### Principal component analysis

# cleaning the data

## occations where plants die as an indicator (goes NA, if model crashes)

# for(j in 1:nrow(Store)){  
# if(is.na(Store$Pzero[j])){  
# Store\_failure <- rbind(Store\_failure, Store[j,])  
# Store<-Store[-j,]  
# }  
# }

# for(j in 1:nrow(Store)){  
# if(is.na(Store$Pzero[j])){  
# Store\_failure <- rbind(Store\_failure, Store[j,])  
# Store<-Store[-j,]  
# }  
# }  
  
# no crashes in Store! :D Store.txt in the repo is a Monte Carlo simulation with Heavy clay, 800 days and 5000 runs  
#   
# nrow(Store)  
# head(Store)  
# ncol(Store)

#### LINEAR REGRESSION

Preparing the data

mydata <- read.table("Sandy clay loam 5000 runs 800 days.txt")  
head(mydata)

## Z Zr d ConcConst CM.gw c alpha  
## 1 4758.0925 357.7245 0.13576913 11.505491 9.615242 7.606346 1.0718089  
## 2 4699.0284 377.9734 0.13572194 9.867857 14.346724 9.406837 0.9543441  
## 3 1706.6431 321.3043 0.14732550 2.996419 8.626795 9.261121 1.1129852  
## 4 9848.4711 468.7371 0.15099179 5.785591 13.731347 7.674285 1.0965530  
## 5 637.4391 520.1043 0.14714997 3.135697 1.375117 6.068434 1.1517355  
## 6 7112.6880 391.0667 0.09708455 9.169175 3.812370 7.600359 1.3663670  
## lambda meanM sdM meanSmM sdSmM meanP  
## 1 0.3889316 79.909722 31.7069832 19221.544 5615.868 2.083931e+01  
## 2 0.2844405 5.120395 8.9692914 10514.995 3705.077 1.562370e+02  
## 3 0.8572492 3.718026 5.6830704 9519.383 3260.757 4.835960e+02  
## 4 0.6604727 122.829026 22.8396832 16439.396 4661.273 1.009273e+01  
## 5 0.9408076 152.976515 0.9289087 11318.655 4075.763 1.345707e-15  
## 6 0.9110414 2.600087 5.3314894 34146.030 12730.870 6.711274e+02  
## sdP meanCM sdCM minCM maxCM cum\_flux  
## 1 5.132426e+01 88.939295 385.5153124 2.287591 3073.179345 -16322.8429  
## 2 1.002441e+02 803.216074 1431.6063491 2.496244 9936.876402 403.0581  
## 3 1.733151e+02 179.124406 203.5934264 2.167909 1330.853030 4900.4683  
## 4 4.284319e+01 5.446380 36.4980401 1.181372 824.529870 -32365.4190  
## 5 1.139360e-14 1.265737 0.4553955 0.502369 2.057744 -53012.5336  
## 6 1.898956e+02 1659.457099 3475.6532499 5.729518 41382.487912 144.8994  
## Pzero  
## 1 0  
## 2 0  
## 3 0  
## 4 0  
## 5 0  
## 6 0

attach(mydata)

## The following objects are masked \_by\_ .GlobalEnv:  
##   
## alpha, c, CM.gw, ConcConst, d, lambda, Z, Zr

# for(i in (9:19))  
# {   
# for(j in (1:8) )  
#   
# {   
# fit <- lm(mydata[,i] ~ mydata[,j], data=mydata) #does a regression for each column in my csv file against my independent variable 'etch'  
# rsq <- summary(fit)$r.squared  
# writelines(paste(rsq,i,"\n"))  
# }  
# }

Mean soilmoisture M

M\_all <- lm(meanM ~ Z + Zr + d + ConcConst + CM.gw + c + alpha + lambda, data = mydata)  
summary(M\_all)

