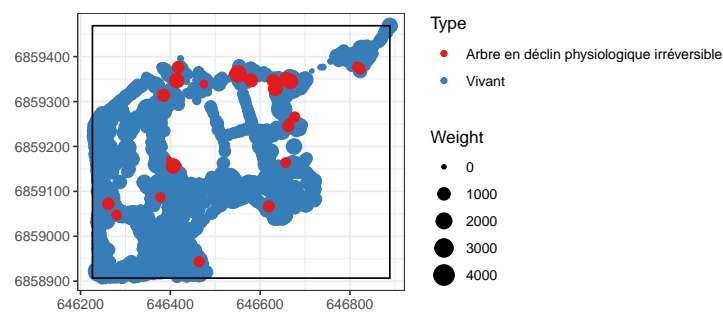
Jeux de points Création de la BDD sans les 25 arbres en déclin donc contient vivant et abattus-patho :

```
BDD_Vivants_et_Abattus_renseignes_POSL %>%
  # Le poids est la surface terrière
  mutate(PointWeight = Circonference^2/4/pi) %>%
  filter(MotifAbattage != "Arbre en déclin physiologique irréversible") %>%
  mutate(PointType = ifelse(Etat == "Vivant", "Vivant",
    "Foyer d'agent(s) pathogène(s)")) %>%
  as.wmppp(unitname = c("meter", "meters")) ->
  BDD_V2022_A2022_Poids_POSL_sans_abattus_declin_wmppp
autoplot(BDD_V2022_A2022_Poids_POSL_sans_abattus_declin_wmppp)
```



Création de la BDD sans les 23 arbres foyer patho donc reste uniquement vivants et en déclin:

```
BDD_Vivants_et_Abattus_renseignes_POSL %>%
  # Le poids est la surface terrière
  mutate(PointWeight = Circonference^2/4/pi) %>%
  filter(MotifAbattage != "Foyer d'agent(s) pathogène(s)") %>%
  mutate(PointType = ifelse(Etat == "Vivant", "Vivant",
    "Arbre en déclin physiologique irréversible")) %>%
  as.wmppp(unitname = c("meter", "meters")) ->
  BDD_V2022_A2022_Poids_POSL_sans_patho_wmppp
autoplot(BDD_V2022_A2022_Poids_POSL_sans_patho_wmppp)
```

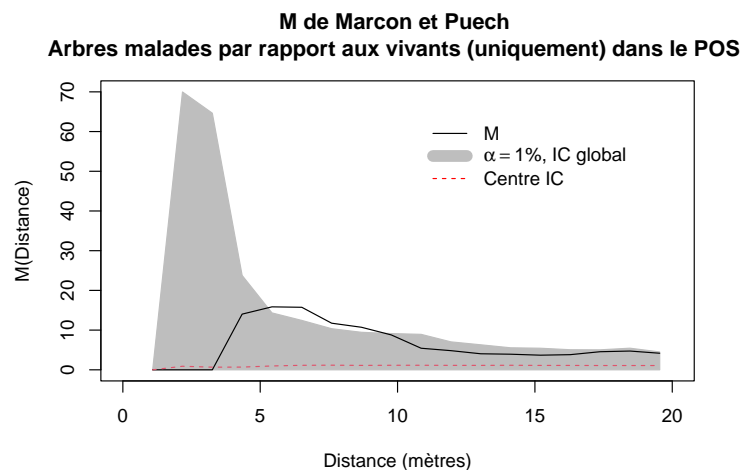


```
M_Malades <- MEnvelope(BDD_V2022_A2022_Poids_POSL_sans_abattus_declin_wmppp,
  NumberOfSimulations = 1000, Alpha = 0.01, ReferenceType = "Foyer d'agent(s) pathogène(s)",
  SimulationType = "RandomLocation", Global = TRUE)
```

