```
#Install and load mcr library
install.packages("mcr")
library(mcr)

#Load data
Peat_data_MAAT <- read.delim("~/Desktop/ERC fellowship/Peat calibration work/Peat calibration paper/Peat_calibration/Peat_data_MAAT.txt")
Peat_data_CBTpr <- read.delim("~/Desktop/ERC fellowship/Peat calibration work/Peat calibration paper/Peat_calibration/Peat_data_CBTpr.txt")
Peat_data_CBTpeat <- read.delim("~/Desktop/ERC fellowship/Peat calibration work/Peat calibration paper/Peat_calibration/Peat_data_CBTpeat.txt")

#Define xt and yt for temp. calibration
yt <- Peat_data_MAAT$Annuan.mean.Temp...oC.
xt <- Peat_data_MAAT$MBT5me.

#Define xph and yph for temp. calibration
xCBTpr <- Peat_data_CBTpr$CBT.
xCBTpeat <- Peat_data_CBTpeat$CBTpeat
yCBTpr <- Peat_data_CBTpr$pH
yCBTpeat <- Peat_data_CBTpeat$pH

#Generate linear regression models
lin.reg.peat.MAAT <- lm(yt~xt)
lin.reg.peat.CBTpr <- lm(yCBTpr~xCBTpr)
lin.reg.peat.CBTpeat <- lm(yCBTpeat~xCBTpeat)

#DEMING REGRESSION WITH RATIO OF VARIANCE
#Caculate Deming regression with ratio of variance (varMBT/varMAAT)
var.dem.reg.peat.MAAT <-mcreg(xt,yt, method.reg = "Deming", error.ratio = 0.0011)
#error ratio defined as stdev(x)^2/stdev(y)^2. In this case stdev x is assumed to be 0.05 and stdev y is assumed to be 1.5 → error ratio = 0.0011

#Caculate Deming regression with ratio of variance (varCBT or CBTpeat/varph)
var.dem.reg.peat.CBTpr <-mcreg(xCBTpr,yCBTpr, method.reg = "Deming", error.ratio = 0.25)
#error ratio defined as stdev(x)^2/stdev(y)^2. In this case stdev x is assumed to be 0.25 and stdev y is assumed to be 0.5 → error ratio = 0.25
var.dem.reg.peat.CBTpeat <-mcreg(xCBTpeat,yCBTpeat, method.reg = "Deming", error.ratio = 0.16)
#error ratio defined as stdev(x)^2/stdev(y)^2. In this case stdev x is assumed to be 0.2 and stdev y is assumed to be 0.5 → error ratio = 0.16

#Plot results (prelim)
plot(var.dem.reg.peat.MAAT)
plot(var.dem.reg.peat.CBTpr)
plot(var.dem.reg.peat.CBTpeat)

#Get slope and intercept
mcreg(xt,yt, method.reg = "Deming", error.ratio = 0.0011)@para
```

```
mcreg(xCBTpr,yCBTpr, method.reg = "Deming", error.ratio = 0.25)@para
mcreg(xCBTpeat,yCBTpeat, method.reg = "Deming", error.ratio = 0.16)@para

#CALCULATE ROOT MEAN SQUARE ERROR
#Calculate predicted y using newly generated Deming regression
pred.yt <- 52.18*xt-23.05
pred.yCBTpr <- 2.69*xCBTpr+9.19
pred.yCBTpeat <- 2.49*xCBTpeat+8.07

#Calculate residuals for y
res.yt <- yt-pred.yt
res.yCBTpr <- yCBTpr-pred.yCBTpr
res.yCBTpeat <- yCBTpeat-pred.yCBTpeat

#Calculate root mean square error for y
sqrt(mean(res.yt^2)*96/95)
sqrt(mean(res.yCBTpr^2)*50/49)
sqrt(mean(res.yCBTpeat^2)*51/50)

#Plot results in nice plot (data filled symbols)
#MCResult.plot(var.dem.reg.peat.MAAT, equal.axis=FALSE,
x.lab="MBT5me'",y.lab="MAAT (oC)", points.col="black",
ci.area=TRUE,ci.area.col = "grey", points.pch = 19, reg.col="black", reg.lwd=2.5,
reg.lty=2, main = "Peat brGDGT temp. calibration", sub = "", add.grid = FALSE,
points.cex = 1.3, identity=FALSE)

#Plot results in nice plot (data open symbols)
MCResult.plot(var.dem.reg.peat.MAAT, equal.axis=FALSE,
x.lab="MBT5me'",y.lab="MAAT (oC)", points.col="black",
ci.area=TRUE,ci.area.col = "grey", reg.col="black", reg.lwd=2.5, reg.lty=2, main =
"Peat brGDGT temp. calibration", sub = "", add.grid = FALSE, points.cex = 1.3,
identity=FALSE)
MCResult.plot(var.dem.reg.peat.CBTpr, equal.axis=FALSE,
x.lab="CBT'",y.lab="pH", points.col="black", ci.area=TRUE,ci.area.col = "grey",
reg.col="black", reg.lwd=2.5, reg.lty=2, main = "Peat brGDGT pH calibration", sub =
"", add.grid = FALSE, points.cex = 1.3, identity=FALSE)
MCResult.plot(var.dem.reg.peat.CBTpeat, equal.axis=FALSE,
x.lab="CBTpeat'",y.lab="pH", points.col="black", ci.area=TRUE,ci.area.col = "grey",
reg.col="black", reg.lwd=2.5, reg.lty=2, main = "Peat pH calibration", sub = "",
add.grid = FALSE, points.cex = 1.3, identity=FALSE)

# Add linear regression model
abline (lin.reg.peat.MAAT, col="red")
abline (lin.reg.peat.CBTpr, col="red")
abline (lin.reg.peat.CBTpeat, col="red")
```