# #Load library

|  |
| --- |
| library(raster)  library(rgdal)  library(sp)  library(rgeos)  library(RColorBrewer)  library(fields)  #library(drc)  library(nlme)  #library(devtools) |

# #Import data

|  |
| --- |
| IC1\_raw<-read.csv("IC1\_raw.csv")  #Sort by alphabetical order  IC1\_raw\_sorted<-IC1\_raw[order(IC1\_raw$Citation),] |

# #Create dataframe

|  |
| --- |
| pervious\_stat<-data.frame(Statistics=c("N","Mean","SD","Min.","Max"),All=rep(999,times=5),Experimental=rep(999,times=5),Modelling=rep(999,times=5),All=rep(999,times=5),Experimental=rep(999,times=5),Modelling=rep(999,times=5)) |

# #Convert factor to numeric and characters to factors

|  |
| --- |
| IC1\_raw$irri\_rate<-as.character(IC1\_raw$irri\_rate)  IC1\_raw$irri\_rate<-as.numeric(IC1\_raw$irri\_rate)  IC1\_raw$delta\_Tmean<-as.character(IC1\_raw$delta\_Tmean)  IC1\_raw$delta\_Tmean<-as.numeric(IC1\_raw$delta\_Tmean)  IC1\_raw$delta\_Ttransmax<-as.character(IC1\_raw$delta\_Ttransmax)  IC1\_raw$delta\_Ttransmax<-as.numeric(IC1\_raw$delta\_Ttransmax)  IC1\_raw$Approach<-as.factor(IC1\_raw$Approach)  IC1\_raw$Environment<-as.factor(IC1\_raw$Environment)  IC1\_raw\_sorted$irri\_rate<-as.character(IC1\_raw\_sorted$irri\_rate)  IC1\_raw\_sorted$irri\_rate<-as.numeric(IC1\_raw\_sorted$irri\_rate)  IC1\_raw\_sorted$delta\_Tmean<-as.character(IC1\_raw\_sorted$delta\_Tmean)  IC1\_raw\_sorted$delta\_Tmean<-as.numeric(IC1\_raw\_sorted$delta\_Tmean)  IC1\_raw\_sorted$delta\_Ttransmax<-as.character(IC1\_raw\_sorted$delta\_Ttransmax)  IC1\_raw\_sorted$delta\_Ttransmax<-as.numeric(IC1\_raw\_sorted$delta\_Ttransmax)  IC1\_raw\_sorted$Approach<-as.factor(IC1\_raw\_sorted$Approach)  IC1\_raw\_sorted$Environment<-as.factor(IC1\_raw\_sorted$Environment) |

# #Calculate cooling statistics (pervious)

|  |
| --- |
| #Exclude studies  #IC1\_raw\_excluded<-IC1\_raw[-c(19,20,14,25,27,33,8,26),]  IC1\_raw\_excluded<-IC1\_raw\_sorted[-c(3,5,10,11,13,18,19,21,22,23,24,25,26,28:31),]  pervious\_stat[1,2:7]<-c(length(IC1\_raw\_excluded$delta\_Tmean[!is.na(IC1\_raw\_excluded$delta\_Tmean)]),length(IC1\_raw\_excluded$delta\_Tmean[IC1\_raw\_excluded$Approach=="Experimental"&!is.na(IC1\_raw\_excluded$delta\_Tmean)]),length(IC1\_raw\_excluded$delta\_Tmean[IC1\_raw\_excluded$Approach=="Modelling"&!is.na(IC1\_raw\_excluded$delta\_Tmean)]),length(IC1\_raw\_excluded$delta\_Ttransmax[!is.na(IC1\_raw\_excluded$delta\_Ttransmax)]),length(IC1\_raw\_excluded$delta\_Ttransmax[IC1\_raw\_excluded$Approach=="Experimental"&!is.na(IC1\_raw\_excluded$delta\_Ttransmax)]),length(IC1\_raw\_excluded$delta\_Ttransmax[IC1\_raw\_excluded$Approach=="Modelling"&!is.na(IC1\_raw\_excluded$delta\_Ttransmax)]))  pervious\_stat[2:5,2]<-c(mean(IC1\_raw\_excluded$delta\_Tmean,na.rm=T),sd(IC1\_raw\_excluded$delta\_Tmean,na.rm=T),min(IC1\_raw\_excluded$delta\_Tmean,na.rm=T),max(IC1\_raw\_excluded$delta\_Tmean,na.rm=T))  pervious\_stat[2:5,3]<-c(mean(IC1\_raw\_excluded$delta\_Tmean[IC1\_raw\_excluded$Approach=="Experimental"],na.rm=T),sd(IC1\_raw\_excluded$delta\_Tmean[IC1\_raw\_excluded$Approach=="Experimental"],na.rm=T),min(IC1\_raw\_excluded$delta\_Tmean[IC1\_raw\_excluded$Approach=="Experimental"],na.rm=T),max(IC1\_raw\_excluded$delta\_Tmean[IC1\_raw\_excluded$Approach=="Experimental"],na.rm=T))  pervious\_stat[2:5,4]<-c(mean(IC1\_raw\_excluded$delta\_Tmean[IC1\_raw\_excluded$Approach=="Modelling"],na.rm=T),sd(IC1\_raw\_excluded$delta\_Tmean[IC1\_raw\_excluded$Approach=="Modelling"],na.rm=T),min(IC1\_raw\_excluded$delta\_Tmean[IC1\_raw\_excluded$Approach=="Modelling"],na.rm=T),max(IC1\_raw\_excluded$delta\_Tmean[IC1\_raw\_excluded$Approach=="Modelling"],na.rm=T)) pervious\_stat[2:5,5]<-c(mean(IC1\_raw\_excluded$delta\_Ttransmax,na.rm=T),sd(IC1\_raw\_excluded$delta\_Ttransmax,na.rm=T),min(IC1\_raw\_excluded$delta\_Ttransmax,na.rm=T),max(IC1\_raw\_excluded$delta\_Ttransmax,na.rm=T))  pervious\_stat[2:5,6]<-c(mean(IC1\_raw\_excluded$delta\_Ttransmax[IC1\_raw\_excluded$Approach=="Experimental"],na.rm=T),sd(IC1\_raw\_excluded$delta\_Ttransmax[IC1\_raw\_excluded$Approach=="Experimental"],na.rm=T),min(IC1\_raw\_excluded$delta\_Ttransmax[IC1\_raw\_excluded$Approach=="Experimental"],na.rm=T),max(IC1\_raw\_excluded$delta\_Ttransmax[IC1\_raw\_excluded$Approach=="Experimental"],na.rm=T))  pervious\_stat[2:5,7]<-c(mean(IC1\_raw\_excluded$delta\_Ttransmax[IC1\_raw\_excluded$Approach=="Modelling"],na.rm=T),sd(IC1\_raw\_excluded$delta\_Ttransmax[IC1\_raw\_excluded$Approach=="Modelling"],na.rm=T),min(IC1\_raw\_excluded$delta\_Ttransmax[IC1\_raw\_excluded$Approach=="Modelling"],na.rm=T),max(IC1\_raw\_excluded$delta\_Ttransmax[IC1\_raw\_excluded$Approach=="Modelling"],na.rm=T))  write.csv(pervious\_stat,"C:/Users/Cheung Pui Kwan/Desktop/Temp/pervious\_stat.csv") |