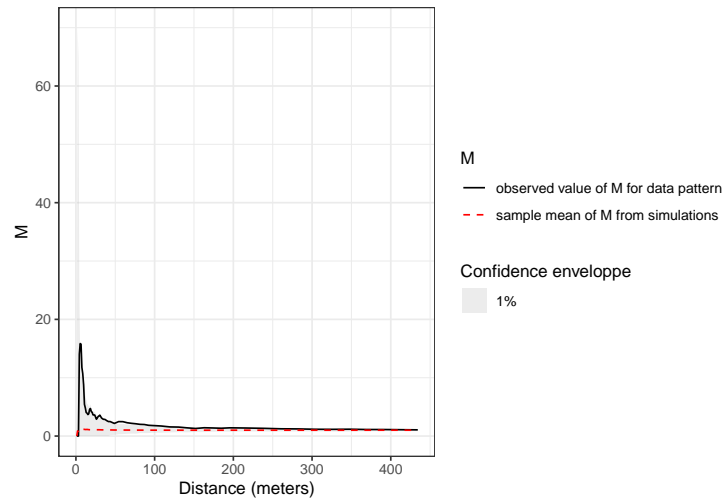
M malades

```
## Generating 1000 simulations by evaluating
## expression ...
## 1, 2, 3, .....10.....20.....30.....40..
## .....50.....60.....70.....80....
## .....90.....100.....110.....120.....
## .....130.....140.....150.....160.....
## .....170.....180.....190.....200.....210
## .....220.....230.....240.....250..
## .....260.....270.....280.....290....
## .....300.....310.....320.....330.....
## .....340.....350.....360.....370.....
## .....380.....390.....400.....410.....420
## .....430.....440.....450.....460....
## .....470.....480.....490.....500....
## .....510.....520.....530.....540.....
## .....550.....560.....570.....580.....
## .....590.....600.....610.....620.....630
## .....640.....650.....660.....670....
## .....680.....690.....700.....710....
## .....720.....730.....740.....750.....
## .....760.....770.....780.....790.....
## .....800.....810.....820.....830.....840
## .....850.....860.....870.....880....
## .....890.....900.....910.....920....
## .....930.....940.....950.....960.....
## .....970.....980.....990.....1000..
##
## Done.
```

```
plot(M_Malades, legend = FALSE, xlim = c(0, 20), xlab = "Distance (mètres)",
  ylab = "M(Distance)", main = "M de Marcon et Puech \n Arbres malades par rapport aux vivants (uniquement) dans le POSL")
legend("topright", c("M", expression(alpha == "1%", IC global"),
  "Centre IC"), col = c("black", "grey", "red"),
  lty = c(1, 1, 8), lwd = c(1, 10, 1), bty = "n",
  text.col = "black", horiz = FALSE, inset = 0.1)
```



```
autoplot(M_Malades)
```



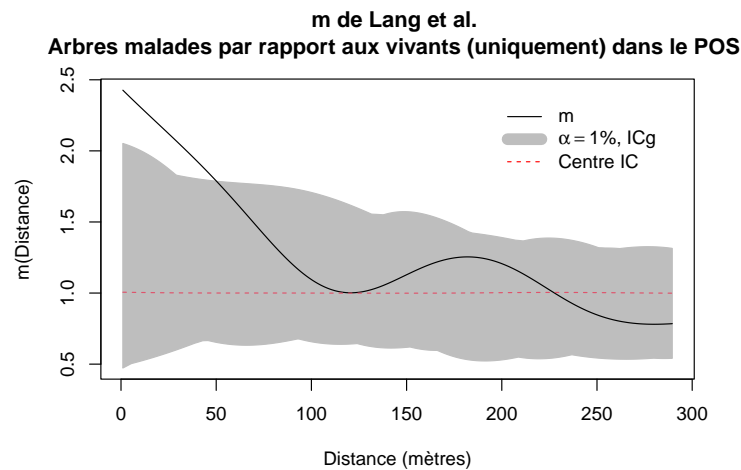
Conclusion : conc sign entre 6m et 8m et M est alors = 10 ou 11 !!! Remarque : warning fun.

```
m_Malades <- mEnvelope(BDD_V2022_A2022_Poids_POSL_sans_abattus_declin_wmppp,
  NumberOfSimulations = 1000, Alpha = 0.01, ReferenceType = "Foyer d'agent(s) pathogène(s)",
  SimulationType = "RandomLocation", Global = TRUE)
```