##   
## Call:  
## lm(formula = meanM ~ Z + Zr + d + ConcConst + CM.gw + c + alpha +   
## lambda, data = mydata)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -173.73 -24.08 1.75 24.56 95.16   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 1.868e+00 4.040e+00 0.462 0.644   
## Z 1.672e-04 1.664e-04 1.005 0.315   
## Zr 7.472e-02 6.422e-03 11.636 <2e-16 \*\*\*  
## d 3.853e+02 7.218e+00 53.376 <2e-16 \*\*\*  
## ConcConst 1.073e+00 1.045e-01 10.274 <2e-16 \*\*\*  
## CM.gw 2.344e-02 1.048e-01 0.224 0.823   
## c -1.191e+01 2.109e-01 -56.446 <2e-16 \*\*\*  
## alpha 3.233e+01 1.738e+00 18.595 <2e-16 \*\*\*  
## lambda 1.672e+01 1.762e+00 9.493 <2e-16 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 32.02 on 4961 degrees of freedom  
## Multiple R-squared: 0.574, Adjusted R-squared: 0.5733   
## F-statistic: 835.4 on 8 and 4961 DF, p-value: < 2.2e-16

# # Groundwater depth Z  
# MZ <- lm(meanM ~ Z, data=mydata)  
# summary(MZ)  
#   
# # Root depth Zr  
# MZr <- lm(meanM ~ Zr, data=mydata)  
# summary(MZr)  
#   
# # plant mortality d  
# Md <- lm(meanM ~ d, data=mydata)  
# summary(Md)  
#   
# # salt concentration in rain  
# MConcConst <- lm(meanM ~ ConcConst, data=mydata)  
# summary(MConcConst)  
#   
# # salt concentration in groundwater  
# MCM.gw <- lm(meanM ~ CM.gw, data=mydata)  
# summary(MCM.gw)  
#   
# # plant growth factor c  
# Mc <- lm(meanM ~ c, data=mydata)  
# summary(Mc)  
#   
# # alpha  
# Malpha <- lm(meanM ~ alpha, data=mydata)  
# summary(Malpha)  
#   
# # lambda  
# Mlambda <- lm(meanM ~ lambda, data=mydata)  
# summary(Mlambda)  
#   
  
### comparing the models

### Standard deviation soilmoisture M (sdM)

sdM\_all <- lm(sdM ~ Z + Zr + d + ConcConst + CM.gw + c + alpha + lambda, data = mydata)  
summary(sdM\_all)

##   
## Call:  
## lm(formula = sdM ~ Z + Zr + d + ConcConst + CM.gw + c + alpha +   
## lambda, data = mydata)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -15.815 -5.954 -3.674 -0.898 60.639   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) -3.388e+00 1.535e+00 -2.207 0.0274 \*   
## Z 4.534e-04 6.321e-05 7.174 8.37e-13 \*\*\*  
## Zr 2.265e-02 2.440e-03 9.282 < 2e-16 \*\*\*  
## d -1.657e+01 2.742e+00 -6.042 1.63e-09 \*\*\*  
## ConcConst 5.346e-02 3.969e-02 1.347 0.1781   
## CM.gw 3.467e-02 3.982e-02 0.871 0.3840   
## c 1.039e+00 8.015e-02 12.962 < 2e-16 \*\*\*  
## alpha -2.111e-01 6.605e-01 -0.320 0.7493   
## lambda -6.923e+00 6.693e-01 -10.344 < 2e-16 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 12.17 on 4961 degrees of freedom  
## Multiple R-squared: 0.08266, Adjusted R-squared: 0.08118   
## F-statistic: 55.88 on 8 and 4961 DF, p-value: < 2.2e-16