# #Import .tif

|  |
| --- |
| Adegoke2003\_LW<-raster("Adegoke2003\_Nebraska\_LWnet.tif")  Adegoke2003\_RP<-raster("Adegoke2003\_Nebraska\_RP.tif")  Adegoke2003\_SH<-raster("Adegoke2003\_Nebraska\_SH.tif")  Adegoke2003\_SM<-raster("Adegoke2003\_Nebraska\_SM.tif")  Adegoke2003\_SW<-raster("Adegoke2003\_Nebraska\_SWnet.tif")  Adegoke2003\_Ta<-raster("Adegoke2003\_Nebraska\_Ta.tif")  Adegoke2003\_v<-raster("Adegoke2003\_Nebraska\_v.tif")  Alter2015\_1LW<-raster("Alter2015\_Gezira\_LWnet\_Jul.tif")  Alter2015\_1RP<-raster("Alter2015\_Gezira\_RP\_Jul.tif")  Alter2015\_1SH<-raster("Alter2015\_Gezira\_SH\_Jul.tif")  Alter2015\_1SM<-raster("Alter2015\_Gezira\_SM\_Jul.tif")  Alter2015\_1SW<-raster("Alter2015\_Gezira\_SWnet\_Jul.tif")  Alter2015\_1Ta<-raster("Alter2015\_Gezira\_Ta\_Jul.tif")  Alter2015\_1v<-raster("Alter2015\_Gezira\_v\_Jul.tif")  Alter2015\_2LW<-raster("Alter2015\_Gezira\_LWnet\_Aug.tif")  Alter2015\_2RP<-raster("Alter2015\_Gezira\_RP\_Aug.tif")  Alter2015\_2SH<-raster("Alter2015\_Gezira\_SH\_Aug.tif")  Alter2015\_2SM<-raster("Alter2015\_Gezira\_SM\_Aug.tif")  Alter2015\_2SW<-raster("Alter2015\_Gezira\_SWnet\_Aug.tif")  Alter2015\_2Ta<-raster("Alter2015\_Gezira\_Ta\_Aug.tif")  Alter2015\_2v<-raster("Alter2015\_Gezira\_v\_Aug.tif")  Bonan2000\_LW<-raster("Bonan2000\_Boulder\_LWnet.tif")  Bonan2000\_RP<-raster("Bonan2000\_Boulder\_RP.tif")  Bonan2000\_SH<-raster("Bonan2000\_Boulder\_SH.tif")  Bonan2000\_SM<-raster("Bonan2000\_Boulder\_SM.tif")  Bonan2000\_SW<-raster("Bonan2000\_Boulder\_SWnet.tif")  Bonan2000\_Ta<-raster("Bonan2000\_Boulder\_Ta.tif")  Bonan2000\_v<-raster("Bonan2000\_Boulder\_v.tif")  Broadbent2018\_LW<-raster("Broadbent2018\_Mawson\_LWnet.tif")  Broadbent2018\_RP<-raster("Broadbent2018\_Mawson\_RP.tif")  Broadbent2018\_SH<-raster("Broadbent2018\_Mawson\_SH.tif")  Broadbent2018\_SM<-raster("Broadbent2018\_Mawson\_SM.tif")  Broadbent2018\_SW<-raster("Broadbent2018\_Mawson\_SWnet.tif")  Broadbent2018\_Ta<-raster("Broadbent2018\_Mawson\_Ta.tif")  Broadbent2018\_v<-raster("Broadbent2018\_Mawson\_v.tif")  Broadbent2019\_LW<-raster("Broadbent2019\_Mawson\_LWnet.tif")  Broadbent2019\_RP<-raster("Broadbent2019\_Mawson\_RP.tif")  Broadbent2019\_SH<-raster("Broadbent2019\_Mawson\_SH.tif")  Broadbent2019\_SM<-raster("Broadbent2019\_Mawson\_SM.tif")  Broadbent2019\_SW<-raster("Broadbent2019\_Mawson\_SWnet.tif")  Broadbent2019\_Ta<-raster("Broadbent2019\_Mawson\_Ta.tif")  Broadbent2019\_v<-raster("Broadbent2019\_Mawson\_v.tif")  Chen2017\_LW<-raster("Chen2017\_YellowRiver\_LWnet.tif")  Chen2017\_RP<-raster("Chen2017\_YellowRiver\_RP.tif")  Chen2017\_SH<-raster("Chen2017\_YellowRiver\_SH.tif")  Chen2017\_SM<-raster("Chen2017\_YellowRiver\_SM.tif")  Chen2017\_SW<-raster("Chen2017\_YellowRiver\_SWnet.tif")  Chen2017\_Ta<-raster("Chen2017\_YellowRiver\_Ta.tif")  Chen2017\_v<-raster("Chen2017\_YellowRiver\_v.tif")  Chen2018\_1LW<-raster("Chen2018\_Mead\_LWnet\_May.tif")  Chen2018\_1RP<-raster("Chen2018\_Mead\_RP\_May.tif")  Chen2018\_1SH<-raster("Chen2018\_Mead\_SH\_May.tif")  Chen2018\_1SM<-raster("Chen2018\_Mead\_SM\_May.tif")  Chen2018\_1SW<-raster("Chen2018\_Mead\_SWnet\_May.tif")  Chen2018\_1Ta<-raster("Chen2018\_Mead\_Ta\_May.tif")  Chen2018\_1v<-raster("Chen2018\_Mead\_v\_May.tif")  Chen2018\_2LW<-raster("Chen2018\_Mead\_LWnet\_Jun.tif")  Chen2018\_2RP<-raster("Chen2018\_Mead\_RP\_Jun.tif")  Chen2018\_2SH<-raster("Chen2018\_Mead\_SH\_Jun.tif")  Chen2018\_2SM<-raster("Chen2018\_Mead\_SM\_Jun.tif")  Chen2018\_2SW<-raster("Chen2018\_Mead\_SWnet\_Jun.tif")  Chen2018\_2Ta<-raster("Chen2018\_Mead\_Ta\_Jun.tif")  Chen2018\_2v<-raster("Chen2018\_Mead\_v\_Jun.tif")  Chen2018\_3LW<-raster("Chen2018\_Mead\_LWnet\_Jul.tif")  Chen2018\_3RP<-raster("Chen2018\_Mead\_RP\_Jul.tif")  Chen2018\_3SH<-raster("Chen2018\_Mead\_SH\_Jul.tif")  Chen2018\_3SM<-raster("Chen2018\_Mead\_SM\_Jul.tif")  Chen2018\_3SW<-raster("Chen2018\_Mead\_SWnet\_Jul.tif")  Chen2018\_3Ta<-raster("Chen2018\_Mead\_Ta\_Jul.tif")  Chen2018\_3v<-raster("Chen2018\_Mead\_v\_Jul.tif")  Chen2018\_4LW<-raster("Chen2018\_Mead\_LWnet\_Aug.tif")  Chen2018\_4RP<-raster("Chen2018\_Mead\_RP\_Aug.tif")  Chen2018\_4SH<-raster("Chen2018\_Mead\_SH\_Aug.tif")  Chen2018\_4SM<-raster("Chen2018\_Mead\_SM\_Aug.tif")  Chen2018\_4SW<-raster("Chen2018\_Mead\_SWnet\_Aug.tif")  Chen2018\_4Ta<-raster("Chen2018\_Mead\_Ta\_Aug.tif")  Chen2018\_4v<-raster("Chen2018\_Mead\_v\_Aug.tif")  Chen2018\_5LW<-raster("Chen2018\_Mead\_LWnet\_Sep.tif")  Chen2018\_5RP<-raster("Chen2018\_Mead\_RP\_Sep.tif")  Chen2018\_5SH<-raster("Chen2018\_Mead\_SH\_Sep.tif")  Chen2018\_5SM<-raster("Chen2018\_Mead\_SM\_Sep.tif")  Chen2018\_5SW<-raster("Chen2018\_Mead\_SWnet\_Sep.tif")  Chen2018\_5Ta<-raster("Chen2018\_Mead\_Ta\_Sep.tif")  Chen2018\_5v<-raster("Chen2018\_Mead\_v\_Sep.tif")  Cook2014\_LW<-raster("Cook2014\_Global\_LWnet.tif")  Cook2014\_RP<-raster("Cook2014\_Global\_RP.tif")  Cook2014\_SH<-raster("Cook2014\_Global\_SH.tif")  Cook2014\_SM<-raster("Cook2014\_Global\_SM.tif")  Cook2014\_SW<-raster("Cook2014\_Global\_SWnet.tif")  Cook2014\_Ta<-raster("Cook2014\_Global\_Ta.tif")  Cook2014\_v<-raster("Cook2014\_Global\_v.tif")  Daniel2018\_LW<-raster("Daniel2018\_Paris\_LWnet.tif")  Daniel2018\_RP<-raster("Daniel2018\_Paris\_RP.tif")  Daniel2018\_SH<-raster("Daniel2018\_Paris\_SH.tif")  Daniel2018\_SM<-raster("Daniel2018\_Paris\_SM.tif")  Daniel2018\_SW<-raster("Daniel2018\_Paris\_SWnet.tif")  Daniel2018\_Ta<-raster("Daniel2018\_Paris\_Ta.tif")  Daniel2018\_v<-raster("Daniel2018\_Paris\_v.tif")  Geerts2006\_LW<-raster("Geerts2006\_MCMIA\_LWnet.tif")  Geerts2006\_RP<-raster("Geerts2006\_MCMIA\_RP.tif")  Geerts2006\_SH<-raster("Geerts2006\_MCMIA\_SH.tif")  Geerts2006\_SM<-raster("Geerts2006\_MCMIA\_SM.tif")  Geerts2006\_SW<-raster("Geerts2006\_MCMIA\_SWnet.tif")  Geerts2006\_Ta<-raster("Geerts2006\_MCMIA\_Ta.tif")  Geerts2006\_v<-raster("Geerts2006\_MCMIA\_v.tif")  Grossman\_Clarke2010\_1LW<-raster("Grossman-Clarke2010\_Phoenix\_LWnet\_2003.tif")  Grossman\_Clarke2010\_1RP<-raster("Grossman-Clarke2010\_Phoenix\_RP\_2003.tif")  Grossman\_Clarke2010\_1SH<-raster("Grossman-Clarke2010\_Phoenix\_SH\_2003.tif")  Grossman\_Clarke2010\_1SM<-raster("Grossman-Clarke2010\_Phoenix\_SM\_2003.tif")  Grossman\_Clarke2010\_1SW<-raster("Grossman-Clarke2010\_Phoenix\_SWnet\_2003.tif")  Grossman\_Clarke2010\_1Ta<-raster("Grossman-Clarke2010\_Phoenix\_Ta\_2003.tif")  Grossman\_Clarke2010\_1v<-raster("Grossman-Clarke2010\_Phoenix\_v\_2003.tif")  Grossman\_Clarke2010\_2LW<-raster("Grossman-Clarke2010\_Phoenix\_LWnet\_2005to2007Jun.tif")  Grossman\_Clarke2010\_2RP<-raster("Grossman-Clarke2010\_Phoenix\_RP\_2005to2007Jun.tif")  Grossman\_Clarke2010\_2SH<-raster("Grossman-Clarke2010\_Phoenix\_SH\_2005to2007Jun.tif")  Grossman\_Clarke2010\_2SM<-raster("Grossman-Clarke2010\_Phoenix\_SM\_2005to2007Jun.tif")  Grossman\_Clarke2010\_2SW<-raster("Grossman-Clarke2010\_Phoenix\_SWnet\_2005to2007Jun.tif")  Grossman\_Clarke2010\_2Ta<-raster("Grossman-Clarke2010\_Phoenix\_Ta\_2005to2007Jun.tif")  Grossman\_Clarke2010\_2v<-raster("Grossman-Clarke2010\_Phoenix\_v\_2005to2007Jun.tif")  Grossman\_Clarke2010\_3LW<-raster("Grossman-Clarke2010\_Phoenix\_LWnet\_2005to2007Jul.tif")  Grossman\_Clarke2010\_3RP<-raster("Grossman-Clarke2010\_Phoenix\_RP\_2005to2007Jul.tif")  Grossman\_Clarke2010\_3SH<-raster("Grossman-Clarke2010\_Phoenix\_SH\_2005to2007Jul.tif")  Grossman\_Clarke2010\_3SM<-raster("Grossman-Clarke2010\_Phoenix\_SM\_2005to2007Jul.tif")  Grossman\_Clarke2010\_3SW<-raster("Grossman-Clarke2010\_Phoenix\_SWnet\_2005to2007Jul.tif")  Grossman\_Clarke2010\_3Ta<-raster("Grossman-Clarke2010\_Phoenix\_Ta\_2005to2007Jul.tif")  Grossman\_Clarke2010\_3v<-raster("Grossman-Clarke2010\_Phoenix\_v\_2005to2007Jul.tif")  Hancock2015\_LW<-raster("Hancock2015\_Toowoomba\_LWnet.tif")  Hancock2015\_RP<-raster("Hancock2015\_Toowoomba\_RP.tif")  Hancock2015\_SH<-raster("Hancock2015\_Toowoomba\_SH.tif")  Hancock2015\_SM<-raster("Hancock2015\_Toowoomba\_SM.tif")  Hancock2015\_SW<-raster("Hancock2015\_Toowoomba\_SWnet.tif")  Hancock2015\_Ta<-raster("Hancock2015\_Toowoomba\_Ta.tif")  Hancock2015\_v<-raster("Hancock2015\_Toowoomba\_v.tif")  Harding2012\_1LW<-raster("Harding2012\_LWnet\_1983.tif")  Harding2012\_1RP<-raster("Harding2012\_RP\_1983.tif")  Harding2012\_1SH<-raster("Harding2012\_SH\_1983.tif")  Harding2012\_1SM<-raster("Harding2012\_SM\_1983.tif")  Harding2012\_1SW<-raster("Harding2012\_SWnet\_1983.tif")  Harding2012\_1Ta<-raster("Harding2012\_Ta\_1983.tif")  Harding2012\_1v<-raster("Harding2012\_v\_1983.tif")  Harding2012\_2LW<-raster("Harding2012\_LWnet\_1985.tif")  Harding2012\_2RP<-raster("Harding2012\_RP\_1985.tif")  Harding2012\_2SH<-raster("Harding2012\_SH\_1985.tif")  Harding2012\_2SM<-raster("Harding2012\_SM\_1985.tif")  Harding2012\_2SW<-raster("Harding2012\_SWnet\_1985.tif")  Harding2012\_2Ta<-raster("Harding2012\_Ta\_1985.tif")  Harding2012\_2v<-raster("Harding2012\_v\_1985.tif")  Harding2012\_3LW<-raster("Harding2012\_LWnet\_1988.tif")  Harding2012\_3RP<-raster("Harding2012\_RP\_1988.tif")  Harding2012\_3SH<-raster("Harding2012\_SH\_1988.tif")  Harding2012\_3SM<-raster("Harding2012\_SM\_1988.tif")  Harding2012\_3SW<-raster("Harding2012\_SWnet\_1988.tif")  Harding2012\_3Ta<-raster("Harding2012\_Ta\_1988.tif")  Harding2012\_3v<-raster("Harding2012\_v\_1988.tif")  Harding2012\_4LW<-raster("Harding2012\_LWnet\_1990.tif")  Harding2012\_4RP<-raster("Harding2012\_RP\_1990.tif")  Harding2012\_4SH<-raster("Harding2012\_SH\_1990.tif")  Harding2012\_4SM<-raster("Harding2012\_SM\_1990.tif")  Harding2012\_4SW<-raster("Harding2012\_SWnet\_1990.tif")  Harding2012\_4Ta<-raster("Harding2012\_Ta\_1990.tif")  Harding2012\_4v<-raster("Harding2012\_v\_1990.tif")  Harding2012\_5LW<-raster("Harding2012\_LWnet\_1993.tif")  Harding2012\_5RP<-raster("Harding2012\_RP\_1993.tif")  Harding2012\_5SH<-raster("Harding2012\_SH\_1993.tif")  Harding2012\_5SM<-raster("Harding2012\_SM\_1993.tif")  Harding2012\_5SW<-raster("Harding2012\_SWnet\_1993.tif")  Harding2012\_5Ta<-raster("Harding2012\_Ta\_1993.tif")  Harding2012\_5v<-raster("Harding2012\_v\_1993.tif")  Harding2012\_6LW<-raster("Harding2012\_LWnet\_1997.tif")  Harding2012\_6RP<-raster("Harding2012\_RP\_1997.tif")  Harding2012\_6SH<-raster("Harding2012\_SH\_1997.tif")  Harding2012\_6SM<-raster("Harding2012\_SM\_1997.tif")  Harding2012\_6SW<-raster("Harding2012\_SWnet\_1997.tif")  Harding2012\_6Ta<-raster("Harding2012\_Ta\_1997.tif")  Harding2012\_6v<-raster("Harding2012\_v\_1997.tif")  Harding2012\_7LW<-raster("Harding2012\_LWnet\_2000.tif")  Harding2012\_7RP<-raster("Harding2012\_RP\_2000.tif")  Harding2012\_7SH<-raster("Harding2012\_SH\_2000.tif")  Harding2012\_7SM<-raster("Harding2012\_SM\_2000.tif")  Harding2012\_7SW<-raster("Harding2012\_SWnet\_2000.tif")  Harding2012\_7Ta<-raster("Harding2012\_Ta\_2000.tif")  Harding2012\_7v<-raster("Harding2012\_v\_2000.tif")  Harding2012\_8LW<-raster("Harding2012\_LWnet\_2007.tif")  Harding2012\_8RP<-raster("Harding2012\_RP\_2007.tif")  Harding2012\_8SH<-raster("Harding2012\_SH\_2007.tif")  Harding2012\_8SM<-raster("Harding2012\_SM\_2007.tif")  Harding2012\_8SW<-raster("Harding2012\_SWnet\_2007.tif")  Harding2012\_8Ta<-raster("Harding2012\_Ta\_2007.tif")  Harding2012\_8v<-raster("Harding2012\_v\_2007.tif")  Harding2012\_9LW<-raster("Harding2012\_LWnet\_2008.tif")  Harding2012\_9RP<-raster("Harding2012\_RP\_2008.tif")  Harding2012\_9SH<-raster("Harding2012\_SH\_2008.tif")  Harding2012\_9SM<-raster("Harding2012\_SM\_2008.tif")  Harding2012\_9SW<-raster("Harding2012\_SWnet\_2008.tif")  Harding2012\_9Ta<-raster("Harding2012\_Ta\_2008.tif")  Harding2012\_9v<-raster("Harding2012\_v\_2008.tif")  Huber2014\_LW<-raster("Huber2014\_LWnet.tif")  Huber2014\_RP<-raster("Huber2014\_RP.tif")  Huber2014\_SH<-raster("Huber2014\_SH.tif")  Huber2014\_SM<-raster("Huber2014\_SM.tif")  Huber2014\_SW<-raster("Huber2014\_SWnet.tif")  Huber2014\_Ta<-raster("Huber2014\_Ta.tif")  Huber2014\_v<-raster("Huber2014\_v.tif")  Iglesias2002\_1LW<-raster("Iglesias2002\_LWnet\_Aug.tif")  Iglesias2002\_1RP<-raster("Iglesias2002\_RP\_Aug.tif")  Iglesias2002\_1SH<-raster("Iglesias2002\_SH\_Aug.tif")  Iglesias2002\_1SM<-raster("Iglesias2002\_SM\_Aug.tif")  Iglesias2002\_1SW<-raster("Iglesias2002\_SWnet\_Aug.tif")  Iglesias2002\_1Ta<-raster("Iglesias2002\_Ta\_Aug.tif")  Iglesias2002\_1v<-raster("Iglesias2002\_v\_Aug.tif")  Iglesias2002\_2LW<-raster("Iglesias2002\_LWnet\_Sep.tif")  Iglesias2002\_2RP<-raster("Iglesias2002\_RP\_Sep.tif")  Iglesias2002\_2SH<-raster("Iglesias2002\_SH\_Sep.tif")  Iglesias2002\_2SM<-raster("Iglesias2002\_SM\_Sep.tif")  Iglesias2002\_2SW<-raster("Iglesias2002\_SWnet\_Sep.tif")  Iglesias2002\_2Ta<-raster("Iglesias2002\_Ta\_Sep.tif")  Iglesias2002\_2v<-raster("Iglesias2002\_v\_Sep.tif")  Iglesias2005\_1LW<-raster("Iglesias2005\_LWnet\_Jul.tif")  Iglesias2005\_1RP<-raster("Iglesias2005\_RP\_Jul.tif")  Iglesias2005\_1SH<-raster("Iglesias2005\_SH\_Jul.tif")  Iglesias2005\_1SM<-raster("Iglesias2005\_SM\_Jul.tif")  Iglesias2005\_1SW<-raster("Iglesias2005\_SWnet\_Jul.tif")  Iglesias2005\_1Ta<-raster("Iglesias2005\_Ta\_Jul.tif")  Iglesias2005\_1v<-raster("Iglesias2005\_v\_Jul.tif")  Iglesias2005\_2LW<-raster("Iglesias2005\_LWnet\_Aug.tif")  Iglesias2005\_2RP<-raster("Iglesias2005\_RP\_Aug.tif")  Iglesias2005\_2SH<-raster("Iglesias2005\_SH\_Aug.tif")  Iglesias2005\_2SM<-raster("Iglesias2005\_SM\_Aug.tif")  Iglesias2005\_2SW<-raster("Iglesias2005\_SWnet\_Aug.tif")  Iglesias2005\_2Ta<-raster("Iglesias2005\_Ta\_Aug.tif")  Iglesias2005\_2v<-raster("Iglesias2005\_v\_Aug.tif")  Kanamaru2008\_LW<-raster("Kanamaru2008\_LWnet.tif")  Kanamaru2008\_RP<-raster("Kanamaru2008\_RP.tif")  Kanamaru2008\_SH<-raster("Kanamaru2008\_SH.tif")  Kanamaru2008\_SM<-raster("Kanamaru2008\_SM.tif")  Kanamaru2008\_SW<-raster("Kanamaru2008\_SWnet.tif")  Kanamaru2008\_Ta<-raster("Kanamaru2008\_Ta.tif")  Kanamaru2008\_v<-raster("Kanamaru2008\_v.tif")  Kohl1974\_LW<-raster("Kohl1974\_LWnet.tif")  Kohl1974\_RP<-raster("Kohl1974\_RP.tif")  Kohl1974\_SH<-raster("Kohl1974\_SH.tif")  Kohl1974\_SM<-raster("Kohl1974\_SM.tif")  Kohl1974\_SW<-raster("Kohl1974\_SWnet.tif")  Kohl1974\_Ta<-raster("Kohl1974\_Ta.tif")  Kohl1974\_v<-raster("Kohl1974\_v.tif")  Lakatos2010\_LW<-raster("Lakatos2010\_LWnet.tif")  Lakatos2010\_RP<-raster("Lakatos2010\_RP.tif")  Lakatos2010\_SH<-raster("Lakatos2010\_SH.tif")  Lakatos2010\_SM<-raster("Lakatos2010\_SM.tif")  Lakatos2010\_SW<-raster("Lakatos2010\_SWnet.tif")  Lakatos2010\_Ta<-raster("Lakatos2010\_Ta.tif")  Lakatos2010\_v<-raster("Lakatos2010\_v.tif")  Lakatos2012\_LW<-raster("Lakatos2012\_LWnet.tif")  Lakatos2012\_RP<-raster("Lakatos2012\_RP.tif")  Lakatos2012\_SH<-raster("Lakatos2012\_SH.tif")  Lakatos2012\_SM<-raster("Lakatos2012\_SM.tif")  Lakatos2012\_SW<-raster("Lakatos2012\_SWnet.tif")  Lakatos2012\_Ta<-raster("Lakatos2012\_Ta.tif")  Lakatos2012\_v<-raster("Lakatos2012\_v.tif")  Nainanayake2004\_1LW<-raster("Nainanayake2004\_LWnet\_2004Decto2005Mar.tif")  Nainanayake2004\_1RP<-raster("Nainanayake2004\_RP\_2004Decto2005Mar.tif")  Nainanayake2004\_1SH<-raster("Nainanayake2004\_SH\_2004Decto2005Mar.tif")  Nainanayake2004\_1SM<-raster("Nainanayake2004\_SM\_2004Decto2005Mar.tif")  Nainanayake2004\_1SW<-raster("Nainanayake2004\_SWnet\_2004Decto2005Mar.tif")  Nainanayake2004\_1Ta<-raster("Nainanayake2004\_Ta\_2004Decto2005Mar.tif")  Nainanayake2004\_1v<-raster("Nainanayake2004\_v\_2004Decto2005Mar.tif")  Nainanayake2004\_2LW<-raster("Nainanayake2004\_LWnet\_2004JultoSep.tif")  Nainanayake2004\_2RP<-raster("Nainanayake2004\_RP\_2004JultoSep.tif")  Nainanayake2004\_2SH<-raster("Nainanayake2004\_SH\_2004JultoSep.tif")  Nainanayake2004\_2SM<-raster("Nainanayake2004\_SM\_2004JultoSep.tif")  Nainanayake2004\_2SW<-raster("Nainanayake2004\_SWnet\_2004JultoSep.tif")  Nainanayake2004\_2Ta<-raster("Nainanayake2004\_Ta\_2004JultoSep.tif")  Nainanayake2004\_2v<-raster("Nainanayake2004\_v\_2004JultoSep.tif")  Nainanayake2004\_3LW<-raster("Nainanayake2004\_LWnet\_2005JultoOct.tif")  Nainanayake2004\_3RP<-raster("Nainanayake2004\_RP\_2005JultoOct.tif")  Nainanayake2004\_3SH<-raster("Nainanayake2004\_SH\_2005JultoOct.tif")  Nainanayake2004\_3SM<-raster("Nainanayake2004\_SM\_2005JultoOct.tif")  Nainanayake2004\_3SW<-raster("Nainanayake2004\_SWnet\_2005JultoOct.tif")  Nainanayake2004\_3Ta<-raster("Nainanayake2004\_Ta\_2005JultoOct.tif")  Nainanayake2004\_3v<-raster("Nainanayake2004\_v\_2005JultoOct.tif")  Puma2010\_LW<-raster("Puma2010\_Global\_LWnet.tif")  Puma2010\_RP<-raster("Puma2010\_Global\_RP.tif")  Puma2010\_SH<-raster("Puma2010\_Global\_SH.tif")  Puma2010\_SM<-raster("Puma2010\_Global\_SM.tif")  Puma2010\_SW<-raster("Puma2010\_Global\_SWnet.tif")  Puma2010\_Ta<-raster("Puma2010\_Global\_Ta.tif")  Puma2010\_v<-raster("Puma2010\_Global\_v.tif")  Sacks2009\_LW<-raster("Sacks2009\_Global\_LWnet.tif")  Sacks2009\_RP<-raster("Sacks2009\_Global\_RP.tif")  Sacks2009\_SH<-raster("Sacks2009\_Global\_SH.tif")  Sacks2009\_SM<-raster("Sacks2009\_Global\_SM.tif")  Sacks2009\_SW<-raster("Sacks2009\_Global\_SWnet.tif")  Sacks2009\_Ta<-raster("Sacks2009\_Global\_Ta.tif")  Sacks2009\_v<-raster("Sacks2009\_Global\_v.tif")  Sorooshian2011\_LW<-raster("Sorooshian2011\_LWnet.tif")  Sorooshian2011\_RP<-raster("Sorooshian2011\_RP.tif")  Sorooshian2011\_SH<-raster("Sorooshian2011\_SH.tif")  Sorooshian2011\_SM<-raster("Sorooshian2011\_SM.tif")  Sorooshian2011\_SW<-raster("Sorooshian2011\_SWnet.tif")  Sorooshian2011\_Ta<-raster("Sorooshian2011\_Ta.tif")  Sorooshian2011\_v<-raster("Sorooshian2011\_v.tif")  Sugimoto2019\_LW<-raster("Sugimoto2019\_LWnet.tif")  Sugimoto2019\_RP<-raster("Sugimoto2019\_RP.tif")  Sugimoto2019\_SH<-raster("Sugimoto2019\_SH.tif")  Sugimoto2019\_SM<-raster("Sugimoto2019\_SM.tif")  Sugimoto2019\_SW<-raster("Sugimoto2019\_SWnet.tif")  Sugimoto2019\_Ta<-raster("Sugimoto2019\_Ta.tif")  Sugimoto2019\_v<-raster("Sugimoto2019\_v.tif")  Thiery2017\_LW<-raster("Thiery2017\_Global\_LWnet.tif")  Thiery2017\_RP<-raster("Thiery2017\_Global\_RP.tif")  Thiery2017\_SH<-raster("Thiery2017\_Global\_SH.tif")  Thiery2017\_SM<-raster("Thiery2017\_Global\_SM.tif")  Thiery2017\_SW<-raster("Thiery2017\_Global\_SWnet.tif")  Thiery2017\_Ta<-raster("Thiery2017\_Global\_Ta.tif")  Thiery2017\_v<-raster("Thiery2017\_Global\_v.tif")  Thompson1993\_LW<-raster("Thompson1993\_LWnet.tif")  Thompson1993\_RP<-raster("Thompson1993\_RP.tif")  Thompson1993\_SH<-raster("Thompson1993\_SH.tif")  Thompson1993\_SM<-raster("Thompson1993\_SM.tif")  Thompson1993\_SW<-raster("Thompson1993\_SWnet.tif")  Thompson1993\_Ta<-raster("Thompson1993\_Ta.tif")  Thompson1993\_v<-raster("Thompson1993\_v.tif")  Vahmani2016\_LW<-raster("Vahmani2016\_LWnet.tif")  Vahmani2016\_RP<-raster("Vahmani2016\_RP.tif")  Vahmani2016\_SH<-raster("Vahmani2016\_SH.tif")  Vahmani2016\_SM<-raster("Vahmani2016\_SM.tif")  Vahmani2016\_SW<-raster("Vahmani2016\_SWnet.tif")  Vahmani2016\_Ta<-raster("Vahmani2016\_Ta.tif")  Vahmani2016\_v<-raster("Vahmani2016\_v.tif")  Wen2012\_LW<-raster("Wen2012\_LWnet.tif")  Wen2012\_RP<-raster("Wen2012\_RP.tif")  Wen2012\_SH<-raster("Wen2012\_SH.tif")  Wen2012\_SM<-raster("Wen2012\_SM.tif")  Wen2012\_SW<-raster("Wen2012\_SWnet.tif")  Wen2012\_Ta<-raster("Wen2012\_Ta.tif")  Wen2012\_v<-raster("Wen2012\_v.tif")  Yang2015\_LW<-raster("Yang2015\_LWnet.tif")  Yang2015\_RP<-raster("Yang2015\_RP.tif")  Yang2015\_SH<-raster("Yang2015\_SH.tif")  Yang2015\_SM<-raster("Yang2015\_SM.tif")  Yang2015\_SW<-raster("Yang2015\_SWnet.tif")  Yang2015\_Ta<-raster("Yang2015\_Ta.tif")  Yang2015\_v<-raster("Yang2015\_v.tif")  Yang2016\_LW<-raster("Yang2016\_LWnet.tif")  Yang2016\_RP<-raster("Yang2016\_RP.tif")  Yang2016\_SH<-raster("Yang2016\_SH.tif")  Yang2016\_SM<-raster("Yang2016\_SM.tif")  Yang2016\_SW<-raster("Yang2016\_SWnet.tif")  Yang2016\_Ta<-raster("Yang2016\_Ta.tif")  Yang2016\_v<-raster("Yang2016\_v.tif")  Yang2017\_1LW<-raster("Yang2017\_LWnet\_2002.tif")  Yang2017\_1RP<-raster("Yang2017\_RP\_2002.tif")  Yang2017\_1SH<-raster("Yang2017\_SH\_2002.tif")  Yang2017\_1SM<-raster("Yang2017\_SM\_2002.tif")  Yang2017\_1SW<-raster("Yang2017\_SWnet\_2002.tif")  Yang2017\_1Ta<-raster("Yang2017\_Ta\_2002.tif")  Yang2017\_1v<-raster("Yang2017\_v\_2002.tif")  Yang2017\_2LW<-raster("Yang2017\_LWnet\_2005to2007.tif")  Yang2017\_2RP<-raster("Yang2017\_RP\_2005to2007.tif")  Yang2017\_2SH<-raster("Yang2017\_SH\_2005to2007.tif")  Yang2017\_2SM<-raster("Yang2017\_SM\_2005to2007.tif")  Yang2017\_2SW<-raster("Yang2017\_SWnet\_2005to2007.tif")  Yang2017\_2Ta<-raster("Yang2017\_Ta\_2005to2007.tif")  Yang2017\_2v<-raster("Yang2017\_v\_2005to2007.tif")  Yang2017\_3LW<-raster("Yang2017\_LWnet\_2010.tif")  Yang2017\_3RP<-raster("Yang2017\_RP\_2010.tif")  Yang2017\_3SH<-raster("Yang2017\_SH\_2010.tif")  Yang2017\_3SM<-raster("Yang2017\_SM\_2010.tif")  Yang2017\_3SW<-raster("Yang2017\_SWnet\_2010.tif")  Yang2017\_3Ta<-raster("Yang2017\_Ta\_2010.tif")  Yang2017\_3v<-raster("Yang2017\_v\_2010.tif")  Yang2017\_4LW<-raster("Yang2017\_LWnet\_2013.tif")  Yang2017\_4RP<-raster("Yang2017\_RP\_2013.tif")  Yang2017\_4SH<-raster("Yang2017\_SH\_2013.tif")  Yang2017\_4SM<-raster("Yang2017\_SM\_2013.tif")  Yang2017\_4SW<-raster("Yang2017\_SWnet\_2013.tif")  Yang2017\_4Ta<-raster("Yang2017\_Ta\_2013.tif")  Yang2017\_4v<-raster("Yang2017\_v\_2013.tif")  Zou2014\_LW<-raster("Zou2014\_LWnet.tif")  Zou2014\_RP<-raster("Zou2014\_RP.tif")  Zou2014\_SH<-raster("Zou2014\_SH.tif")  Zou2014\_SM<-raster("Zou2014\_SM.tif")  Zou2014\_SW<-raster("Zou2014\_SWnet.tif")  Zou2014\_Ta<-raster("Zou2014\_Ta.tif")  Zou2014\_v<-raster("Zou2014\_v.tif")  Chen2017.2\_LW<-raster("Chen2017(2)\_YellowRiver\_LWnet.tif")  Chen2017.2\_RP<-raster("Chen2017(2)\_YellowRiver\_RP.tif")  Chen2017.2\_SH<-raster("Chen2017(2)\_YellowRiver\_SH.tif")  Chen2017.2\_SM<-raster("Chen2017(2)\_YellowRiver\_SM.tif")  Chen2017.2\_SW<-raster("Chen2017(2)\_YellowRiver\_SWnet.tif")  Chen2017.2\_Ta<-raster("Chen2017(2)\_YellowRiver\_Ta.tif")  Chen2017.2\_v<-raster("Chen2017(2)\_YellowRiver\_v.tif")  Chen2017.3\_LW<-raster("Chen2017(3)\_YellowRiver\_LWnet.tif")  Chen2017.3\_RP<-raster("Chen2017(3)\_YellowRiver\_RP.tif")  Chen2017.3\_SH<-raster("Chen2017(3)\_YellowRiver\_SH.tif")  Chen2017.3\_SM<-raster("Chen2017(3)\_YellowRiver\_SM.tif")  Chen2017.3\_SW<-raster("Chen2017(3)\_YellowRiver\_SWnet.tif")  Chen2017.3\_Ta<-raster("Chen2017(3)\_YellowRiver\_Ta.tif")  Chen2017.3\_v<-raster("Chen2017(3)\_YellowRiver\_v.tif")  Huber2014.2\_LW<-raster("Huber2014(2)\_LWnet.tif")  Huber2014.2\_RP<-raster("Huber2014(2)\_RP.tif")  Huber2014.2\_SH<-raster("Huber2014(2)\_SH.tif")  Huber2014.2\_SM<-raster("Huber2014(2)\_SM.tif")  Huber2014.2\_SW<-raster("Huber2014(2)\_SWnet.tif")  Huber2014.2\_Ta<-raster("Huber2014(2)\_Ta.tif")  Huber2014.2\_v<-raster("Huber2014(2)\_v.tif")  Valmassoi2020\_LW<-raster("Valmassoi2020\_LWnet.tif")  Valmassoi2020\_RP<-raster("Valmassoi2020\_RP.tif")  Valmassoi2020\_SH<-raster("Valmassoi2020\_SH.tif")  Valmassoi2020\_SM<-raster("Valmassoi2020\_SM.tif")  Valmassoi2020\_SW<-raster("Valmassoi2020\_SWnet.tif")  Valmassoi2020\_Ta<-raster("Valmassoi2020\_Ta.tif")  Valmassoi2020\_v<-raster("Valmassoi2020\_v.tif") |