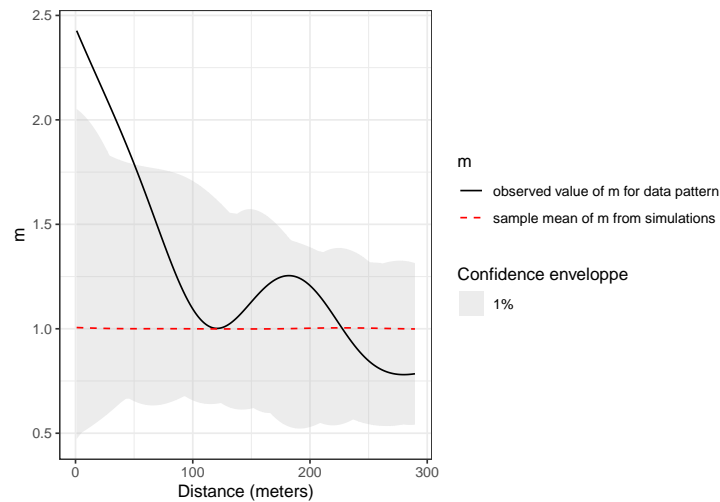
m malades

```
## Generating 1000 simulations by evaluating
## expression ...
## 1, 2, 3, .....10.....20.....30.....40..
## .....50.....60.....70.....80....
## .....90.....100.....110.....120.....
## ...130.....140.....150.....160.....
## ..170.....180.....190.....200.....210
## .....220.....230.....240.....250..
## .....260.....270.....280.....290....
## ....300.....310.....320.....330.....
## ...340.....350.....360.....370.....
## ..380.....390.....400.....410.....420
## .....430.....440.....450.....460..
## .....470.....480.....490.....500....
## ....510.....520.....530.....540.....
## ...550.....560.....570.....580.....
## ..590.....600.....610.....620.....630
## .....640.....650.....660.....670..
## ....680.....690.....700.....710....
## .....720.....730.....740.....750.....
## ....760.....770.....780.....790.....
## ...800.....810.....820.....830.....840
## .....850.....860.....870.....880..
## .....890.....900.....910.....920....
## ....930.....940.....950.....960.....
## ...970.....980.....990.....1000.
##
## Done.
```

```
plot(m_Malades, legend = FALSE, xlab = "Distance (mètres)",
     ylab = "m(Distance)", main = "m de Lang et al. \n Arbres malades par rapport aux vivants (uniquement) dans le POSL")
legend("topright", c("m", expression(alpha == "1%", ICg"),
                     "Centre IC"), col = c("black", "grey", "red"),
      lty = c(1, 1, 8), lwd = c(1, 10, 1), bty = "n",
      text.col = "black", horiz = FALSE, inset = 0.05)
```



```
autoplot(m_Malades)
```

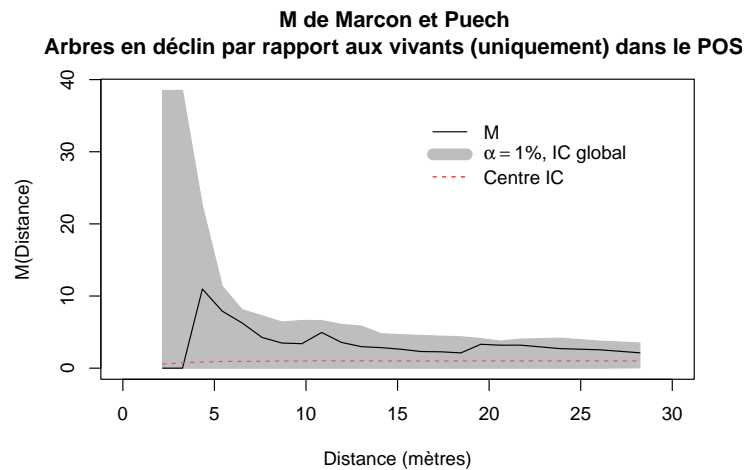


```
M_Declin <- MEnvelope(BDD_V2022_A2022_Poids_POSL_sans_patho_wmpps,
                      NumberOfSimulations = 1000, Alpha = 0.01, ReferenceType = "Arbre en déclin physiologique irréversible",
                      SimulationType = "RandomLocation", Global = TRUE)
```

