**Load these packages in R:**

install.packages(c("zoo", "sandwich", "MASS", "quadprog", "tseries", "strucchange", "fracdiff", "forecast", "iterators", "codetools", "foreach", "bfast", "mailR"))

library(zoo)

library(sandwich)

library(MASS)

library(quadprog)

library(tseries)

library(strucchange)

library(fracdiff)

library(forecast)

library(iterators)

library(codetools)

library(foreach)

library(bfast)

library(mailR)

**Copy and paste the following into R after loading required packages::**

setwd("V:/Projects/Onuoha\_Hilda/BFAST/Extract")

filename <- "tile\_231"

datafile <- paste0(filename, "\_ndvi\_fill.csv")

inidata<-read.table(datafile, header=FALSE, sep = ",", dec = ".") #use only with small files; modify if no labels are in the input

mdata<-as.matrix(inidata)

tpdata<-mdata

vmax<-dim(mdata)

vmax[1]

vmax[2]

for(count in 1:vmax[1]){

poly\_id<-tpdata[count,1] #highlighted number identifies field that will used to ID pixel

ndvi<-tpdata[count,2:vmax[2]] #highlighted number identifies first column with NDVI data

plot(ndvi)

tsdata<-ts(ndvi,frequency=23,start=c(2001,1))

dim(tsdata)<-NULL

rdist<-23/length(tsdata)

fits<-bfast(tsdata,h=rdist,season="harmonic",max.iter=1)

plot(fits)

fits2<-fits$Time

ts\_trend\_break\_time<-t(fits2[1])

fits3<-fits$Magnitude

ts\_trend\_break\_magnitude<-t(fits3[1])

fits4<-fits$output

fits4a<-fits4[[1]]$Vt.bp

fits4adata<-as.matrix(fits4a)

fits4amax<-dim(fits4adata)

ts\_trend\_nbbreak<-t(fits4amax[1])

results1<-ts\_trend\_break\_time

aLine<-t(c(poly\_id,results1))

write.table(aLine, file=paste0(filename, "\_trend\_breaks\_time.txt"), append=TRUE,quote=FALSE,sep=",", eol="\n",na="NA", dec=".",row.names=FALSE,col.names=FALSE,qmethod=c("escape","double"))

results2<-ts\_trend\_break\_magnitude

aLine<-t(c(poly\_id,results2))

write.table(aLine,file=paste0(filename, "\_trend\_breaks\_magnitude.txt"), append=TRUE,quote=FALSE, sep=",",eol="\n", na="NA", dec=".",row.names=FALSE,col.names=FALSE,qmethod=c("escape","double"))

results3<-ts\_trend\_nbbreak

aLine<-t(c(poly\_id,results3))

write.table(aLine,file=paste0(filename, "\_trend\_nbbreaks.txt"),append=TRUE,quote=FALSE,sep=",", eol="\n",na="NA", de=".", ,row.names=FALSE,col.names=FALSE,qmethod=c("escape","double"))

fits4b<-fits4[[1]]$Tt

results4<-fits4b

aLine<-t(c(poly\_id,results4))

write.table(aLine,file=paste0(filename, "\_trend\_bfast.txt"),append=TRUE,quote=FALSE, sep=",",eol="\n",na="NA",dec=".", row.names=FALSE,col.names=FALSE,qmethod=c("escape","double"))

fits4c<-fits4[[1]]$Wt.bp

fits4cdata<-as.matrix(fits4c)

fits4cmax<-dim(fits4cdata)

ts\_season\_nbbreak<-t(fits4cmax[1])

results5<-ts\_season\_nbbreak

aLine<-t(c(poly\_id,results5))

write.table(aLine,file=paste0(filename, "\_season\_nbbreaks.txt"),append=TRUE,quote=FALSE, sep=",",eol="\n", na="NA", de=".", row.names=FALSE,col.names=FALSE,qmethod=c("escape","double"))

ts\_season\_breaks\_time<-t(fits4cdata)

results6<- ts\_season\_breaks\_time

aLine<- t(c(poly\_id,results6))

write.table(aLine,file=paste0(filename, "\_season\_breaks\_time.txt"),append=TRUE,quote=FALSE,sep=",", eol="\n",na="NA", de=".",row.names=FALSE,col.names=FALSE,qmethod=c("escape","double"))

fits4d<-fits4[[1]]$St

results7<-fits4d

aLine<-t(c(poly\_id,results7))

write.table(aLine,file=paste0(filename, "\_season\_bfast.txt"),append=TRUE,quote=FALSE,sep=",",eol="\n", na="NA",dec=".", row.names=FALSE,col.names=FALSE,qmethod=c("escape","double"))}

send.mail(from="jmshutch@gmail.com",

to="shutch@ksu.edu",

subject="R Update ",

body="BFAST calculations have finished for tile\_231",

html=T,

smtp=list(host.name = "smtp.gmail.com",

port = 465,

user.name = "jmshutch@gmail.com",

passwd = "Cincy1!ihl",

ssl = T),

authenticate=T)

#attach.files="C:\\Users\\Deepanshu\\Downloads\\Nature of Expenses.xls")

rm(list=ls())