# #Define extent without Antarctica and crop raster by extent for global studies

|  |
| --- |
| global\_land\_extent\_no\_antar<-extent(-180.3125, 179.8811, -57.8, 90.25)  Cook2014\_LW <-crop(Cook2014\_LW,global\_land\_extent\_no\_antar)  Cook2014\_SH <-crop(Cook2014\_SH,global\_land\_extent\_no\_antar)  Cook2014\_SW <-crop(Cook2014\_SW,global\_land\_extent\_no\_antar)  Cook2014\_Ta <-crop(Cook2014\_Ta,global\_land\_extent\_no\_antar)  Cook2014\_v <-crop(Cook2014\_v,global\_land\_extent\_no\_antar)  Cook2014\_RP <-crop(Cook2014\_RP,global\_land\_extent\_no\_antar)  Cook2014\_SM <-crop(Cook2014\_SM,global\_land\_extent\_no\_antar)  Puma2010\_LW <-crop(Puma2010\_LW,global\_land\_extent\_no\_antar)  Puma2010\_SH <-crop(Puma2010\_SH,global\_land\_extent\_no\_antar)  Puma2010\_SW <-crop(Puma2010\_SW,global\_land\_extent\_no\_antar)  Puma2010\_Ta <-crop(Puma2010\_Ta,global\_land\_extent\_no\_antar)  Puma2010\_v <-crop(Puma2010\_v,global\_land\_extent\_no\_antar)  Puma2010\_RP <-crop(Puma2010\_RP,global\_land\_extent\_no\_antar)  Puma2010\_SM <-crop(Puma2010\_SM,global\_land\_extent\_no\_antar)  Sacks2009\_LW <-crop(Sacks2009\_LW,global\_land\_extent\_no\_antar)  Sacks2009\_SH <-crop(Sacks2009\_SH,global\_land\_extent\_no\_antar)  Sacks2009\_SW <-crop(Sacks2009\_SW,global\_land\_extent\_no\_antar)  Sacks2009\_Ta <-crop(Sacks2009\_Ta,global\_land\_extent\_no\_antar)  Sacks2009\_v <-crop(Sacks2009\_v,global\_land\_extent\_no\_antar)  Sacks2009\_RP <-crop(Sacks2009\_RP,global\_land\_extent\_no\_antar)  Sacks2009\_SM <-crop(Sacks2009\_SM,global\_land\_extent\_no\_antar)  Thiery2017\_LW <-crop(Thiery2017\_LW,global\_land\_extent\_no\_antar)  Thiery2017\_SH <-crop(Thiery2017\_SH,global\_land\_extent\_no\_antar)  Thiery2017\_SW <-crop(Thiery2017\_SW,global\_land\_extent\_no\_antar)  Thiery2017\_Ta <-crop(Thiery2017\_Ta,global\_land\_extent\_no\_antar)  Thiery2017\_v <-crop(Thiery2017\_v,global\_land\_extent\_no\_antar)  Thiery2017\_RP <-crop(Thiery2017\_RP,global\_land\_extent\_no\_antar)  Thiery2017\_SM <-crop(Thiery2017\_SM,global\_land\_extent\_no\_antar) |

# #Amend extent of Vahmani2016

|  |
| --- |
| #Vahmani2016\_extext<-extent(-120, -117.25, 32.5, 34.5)  #Vahmani2016\_LW<-crop(Vahmani2016\_LW,Vahmani2016\_extext)  #Vahmani2016\_SH<-crop(Vahmani2016\_SH,Vahmani2016\_extext)  #Vahmani2016\_SW<-crop(Vahmani2016\_SW,Vahmani2016\_extext)  #Vahmani2016\_Ta<-crop(Vahmani2016\_Ta,Vahmani2016\_extext)  #Vahmani2016\_v<-crop(Vahmani2016\_v,Vahmani2016\_extext)  #Vahmani2016\_RP<-crop(Vahmani2016\_RP,Vahmani2016\_extext)  #Vahmani2016\_SM<-crop(Vahmani2016\_SM,Vahmani2016\_extext) |