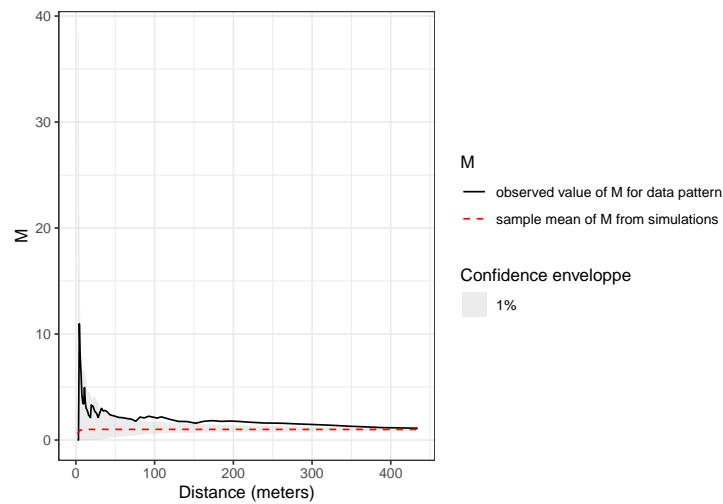
M déclin


```
## Generating 1000 simulations by evaluating
## expression ...
## 1, 2, 3, .....10.....20.....30.....40..
## .....50.....60.....70.....80....
## .....90.....100.....110.....120.....
## ...130.....140.....150.....160.....
## ...170.....180.....190.....200.....210
## .....220.....230.....240.....250..
## .....260.....270.....280.....290...
## .....300.....310.....320.....330.....
## ...340.....350.....360.....370.....
## ...380.....390.....400.....410.....420
## .....430.....440.....450.....460..
## .....470.....480.....490.....500...
## ...510.....520.....530.....540.....
## ...550.....560.....570.....580.....
## ...590.....600.....610.....620.....630
## .....640.....650.....660.....670..
## .....680.....690.....700.....710...
## ...720.....730.....740.....750.....
## ...760.....770.....780.....790.....
## ...800.....810.....820.....830.....840
## .....850.....860.....870.....880..
## .....890.....900.....910.....920...
## ...930.....940.....950.....960.....
## ...970.....980.....990.....1000.
##
## Done.
```

```
plot(M_Declin, legend = FALSE, xlim = c(0, 30), xlab = "Distance (mètres)",
     ylab = "M(Distance)", main = "M de Marcon et Puech \n Arbres en déclin par rapport aux vivants (uniquement) dans le POSL")
legend("topright", c("M", expression(alpha == "1%", IC global"),
"Centre IC"), col = c("black", "grey", "red"),
      lty = c(1, 1, 8), lwd = c(1, 10, 1), bty = "n",
      text.col = "black", horiz = FALSE, inset = 0.1)
```



```
autoplot(M_Declin)
```



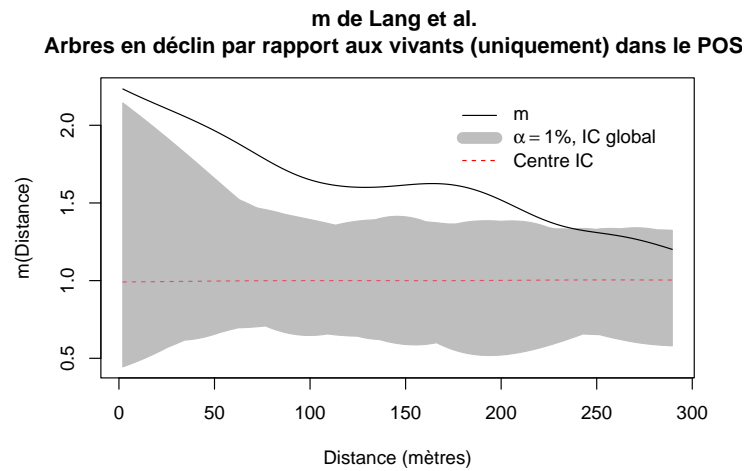
```
m_Declin <- mEnvelope(BDD_V2022_A2022_Poids_PO SL_sans_patho_wm p p p ,
  NumberOfSimulations = 1000, Alpha = 0.01, ReferenceType = "Arbre en d  clin physiologique irr  versible",
  SimulationType = "RandomLocation", Global = TRUE)
```