# Groundwater depth Z  
# sdMZ <- lm(sdM ~ Z, data=mydata)  
# summary(sdMZ)  
#   
# # Root depth Zr  
# sdMZr <- lm(sdM ~ Zr, data=mydata)  
# summary(sdMZr)  
#   
# # plant mortality d  
# sdMd <- lm(sdM ~ d, data=mydata)  
# summary(sdMd)  
#   
# # salt concentration in rain  
# sdMConcConst <- lm(sdM ~ ConcConst, data=mydata)  
# summary(sdMConcConst)  
#   
# # salt concentration in groundwater  
# sdMCM.gw <- lm(sdM ~ CM.gw, data=mydata)  
# summary(sdMCM.gw)  
#   
# # plant growth factor c  
# sdMc <- lm(sdM ~ c, data=mydata)  
# summary(sdMc)  
#   
# # alpha  
# sdMalpha <- lm(sdM ~ alpha, data=mydata)  
# summary(sdMalpha)  
#   
# # lambda  
# sdMlambda <- lm(sdM ~ lambda, data=mydata)  
# summary(sdMlambda)  
#   
  
### comparing the models

Mean soil SALT mass meanSmM

SM\_all <- lm(meanSmM ~ Z + Zr + d + ConcConst + CM.gw + c + alpha + lambda, data = mydata)  
summary(sdM\_all)

##   
## Call:  
## lm(formula = sdM ~ Z + Zr + d + ConcConst + CM.gw + c + alpha +   
## lambda, data = mydata)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -15.815 -5.954 -3.674 -0.898 60.639   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) -3.388e+00 1.535e+00 -2.207 0.0274 \*   
## Z 4.534e-04 6.321e-05 7.174 8.37e-13 \*\*\*  
## Zr 2.265e-02 2.440e-03 9.282 < 2e-16 \*\*\*  
## d -1.657e+01 2.742e+00 -6.042 1.63e-09 \*\*\*  
## ConcConst 5.346e-02 3.969e-02 1.347 0.1781   
## CM.gw 3.467e-02 3.982e-02 0.871 0.3840   
## c 1.039e+00 8.015e-02 12.962 < 2e-16 \*\*\*  
## alpha -2.111e-01 6.605e-01 -0.320 0.7493   
## lambda -6.923e+00 6.693e-01 -10.344 < 2e-16 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 12.17 on 4961 degrees of freedom  
## Multiple R-squared: 0.08266, Adjusted R-squared: 0.08118   
## F-statistic: 55.88 on 8 and 4961 DF, p-value: < 2.2e-16

#   
# # Groundwater depth Z  
# SMZ <- lm(meanSmM ~ Z, data=mydata)  
# summary(SMZ)  
#   
# # Root depth Zr  
# SMZr <- lm(meanSmM ~ Zr, data=mydata)  
# summary(SMZr)  
#   
# # plant mortality d  
# SMd <- lm(meanSmM ~ d, data=mydata)  
# summary(SMd)  
#   
# # salt concentration in rain  
# SMConcConst <- lm(meanSmM ~ ConcConst, data=mydata)  
# summary(SMConcConst)  
#   
# # salt concentration in groundwater  
# SMCM.gw <- lm(meanSmM ~ CM.gw, data=mydata)  
# summary(SMCM.gw)  
#   
# # plant growth factor c  
# SMc <- lm(meanSmM ~ c, data=mydata)  
# summary(SMc)  
#   
# # alpha  
# SMalpha <- lm(meanSmM ~ alpha, data=mydata)  
# summary(SMalpha)  
#   
# # lambda  
# SMlambda <- lm(meanSmM ~ lambda, data=mydata)  
# summary(SMlambda)  
#   
#   
# ### comparing the models

Standard deviation of Soil Salt mass sdSmM (maybe not too important)

### Mean plant biomass P

meanP

P\_all <- lm(meanP ~ Z + Zr + d + ConcConst + CM.gw + c + alpha + lambda, data = mydata)  
summary(P\_all)