# #Calculate mean of .tif and store in data frame

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Giovanni\_data<-data.frame(Citation=IC1\_raw$Citation,LWnet=999, RP=999,SH=999,SM=999,SWnet=999,Ta=999,v=999)  expand<-c(1,2,1,1,1,1,5,1,1,1,3,1,9,1,2,2,1,1,1,1,3,1,1,1,1,1,1,1,1,1,1,4,1,1,1,1,1)  #create an expanded data frame to store data that will be aggregated into the main data frame because some studies have more than 1 set of parameters  Giovanni\_data\_expanded<-data.frame(Citation=rep(999,times=sum(expand)),LWnet=999,RP=999,SH=999,SM=999,SWnet=999,Ta=999,v=999)  #Name the first column of the expanded data frame for aggregation in the next step  i=1  j=1  k=1  while(i<38){  Giovanni\_data\_expanded[k:j,]<-Giovanni\_data[rep(i,times=expand[i]),]  k=j+1  i=i+1  j=sum(expand[1:i])  }  #Fill the expanded data frame   |  | | --- | | Giovanni\_data\_expanded[1,2]<-cellStats(Adegoke2003\_LW,stat="mean") | | Giovanni\_data\_expanded[1,3]<-cellStats(Adegoke2003\_RP,stat="mean") | | Giovanni\_data\_expanded[1,4]<-cellStats(Adegoke2003\_SH,stat="mean") | | Giovanni\_data\_expanded[1,5]<-cellStats(Adegoke2003\_SM,stat="mean") | | Giovanni\_data\_expanded[1,6]<-cellStats(Adegoke2003\_SW,stat="mean") | | Giovanni\_data\_expanded[1,7]<-cellStats(Adegoke2003\_Ta,stat="mean") | | Giovanni\_data\_expanded[1,8]<-cellStats(Adegoke2003\_v,stat="mean") | | Giovanni\_data\_expanded[2,2]<-cellStats(Alter2015\_1LW,stat="mean") | | Giovanni\_data\_expanded[2,3]<-cellStats(Alter2015\_1RP,stat="mean") | | Giovanni\_data\_expanded[2,4]<-cellStats(Alter2015\_1SH,stat="mean") | | Giovanni\_data\_expanded[2,5]<-cellStats(Alter2015\_1SM,stat="mean") | | Giovanni\_data\_expanded[2,6]<-cellStats(Alter2015\_1SW,stat="mean") | | Giovanni\_data\_expanded[2,7]<-cellStats(Alter2015\_1Ta,stat="mean") | | Giovanni\_data\_expanded[2,8]<-cellStats(Alter2015\_1v,stat="mean") | | Giovanni\_data\_expanded[3,2]<-cellStats(Alter2015\_2LW,stat="mean") | | Giovanni\_data\_expanded[3,3]<-cellStats(Alter2015\_2RP,stat="mean") | | Giovanni\_data\_expanded[3,4]<-cellStats(Alter2015\_2SH,stat="mean") | | Giovanni\_data\_expanded[3,5]<-cellStats(Alter2015\_2SM,stat="mean") | | Giovanni\_data\_expanded[3,6]<-cellStats(Alter2015\_2SW,stat="mean") | | Giovanni\_data\_expanded[3,7]<-cellStats(Alter2015\_2Ta,stat="mean") | | Giovanni\_data\_expanded[3,8]<-cellStats(Alter2015\_2v,stat="mean") | | Giovanni\_data\_expanded[4,2]<-cellStats(Bonan2000\_LW,stat="mean") | | Giovanni\_data\_expanded[4,3]<-cellStats(Bonan2000\_RP,stat="mean") | | Giovanni\_data\_expanded[4,4]<-cellStats(Bonan2000\_SH,stat="mean") | | Giovanni\_data\_expanded[4,5]<-cellStats(Bonan2000\_SM,stat="mean") | | Giovanni\_data\_expanded[4,6]<-cellStats(Bonan2000\_SW,stat="mean") | | Giovanni\_data\_expanded[4,7]<-cellStats(Bonan2000\_Ta,stat="mean") | | Giovanni\_data\_expanded[4,8]<-cellStats(Bonan2000\_v,stat="mean") | | Giovanni\_data\_expanded[5,2]<-cellStats(Broadbent2018\_LW,stat="mean") | | Giovanni\_data\_expanded[5,3]<-cellStats(Broadbent2018\_RP,stat="mean") | | Giovanni\_data\_expanded[5,4]<-cellStats(Broadbent2018\_SH,stat="mean") | | Giovanni\_data\_expanded[5,5]<-cellStats(Broadbent2018\_SM,stat="mean") | | Giovanni\_data\_expanded[5,6]<-cellStats(Broadbent2018\_SW,stat="mean") | | Giovanni\_data\_expanded[5,7]<-cellStats(Broadbent2018\_Ta,stat="mean") | | Giovanni\_data\_expanded[5,8]<-cellStats(Broadbent2018\_v,stat="mean") | | Giovanni\_data\_expanded[6,2]<-cellStats(Broadbent2019\_LW,stat="mean") | | Giovanni\_data\_expanded[6,3]<-cellStats(Broadbent2019\_RP,stat="mean") | | Giovanni\_data\_expanded[6,4]<-cellStats(Broadbent2019\_SH,stat="mean") | | Giovanni\_data\_expanded[6,5]<-cellStats(Broadbent2019\_SM,stat="mean") | | Giovanni\_data\_expanded[6,6]<-cellStats(Broadbent2019\_SW,stat="mean") | | Giovanni\_data\_expanded[6,7]<-cellStats(Broadbent2019\_Ta,stat="mean") | | Giovanni\_data\_expanded[6,8]<-cellStats(Broadbent2019\_v,stat="mean") | | Giovanni\_data\_expanded[7,2]<-cellStats(Chen2017\_LW,stat="mean") | | Giovanni\_data\_expanded[7,3]<-cellStats(Chen2017\_RP,stat="mean") | | Giovanni\_data\_expanded[7,4]<-cellStats(Chen2017\_SH,stat="mean") | | Giovanni\_data\_expanded[7,5]<-cellStats(Chen2017\_SM,stat="mean") | | Giovanni\_data\_expanded[7,6]<-cellStats(Chen2017\_SW,stat="mean") | | Giovanni\_data\_expanded[7,7]<-cellStats(Chen2017\_Ta,stat="mean") | | Giovanni\_data\_expanded[7,8]<-cellStats(Chen2017\_v,stat="mean") | | Giovanni\_data\_expanded[8,2]<-cellStats(Chen2018\_1LW,stat="mean") | | Giovanni\_data\_expanded[8,3]<-cellStats(Chen2018\_1RP,stat="mean") | | Giovanni\_data\_expanded[8,4]<-cellStats(Chen2018\_1SH,stat="mean") | | Giovanni\_data\_expanded[8,5]<-cellStats(Chen2018\_1SM,stat="mean") | | Giovanni\_data\_expanded[8,6]<-cellStats(Chen2018\_1SW,stat="mean") | | Giovanni\_data\_expanded[8,7]<-cellStats(Chen2018\_1Ta,stat="mean") | | Giovanni\_data\_expanded[8,8]<-cellStats(Chen2018\_1v,stat="mean") | | Giovanni\_data\_expanded[9,2]<-cellStats(Chen2018\_2LW,stat="mean") | | Giovanni\_data\_expanded[9,3]<-cellStats(Chen2018\_2RP,stat="mean") | | Giovanni\_data\_expanded[9,4]<-cellStats(Chen2018\_2SH,stat="mean") | | Giovanni\_data\_expanded[9,5]<-cellStats(Chen2018\_2SM,stat="mean") | | Giovanni\_data\_expanded[9,6]<-cellStats(Chen2018\_2SW,stat="mean") | | Giovanni\_data\_expanded[9,7]<-cellStats(Chen2018\_2Ta,stat="mean") | | Giovanni\_data\_expanded[9,8]<-cellStats(Chen2018\_2v,stat="mean") | | Giovanni\_data\_expanded[10,2]<-cellStats(Chen2018\_3LW,stat="mean") | | Giovanni\_data\_expanded[10,3]<-cellStats(Chen2018\_3RP,stat="mean") | | Giovanni\_data\_expanded[10,4]<-cellStats(Chen2018\_3SH,stat="mean") | | Giovanni\_data\_expanded[10,5]<-cellStats(Chen2018\_3SM,stat="mean") | | Giovanni\_data\_expanded[10,6]<-cellStats(Chen2018\_3SW,stat="mean") | | Giovanni\_data\_expanded[10,7]<-cellStats(Chen2018\_3Ta,stat="mean") | | Giovanni\_data\_expanded[10,8]<-cellStats(Chen2018\_3v,stat="mean") | | Giovanni\_data\_expanded[11,2]<-cellStats(Chen2018\_4LW,stat="mean") | | Giovanni\_data\_expanded[11,3]<-cellStats(Chen2018\_4RP,stat="mean") | | Giovanni\_data\_expanded[11,4]<-cellStats(Chen2018\_4SH,stat="mean") | | Giovanni\_data\_expanded[11,5]<-cellStats(Chen2018\_4SM,stat="mean") | | Giovanni\_data\_expanded[11,6]<-cellStats(Chen2018\_4SW,stat="mean") | | Giovanni\_data\_expanded[11,7]<-cellStats(Chen2018\_4Ta,stat="mean") | | Giovanni\_data\_expanded[11,8]<-cellStats(Chen2018\_4v,stat="mean") | | Giovanni\_data\_expanded[12,2]<-cellStats(Chen2018\_5LW,stat="mean") | | Giovanni\_data\_expanded[12,3]<-cellStats(Chen2018\_5RP,stat="mean") | | Giovanni\_data\_expanded[12,4]<-cellStats(Chen2018\_5SH,stat="mean") | | Giovanni\_data\_expanded[12,5]<-cellStats(Chen2018\_5SM,stat="mean") | | Giovanni\_data\_expanded[12,6]<-cellStats(Chen2018\_5SW,stat="mean") | | Giovanni\_data\_expanded[12,7]<-cellStats(Chen2018\_5Ta,stat="mean") | | Giovanni\_data\_expanded[12,8]<-cellStats(Chen2018\_5v,stat="mean") | | Giovanni\_data\_expanded[13,2]<-cellStats(Cook2014\_LW,stat="mean") | | Giovanni\_data\_expanded[13,3]<-cellStats(Cook2014\_RP,stat="mean") | | Giovanni\_data\_expanded[13,4]<-cellStats(Cook2014\_SH,stat="mean") | | Giovanni\_data\_expanded[13,5]<-cellStats(Cook2014\_SM,stat="mean") | | Giovanni\_data\_expanded[13,6]<-cellStats(Cook2014\_SW,stat="mean") | | Giovanni\_data\_expanded[13,7]<-cellStats(Cook2014\_Ta,stat="mean") | | Giovanni\_data\_expanded[13,8]<-cellStats(Cook2014\_v,stat="mean") | | Giovanni\_data\_expanded[14,2]<-cellStats(Daniel2018\_LW,stat="mean") | | Giovanni\_data\_expanded[14,3]<-cellStats(Daniel2018\_RP,stat="mean") | | Giovanni\_data\_expanded[14,4]<-cellStats(Daniel2018\_SH,stat="mean") | | Giovanni\_data\_expanded[14,5]<-cellStats(Daniel2018\_SM,stat="mean") | | Giovanni\_data\_expanded[14,6]<-cellStats(Daniel2018\_SW,stat="mean") | | Giovanni\_data\_expanded[14,7]<-cellStats(Daniel2018\_Ta,stat="mean") | | Giovanni\_data\_expanded[14,8]<-cellStats(Daniel2018\_v,stat="mean") | | Giovanni\_data\_expanded[15,2]<-cellStats(Geerts2006\_LW,stat="mean") | | Giovanni\_data\_expanded[15,3]<-cellStats(Geerts2006\_RP,stat="mean") | | Giovanni\_data\_expanded[15,4]<-cellStats(Geerts2006\_SH,stat="mean") | | Giovanni\_data\_expanded[15,5]<-cellStats(Geerts2006\_SM,stat="mean") | | Giovanni\_data\_expanded[15,6]<-cellStats(Geerts2006\_SW,stat="mean") | | Giovanni\_data\_expanded[15,7]<-cellStats(Geerts2006\_Ta,stat="mean") | | Giovanni\_data\_expanded[15,8]<-cellStats(Geerts2006\_v,stat="mean") | | Giovanni\_data\_expanded[16,2]<-cellStats(Grossman\_Clarke2010\_1LW,stat="mean") | | Giovanni\_data\_expanded[16,3]<-cellStats(Grossman\_Clarke2010\_1RP,stat="mean") | | Giovanni\_data\_expanded[16,4]<-cellStats(Grossman\_Clarke2010\_1SH,stat="mean") | | Giovanni\_data\_expanded[16,5]<-cellStats(Grossman\_Clarke2010\_1SM,stat="mean") | | Giovanni\_data\_expanded[16,6]<-cellStats(Grossman\_Clarke2010\_1SW,stat="mean") | | Giovanni\_data\_expanded[16,7]<-cellStats(Grossman\_Clarke2010\_1Ta,stat="mean") | | Giovanni\_data\_expanded[16,8]<-cellStats(Grossman\_Clarke2010\_1v,stat="mean") | | Giovanni\_data\_expanded[17,2]<-cellStats(Grossman\_Clarke2010\_2LW,stat="mean") | | Giovanni\_data\_expanded[17,3]<-cellStats(Grossman\_Clarke2010\_2RP,stat="mean") | | Giovanni\_data\_expanded[17,4]<-cellStats(Grossman\_Clarke2010\_2SH,stat="mean") | | Giovanni\_data\_expanded[17,5]<-cellStats(Grossman\_Clarke2010\_2SM,stat="mean") | | Giovanni\_data\_expanded[17,6]<-cellStats(Grossman\_Clarke2010\_2SW,stat="mean") | | Giovanni\_data\_expanded[17,7]<-cellStats(Grossman\_Clarke2010\_2Ta,stat="mean") | | Giovanni\_data\_expanded[17,8]<-cellStats(Grossman\_Clarke2010\_2v,stat="mean") | | Giovanni\_data\_expanded[18,2]<-cellStats(Grossman\_Clarke2010\_3LW,stat="mean") | | Giovanni\_data\_expanded[18,3]<-cellStats(Grossman\_Clarke2010\_3RP,stat="mean") | | Giovanni\_data\_expanded[18,4]<-cellStats(Grossman\_Clarke2010\_3SH,stat="mean") | | Giovanni\_data\_expanded[18,5]<-cellStats(Grossman\_Clarke2010\_3SM,stat="mean") | | Giovanni\_data\_expanded[18,6]<-cellStats(Grossman\_Clarke2010\_3SW,stat="mean") | | Giovanni\_data\_expanded[18,7]<-cellStats(Grossman\_Clarke2010\_3Ta,stat="mean") | | Giovanni\_data\_expanded[18,8]<-cellStats(Grossman\_Clarke2010\_3v,stat="mean") | | Giovanni\_data\_expanded[19,2]<-cellStats(Hancock2015\_LW,stat="mean") | | Giovanni\_data\_expanded[19,3]<-cellStats(Hancock2015\_RP,stat="mean") | | Giovanni\_data\_expanded[19,4]<-cellStats(Hancock2015\_SH,stat="mean") | | Giovanni\_data\_expanded[19,5]<-cellStats(Hancock2015\_SM,stat="mean") | | Giovanni\_data\_expanded[19,6]<-cellStats(Hancock2015\_SW,stat="mean") | | Giovanni\_data\_expanded[19,7]<-cellStats(Hancock2015\_Ta,stat="mean") | | Giovanni\_data\_expanded[19,8]<-cellStats(Hancock2015\_v,stat="mean") | | Giovanni\_data\_expanded[20,2]<-cellStats(Harding2012\_1LW,stat="mean") | | Giovanni\_data\_expanded[20,3]<-cellStats(Harding2012\_1RP,stat="mean") | | Giovanni\_data\_expanded[20,4]<-cellStats(Harding2012\_1SH,stat="mean") | | Giovanni\_data\_expanded[20,5]<-cellStats(Harding2012\_1SM,stat="mean") | | Giovanni\_data\_expanded[20,6]<-cellStats(Harding2012\_1SW,stat="mean") | | Giovanni\_data\_expanded[20,7]<-cellStats(Harding2012\_1Ta,stat="mean") | | Giovanni\_data\_expanded[20,8]<-cellStats(Harding2012\_1v,stat="mean") | | Giovanni\_data\_expanded[21,2]<-cellStats(Harding2012\_2LW,stat="mean") | | Giovanni\_data\_expanded[21,3]<-cellStats(Harding2012\_2RP,stat="mean") | | Giovanni\_data\_expanded[21,4]<-cellStats(Harding2012\_2SH,stat="mean") | | Giovanni\_data\_expanded[21,5]<-cellStats(Harding2012\_2SM,stat="mean") | | Giovanni\_data\_expanded[21,6]<-cellStats(Harding2012\_2SW,stat="mean") | | Giovanni\_data\_expanded[21,7]<-cellStats(Harding2012\_2Ta,stat="mean") | | Giovanni\_data\_expanded[21,8]<-cellStats(Harding2012\_2v,stat="mean") | | Giovanni\_data\_expanded[22,2]<-cellStats(Harding2012\_3LW,stat="mean") | | Giovanni\_data\_expanded[22,3]<-cellStats(Harding2012\_3RP,stat="mean") | | Giovanni\_data\_expanded[22,4]<-cellStats(Harding2012\_3SH,stat="mean") | | Giovanni\_data\_expanded[22,5]<-cellStats(Harding2012\_3SM,stat="mean") | | Giovanni\_data\_expanded[22,6]<-cellStats(Harding2012\_3SW,stat="mean") | | Giovanni\_data\_expanded[22,7]<-cellStats(Harding2012\_3Ta,stat="mean") | | Giovanni\_data\_expanded[22,8]<-cellStats(Harding2012\_3v,stat="mean") | | Giovanni\_data\_expanded[23,2]<-cellStats(Harding2012\_4LW,stat="mean") | | Giovanni\_data\_expanded[23,3]<-cellStats(Harding2012\_4RP,stat="mean") | | Giovanni\_data\_expanded[23,4]<-cellStats(Harding2012\_4SH,stat="mean") | | Giovanni\_data\_expanded[23,5]<-cellStats(Harding2012\_4SM,stat="mean") | | Giovanni\_data\_expanded[23,6]<-cellStats(Harding2012\_4SW,stat="mean") | | Giovanni\_data\_expanded[23,7]<-cellStats(Harding2012\_4Ta,stat="mean") | | Giovanni\_data\_expanded[23,8]<-cellStats(Harding2012\_4v,stat="mean") | | Giovanni\_data\_expanded[24,2]<-cellStats(Harding2012\_5LW,stat="mean") | | Giovanni\_data\_expanded[24,3]<-cellStats(Harding2012\_5RP,stat="mean") | | Giovanni\_data\_expanded[24,4]<-cellStats(Harding2012\_5SH,stat="mean") | | Giovanni\_data\_expanded[24,5]<-cellStats(Harding2012\_5SM,stat="mean") | | Giovanni\_data\_expanded[24,6]<-cellStats(Harding2012\_5SW,stat="mean") | | Giovanni\_data\_expanded[24,7]<-cellStats(Harding2012\_5Ta,stat="mean") | | Giovanni\_data\_expanded[24,8]<-cellStats(Harding2012\_5v,stat="mean") | | Giovanni\_data\_expanded[25,2]<-cellStats(Harding2012\_6LW,stat="mean") | | Giovanni\_data\_expanded[25,3]<-cellStats(Harding2012\_6RP,stat="mean") | | Giovanni\_data\_expanded[25,4]<-cellStats(Harding2012\_6SH,stat="mean") | | Giovanni\_data\_expanded[25,5]<-cellStats(Harding2012\_6SM,stat="mean") | | Giovanni\_data\_expanded[25,6]<-cellStats(Harding2012\_6SW,stat="mean") | | Giovanni\_data\_expanded[25,7]<-cellStats(Harding2012\_6Ta,stat="mean") | | Giovanni\_data\_expanded[25,8]<-cellStats(Harding2012\_6v,stat="mean") | | Giovanni\_data\_expanded[26,2]<-cellStats(Harding2012\_7LW,stat="mean") | | Giovanni\_data\_expanded[26,3]<-cellStats(Harding2012\_7RP,stat="mean") | | Giovanni\_data\_expanded[26,4]<-cellStats(Harding2012\_7SH,stat="mean") | | Giovanni\_data\_expanded[26,5]<-cellStats(Harding2012\_7SM,stat="mean") | | Giovanni\_data\_expanded[26,6]<-cellStats(Harding2012\_7SW,stat="mean") | | Giovanni\_data\_expanded[26,7]<-cellStats(Harding2012\_7Ta,stat="mean") | | Giovanni\_data\_expanded[26,8]<-cellStats(Harding2012\_7v,stat="mean") | | Giovanni\_data\_expanded[27,2]<-cellStats(Harding2012\_8LW,stat="mean") | | Giovanni\_data\_expanded[27,3]<-cellStats(Harding2012\_8RP,stat="mean") | | Giovanni\_data\_expanded[27,4]<-cellStats(Harding2012\_8SH,stat="mean") | | Giovanni\_data\_expanded[27,5]<-cellStats(Harding2012\_8SM,stat="mean") | | Giovanni\_data\_expanded[27,6]<-cellStats(Harding2012\_8SW,stat="mean") | | Giovanni\_data\_expanded[27,7]<-cellStats(Harding2012\_8Ta,stat="mean") | | Giovanni\_data\_expanded[27,8]<-cellStats(Harding2012\_8v,stat="mean") | | Giovanni\_data\_expanded[28,2]<-cellStats(Harding2012\_9LW,stat="mean") | | Giovanni\_data\_expanded[28,3]<-cellStats(Harding2012\_9RP,stat="mean") | | Giovanni\_data\_expanded[28,4]<-cellStats(Harding2012\_9SH,stat="mean") | | Giovanni\_data\_expanded[28,5]<-cellStats(Harding2012\_9SM,stat="mean") | | Giovanni\_data\_expanded[28,6]<-cellStats(Harding2012\_9SW,stat="mean") | | Giovanni\_data\_expanded[28,7]<-cellStats(Harding2012\_9Ta,stat="mean") | | Giovanni\_data\_expanded[28,8]<-cellStats(Harding2012\_9v,stat="mean") | | Giovanni\_data\_expanded[29,2]<-cellStats(Huber2014\_LW,stat="mean") | | Giovanni\_data\_expanded[29,3]<-cellStats(Huber2014\_RP,stat="mean") | | Giovanni\_data\_expanded[29,4]<-cellStats(Huber2014\_SH,stat="mean") | | Giovanni\_data\_expanded[29,5]<-cellStats(Huber2014\_SM,stat="mean") | | Giovanni\_data\_expanded[29,6]<-cellStats(Huber2014\_SW,stat="mean") | | Giovanni\_data\_expanded[29,7]<-cellStats(Huber2014\_Ta,stat="mean") | | Giovanni\_data\_expanded[29,8]<-cellStats(Huber2014\_v,stat="mean") | | Giovanni\_data\_expanded[30,2]<-cellStats(Iglesias2002\_1LW,stat="mean") | | Giovanni\_data\_expanded[30,3]<-cellStats(Iglesias2002\_1RP,stat="mean") | | Giovanni\_data\_expanded[30,4]<-cellStats(Iglesias2002\_1SH,stat="mean") | | Giovanni\_data\_expanded[30,5]<-cellStats(Iglesias2002\_1SM,stat="mean") | | Giovanni\_data\_expanded[30,6]<-cellStats(Iglesias2002\_1SW,stat="mean") | | Giovanni\_data\_expanded[30,7]<-cellStats(Iglesias2002\_1Ta,stat="mean") | | Giovanni\_data\_expanded[30,8]<-cellStats(Iglesias2002\_1v,stat="mean") | | Giovanni\_data\_expanded[31,2]<-cellStats(Iglesias2002\_2LW,stat="mean") | | Giovanni\_data\_expanded[31,3]<-cellStats(Iglesias2002\_2RP,stat="mean") | | Giovanni\_data\_expanded[31,4]<-cellStats(Iglesias2002\_2SH,stat="mean") | | Giovanni\_data\_expanded[31,5]<-cellStats(Iglesias2002\_2SM,stat="mean") | | Giovanni\_data\_expanded[31,6]<-cellStats(Iglesias2002\_2SW,stat="mean") | | Giovanni\_data\_expanded[31,7]<-cellStats(Iglesias2002\_2Ta,stat="mean") | | Giovanni\_data\_expanded[31,8]<-cellStats(Iglesias2002\_2v,stat="mean") | | Giovanni\_data\_expanded[32,2]<-cellStats(Iglesias2005\_1LW,stat="mean") | | Giovanni\_data\_expanded[32,3]<-cellStats(Iglesias2005\_1RP,stat="mean") | | Giovanni\_data\_expanded[32,4]<-cellStats(Iglesias2005\_1SH,stat="mean") | | Giovanni\_data\_expanded[32,5]<-cellStats(Iglesias2005\_1SM,stat="mean") | | Giovanni\_data\_expanded[32,6]<-cellStats(Iglesias2005\_1SW,stat="mean") | | Giovanni\_data\_expanded[32,7]<-cellStats(Iglesias2005\_1Ta,stat="mean") | | Giovanni\_data\_expanded[32,8]<-cellStats(Iglesias2005\_1v,stat="mean") | | Giovanni\_data\_expanded[33,2]<-cellStats(Iglesias2005\_2LW,stat="mean") | | Giovanni\_data\_expanded[33,3]<-cellStats(Iglesias2005\_2RP,stat="mean") | | Giovanni\_data\_expanded[33,4]<-cellStats(Iglesias2005\_2SH,stat="mean") | | Giovanni\_data\_expanded[33,5]<-cellStats(Iglesias2005\_2SM,stat="mean") | | Giovanni\_data\_expanded[33,6]<-cellStats(Iglesias2005\_2SW,stat="mean") | | Giovanni\_data\_expanded[33,7]<-cellStats(Iglesias2005\_2Ta,stat="mean") | | Giovanni\_data\_expanded[33,8]<-cellStats(Iglesias2005\_2v,stat="mean") | | Giovanni\_data\_expanded[34,2]<-cellStats(Kanamaru2008\_LW,stat="mean") | | Giovanni\_data\_expanded[34,3]<-cellStats(Kanamaru2008\_RP,stat="mean") | | Giovanni\_data\_expanded[34,4]<-cellStats(Kanamaru2008\_SH,stat="mean") | | Giovanni\_data\_expanded[34,5]<-cellStats(Kanamaru2008\_SM,stat="mean") | | Giovanni\_data\_expanded[34,6]<-cellStats(Kanamaru2008\_SW,stat="mean") | | Giovanni\_data\_expanded[34,7]<-cellStats(Kanamaru2008\_Ta,stat="mean") | | Giovanni\_data\_expanded[34,8]<-cellStats(Kanamaru2008\_v,stat="mean") | | Giovanni\_data\_expanded[35,2]<-cellStats(Kohl1974\_LW,stat="mean") | | Giovanni\_data\_expanded[35,3]<-cellStats(Kohl1974\_RP,stat="mean") | | Giovanni\_data\_expanded[35,4]<-cellStats(Kohl1974\_SH,stat="mean") | | Giovanni\_data\_expanded[35,5]<-cellStats(Kohl1974\_SM,stat="mean") | | Giovanni\_data\_expanded[35,6]<-cellStats(Kohl1974\_SW,stat="mean") | | Giovanni\_data\_expanded[35,7]<-cellStats(Kohl1974\_Ta,stat="mean") | | Giovanni\_data\_expanded[35,8]<-cellStats(Kohl1974\_v,stat="mean") | | Giovanni\_data\_expanded[36,2]<-cellStats(Lakatos2010\_LW,stat="mean") | | Giovanni\_data\_expanded[36,3]<-cellStats(Lakatos2010\_RP,stat="mean") | | Giovanni\_data\_expanded[36,4]<-cellStats(Lakatos2010\_SH,stat="mean") | | Giovanni\_data\_expanded[36,5]<-cellStats(Lakatos2010\_SM,stat="mean") | | Giovanni\_data\_expanded[36,6]<-cellStats(Lakatos2010\_SW,stat="mean") | | Giovanni\_data\_expanded[36,7]<-cellStats(Lakatos2010\_Ta,stat="mean") | | Giovanni\_data\_expanded[36,8]<-cellStats(Lakatos2010\_v,stat="mean") | | Giovanni\_data\_expanded[37,2]<-cellStats(Lakatos2012\_LW,stat="mean") | | Giovanni\_data\_expanded[37,3]<-cellStats(Lakatos2012\_RP,stat="mean") | | Giovanni\_data\_expanded[37,4]<-cellStats(Lakatos2012\_SH,stat="mean") | | Giovanni\_data\_expanded[37,5]<-cellStats(Lakatos2012\_SM,stat="mean") | | Giovanni\_data\_expanded[37,6]<-cellStats(Lakatos2012\_SW,stat="mean") | | Giovanni\_data\_expanded[37,7]<-cellStats(Lakatos2012\_Ta,stat="mean") | | Giovanni\_data\_expanded[37,8]<-cellStats(Lakatos2012\_v,stat="mean") | | Giovanni\_data\_expanded[38,2]<-cellStats(Nainanayake2004\_1LW,stat="mean") | | Giovanni\_data\_expanded[38,3]<-cellStats(Nainanayake2004\_1RP,stat="mean") | | Giovanni\_data\_expanded[38,4]<-cellStats(Nainanayake2004\_1SH,stat="mean") | | Giovanni\_data\_expanded[38,5]<-cellStats(Nainanayake2004\_1SM,stat="mean") | | Giovanni\_data\_expanded[38,6]<-cellStats(Nainanayake2004\_1SW,stat="mean") | | Giovanni\_data\_expanded[38,7]<-cellStats(Nainanayake2004\_1Ta,stat="mean") | | Giovanni\_data\_expanded[38,8]<-cellStats(Nainanayake2004\_1v,stat="mean") | | Giovanni\_data\_expanded[39,2]<-cellStats(Nainanayake2004\_2LW,stat="mean") | | Giovanni\_data\_expanded[39,3]<-cellStats(Nainanayake2004\_2RP,stat="mean") | | Giovanni\_data\_expanded[39,4]<-cellStats(Nainanayake2004\_2SH,stat="mean") | | Giovanni\_data\_expanded[39,5]<-cellStats(Nainanayake2004\_2SM,stat="mean") | | Giovanni\_data\_expanded[39,6]<-cellStats(Nainanayake2004\_2SW,stat="mean") | | Giovanni\_data\_expanded[39,7]<-cellStats(Nainanayake2004\_2Ta,stat="mean") | | Giovanni\_data\_expanded[39,8]<-cellStats(Nainanayake2004\_2v,stat="mean") | | Giovanni\_data\_expanded[40,2]<-cellStats(Nainanayake2004\_3LW,stat="mean") | | Giovanni\_data\_expanded[40,3]<-cellStats(Nainanayake2004\_3RP,stat="mean") | | Giovanni\_data\_expanded[40,4]<-cellStats(Nainanayake2004\_3SH,stat="mean") | | Giovanni\_data\_expanded[40,5]<-cellStats(Nainanayake2004\_3SM,stat="mean") | | Giovanni\_data\_expanded[40,6]<-cellStats(Nainanayake2004\_3SW,stat="mean") | | Giovanni\_data\_expanded[40,7]<-cellStats(Nainanayake2004\_3Ta,stat="mean") | | Giovanni\_data\_expanded[40,8]<-cellStats(Nainanayake2004\_3v,stat="mean") | | Giovanni\_data\_expanded[41,2]<-cellStats(Puma2010\_LW,stat="mean") | | Giovanni\_data\_expanded[41,3]<-cellStats(Puma2010\_RP,stat="mean") | | Giovanni\_data\_expanded[41,4]<-cellStats(Puma2010\_SH,stat="mean") | | Giovanni\_data\_expanded[41,5]<-cellStats(Puma2010\_SM,stat="mean") | | Giovanni\_data\_expanded[41,6]<-cellStats(Puma2010\_SW,stat="mean") | | Giovanni\_data\_expanded[41,7]<-cellStats(Puma2010\_Ta,stat="mean") | | Giovanni\_data\_expanded[41,8]<-cellStats(Puma2010\_v,stat="mean") | | Giovanni\_data\_expanded[42,2]<-cellStats(Sacks2009\_LW,stat="mean") | | Giovanni\_data\_expanded[42,3]<-cellStats(Sacks2009\_RP,stat="mean") | | Giovanni\_data\_expanded[42,4]<-cellStats(Sacks2009\_SH,stat="mean") | | Giovanni\_data\_expanded[42,5]<-cellStats(Sacks2009\_SM,stat="mean") | | Giovanni\_data\_expanded[42,6]<-cellStats(Sacks2009\_SW,stat="mean") | | Giovanni\_data\_expanded[42,7]<-cellStats(Sacks2009\_Ta,stat="mean") | | Giovanni\_data\_expanded[42,8]<-cellStats(Sacks2009\_v,stat="mean") | | Giovanni\_data\_expanded[43,2]<-cellStats(Sorooshian2011\_LW,stat="mean") | | Giovanni\_data\_expanded[43,3]<-cellStats(Sorooshian2011\_RP,stat="mean") | | Giovanni\_data\_expanded[43,4]<-cellStats(Sorooshian2011\_SH,stat="mean") | | Giovanni\_data\_expanded[43,5]<-cellStats(Sorooshian2011\_SM,stat="mean") | | Giovanni\_data\_expanded[43,6]<-cellStats(Sorooshian2011\_SW,stat="mean") | | Giovanni\_data\_expanded[43,7]<-cellStats(Sorooshian2011\_Ta,stat="mean") | | Giovanni\_data\_expanded[43,8]<-cellStats(Sorooshian2011\_v,stat="mean") | | Giovanni\_data\_expanded[44,2]<-cellStats(Sugimoto2019\_LW,stat="mean") | | Giovanni\_data\_expanded[44,3]<-cellStats(Sugimoto2019\_RP,stat="mean") | | Giovanni\_data\_expanded[44,4]<-cellStats(Sugimoto2019\_SH,stat="mean") | | Giovanni\_data\_expanded[44,5]<-cellStats(Sugimoto2019\_SM,stat="mean") | | Giovanni\_data\_expanded[44,6]<-cellStats(Sugimoto2019\_SW,stat="mean") | | Giovanni\_data\_expanded[44,7]<-cellStats(Sugimoto2019\_Ta,stat="mean") | | Giovanni\_data\_expanded[44,8]<-cellStats(Sugimoto2019\_v,stat="mean") | | Giovanni\_data\_expanded[45,2]<-cellStats(Thiery2017\_LW,stat="mean") | | Giovanni\_data\_expanded[45,3]<-cellStats(Thiery2017\_RP,stat="mean") | | Giovanni\_data\_expanded[45,4]<-cellStats(Thiery2017\_SH,stat="mean") | | Giovanni\_data\_expanded[45,5]<-cellStats(Thiery2017\_SM,stat="mean") | | Giovanni\_data\_expanded[45,6]<-cellStats(Thiery2017\_SW,stat="mean") | | Giovanni\_data\_expanded[45,7]<-cellStats(Thiery2017\_Ta,stat="mean") | | Giovanni\_data\_expanded[45,8]<-cellStats(Thiery2017\_v,stat="mean") | | Giovanni\_data\_expanded[46,2]<-cellStats(Thompson1993\_LW,stat="mean") | | Giovanni\_data\_expanded[46,3]<-cellStats(Thompson1993\_RP,stat="mean") | | Giovanni\_data\_expanded[46,4]<-cellStats(Thompson1993\_SH,stat="mean") | | Giovanni\_data\_expanded[46,5]<-cellStats(Thompson1993\_SM,stat="mean") | | Giovanni\_data\_expanded[46,6]<-cellStats(Thompson1993\_SW,stat="mean") | | Giovanni\_data\_expanded[46,7]<-cellStats(Thompson1993\_Ta,stat="mean") | | Giovanni\_data\_expanded[46,8]<-cellStats(Thompson1993\_v,stat="mean") | | Giovanni\_data\_expanded[47,2]<-cellStats(Vahmani2016\_LW,stat="mean") | | Giovanni\_data\_expanded[47,3]<-cellStats(Vahmani2016\_RP,stat="mean") | | Giovanni\_data\_expanded[47,4]<-cellStats(Vahmani2016\_SH,stat="mean") | | Giovanni\_data\_expanded[47,5]<-cellStats(Vahmani2016\_SM,stat="mean") | | Giovanni\_data\_expanded[47,6]<-cellStats(Vahmani2016\_SW,stat="mean") | | Giovanni\_data\_expanded[47,7]<-cellStats(Vahmani2016\_Ta,stat="mean") | | Giovanni\_data\_expanded[47,8]<-cellStats(Vahmani2016\_v,stat="mean") | | Giovanni\_data\_expanded[48,2]<-cellStats(Wen2012\_LW,stat="mean") | | Giovanni\_data\_expanded[48,3]<-cellStats(Wen2012\_RP,stat="mean") | | Giovanni\_data\_expanded[48,4]<-cellStats(Wen2012\_SH,stat="mean") | | Giovanni\_data\_expanded[48,5]<-cellStats(Wen2012\_SM,stat="mean") | | Giovanni\_data\_expanded[48,6]<-cellStats(Wen2012\_SW,stat="mean") | | Giovanni\_data\_expanded[48,7]<-cellStats(Wen2012\_Ta,stat="mean") | | Giovanni\_data\_expanded[48,8]<-cellStats(Wen2012\_v,stat="mean") | | Giovanni\_data\_expanded[49,2]<-cellStats(Yang2015\_LW,stat="mean") | | Giovanni\_data\_expanded[49,3]<-cellStats(Yang2015\_RP,stat="mean") | | Giovanni\_data\_expanded[49,4]<-cellStats(Yang2015\_SH,stat="mean") | | Giovanni\_data\_expanded[49,5]<-cellStats(Yang2015\_SM,stat="mean") | | Giovanni\_data\_expanded[49,6]<-cellStats(Yang2015\_SW,stat="mean") | | Giovanni\_data\_expanded[49,7]<-cellStats(Yang2015\_Ta,stat="mean") | | Giovanni\_data\_expanded[49,8]<-cellStats(Yang2015\_v,stat="mean") | | Giovanni\_data\_expanded[50,2]<-cellStats(Yang2016\_LW,stat="mean") | | Giovanni\_data\_expanded[50,3]<-cellStats(Yang2016\_RP,stat="mean") | | Giovanni\_data\_expanded[50,4]<-cellStats(Yang2016\_SH,stat="mean") | | Giovanni\_data\_expanded[50,5]<-cellStats(Yang2016\_SM,stat="mean") | | Giovanni\_data\_expanded[50,6]<-cellStats(Yang2016\_SW,stat="mean") | | Giovanni\_data\_expanded[50,7]<-cellStats(Yang2016\_Ta,stat="mean") | | Giovanni\_data\_expanded[50,8]<-cellStats(Yang2016\_v,stat="mean") | | Giovanni\_data\_expanded[51,2]<-cellStats(Yang2017\_1LW,stat="mean") | | Giovanni\_data\_expanded[51,3]<-cellStats(Yang2017\_1RP,stat="mean") | | Giovanni\_data\_expanded[51,4]<-cellStats(Yang2017\_1SH,stat="mean") | | Giovanni\_data\_expanded[51,5]<-cellStats(Yang2017\_1SM,stat="mean") | | Giovanni\_data\_expanded[51,6]<-cellStats(Yang2017\_1SW,stat="mean") | | Giovanni\_data\_expanded[51,7]<-cellStats(Yang2017\_1Ta,stat="mean") | | Giovanni\_data\_expanded[51,8]<-cellStats(Yang2017\_1v,stat="mean") | | Giovanni\_data\_expanded[52,2]<-cellStats(Yang2017\_2LW,stat="mean") | | Giovanni\_data\_expanded[52,3]<-cellStats(Yang2017\_2RP,stat="mean") | | Giovanni\_data\_expanded[52,4]<-cellStats(Yang2017\_2SH,stat="mean") | | Giovanni\_data\_expanded[52,5]<-cellStats(Yang2017\_2SM,stat="mean") | | Giovanni\_data\_expanded[52,6]<-cellStats(Yang2017\_2SW,stat="mean") | | Giovanni\_data\_expanded[52,7]<-cellStats(Yang2017\_2Ta,stat="mean") | | Giovanni\_data\_expanded[52,8]<-cellStats(Yang2017\_2v,stat="mean") | | Giovanni\_data\_expanded[53,2]<-cellStats(Yang2017\_3LW,stat="mean") | | Giovanni\_data\_expanded[53,3]<-cellStats(Yang2017\_3RP,stat="mean") | | Giovanni\_data\_expanded[53,4]<-cellStats(Yang2017\_3SH,stat="mean") | | Giovanni\_data\_expanded[53,5]<-cellStats(Yang2017\_3SM,stat="mean") | | Giovanni\_data\_expanded[53,6]<-cellStats(Yang2017\_3SW,stat="mean") | | Giovanni\_data\_expanded[53,7]<-cellStats(Yang2017\_3Ta,stat="mean") | | Giovanni\_data\_expanded[53,8]<-cellStats(Yang2017\_3v,stat="mean") | | Giovanni\_data\_expanded[54,2]<-cellStats(Yang2017\_4LW,stat="mean") | | Giovanni\_data\_expanded[54,3]<-cellStats(Yang2017\_4RP,stat="mean") | | Giovanni\_data\_expanded[54,4]<-cellStats(Yang2017\_4SH,stat="mean") | | Giovanni\_data\_expanded[54,5]<-cellStats(Yang2017\_4SM,stat="mean") | | Giovanni\_data\_expanded[54,6]<-cellStats(Yang2017\_4SW,stat="mean") | | Giovanni\_data\_expanded[54,7]<-cellStats(Yang2017\_4Ta,stat="mean") | | Giovanni\_data\_expanded[54,8]<-cellStats(Yang2017\_4v,stat="mean") | | Giovanni\_data\_expanded[55,2]<-cellStats(Zou2014\_LW,stat="mean") | | Giovanni\_data\_expanded[55,3]<-cellStats(Zou2014\_RP,stat="mean") | | Giovanni\_data\_expanded[55,4]<-cellStats(Zou2014\_SH,stat="mean") | | Giovanni\_data\_expanded[55,5]<-cellStats(Zou2014\_SM,stat="mean") | | Giovanni\_data\_expanded[55,6]<-cellStats(Zou2014\_SW,stat="mean") | | Giovanni\_data\_expanded[55,7]<-cellStats(Zou2014\_Ta,stat="mean") | | Giovanni\_data\_expanded[55,8]<-cellStats(Zou2014\_v,stat="mean") | | Giovanni\_data\_expanded[56,2]<-cellStats(Chen2017.2\_LW,stat="mean") | | Giovanni\_data\_expanded[56,3]<-cellStats(Chen2017.2\_RP,stat="mean") | | Giovanni\_data\_expanded[56,4]<-cellStats(Chen2017.2\_SH,stat="mean") | | Giovanni\_data\_expanded[56,5]<-cellStats(Chen2017.2\_SM,stat="mean") | | Giovanni\_data\_expanded[56,6]<-cellStats(Chen2017.2\_SW,stat="mean") | | Giovanni\_data\_expanded[56,7]<-cellStats(Chen2017.2\_Ta,stat="mean") | | Giovanni\_data\_expanded[56,8]<-cellStats(Chen2017.2\_v,stat="mean") | | Giovanni\_data\_expanded[57,2]<-cellStats(Chen2017.3\_LW,stat="mean") | | Giovanni\_data\_expanded[57,3]<-cellStats(Chen2017.3\_RP,stat="mean") | | Giovanni\_data\_expanded[57,4]<-cellStats(Chen2017.3\_SH,stat="mean") | | Giovanni\_data\_expanded[57,5]<-cellStats(Chen2017.3\_SM,stat="mean") | | Giovanni\_data\_expanded[57,6]<-cellStats(Chen2017.3\_SW,stat="mean") | | Giovanni\_data\_expanded[57,7]<-cellStats(Chen2017.3\_Ta,stat="mean") | | Giovanni\_data\_expanded[57,8]<-cellStats(Chen2017.3\_v,stat="mean") | | Giovanni\_data\_expanded[58,2]<-cellStats(Huber2014.2\_LW,stat="mean") | | Giovanni\_data\_expanded[58,3]<-cellStats(Huber2014.2\_RP,stat="mean") | | Giovanni\_data\_expanded[58,4]<-cellStats(Huber2014.2\_SH,stat="mean") | | Giovanni\_data\_expanded[58,5]<-cellStats(Huber2014.2\_SM,stat="mean") | | Giovanni\_data\_expanded[58,6]<-cellStats(Huber2014.2\_SW,stat="mean") | | Giovanni\_data\_expanded[58,7]<-cellStats(Huber2014.2\_Ta,stat="mean") | | Giovanni\_data\_expanded[58,8]<-cellStats(Huber2014.2\_v,stat="mean") | | Giovanni\_data\_expanded[59,2]<-cellStats(Valmassoi2020\_LW,stat="mean") | | Giovanni\_data\_expanded[59,3]<-cellStats(Valmassoi2020\_RP,stat="mean") | | Giovanni\_data\_expanded[59,4]<-cellStats(Valmassoi2020\_SH,stat="mean") | | Giovanni\_data\_expanded[59,5]<-cellStats(Valmassoi2020\_SM,stat="mean") | | Giovanni\_data\_expanded[59,6]<-cellStats(Valmassoi2020\_SW,stat="mean") | | Giovanni\_data\_expanded[59,7]<-cellStats(Valmassoi2020\_Ta,stat="mean") | | Giovanni\_data\_expanded[59,8]<-cellStats(Valmassoi2020\_v,stat="mean") |   #Check whether the data look normal  summary(Giovanni\_data\_expanded[,2])  summary(Giovanni\_data\_expanded[,3])  summary(Giovanni\_data\_expanded[,4])  summary(Giovanni\_data\_expanded[,5])  summary(Giovanni\_data\_expanded[,6])  summary(Giovanni\_data\_expanded[,7])  summary(Giovanni\_data\_expanded[,8])  #Aggreate expanded data frame to main data frame  Giovanni\_data<-as.data.frame(aggregate(cbind(LWnet,RP,SH,SM,SWnet,Ta,v)~Citation,data=Giovanni\_data\_expanded,FUN=mean))  #Sum LWnet and SWnet to get Qnet  Giovanni\_data[,ncol(Giovanni\_data)+1]<-Giovanni\_data$LWnet+Giovanni\_data$SWnet  colnames(Giovanni\_data)[ncol(Giovanni\_data)]<-"Qnet"  #Copy a data frame and use data reported in papers to replace Giovanni data  #Giovanni\_data\_replaced<-Giovanni\_data  #Giovanni\_data\_replaced$SH[c(10,18,32)]<-c(8.06,4.41,7.31)  #Giovanni\_data\_replaced$Ta[c(4,7,10,17,19,20,25,28,30,32)]<-c(31.38,23.587,25.4,23.92,12.72,10.27,29,18.84,24.83,26.76)  #Giovanni\_data\_replaced$v[c(18)]<-c(3.7)  #Combine cooling data with background climate and other data  Giovanni\_data[,(ncol(Giovanni\_data)+1):(ncol(Giovanni\_data)+3)]<-IC1\_raw\_sorted[,12:14] Giovanni\_data<-cbind(Giovanni\_data,IC1\_raw\_sorted[,1:11]) rownames(Giovanni\_data)<-1:37 |