m d  clin

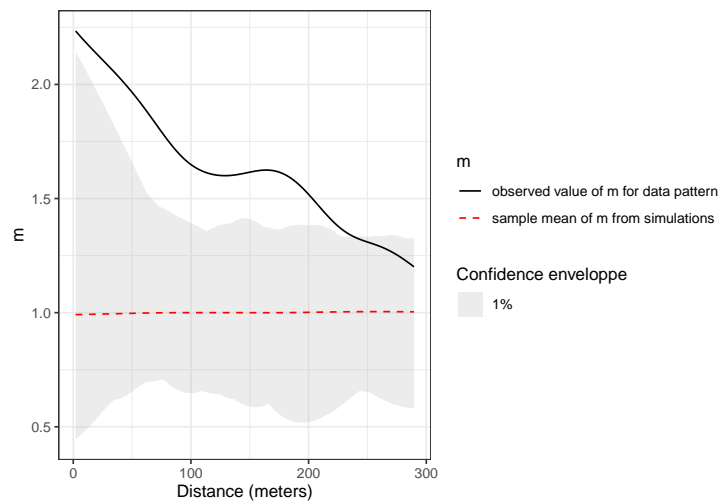
```
## Generating 1000 simulations by evaluating
## expression ...
## 1, 2, 3, .....10.....20.....30.....40..
## .....50.....60.....70.....80....
## .....90.....100.....110.....120.....
## ..130.....140.....150.....160.....
## ..170.....180.....190.....200.....210
## .....220.....230.....240.....250..
## .....260.....270.....280.....290...
## ....300.....310.....320.....330.....
## ..340.....350.....360.....370.....
## ..380.....390.....400.....410.....420
## .....430.....440.....450.....460..
## .....470.....480.....490.....500...
## ....510.....520.....530.....540.....
## ..550.....560.....570.....580.....
## ..590.....600.....610.....620.....630
## .....640.....650.....660.....670..
## .....680.....690.....700.....710...
## ....720.....730.....740.....750.....
## ..760.....770.....780.....790.....
## ..800.....810.....820.....830.....840
## .....850.....860.....870.....880..
## .....890.....900.....910.....920...
## ....930.....940.....950.....960....
## ...970.....980.....990.....1000.
##
## Done.
```

```
plot(m_Declin, legend = FALSE, xlab = "Distance (m  tres)",
  ylab = "m(Distance)", main = "m de Lang et al. \n Arbres en d  clin par rapport aux vivants (uniquement) dans le PO SL",
  legend("topright", c("m", expression(alpha == "1%", IC global"),
    "Centre IC"), col = c("black", "grey", "red"),
```

```
lty = c(1, 1, 8), lwd = c(1, 10, 1), bty = "n",
text.col = "black", horiz = FALSE, inset = 0.05)
```



```
autoplot(m_Declin)
```



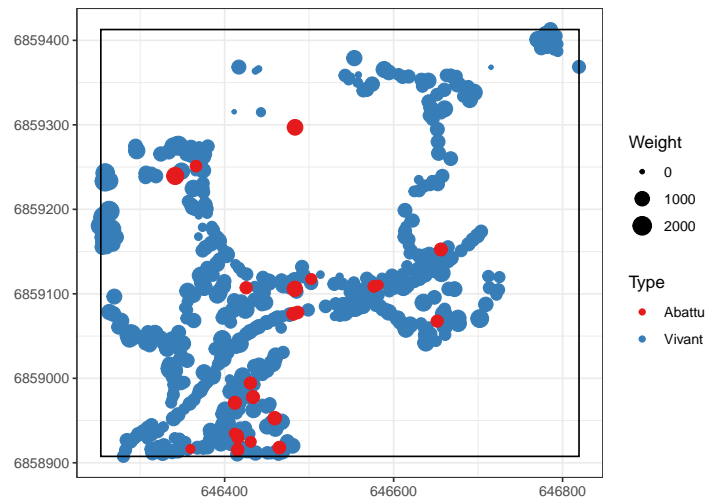
4.5 Question 4 : les érables malades sont-ils plus concentrés que les érables vivants ?

4.5.1 Jeu de points

```

BDD_Vivants_et_Abattus_renseignes_POSL %>%
  filter(EspeceFrancais == "Erable") %>%
  # Le poids est la surface terrière
  mutate(PointWeight = Circonference^2/4/pi) %>%
  filter(MotifAbattage != "Arbre en déclin physiologique irréversible") %>%
  mutate(PointType = ifelse(Etat == "Vivant", "Vivant",
    "Abattu")) %>%
  as.wmppp(unitname = c("meter", "meters")) ->
  BDD_V2022_A2022_Poids_POSL_erables_VPatho_wmppp
autoplot(BDD_V2022_A2022_Poids_POSL_erables_VPatho_wmppp)