##   
## Call:  
## lm(formula = meanP ~ Z + Zr + d + ConcConst + CM.gw + c + alpha +   
## lambda, data = mydata)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -318.58 -91.34 -24.54 59.74 1031.78   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) -8.894e+01 1.851e+01 -4.805 1.60e-06 \*\*\*  
## Z -6.044e-03 7.622e-04 -7.930 2.69e-15 \*\*\*  
## Zr 2.638e-01 2.942e-02 8.965 < 2e-16 \*\*\*  
## d -1.492e+03 3.307e+01 -45.102 < 2e-16 \*\*\*  
## ConcConst -3.541e+00 4.787e-01 -7.397 1.62e-13 \*\*\*  
## CM.gw 5.171e-01 4.802e-01 1.077 0.282   
## c 4.301e+01 9.665e-01 44.505 < 2e-16 \*\*\*  
## alpha 3.585e+01 7.965e+00 4.501 6.91e-06 \*\*\*  
## lambda 1.497e+02 8.071e+00 18.548 < 2e-16 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 146.7 on 4961 degrees of freedom  
## Multiple R-squared: 0.477, Adjusted R-squared: 0.4762   
## F-statistic: 565.6 on 8 and 4961 DF, p-value: < 2.2e-16

# # Groundwater depth Z  
# PZ <- lm(meanP ~ Z, data=mydata)  
# summary(PZ)  
#   
# # Root depth Zr  
# PZr <- lm(meanP ~ Zr, data=mydata)  
# summary(PZr)  
#   
# # plant mortality d  
# Pd <- lm(meanP ~ d, data=mydata)  
# summary(Pd)  
#   
# # salt concentration in rain  
# PConcConst <- lm(meanP ~ ConcConst, data=mydata)  
# summary(PConcConst)  
#   
# # salt concentration in groundwater  
# PCM.gw <- lm(meanP ~ CM.gw, data=mydata)  
# summary(PCM.gw)  
#   
# # plant growth factor c  
# Pc <- lm(meanP ~ c, data=mydata)  
# summary(Pc)  
#   
# # alpha  
# Palpha <- lm(meanP ~ alpha, data=mydata)  
# summary(Palpha)  
#   
# # lambda  
# Plambda <- lm(meanP ~ lambda, data=mydata)  
# summary(Plambda)  
#   
  
### comparing the models

### Standard deviation of plant biomass P (sdP)

sdP\_all <- lm(sdP ~ Z + Zr + d + ConcConst + CM.gw + c + alpha + lambda, data = mydata)  
summary(sdP\_all)

##   
## Call:  
## lm(formula = sdP ~ Z + Zr + d + ConcConst + CM.gw + c + alpha +   
## lambda, data = mydata)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -115.596 -29.850 -1.758 24.751 222.272   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) -4.824e+01 5.724e+00 -8.427 < 2e-16 \*\*\*  
## Z 1.798e-04 2.357e-04 0.763 0.446   
## Zr 9.294e-02 9.098e-03 10.215 < 2e-16 \*\*\*  
## d -5.107e+02 1.023e+01 -49.942 < 2e-16 \*\*\*  
## ConcConst -1.292e+00 1.480e-01 -8.728 < 2e-16 \*\*\*  
## CM.gw 3.948e-02 1.485e-01 0.266 0.790   
## c 1.793e+01 2.989e-01 60.003 < 2e-16 \*\*\*  
## alpha 1.981e+01 2.463e+00 8.044 1.08e-15 \*\*\*  
## lambda 2.900e+01 2.496e+00 11.618 < 2e-16 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 45.36 on 4961 degrees of freedom  
## Multiple R-squared: 0.5625, Adjusted R-squared: 0.5618   
## F-statistic: 797.5 on 8 and 4961 DF, p-value: < 2.2e-16

# # Groundwater depth Z  
# sdPZ <- lm(sdP ~ Z, data=mydata)  
# summary(sdPZ)  
#   
# # Root depth Zr  
# sdPZr <- lm(sdP ~ Zr, data=mydata)  
# summary(sdPZr)  
#   
# # plant mortality d  
# sdPd <- lm(sdP ~ d, data=mydata)  
# summary(sdPd)  
#   
# # salt concentration in rain  
# sdPConcConst <- lm(sdP ~ ConcConst, data=mydata)  
# summary(sdPConcConst)  
#   
# # salt concentration in groundwater  
# sdPCM.gw <- lm(sdP ~ CM.gw, data=mydata)  
# summary(sdPCM.gw)  
#   
# # plant growth factor c  
# sdPc <- lm(sdP ~ c, data=mydata)  
# summary(sdPc)  
#   
# # alpha  
# sdPalpha <- lm(sdP ~ alpha, data=mydata)  
# summary(sdPalpha)  
#   
# # lambda  
# sdPlambda <- lm(sdP ~ lambda, data=mydata)  
# summary(sdPlambda)  
#   
#   
# ### comparing the models  
#   
#   
# ```  
#   
# ### mean soil salt concentration (meanCM)  
#   
#   
#   
# ```{r}  
# CM\_all <- lm(meanCM ~ Z + Zr + d + ConcConst + CM.gw + c + alpha + lambda, data = mydata)  
# summary(CM\_all)  
#   
# # Groundwater depth Z  
# CMZ <- lm(meanCM ~ Z, data=mydata)  
# summary(CMZ)  
#   
# # Root depth Zr  
# CMZr <- lm(meanCM ~ Zr, data=mydata)  
# summary(CMZr)  
#   
# # plant mortality d  
# CMd <- lm(meanCM ~ d, data=mydata)  
# summary(CMd)  
#   
# # salt concentration in rain  
# CMConcConst <- lm(meanCM ~ ConcConst, data=mydata)  
# summary(CMConcConst)  
#   
# # salt concentration in groundwater  
# CMCM.gw <- lm(meanCM ~ CM.gw, data=mydata)  
# summary(CMCM.gw)  
#   
# # plant growth factor c  
# CMc <- lm(meanCM ~ c, data=mydata)  
# summary(CMc)  
#   
# # alpha  
# CMalpha <- lm(meanCM ~ alpha, data=mydata)  
# summary(CMalpha)  
#   
# # lambda  
# CMlambda <- lm(meanCM ~ lambda, data=mydata)  
# summary(CMlambda)  
#   
#   
# ### comparing the models

Standard deviation of soil salt concentration sdCM, maybe not too important, can be added later

Neither minimum of soil salt concentration minCM?? can later be added, easily

### Maximum soil salt concentration maxCM

maxCM\_all <- lm(maxCM ~ Z + Zr + d + ConcConst + CM.gw + c + alpha + lambda, data = mydata)  
summary(maxCM\_all)

##   
## Call:  
## lm(formula = maxCM ~ Z + Zr + d + ConcConst + CM.gw + c + alpha +   
## lambda, data = mydata)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -32640 -8389 -3491 3484 371069   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) -2.965e+04 2.539e+03 -11.676 < 2e-16 \*\*\*  
## Z 1.969e+00 1.046e-01 18.832 < 2e-16 \*\*\*  
## Zr 1.681e+01 4.037e+00 4.164 3.18e-05 \*\*\*  
## d -1.010e+05 4.537e+03 -22.269 < 2e-16 \*\*\*  
## ConcConst 7.649e+02 6.567e+01 11.648 < 2e-16 \*\*\*  
## CM.gw 2.211e+01 6.588e+01 0.336 0.737   
## c 2.553e+03 1.326e+02 19.254 < 2e-16 \*\*\*  
## alpha 8.598e+03 1.093e+03 7.868 4.38e-15 \*\*\*  
## lambda 8.212e+03 1.107e+03 7.416 1.41e-13 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 20130 on 4961 degrees of freedom  
## Multiple R-squared: 0.2273, Adjusted R-squared: 0.2261   
## F-statistic: 182.4 on 8 and 4961 DF, p-value: < 2.2e-16

# # Groundwater depth Z  
# maxCMZ <- lm(maxCM ~ Z, data=mydata)  
# summary(maxCMZ)  
#   
# # Root depth Zr  
# maxCMZr <- lm(maxCM ~ Zr, data=mydata)  
# summary(maxCMZr)  
#   
# # plant mortality d  
# maxCMd <- lm(maxCM ~ d, data=mydata)  
# summary(maxCMd)  
#   
# # salt concentration in rain  
# maxCMConcConst <- lm(maxCM ~ ConcConst, data=mydata)  
# summary(maxCMConcConst)  
#   
# # salt concentration in groundwater  
# maxCMCM.gw <- lm(maxCM ~ CM.gw, data=mydata)  
# summary(maxCMCM.gw)  
#   
# # plant growth factor c  
# maxCMc <- lm(maxCM ~ c, data=mydata)  
# summary(maxCMc)  
#   
# # alpha  
# maxCMalpha <- lm(maxCM ~ alpha, data=mydata)  
# summary(maxCMalpha)  
#   
# # lambda  
# maxCMlambda <- lm(maxCM ~ lambda, data=mydata)  
# summary(maxCMlambda)  
#   
#   
# ### comparing the models