# #Regression

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| #Exclude studies  #Giovanni\_data\_excluded <-Giovanni\_data[-c(19,20,8,22,23,26,14,25,27,33,28),] Giovanni\_data\_excluded <-Giovanni\_data[-c(3,5,10,11,13,18,19,21,22,23,24,25,26,28:31,16),]  Giovanni\_data\_excluded$RP\_monthly<-Giovanni\_data\_excluded$RP\*24\*60\*60\*30  #Check available samples  Giovanni\_data\_excluded$Citation[!is.na(Giovanni\_data\_excluded$delta\_Tmean)==TRUE]  #Check colinearity  cor(Giovanni\_data\_excluded[,c(3:5,7:9)])  lm\_Tmean\_weather<- lm(delta\_Tmean~Ta+SH+v+Qnet+RP,data=Giovanni\_data\_excluded)  summary(lm\_Tmean\_weather)  lm\_Tmean\_weather\_step<-step(lm\_Tmean\_weather,direction="both",trace=F)  summary(lm\_Tmean\_weather\_step)  lm\_Tmean\_irri<- lm(delta\_Tmean~ irri\_rate,data=Giovanni\_data\_excluded)  summary(lm\_Tmean\_irri)  lm\_Tmean\_weather\_irri<- lm(delta\_Tmean~Ta+SH+v+Qnet+RP+irri\_rate,data=Giovanni\_data\_excluded)  summary(lm\_Tmean\_weather\_irri)  lm\_Tmean\_weather\_irri\_step<-step(lm\_Tmean\_weather\_irri,direction="both",trace=F)  summary(lm\_Tmean\_weather\_irri\_step)  plot(Giovanni\_data\_excluded$Ta,Giovanni\_data\_excluded$delta\_Tmean,xlab="Ta (oC)",ylab="delta Tmean (oC)",xlim=c(280,310))  abline(h=0)  text(Giovanni\_data\_excluded$Ta,Giovanni\_data\_excluded$delta\_Tmean,labels=rownames(Giovanni\_data\_excluded),adj=c(-0.5,0))  plot(Giovanni\_data\_excluded$SH,Giovanni\_data\_excluded$delta\_Tmean,xlab="Specific humidity (g/kg)",ylab="delta Tmean (oC)",xlim=c(0,0.02))  abline(h=0)  text(Giovanni\_data\_excluded$SH,Giovanni\_data\_excluded$delta\_Tmean,labels=rownames(Giovanni\_data\_excluded),adj=c(-0.5,0))  plot(Giovanni\_data\_excluded$v,Giovanni\_data\_excluded$delta\_Tmean,xlab="Wind speed (m/s)",ylab="delta Tmean (oC)")  abline(h=0)  text(Giovanni\_data\_excluded$v,Giovanni\_data\_excluded$delta\_Tmean,labels=rownames(Giovanni\_data\_excluded),adj=c(-0.5,0))  plot(Giovanni\_data\_excluded$Qnet,Giovanni\_data\_excluded$delta\_Tmean,xlab="Net radiation (W/m2)",ylab="delta Tmean (oC)",xlim=c(50,250))  abline(h=0)  text(Giovanni\_data\_excluded$Qnet,Giovanni\_data\_excluded$delta\_Tmean,labels=rownames(Giovanni\_data\_excluded),adj=c(-1,0))  plot(Giovanni\_data\_excluded$RP\_monthly,Giovanni\_data\_excluded$delta\_Tmean,xlab="Rainfall (mm/month)",ylab="delta Tmean (oC)",xlim=c(0,200))  abline(h=0)  text(Giovanni\_data\_excluded$RP\_monthly,Giovanni\_data\_excluded$delta\_Tmean,labels=rownames(Giovanni\_data\_excluded),adj=c(-1,0))  plot(Giovanni\_data\_excluded$SM,Giovanni\_data\_excluded$delta\_Tmean,xlab="Soil moisture (0-10 cm) (kg/m^2)",ylab="delta Tmean (oC)",xlim=c(0,40))  abline(h=0)  text(Giovanni\_data\_excluded$SM,Giovanni\_data\_excluded$delta\_Tmean,labels=rownames(Giovanni\_data\_excluded),adj=c(-1,0))  plot(Giovanni\_data\_excluded$irri\_rate,Giovanni\_data\_excluded$delta\_Tmean,xlab="Daily irrigation rate (mm)",ylab="delta Tmean (oC)",xlim=c(0,45))  abline(h=0)  text(Giovanni\_data\_excluded$irri\_rate,Giovanni\_data\_excluded$delta\_Tmean,labels=rownames(Giovanni\_data\_excluded),adj=c(-0.5,0))  lm\_Ttransmax\_weather<- lm(delta\_Ttransmax~Ta+SH+v+Qnet+RP,data=Giovanni\_data\_excluded)  summary(lm\_Ttransmax\_weather)  lm\_Ttransmax\_weather\_step<-step(lm\_Ttransmax\_weather,direction="both",trace=F)  summary(lm\_Ttransmax\_weather\_step)  plot(Giovanni\_data\_excluded$Ta,Giovanni\_data\_excluded$delta\_Ttransmax,xlab="Ta (oC)",ylab="delta Ttransmax (oC)",ylim=c(-11,1))  abline(h=0)  text(Giovanni\_data\_excluded$Ta,Giovanni\_data\_excluded$delta\_Ttransmax,labels=rownames(Giovanni\_data\_excluded),adj=c(-0.5,0))  plot(Giovanni\_data\_excluded$SH,Giovanni\_data\_excluded$delta\_Ttransmax,xlab="Specific humidity (g/kg)",ylab="delta Ttransmax (oC)" ,ylim=c(-11,1))  abline(h=0)  text(Giovanni\_data\_excluded$SH,Giovanni\_data\_excluded$delta\_Ttransmax,labels=rownames(Giovanni\_data\_excluded),adj=c(-0.5,0))  plot(Giovanni\_data\_excluded$v,Giovanni\_data\_excluded$delta\_Ttransmax,xlab="Wind speed (m/s)",ylab="delta Ttransmax (oC)" ,ylim=c(-11,1))  abline(h=0)  text(Giovanni\_data\_excluded$v,Giovanni\_data\_excluded$delta\_Ttransmax,labels=rownames(Giovanni\_data\_excluded),adj=c(-0.5,0))  plot(Giovanni\_data\_excluded$Qnet,Giovanni\_data\_excluded$delta\_Ttransmax,xlab="Net radiation (W/m2)",ylab="delta Ttransmax (oC)",ylim=c(-11,1))  abline(h=0)  text(Giovanni\_data\_excluded$Qnet,Giovanni\_data\_excluded$delta\_Ttransmax,labels=rownames(Giovanni\_data\_excluded),adj=c(-2,0))  plot(Giovanni\_data\_excluded$RP,Giovanni\_data\_excluded$delta\_Transmax,xlab="Rainfall (mm/day)",ylab="delta Transmax (oC)" ,ylim=c(-11,1))  abline(h=0)  text(Giovanni\_data\_excluded$RP,Giovanni\_data\_excluded$delta\_Transmax,labels=rownames(Giovanni\_data\_excluded),adj=c(-2,0))  plot(Giovanni\_data\_excluded$SM,Giovanni\_data\_excluded$delta\_Transmax,xlab="Soil moisture (0-10 cm) (kg/m^2)",ylab="delta Transmax (oC)" ,ylim=c(-11,1))  abline(h=0)  text(Giovanni\_data\_excluded$SM,Giovanni\_data\_excluded$delta\_Transmax,labels=rownames(Giovanni\_data\_excluded),adj=c(-2,0))  library(relaimpo)  relaimpo\_Tmean\_weather\_step<-calc.relimp(lm\_Tmean\_weather\_step)  relaimpo\_Tmean\_weather\_step  relaimpo\_Tmean\_weather\_irri\_step <-calc.relimp(lm\_Tmean\_weather\_irri\_step)  relaimpo\_Tmean\_weather\_irri\_step  relaimpo\_Ttransmax\_weather\_step <-calc.relimp(lm\_Ttransmax\_weather\_step)  relaimpo\_Ttransmax\_weather\_step  #change specific humidity and air temperature units from kg/kg to g/kg and from K to oC, and rain precipitation from kg/m2/s to daily total  Giovanni\_data\_excluded\_scaled<- Giovanni\_data\_excluded  Giovanni\_data\_excluded\_scaled[,3]<-Giovanni\_data\_excluded[,3]\*60\*60\*24  Giovanni\_data\_excluded\_scaled[,4]<-Giovanni\_data\_excluded[,4]\*1000  Giovanni\_data\_excluded\_scaled[,7]<-Giovanni\_data\_excluded[,7]-273.15  write.csv(Giovanni\_data\_excluded\_scaled,"C:/Users/Cheung Pui Kwan/Desktop/temp/IC1\_data.csv")  #Export regression results  regression\_table<-data.frame(Variable=c("(Intercept)","Ta","Rainfall"),Unit=c("NA","oC","10 mm/month"),Estimate=999,SE=999,t=999,p=999,R2=999)  regression\_table[,3:6]<-coef(summary(lm\_Tmean\_weather\_step))  regression\_table[,7]<-c("NA",unname(relaimpo\_Tmean\_weather\_step$lmg))  regression\_table[3,3:4]<-regression\_table[3,3:4]\*10/(60\*60\*24\*30)  write.csv(regression\_table,"C:/Users/Cheung Pui Kwan/Desktop/temp/regression\_table.csv") |

# #Plot regression

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| --- |
| Giovanni\_data\_excluded$Climate\_broad<-substring(Giovanni\_data\_excluded$Climate.classification,1,1)  #Ta  par(bg="white",mfrow=c(1,1), mgp=c(2.5,0.5,0))  Giovanni\_data\_excluded$Ta\_degC<-Giovanni\_data\_excluded$Ta-273.15  plot(Giovanni\_data\_excluded$Ta\_degC[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="B"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="B"],pch=21,bg=rgb(1,0,0),xlab="",ylab="",las=1,cex=1.5,xlim=c(15,31),ylim=c(-3.5,1.5))  abline(h=0,lty=2)  mtext(side=1,"Near surface mean air temperature (\u00B0C)",font=2,line=1.5)  mtext(side=2,"Irrigation-induced change in mean air temperature (\u00B0C)",font=2,line=1.5,las=3)  points(Giovanni\_data\_excluded$Ta\_degC[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="B"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="B"],pch=24,bg=rgb(1,0,0),cex=1.5)  points(Giovanni\_data\_excluded$Ta\_degC[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="C"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="C"],pch=21,bg=rgb(1,1,0),cex=1.5)  points(Giovanni\_data\_excluded$Ta\_degC[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="C"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="C"],pch=24,bg=rgb(1,1,0),cex=1.5)  points(Giovanni\_data\_excluded$Ta\_degC[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="D"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="D"],pch=21,bg=rgb(1,0,1),cex=1.5)  points(Giovanni\_data\_excluded$Ta\_degC[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="D"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="D"],pch=24,bg=rgb(1,0,1),cex=1.5)  points(Giovanni\_data\_excluded$Ta\_degC[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="G"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="G"],pch=21,bg=1,cex=1.5)  points(Giovanni\_data\_excluded$Ta\_degC[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="G"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="G"],pch=24,bg=1,cex=1.5)  abline(lm(Giovanni\_data\_excluded$delta\_Tmean~Giovanni\_data\_excluded$Ta\_degC),col="black",lwd=2)  title("a",adj=0)  legend(20,1.4,legend=c("Modelling","Experimental"),pch=c(1,2),bty="n",cex=1.2)  legend(25.5,1.5,legend=c("B: Arid","C: Temperate","D: Continental"),pch=15,col=c(rgb(1,0,0),rgb(1,1,0),rgb(1,0,1)),bty="n",cex=1.2)  #95% CI  x<-Giovanni\_data\_excluded$Ta\_degC  lm\_Tmean\_Ta\_degC<-lm(Giovanni\_data\_excluded$delta\_Tmean~x)  newx<-seq(9,31)  prd<-predict(lm\_Tmean\_Ta\_degC,newdata=data.frame(x=newx),interval=c("confidence"),level=0.95,type="response")  lines(newx,prd[,2],lty=3)  lines(newx,prd[,3],lty=3)  #Qnet  plot(Giovanni\_data\_excluded$Qnet[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="B"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="B"],pch=21,bg=rgb(1,0,0),xlab="",ylab="",las=1,cex=1.5,xlim=c(70,170),ylim=c(-3.5,1.5))  abline(h=0,lty=2)  mtext(side=1, expression(bold("Study-period near surface mean net radiation (W/m"^"2"\*")")),font=2,line=1.5)  mtext(side=2,"Iirrigation-induced change in air temperature (\u00B0C)",font=2,line=1.5,las=3)  points(Giovanni\_data\_excluded$Qnet[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="B"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="B"],pch=24,bg=rgb(1,0,0),cex=1.5)  points(Giovanni\_data\_excluded$Qnet[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="C"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="C"],pch=21,bg=rgb(1,1,0),cex=1.5)  points(Giovanni\_data\_excluded$Qnet[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="C"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="C"],pch=24,bg=rgb(1,1,0),cex=1.5)  points(Giovanni\_data\_excluded$Qnet[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="D"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="D"],pch=21,bg=rgb(1,0,1),cex=1.5)  points(Giovanni\_data\_excluded$Qnet[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="D"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="D"],pch=24,bg=rgb(1,0,1),cex=1.5)  points(Giovanni\_data\_excluded$Qnet[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="G"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="G"], pch=21,bg=1,cex=1.5)  points(Giovanni\_data\_excluded$Qnet[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="G"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="G"],pch=24,bg=1,cex=1.5)  abline(lm(Giovanni\_data\_excluded$delta\_Tmean~Giovanni\_data\_excluded$Qnet),bg="black",lwd=2)  title("b",adj=0)  x<-Giovanni\_data\_excluded$Qnet  lm\_Tmean\_Qnet<-lm(Giovanni\_data\_excluded$delta\_Tmean~x)  newx<-seq(70,170)  prd<-predict(lm\_Tmean\_Qnet,newdata=data.frame(x=newx),interval=c("confidence"),level=0.95,type="response")  lines(newx,prd[,2],lty=3)  lines(newx,prd[,3],lty=3)  #RP  Giovanni\_data\_excluded$RP\_monthly<-Giovanni\_data\_excluded$RP\*24\*60\*60\*30  plot(Giovanni\_data\_excluded$RP\_monthly[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="B"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="B"],pch=21,bg=rgb(1,0,0),xlab="",ylab="",las=1,cex=1.5,xlim=c(0,150),ylim=c(-3.5,1.5))  abline(h=0,lty=2)  mtext(side=1, "Mean rainfall (mm/month)", font=2,line=1.5)  mtext(side=2,"Irrigation-induced change in mean air temperature (\u00B0C)",font=2,line=1.5,las=3)  points(Giovanni\_data\_excluded$RP\_monthly[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="B"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="B"],pch=24,bg=rgb(1,0,0),cex=1.5)  points(Giovanni\_data\_excluded$RP\_monthly[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="C"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="C"],pch=21,bg=rgb(1,1,0),cex=1.5)  points(Giovanni\_data\_excluded$RP\_monthly[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="C"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="C"],pch=24,bg=rgb(1,1,0),cex=1.5)  points(Giovanni\_data\_excluded$RP\_monthly[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="D"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="D"],pch=21,bg=rgb(1,0,1),cex=1.5)  points(Giovanni\_data\_excluded$RP\_monthly[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="D"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="D"],pch=24,bg=rgb(1,0,1),cex=1.5)  points(Giovanni\_data\_excluded$RP\_monthly[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="G"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Modelling"&Giovanni\_data\_excluded$Climate\_broad=="G"],pch=21,bg=1,cex=1.5)  points(Giovanni\_data\_excluded$RP\_monthly[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="G"],Giovanni\_data\_excluded$delta\_Tmean[Giovanni\_data\_excluded$Approach=="Experimental"&Giovanni\_data\_excluded$Climate\_broad=="G"],pch=24,bg=1,cex=1.5)  abline(lm(Giovanni\_data\_excluded$delta\_Tmean~Giovanni\_data\_excluded$RP\_monthly),col="black",lwd=2)  title("b",adj=0)  x<-Giovanni\_data\_excluded$RP\_monthly  lm\_Tmean\_RP\_monthly<-lm(Giovanni\_data\_excluded$delta\_Tmean~x)  newx<-seq(0,150)  prd<-predict(lm\_Tmean\_RP\_monthly,newdata=data.frame(x=newx),interval=c("confidence"),level=0.95,type="response")  lines(newx,prd[,2],lty=3)  lines(newx,prd[,3],lty=3) |