```



```

M_erables <- MEnvelope(BDD_V2022_A2022_Poids_POSL_erables_VPatho_wmppp,
  NumberOfSimulations=1000,
  Alpha=0.1, # attention : 10% ici
  ReferenceType = "Abattu",
  SimulationType = "RandomLocation",
  Global=TRUE)

```

M érables foyer patho

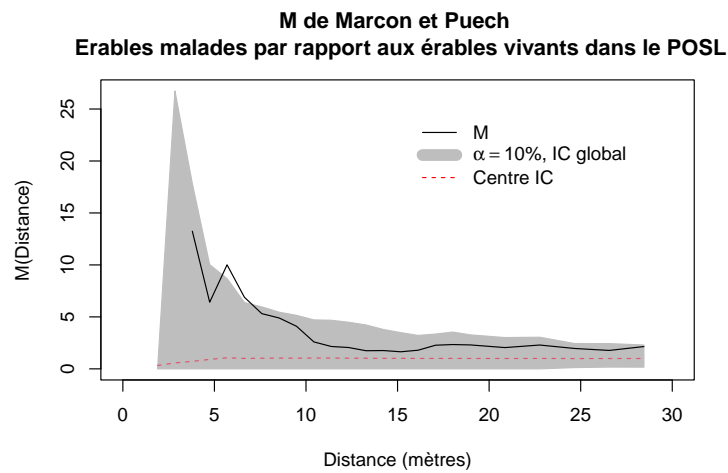
```

## Generating 1000 simulations by evaluating
## expression ...
## 1, 2, 3, .....10.....20.....30.....40..
## .....50.....60.....70.....80....
## .....90.....100.....110.....120.....
## .....130.....140.....150.....160.....
## .....170.....180.....190.....200.....210
## .....220.....230.....240.....250..
## .....260.....270.....280.....290....
## .....300.....310.....320.....330.....
## .....340.....350.....360.....370.....
## .....380.....390.....400.....410.....420
## .....430.....440.....450.....460..
## .....470.....480.....490.....500....
## .....510.....520.....530.....540.....
## .....550.....560.....570.....580.....
## .....590.....600.....610.....620.....630
## .....640.....650.....660.....670..
## .....680.....690.....700.....710...

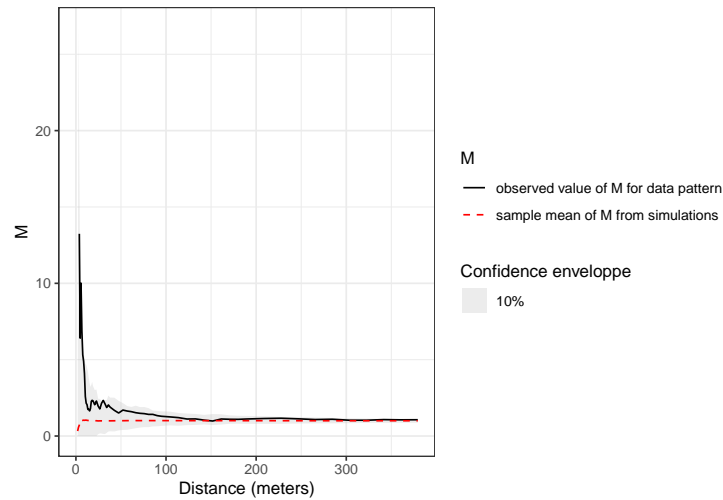
```

```
## .....720.....730.....740.....750.....
## ...760.....770.....780.....790.....
## .800.....810.....820.....830.....840
## .....850.....860.....870.....880..
## .....890.....900.....910.....920...
## ....930.....940.....950.....960.....
## ...970.....980.....990.....1000.
##
## Done.
```

```
plot(M_erables,
     legend = FALSE,
     xlim=c(0,30),
     xlab="Distance (mètres)", ylab="M(Distance)",
     main="M de Marcon et Puech \n Erables malades par rapport aux érables vivants dans le POSL")
legend("topright",c("M", expression(alpha=='10%', IC global'), "Centre IC"),
     col = c("black", "grey", "red"), lty = c(1, 1, 8), lwd = c(1, 10, 1), bty = "n",
     text.col = "black", horiz = FALSE, inset=0.1)
```



```
autoplot(M_erables)
```