### Maximum soil salt concentration maxCM

maxCM\_all <- lm(maxCM ~ Z + Zr + d + ConcConst + CM.gw + c + alpha + lambda, data = mydata)  
summary(maxCM\_all)

##   
## Call:  
## lm(formula = maxCM ~ Z + Zr + d + ConcConst + CM.gw + c + alpha +   
## lambda, data = mydata)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -32640 -8389 -3491 3484 371069   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) -2.965e+04 2.539e+03 -11.676 < 2e-16 \*\*\*  
## Z 1.969e+00 1.046e-01 18.832 < 2e-16 \*\*\*  
## Zr 1.681e+01 4.037e+00 4.164 3.18e-05 \*\*\*  
## d -1.010e+05 4.537e+03 -22.269 < 2e-16 \*\*\*  
## ConcConst 7.649e+02 6.567e+01 11.648 < 2e-16 \*\*\*  
## CM.gw 2.211e+01 6.588e+01 0.336 0.737   
## c 2.553e+03 1.326e+02 19.254 < 2e-16 \*\*\*  
## alpha 8.598e+03 1.093e+03 7.868 4.38e-15 \*\*\*  
## lambda 8.212e+03 1.107e+03 7.416 1.41e-13 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 20130 on 4961 degrees of freedom  
## Multiple R-squared: 0.2273, Adjusted R-squared: 0.2261   
## F-statistic: 182.4 on 8 and 4961 DF, p-value: < 2.2e-16

# # Groundwater depth Z  
# maxCMZ <- lm(maxCM ~ Z, data=mydata)  
# summary(maxCMZ)  
#   
# # Root depth Zr  
# maxCMZr <- lm(maxCM ~ Zr, data=mydata)  
# summary(maxCMZr)  
#   
# # plant mortality d  
# maxCMd <- lm(maxCM ~ d, data=mydata)  
# summary(maxCMd)  
#   
# # salt concentration in rain  
# maxCMConcConst <- lm(maxCM ~ ConcConst, data=mydata)  
# summary(maxCMConcConst)  
#   
# # salt concentration in groundwater  
# maxCMCM.gw <- lm(maxCM ~ CM.gw, data=mydata)  
# summary(maxCMCM.gw)  
#   
# # plant growth factor c  
# maxCMc <- lm(maxCM ~ c, data=mydata)  
# summary(maxCMc)  
#   
# # alpha  
# maxCMalpha <- lm(maxCM ~ alpha, data=mydata)  
# summary(maxCMalpha)  
#   
# # lambda  
# maxCMlambda <- lm(maxCM ~ lambda, data=mydata)  
# summary(maxCMlambda)  
#   
#   
# ### comparing the models

### Cumulative vertical water flux, cum\_flux

cf\_all <- lm(cum\_flux ~ Z + Zr + d + ConcConst + CM.gw + c + alpha + lambda, data = mydata)  
summary(cf\_all)