# #Map of cooling potential

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| --- |
| Global\_LW\_JJA<-raster("Global\_LWnet\_JJA.tif")  Global\_RP\_JJA<-raster("Global\_RP\_JJA.tif")  Global\_SH\_JJA<-raster("Global\_SH\_JJA.tif")  Global\_SM\_JJA<-raster("Global\_SM\_JJA.tif")  Global\_SW\_JJA<-raster("Global\_SWnet\_JJA.tif")  Global\_Ta\_JJA<-raster("Global\_Ta\_JJA.tif")  Global\_v\_JJA<-raster("Global\_v\_JJA.tif")  Global\_LW\_DJF<-raster("Global\_LWnet\_DJF.tif")  Global\_RP\_DJF<-raster("Global\_RP\_DJF.tif")  Global\_SH\_DJF<-raster("Global\_SH\_DJF.tif")  Global\_SM\_DJF<-raster("Global\_SM\_DJF.tif")  Global\_SW\_DJF<-raster("Global\_SWnet\_DJF.tif")  Global\_Ta\_DJF<-raster("Global\_Ta\_DJF.tif")  Global\_v\_DJF<-raster("Global\_v\_DJF.tif")  Global\_Qnet\_JJA<-Global\_LW\_JJA+Global\_SW\_JJA  Global\_Qnet\_DJF<-Global\_LW\_DJF+Global\_SW\_DJF  Global\_delta\_Tmean\_JJA<-(unname(lm\_Tmean\_weather\_step$coefficients[1])+  unname(lm\_Tmean\_weather\_step$coefficients[2])\*Global\_Ta\_JJA+    unname(lm\_Tmean\_weather\_step$coefficients[3])\*Global\_RP\_JJA  )  plot(Global\_delta\_Tmean\_JJA)  Global\_delta\_Tmean\_DJF<-(unname(lm\_Tmean\_weather\_step$coefficients[1])+  unname(lm\_Tmean\_weather\_step$coefficients[2])\*Global\_Ta\_DJF+    unname(lm\_Tmean\_weather\_step$coefficients[3])\*Global\_RP\_DJF  )  plot(Global\_delta\_Tmean\_DJF)  ##### #Crop delta\_Tmean by hemisphere and merge extent(Global\_delta\_Tmean\_DJF) Global\_delta\_Tmean\_DJF\_southern<-crop(Global\_delta\_Tmean\_DJF,extent(-180,180,-60,0)) extent(Global\_delta\_Tmean\_JJA) Global\_delta\_Tmean\_JJA\_northern<-crop(Global\_delta\_Tmean\_JJA,extent(-180,180,0,90))  Global\_delta\_Tmean\_JJA\_DJF<-merge(Global\_delta\_Tmean\_DJF\_southern,Global\_delta\_Tmean\_JJA\_northern)  #Create a full map  Global\_delta\_Tmean\_JJA\_DJF\_full<-Global\_delta\_Tmean\_JJA\_DJF #####  Global\_delta\_Tmean\_JJA<-(unname(lm\_Tmean\_weather\_step$coefficients[1])+  unname(lm\_Tmean\_weather\_step$coefficients[2])\*Global\_Ta\_JJA+    unname(lm\_Tmean\_weather\_step$coefficients[3])\*Global\_RP\_JJA  )  plot(Global\_delta\_Tmean\_JJA)  Global\_delta\_Tmean\_DJF<-(unname(lm\_Tmean\_weather\_step$coefficients[1])+  unname(lm\_Tmean\_weather\_step$coefficients[2])\*Global\_Ta\_DJF+    unname(lm\_Tmean\_weather\_step$coefficients[3])\*Global\_RP\_DJF  )  plot(Global\_delta\_Tmean\_DJF)  #Create raster world map for masking  Global\_delta\_Tmean\_JJA\_land<-Global\_delta\_Tmean\_JJA  Global\_delta\_Tmean\_JJA\_land[!is.na(Global\_delta\_Tmean\_JJA\_land)]<-999  Global\_delta\_Tmean\_JJA\_land  Global\_delta\_Tmean\_DJF\_land<-Global\_delta\_Tmean\_DJF  Global\_delta\_Tmean\_DJF\_land[!is.na(Global\_delta\_Tmean\_DJF\_land)]<-999  Global\_delta\_Tmean\_DJF\_land  #Exclude locations with Ta,v and RP outside the data range  #Global\_Ta\_JJA[Global\_Ta\_JJA>max(Giovanni\_data\_excluded$Ta)|Global\_Ta\_JJA<min(Giovanni\_data\_excluded$Ta)]<-NA  #Global\_v\_JJA[Global\_v\_JJA>max(Giovanni\_data\_excluded$v)|Global\_v\_JJA<min(Giovanni\_data\_excluded$v)]<-NA  #Global\_RP\_JJA[Global\_RP\_JJA>max(Giovanni\_data\_excluded$RP)|Global\_RP\_JJA<min(Giovanni\_data\_excluded$RP)]<-NA  #Global\_Ta\_DJF[Global\_Ta\_DJF>max(Giovanni\_data\_excluded$Ta)|Global\_Ta\_DJF<min(Giovanni\_data\_excluded$Ta)]<-NA  #Global\_v\_DJF[Global\_v\_DJF>max(Giovanni\_data\_excluded$v)|Global\_v\_DJF<min(Giovanni\_data\_excluded$v)]<-NA  #Global\_RP\_DJF[Global\_RP\_DJF>max(Giovanni\_data\_excluded$RP)|Global\_RP\_DJF<min(Giovanni\_data\_excluded$RP)]<-NA  Global\_delta\_Tmean\_JJA<-(unname(lm\_Tmean\_weather\_step$coefficients[1])+  unname(lm\_Tmean\_weather\_step$coefficients[2])\*Global\_Ta\_JJA+    unname(lm\_Tmean\_weather\_step$coefficients[3])\*Global\_RP\_JJA  )  plot(Global\_delta\_Tmean\_JJA)  Global\_delta\_Tmean\_DJF<-(unname(lm\_Tmean\_weather\_step$coefficients[1])+  unname(lm\_Tmean\_weather\_step$coefficients[2])\*Global\_Ta\_DJF+    unname(lm\_Tmean\_weather\_step$coefficients[3])\*Global\_RP\_DJF  )  plot(Global\_delta\_Tmean\_DJF) |

# #Import city data

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| #Input cities data  cities\_point<-readOGR("ne\_10m\_populated\_places.shp") |

# #Check whether the selected 100 cities are available in shapefile

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| --- |
| #Input the name of the 100 cities  cities\_100\_raw<-read.csv("Cities\_100\_raw.csv")  #Remove space  cities\_100\_raw[,1]<-trimws(cities\_100\_raw[,1],which="right")  cities\_100\_raw[,2]<-trimws(cities\_100\_raw[,2],which="right")  cities\_100\_raw[,3]<-trimws(cities\_100\_raw[,3],which="right")  cities\_100\_raw[,4]<-trimws(cities\_100\_raw[,4],which="right")  #Check availability  cities\_100\_raw$City\_availability<-999  i=1  while(i<101){  if(length(cities\_point$MIN\_AREAKM[cities\_point$NAME==cities\_100\_raw$City[i]])>0){  cities\_100\_raw$City\_availability[i]<-"Y"  cities\_100\_raw$City\_name\_in\_data[i]<-cities\_100\_raw$City[i]  } else {  cities\_100\_raw$City\_availability[i]<-"N"  }  i=i+1  }  #Check and save the name and row number of missing city  missing<-which(cities\_100\_raw$City\_availability=="N")  missing\_city<-cities\_100\_raw[which(cities\_100\_raw$City\_availability=="N"),1]  missing\_country<-cities\_100\_raw[which(cities\_100\_raw$City\_availability=="N"),2]  missing\_city  #Save city name of the data for missing cities  cities\_point$NAME[cities\_point$ADM0NAME==missing\_country[1]]  cities\_100\_raw$City\_name\_in\_data[missing[1]]<-cities\_point$NAME[cities\_point$ADM0NAME==missing\_country[1]][12]  cities\_point$NAME[cities\_point$ADM0NAME==missing\_country[2]]  cities\_100\_raw$City\_name\_in\_data[missing[2]]<-cities\_point$NAME[cities\_point$ADM0NAME==missing\_country[2]][247]  cities\_point$NAME[cities\_point$ADM0NAME==missing\_country[3]]  cities\_100\_raw$City\_name\_in\_data[missing[3]]<-cities\_point$NAME[cities\_point$ADM0NAME==missing\_country[3]][27]  #manual input of unknown city area  cities\_100\_raw$Radius.km.<-as.numeric(as.character(cities\_100\_raw$Radius.km.))  cities\_100\_raw$Area.km2.<-as.numeric(as.character(cities\_100\_raw$Area.km2.))  cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Cairns"]<-254.3  cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Davao"]<-129  cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Harstad"]<-11.15  cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Heihe"]<-2\*4  cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Islamabad"]<-220  cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Moroni"]<-30  cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Paramaribo"]<-182  cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Pasto"]<-26.4  cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Kiev"]<-762  cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Nukus"]<-222  cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Sivas"]<-7\*4  cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Suva"]<-10\*5  cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Tallinn"]<-159  cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Tel Aviv-Yafo"]<-577  cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Thimphu"]<-26.1  cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Washington, D.C."]<-5281  cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Turpan"]<-10\*10/2 cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Walvis Bay"]<-10\*4  cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="North Platte"]<-5\*5 #cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Devonport"]<-3\*3 cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Arusha"]<-10\*10 cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Nicosia"]<-111  #cities\_100\_raw$Area.km2.[cities\_100\_raw$City=="Las Palmas"]<-100.55  #Calculate radius  cities\_100\_raw$Radius.km.<-((cities\_100\_raw$Area.km2./pi)^0.5) |

# #Crop and mask raster by shapefile and calculate delta Tmean

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| #Note: crop function is used for cropping the extent of a raster (xmin, ymin, xmax, ymax)  #Note: mask function is used for masking the raster values outside the shapefile  #Note: the extent of the shapefile and the raster has to be the same to be able to use the mask function  #Example 1  test<-readOGR("wrreg\_lamb.shp")  plot(test)  summary(test)  test1<-crop(Sacks2009\_LW,test)  proj4string(Sacks2009\_LW)  test<-spTransform(test,proj4string(Sacks2009\_LW))  plot(Sacks2009\_LW)  plot(test,add=T)  test2<-mask(crop(Sacks2009\_LW,extent(test)),test)  plot(test2)  #Example 2  cities\_100\_point\_test<-subset(cities\_point,NAME==c("Hong Kong","Tokyo"))  cities\_100\_area\_test<-gBuffer(cities\_100\_point,byid=T,width=c(4,2))  cities\_100\_area\_test<-spTransform(cities\_100\_area,proj4string(Sacks2009\_LW))  plot(Sacks2009\_LW)  plot(cities\_100\_area\_test,add=T)  cities\_100\_area\_LW<-mask(crop(Sacks2009\_LW,extent(cities\_100\_area\_test)),cities\_100\_area\_test)  #Rectify the country name before subsetting using both city and country name  same\_name<-character(length = 100) i=1 while(i<101){  print(cities\_point$MAX\_AREAKM[cities\_point$NAME==cities\_100\_raw$City\_name\_in\_data[i]&cities\_point$ADM0NAME==cities\_100\_raw$Country\_Region[i]])  i=i+1  }  #Identify the row number by saving  i=1  while(i<101){ if(is.numeric(cities\_point$MAX\_AREAKM[cities\_point$NAME==cities\_100\_raw$City\_name\_in\_data[i]&cities\_point$ADM0NAME==cities\_100\_raw$Country\_Region[i]])){  same\_name[i]<-(cities\_point$MAX\_AREAKM[cities\_point$NAME==cities\_100\_raw$City\_name\_in\_data[i]&cities\_point$ADM0NAME==cities\_100\_raw$Country\_Region[i]])  }  else{same\_name[i]<-"NA"}  i=i+1  }  #Rectifying the country name  cities\_point$ADM0NAME[cities\_point$NAME=="Hong Kong"]  cities\_100\_raw$Country\_Region[cities\_100\_raw$City=="Hong Kong"]<-cities\_point$ADM0NAME[cities\_point$NAME=="Hong Kong"]  #Check again to see if using city and country name together can get one output of area for all 100 cities  i=1 while(i<101){  print(cities\_point$MAX\_AREAKM[cities\_point$NAME==cities\_100\_raw$City\_name\_in\_data[i]&cities\_point$ADM0NAME==cities\_100\_raw$Country\_Region[i]])  i=i+1  }  #Extract the 100 cities from the data  i=1  cities\_100\_point<-cities\_point[cities\_point$NAME==cities\_100\_raw$City\_name\_in\_data[i]&cities\_point$ADM0NAME==cities\_100\_raw$Country\_Region[i],]  i=2  while(i<101){  temp<-cities\_point[cities\_point$NAME==cities\_100\_raw$City\_name\_in\_data[i]&cities\_point$ADM0NAME==cities\_100\_raw$Country\_Region[i],]  cities\_100\_point<-rbind(cities\_100\_point,temp)  i=i+1  }  #Create a subset of cities point that have a dark background colour in the delta Tmean map cities\_100\_point\_white<-cities\_100\_point[cities\_100\_point$ADM0NAME==c("Iraq")|cities\_100\_point$ADM0NAME==c("Pakistan")|cities\_100\_point$ADM0NAME==c("Nepal")|cities\_100\_point$ADM0NAME==c("Saudi Arabia")|cities\_100\_point$ADM0NAME==c("United Arab Emirates")|cities\_100\_point$ADM0NAME==c("Qatar")|cities\_100\_point$ADM0NAME==c("India")|cities\_100\_point$ADM0NAME==c("Uzbekistan"),]  library(rgeos) #create buffer around 100 cities  cities\_100\_area<-gBuffer(cities\_100\_point,byid=T,width=cities\_100\_raw$Radius.km./100)  cities\_100\_area<-spTransform(cities\_100\_area,proj4string(Global\_delta\_Tmean\_JJA))  plot(Global\_delta\_Tmean\_JJA)  plot(cities\_100\_area,add=T)  #Use extract to get the delta\_Tmean and save in two columns  cities\_100\_raw$delta\_Tmean\_JJA<-as.vector(extract(Global\_delta\_Tmean\_JJA,cities\_100\_area,method="bilinear",na.rm=T,fun=mean,weights=T,normalizeWeights=F))  cities\_100\_raw$delta\_Tmean\_DJF<-as.vector(extract(Global\_delta\_Tmean\_DJF,cities\_100\_area,method="bilinear",na.rm=T,fun=mean,weights=T,normalizeWeights=F))  #Add a column to determine location (southern or northern hemisphere)  i=1  while(i<101){  if(cities\_point$LATITUDE[cities\_point$NAME==cities\_100\_raw$City\_name\_in\_data[i]&cities\_point$ADM0NAME==cities\_100\_raw$Country\_Region[i]]>0){  cities\_100\_raw$Hemisphere[i]<-"Northern"  }  else{  cities\_100\_raw$Hemisphere[i]<-"Southern"  }  i=i+1  }  #Add a column to save JJA or DJF delta\_Tmean depending on location  i=1  while(i<101){  if(cities\_100\_raw$Hemisphere[i]=="Northern"){  cities\_100\_raw$delta\_Tmean[i]<-cities\_100\_raw$delta\_Tmean\_JJA[i]  }  else{  cities\_100\_raw$delta\_Tmean[i]<-cities\_100\_raw$delta\_Tmean\_DJF[i]  }  i=i+1  }  #Set cells with cities\_100\_raw$delta\_Tmean=0 to NA because they were not covered in the data range  cities\_100\_raw$delta\_Tmean[cities\_100\_raw$delta\_Tmean==0]<-NA  #Add broad climate classification  cities\_100\_raw$Climate\_broad<-substring(cities\_100\_raw$Climate,1,1)  cities\_100\_raw$Climate\_broad[cities\_100\_raw$Climate\_broad=="A"]<-"A: Tropical"  cities\_100\_raw$Climate\_broad[cities\_100\_raw$Climate\_broad=="B"]<-"B: Arid"  cities\_100\_raw$Climate\_broad[cities\_100\_raw$Climate\_broad=="C"]<-"C: Temperate"  cities\_100\_raw$Climate\_broad[cities\_100\_raw$Climate\_broad=="D"]<-"D: Continental"  #Export to csv  write.csv(cities\_100\_raw,"C:/Users/Cheung Pui Kwan/Desktop/Temp/cities\_100\_delta\_Tmean.csv") |

# #Crop and merge hemispheres

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| --- |
| #Crop delta\_Tmean by hemisphere and merge extent(Global\_delta\_Tmean\_DJF) Global\_delta\_Tmean\_DJF\_southern<-crop(Global\_delta\_Tmean\_DJF,extent(-180,180,-60,0)) extent(Global\_delta\_Tmean\_JJA) Global\_delta\_Tmean\_JJA\_northern<-crop(Global\_delta\_Tmean\_JJA,extent(-180,180,0,90))  Global\_delta\_Tmean\_JJA\_DJF<-merge(Global\_delta\_Tmean\_DJF\_southern,Global\_delta\_Tmean\_JJA\_northern)  # Crop delta\_Tmean\_full by hemisphere and merge  Global\_delta\_Tmean\_JJA\_DJF\_full<-crop(Global\_delta\_Tmean\_JJA\_DJF\_full,extent(-180,180,-60,90))  #Crop delta\_Tmean\_land by hemisphere and merge extent(Global\_delta\_Tmean\_DJF\_land) Global\_delta\_Tmean\_DJF\_land\_southern<-crop(Global\_delta\_Tmean\_DJF\_land,extent(-180,180,-60,0)) extent(Global\_delta\_Tmean\_JJA\_land) Global\_delta\_Tmean\_JJA\_land\_northern<-crop(Global\_delta\_Tmean\_JJA\_land,extent(-180,180,0,90))  Global\_delta\_Tmean\_JJA\_DJF\_land<-merge(Global\_delta\_Tmean\_DJF\_land\_southern,Global\_delta\_Tmean\_JJA\_land\_northern)  #Crop Ta by hemisphere and merge extent(Global\_Ta\_DJF) Global\_Ta\_DJF\_southern<-crop(Global\_Ta\_DJF,extent(-180,180,-60,0)) extent(Global\_Ta\_JJA) Global\_Ta\_JJA\_northern<-crop(Global\_Ta\_JJA,extent(-180,180,0,90))  Global\_Ta\_JJA\_DJF<-merge(Global\_Ta\_DJF\_southern,Global\_Ta\_JJA\_northern)  #Apply necessary scale  Global\_Ta\_JJA\_DJF\_plot<- Global\_Ta\_JJA\_DJF-273.15  #Crop SH by hemisphere and merge extent(Global\_SH\_DJF) Global\_SH\_DJF\_southern<-crop(Global\_SH\_DJF,extent(-180,180,-60,0)) extent(Global\_SH\_JJA) Global\_SH\_JJA\_northern<-crop(Global\_SH\_JJA,extent(-180,180,0,90))  Global\_SH\_JJA\_DJF<-merge(Global\_SH\_DJF\_southern,Global\_SH\_JJA\_northern)  #Apply necessary scale  Global\_SH\_JJA\_DJF\_plot<- Global\_SH\_JJA\_DJF  #Crop v by hemisphere and merge extent(Global\_v\_DJF) Global\_v\_DJF\_southern<-crop(Global\_v\_DJF,extent(-180,180,-60,0)) extent(Global\_v\_JJA) Global\_v\_JJA\_northern<-crop(Global\_v\_JJA,extent(-180,180,0,90))  Global\_v\_JJA\_DJF<-merge(Global\_v\_DJF\_southern,Global\_v\_JJA\_northern)  #Apply necessary scale  Global\_v\_JJA\_DJF\_plot<- Global\_v\_JJA\_DJF  #Crop Qnet by hemisphere and merge extent(Global\_Qnet\_DJF) Global\_Qnet\_DJF\_southern<-crop(Global\_Qnet\_DJF,extent(-180,180,-60,0)) extent(Global\_Qnet\_JJA) Global\_Qnet\_JJA\_northern<-crop(Global\_Qnet\_JJA,extent(-180,180,0,90))  Global\_Qnet\_JJA\_DJF<-merge(Global\_Qnet\_DJF\_southern,Global\_Qnet\_JJA\_northern)  #Apply necessary scale  Global\_Qnet\_JJA\_DJF\_plot<- Global\_Qnet\_JJA\_DJF  #Crop RP by hemisphere and merge extent(Global\_RP\_DJF) Global\_RP\_DJF\_southern<-crop(Global\_RP\_DJF,extent(-180,180,-60,0)) extent(Global\_RP\_JJA) Global\_RP\_JJA\_northern<-crop(Global\_RP\_JJA,extent(-180,180,0,90))  Global\_RP\_JJA\_DJF<-merge(Global\_RP\_DJF\_southern,Global\_RP\_JJA\_northern)  #Apply necessary scale  Global\_RP\_JJA\_DJF\_plot<- Global\_RP\_JJA\_DJF\*60\*60\*24\*30  #Create grey-out areas  Global\_delta\_Tmean\_JJA\_DJF\_exclusion<-mask(Global\_delta\_Tmean\_JJA\_DJF\_land,Global\_delta\_Tmean\_JJA\_DJF,inverse=T)  plot(Global\_delta\_Tmean\_JJA\_DJF\_exclusion) |