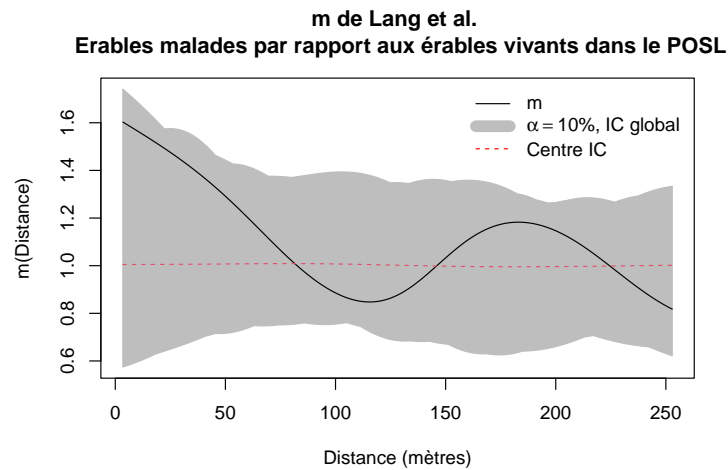
Conclusion : sign conc à 6m à 1000 sim et alpha = 10%, très légèrement sign pour alpha = 1%.

```
m_erables <- mEnvelope(BDD_V2022_A2022_Poids_POSL_erables_VPatho_wmppp,
  NumberOfSimulations=1000,
  Alpha=0.1, # attention : 10% ici
  ReferenceType = "Abattu",
  SimulationType = "RandomLocation",
  Global=TRUE)
```

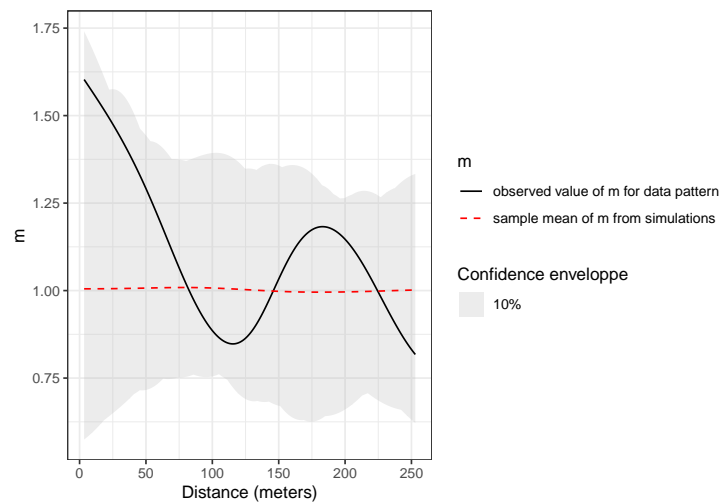
m érables patho

```
## Generating 1000 simulations by evaluating
## expression ...
## 1, 2, 3, .....10.....20.....30.....40..
## .....50.....60.....70.....80....
## .....90.....100.....110.....120.....
## ...130.....140.....150.....160.....
## ..170.....180.....190.....200.....210
## .....220.....230.....240.....250..
## .....260.....270.....280.....290....
## ....300.....310.....320.....330.....
## ...340.....350.....360.....370.....
## ..380.....390.....400.....410.....420
## .....430.....440.....450.....460..
## .....470.....480.....490.....500....
## ....510.....520.....530.....540.....
## ...550.....560.....570.....580.....
## ..590.....600.....610.....620.....630
## .....640.....650.....660.....670..
## .....680.....690.....700.....710....
## ....720.....730.....740.....750.....
## ...760.....770.....780.....790.....
## ..800.....810.....820.....830.....840
## .....850.....860.....870.....880....
## ....890.....900.....910.....920....
## ...930.....940.....950.....960.....
## ..970.....980.....990.....1000.
##
## Done.
```

```
plot(m_erables,
     legend = FALSE,
     xlab="Distance (mètres)", ylab="m(Distance)",
     main="m de Lang et al. \n Erables malades par rapport aux érabes vivants dans le POSL")
legend("topright",c("m", expression(alpha=="10%", IC global'), "Centre IC"),
     col = c("black", "grey", "red"), lty = c(1, 1, 8), lwd = c(1, 10, 1), bty = "n",
     text.col = "black", horiz = FALSE, inset=0.01)
```



```
autoplot(m_erables)
```



Conclusion : NS si alpha 1%, NS le plus souvent si alpha = 10%