##   
## Call:  
## lm(formula = cum\_flux ~ Z + Zr + d + ConcConst + CM.gw + c +   
## alpha + lambda, data = mydata)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -34548 -8533 -1424 7092 96538   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 1.537e+04 1.605e+03 9.576 <2e-16 \*\*\*  
## Z -6.305e-01 6.609e-02 -9.540 <2e-16 \*\*\*  
## Zr 2.978e+01 2.551e+00 11.674 <2e-16 \*\*\*  
## d -1.160e+05 2.867e+03 -40.460 <2e-16 \*\*\*  
## ConcConst -4.041e+02 4.150e+01 -9.737 <2e-16 \*\*\*  
## CM.gw 9.162e+00 4.164e+01 0.220 0.826   
## c 3.659e+03 8.380e+01 43.669 <2e-16 \*\*\*  
## alpha -2.644e+04 6.906e+02 -38.277 <2e-16 \*\*\*  
## lambda -3.115e+04 6.998e+02 -44.505 <2e-16 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 12720 on 4961 degrees of freedom  
## Multiple R-squared: 0.5953, Adjusted R-squared: 0.5946   
## F-statistic: 912.1 on 8 and 4961 DF, p-value: < 2.2e-16

# # Groundwater depth Z  
# cfZ <- lm(cum\_flux ~ Z, data=mydata)  
# summary(cfZ)  
#   
# # Root depth Zr  
# cfZr <- lm(cum\_flux ~ Zr, data=mydata)  
# summary(cfZr)  
#   
# # plant mortality d  
# cfd <- lm(cum\_flux ~ d, data=mydata)  
# summary(cfd)  
#   
# # salt concentration in rain  
# cfConcConst <- lm(cum\_flux ~ ConcConst, data=mydata)  
# summary(cfConcConst)  
#   
# # salt concentration in groundwater  
# cfCM.gw <- lm(cum\_flux ~ CM.gw, data=mydata)  
# summary(cfCM.gw)  
#   
# # plant growth factor c  
# cfc <- lm(cum\_flux ~ c, data=mydata)  
# summary(cfc)  
#   
# # alpha  
# cfalpha <- lm(cum\_flux ~ alpha, data=mydata)  
# summary(cfalpha)  
#   
# # lambda  
# cflambda <- lm(cum\_flux ~ lambda, data=mydata)  
# summary(cflambda)  
#   
  
### comparing the models

### Plant death, P=0, Pzero

Pzero\_all <- lm(Pzero ~ Z + Zr + d + ConcConst + CM.gw + c + alpha + lambda, data = mydata)  
summary(Pzero\_all)

##   
## Call:  
## lm(formula = Pzero ~ Z + Zr + d + ConcConst + CM.gw + c + alpha +   
## lambda, data = mydata)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## 0 0 0 0 0   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)  
## (Intercept) 0 0 NA NA  
## Z 0 0 NA NA  
## Zr 0 0 NA NA  
## d 0 0 NA NA  
## ConcConst 0 0 NA NA  
## CM.gw 0 0 NA NA  
## c 0 0 NA NA  
## alpha 0 0 NA NA  
## lambda 0 0 NA NA  
##   
## Residual standard error: 0 on 4961 degrees of freedom  
## Multiple R-squared: NaN, Adjusted R-squared: NaN   
## F-statistic: NaN on 8 and 4961 DF, p-value: NA

# Groundwater depth Z  
# PzeroZ <- lm(Pzero ~ Z, data=mydata)  
# summary(PzeroZ)  
#   
# # Root depth Zr  
# PzeroZr <- lm(Pzero ~ Zr, data=mydata)  
# summary(PzeroZr)  
#   
# # plant mortality d  
# Pzerod <- lm(Pzero ~ d, data=mydata)  
# summary(Pzerod)  
#   
# # salt concentration in rain  
# PzeroConcConst <- lm(Pzero ~ ConcConst, data=mydata)  
# summary(PzeroConcConst)  
#   
# # salt concentration in groundwater  
# PzeroCM.gw <- lm(Pzero ~ CM.gw, data=mydata)  
# summary(PzeroCM.gw)  
#   
# # plant growth factor c  
# Pzeroc <- lm(Pzero ~ c, data=mydata)  
# summary(Pzeroc)  
#   
# # alpha  
# Pzeroalpha <- lm(Pzero ~ alpha, data=mydata)  
# summary(Pzeroalpha)  
#   
# # lambda  
# Pzerolambda <- lm(Pzero ~ lambda, data=mydata)  
# summary(Pzerolambda)  
#   
  
### comparing the models