# #Plot Koppen-Geiger

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| --- |
| library(fields)  Koppen\_Geiger<-raster("world\_koppen\_tif\_export.tif")  Koppen\_Geiger\_AE<-Koppen\_Geiger  Koppen\_Geiger\_AE[Koppen\_Geiger\_AE>3&Koppen\_Geiger\_AE<29]<-NA  plot(Koppen\_Geiger\_AE)  Koppen\_Geiger\_AE<-crop(Koppen\_Geiger\_AE,extent(-180,180,-60,90))  Koppen\_Geiger\_AE\_resampled<-resample(Koppen\_Geiger\_AE,Global\_delta\_Tmean\_JJA\_DJF\_full)  Koppen\_Geiger\_AE\_resampled[Koppen\_Geiger\_AE\_resampled>0]<-999  Koppen\_Geiger\_AE\_poly<-rasterToPolygons(Koppen\_Geiger\_AE\_resampled,dissolve=T,na.rm=T) plot(Koppen\_Geiger\_AE\_poly,density=10)  #Create a separte legend  barplot(c(1,1,1,1),legend.text=c("Tropical","Arid","Temperate","Continental"),col=c(rgb(0,0,255/255),rgb(255/255,0,0),rgb(255/255,255/255,0),rgb(255/255,0,255/255)),args.legend = list(bty = "n", x = "top", ncol = 4,cex=1.5,pt.lwd=2),ylim=c(0,2)) |

# #Global delta Tmean map

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| --- |
| #Set a colour ramp  Red3White1Blue6<-c("#0000CC","#0000FF","#CCCCFF","#3333FF","#6666FF","#9999FF","#FFFFFF","#FFCCCC","#FF9999","#FF6666")  #Import country boundary  country\_boundary<-readOGR("ne\_50m\_admin\_0\_countries\_lakes.shp")  country\_boundary<-crop(country\_boundary,extent(-180,180,-60,80))  #Exclude Greenland because of abnormal soil moisture level  #greenland\_area<-readOGR("GRL\_adm0.shp")  #Global\_delta\_Tmean\_JJA\_DJF\_noGreenland<-mask(Global\_delta\_Tmean\_JJA\_DJF,greenland\_area,inverse=T,col="grey")  #plot(Global\_delta\_Tmean\_JJA\_DJF\_noGreenland)  #apply necessary scale  Global\_delta\_Tmean\_JJA\_DJF\_plot<-Global\_delta\_Tmean\_JJA\_DJF  #Check value range  Global\_delta\_Tmean\_JJA\_DJF\_plot  minV<-minValue(Global\_delta\_Tmean\_JJA\_DJF\_plot)  maxV<-maxValue(Global\_delta\_Tmean\_JJA\_DJF\_plot)  #Check required colour numbers  length(c(round(minV,digits=1),seq(-2.5,1,0.5),round(maxV,digits=1)))  #Set colour ramps  #blues<-colorRampPalette(c(rev(brewer.pal(9,"Blues"),#abd9e9)))  #reds<-colorRampPalette(c(brewer.pal(9,"Reds")))  #blues\_col<-rev(c("#e0f3f8", "#abd9e9", "#74add1", "#4575b4")) #4 blues  #reds\_col<-c("#ffffbf", "#fee090", "#fdae61", "#f46d43", "#d73027", "#a50026") #6 reds  reds\_col<-c("#ffffbf", "#fdae61", "#d73027")  #Plot (delta\_Tmean,J JA+DJF), save in Rstudio, grey out out-of-range data  library(fields)  par(mgp=c(1.5,0.3,0),mar=c(3.1, 4.1, 3.1, 2.1),las=1)  image.plot(Global\_delta\_Tmean\_JJA\_DJF\_plot,ylim=c(-60,80),zlim=c(minV,maxV),xlab="",ylab="",nlevel=9,col=c(rev(brewer.pal(6,"Blues")),reds\_col),legend.shrink=1,legend.width=1.3,horizontal=T,tck=0,axes=F,axis.args=list(tck=0,mgp=c(3,0.25,0)),breaks=c(minV,seq(-2.5,1,0.5),maxV),lab.breaks=c(round(minV,digits=1),seq(-2.5,1,0.5),round(maxV,digits=1)-0.1))  axis(side=1,at=c(-120,-60,0,60,120),labels=c("-120","-60","0","60","120"),tck=0.02)  axis(side=2,at=c(-60,-30,0,30,60),labels = c("-60","-30","0","30","60"),tck=0.02)  mtext(side=1,line=5.6,"Estimated irrigation-induced change in mean air temperature (\u00B0C)",font=2)  mtext(side=1,line=1.3,"Longitude (degree)",font=2)  mtext(side=2,line=1.3,"Laditude (degree)",font=2,las=3)  box()  plot(Global\_delta\_Tmean\_JJA\_DJF\_exclusion,add=T,col="grey90",axes=F,legend=F)  plot(country\_boundary,add=T,border="grey70",ylim=c(-60,80))  #plot(cities\_100\_point,add=T,pch=4,cex=1.2)  axis(side=3,at=c(-120,-60,0,60,120),labels=c("","","","",""),tck=0.02)  axis(side=4,at=c(-60,-30,0,30,60),labels=c("","","","",""),tck=0.02,pos=180)  abline(h=0,col="white",lwd=1)  abline(h=0.5)  abline(h=-0.5)  text("JJA",x=-170,y=5,font=2)  text("DJF",x=-170,y=-5,font=2)  legend(-170,-35,legend=c("No data"),pch=c(22),pt.bg="grey90",bty="n",pt.cex=1.6,cex=1.2)  #Mask the tropical and polar  Global\_delta\_Tmean\_JJA\_DJF\_excludeAE<-mask(Global\_delta\_Tmean\_JJA\_DJF\_full,Koppen\_Geiger\_AE\_resampled, inverse=T)  plot(Global\_delta\_Tmean\_JJA\_DJF\_excludeAE)  #apply necessary scale  Global\_delta\_Tmean\_JJA\_DJF\_excludeAE\_plot<-Global\_delta\_Tmean\_JJA\_DJF\_excludeAE  #Check value range  Global\_delta\_Tmean\_JJA\_DJF\_excludeAE\_plot  minV<-minValue(Global\_delta\_Tmean\_JJA\_DJF\_excludeAE\_plot)  maxV<-maxValue(Global\_delta\_Tmean\_JJA\_DJF\_excludeAE\_plot)  #Check required colour numbers  length(c(round(minV,digits=1),seq(-2.5,3,0.5),round(maxV,digits=1)))  c(round(minV,digits=1),seq(-2.5,3,0.5),round(maxV,digits=1))  #Set colour ramps  blues<-colorRampPalette(c(rev(brewer.pal(9,"Blues"))))  reds<-colorRampPalette(c(brewer.pal(9,"Reds")))  #blues\_col<-rev(c("#e0f3f8", "#abd9e9", "#74add1", "#4575b4")) #4 blues  #reds\_col5<-c("#ffffbf", "#fee090", "#fdae61", "#f46d43", "#d73027")#5 reds #reds\_col4<-c("#ffffbf", "#fee090", "#fdae61", "#f46d43")#4 reds  #reds\_col<-c("#ffffbf", "#fdae61", "#d73027")  #Plot (delta\_Tmean,J JA+DJF) save in Rstudio, grey out tropical and polar  library(fields)  par(mgp=c(1.5,0.3,0),mar=c(3.1, 4.1, 3.1, 2.1),las=1)  image.plot(Global\_delta\_Tmean\_JJA\_DJF\_excludeAE,ylim=c(-60,80),zlim=c(minV,maxV),xlab="",ylab="" ,col=c("#053061",rev(brewer.pal(11,"RdYlBu"))),legend.shrink=1,legend.width=1.3,horizontal=T,tck=0,axes=F,axis.args=list(tck=0,mgp=c(3,0.25,0)),breaks=c(seq(-3,3,0.5)),lab.breaks=c(seq(-3,2.5,0.5),">3"))  axis(side=1,at=c(-120,-60,0,60,120),labels=c("-120","-60","0","60","120"),tck=0.02)  axis(side=2,at=c(-60,-30,0,30,60),labels = c("-60","-30","0","30","60"),tck=0.02)  mtext(side=1,line=5.6,"Estimated irrigation-induced change in mean air temperature (\u00B0C)",font=2)  mtext(side=1,line=1.3,"Longitude (degree)",font=2)  mtext(side=2,line=1.3,"Laditude (degree)",font=2,las=3)  box()  plot(country\_boundary,add=T,border="grey70",ylim=c(-60,80))  plot(Koppen\_Geiger\_AE\_poly,col="grey90", border="grey70",add=T,axes=F,lwd=0.5)  #plot(Koppen\_Geiger\_AE\_poly,density=10,angle=45,border="grey70",add=T,axes=F,lwd=0.5)  #plot(Koppen\_Geiger\_AE\_poly,density=10,angle=135,border="grey70",add=T,axes=F,lwd=0.5)  plot(cities\_100\_point,add=T,pch=4,cex=1)  plot(cities\_100\_point\_white,add=T,pch=4,cex=1,col="white")  axis(side=3,at=c(-120,-60,0,60,120),labels=c("","","","",""),tck=0.02)  axis(side=4,at=c(-60,-30,0,30,60),labels=c("","","","",""),tck=0.02,pos=180)  abline(h=0,col="white",lwd=1)  abline(h=0.5)  abline(h=-0.5)  text("JJA",x=-170,y=5,font=2)  text("DJF",x=-170,y=-5,font=2)  legend(-170,-35,legend=c("No data"),pch=c(22),pt.bg="grey90",bty="n",pt.cex=1.6,cex=1.2)  #legend(-170,-35,legend=c(""),pch=c(7),pt.bg="grey90",bty="n",pt.cex=1.6,cex=1.2)  legend(-170,-25,legend=c("City"),pch=c(4),pt.bg=c("black"),bty="n",pt.cex=c(1),cex=1.1) |

# #Global Ta map

|  |
| --- |
| #Mask the tropical and polar  Global\_Ta\_JJA\_DJF\_excludeAE<-mask(Global\_Ta\_JJA\_DJF\_plot,Koppen\_Geiger\_AE\_resampled, inverse=T)  plot(Global\_Ta\_JJA\_DJF\_excludeAE)  #apply necessary scale  Global\_Ta\_JJA\_DJF\_excludeAE\_plot<-Global\_Ta\_JJA\_DJF\_excludeAE  #Check value range  Global\_Ta\_JJA\_DJF\_excludeAE\_plot  minV<-minValue(Global\_Ta\_JJA\_DJF\_excludeAE\_plot)  maxV<-maxValue(Global\_Ta\_JJA\_DJF\_excludeAE\_plot)  #Check required colour numbers  length(c(round(minV,digits=1),seq(0,35,5),round(maxV,digits=1)))  (c(round(minV,digits=1),seq(0,35,5),round(maxV,digits=1)))  #Set colour  yellow\_red<-colorRampPalette(brewer.pal(9,"YlOrRd"))  #blues\_col<-rev(c("#e0f3f8", "#abd9e9", "#74add1"))  #Plot (Ta), save in Rstudio  library(RColorBrewer)  library(fields)  par(mgp=c(1.5,0.3,0),mar=c(3.1, 4.1, 3.1, 2.1),las=1)  image.plot(Global\_Ta\_JJA\_DJF\_excludeAE\_plot,ylim=c(-60,80),zlim=c(minV,maxV),xlab="",ylab="",col=c(yellow\_red(8)),legend.shrink=1,legend.width=1.3,horizontal=T,tck=0,axes=F,axis.args=list(tck=0,mgp=c(3,0.25,0)),breaks=c(seq(0,40,5)),lab.breaks=c(seq(0,40,5)))  axis(side=1,at=c(-120,-60,0,60,120),labels=c("-120","-60","0","60","120"),tck=0.02)  axis(side=2,at=c(-60,-30,0,30,60),labels = c("-60","-30","0","30","60"),tck=0.02)  mtext(side=1,line=5.6,"Near surface mean air temperature (\u00B0C)",font=2)  mtext(side=1,line=1.3,"Longitude (degree)",font=2)  mtext(side=2,line=1.3,"Laditude (degree)",font=2,las=3)  box() plot(country\_boundary,add=T,border="grey70",ylim=c(-60,80))  #plot(Global\_delta\_Tmean\_JJA\_DJF\_exclusion,add=T,col="grey90",axes=F,legend=F) plot(Koppen\_Geiger\_AE\_poly,col="grey90", border="grey70",add=T,axes=F,lwd=0.5) #plot(Koppen\_Geiger\_AE\_poly,density=10,angle=45,border="grey70",add=T,axes=F,lwd=0.5)  #plot(Koppen\_Geiger\_AE\_poly,density=10,angle=135,border="grey70",add=T,axes=F,lwd=0.5)  #plot(cities\_100\_point,add=T,pch=4,cex=1.2)  axis(side=3,at=c(-120,-60,0,60,120),labels=c("","","","",""),tck=0.02)  axis(side=4,at=c(-60,-30,0,30,60),labels=c("","","","",""),tck=0.02,pos=180)  abline(h=0,col="white",lwd=1)  abline(h=0.5)  abline(h=-0.5)  text("JJA",x=-170,y=5,font=2)  text("DJF",x=-170,y=-5,font=2)  legend(-170,-35,legend=c("No data"),pch=c(22),pt.bg="grey90",bty="n",pt.cex=1.6,cex=1.2)  title("a",adj=0) |

# #Global v map

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| --- |
| #Mask the tropical and polar  Global\_v\_JJA\_DJF\_excludeAE<-mask(Global\_v\_JJA\_DJF\_plot,Koppen\_Geiger\_AE\_resampled, inverse=T)  plot(Global\_v\_JJA\_DJF\_excludeAE)  #apply necessary scale  Global\_v\_JJA\_DJF\_excludeAE\_plot<-Global\_v\_JJA\_DJF\_excludeAE  #Check value range  Global\_v\_JJA\_DJF\_excludeAE\_plot  minV<-minValue(Global\_v\_JJA\_DJF\_excludeAE\_plot)  maxV<-maxValue(Global\_v\_JJA\_DJF\_excludeAE\_plot)  #Check required colour numbers  length(c(round(minV,digits=1),seq(1,11,2),round(maxV,digits=1)))  (c(round(minV,digits=1),seq(1,11,2),round(maxV,digits=1)))  #Set colour  Greens<-colorRampPalette(brewer.pal(9,"Greens"))  #Plot (v), save in Rstudio  library(RColorBrewer)  library(fields)  par(mgp=c(1.5,0.3,0),mar=c(3.1, 4.1, 3.1, 2.1),las=1)  image.plot(Global\_v\_JJA\_DJF\_excludeAE\_plot,ylim=c(-60,80),zlim=c(minV,maxV),xlab="",ylab="",col=c(Greens(7)),legend.shrink=1,legend.width=1.3,horizontal=T,tck=0,axes=F,axis.args=list(tck=0,mgp=c(3,0.25,0)),breaks=c(minV,seq(1,11,2),maxV),lab.breaks=c(round(minV,digits=1),seq(1,11,2),round(maxV,digits=1)))  axis(side=1,at=c(-120,-60,0,60,120),labels=c("-120","-60","0","60","120"),tck=0.02)  axis(side=2,at=c(-60,-30,0,30,60),labels = c("-60","-30","0","30","60"),tck=0.02)  mtext(side=1,line=5.6,"Near surface mean wind speed (m/s)",font=2)  mtext(side=1,line=1.3,"Longitude (degree)",font=2)  mtext(side=2,line=1.3,"Laditude (degree)",font=2,las=3)  box()  #plot(Global\_delta\_Tmean\_JJA\_DJF\_exclusion,add=T,col="grey90",axes=F,legend=F)  plot(Koppen\_Geiger\_AE\_poly,density=10,angle=45,border="grey70",add=T,axes=F,lwd=0.5)  plot(Koppen\_Geiger\_AE\_poly,density=10,angle=135,border="grey70",add=T,axes=F,lwd=0.5)  plot(country\_boundary,add=T,border="grey70",ylim=c(-60,80))  #plot(cities\_100\_point,add=T,pch=4,cex=1.2)  axis(side=3,at=c(-120,-60,0,60,120),labels=c("","","","",""),tck=0.02)  axis(side=4,at=c(-60,-30,0,30,60),labels=c("","","","",""),tck=0.02,pos=180)  abline(h=0,col="white",lwd=1)  abline(h=0.5)  abline(h=-0.5)  text("JJA",x=-170,y=5,font=2)  text("DJF",x=-170,y=-5,font=2)  legend(-170,-35,legend=c("No data"),pch=c(7),bty="n",pt.cex=1.6,cex=1.2)  title("b",adj=0) |

# #Global RP map

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| #Mask the tropical and polar  Global\_RP\_JJA\_DJF\_excludeAE<-mask(Global\_RP\_JJA\_DJF\_plot,Koppen\_Geiger\_AE\_resampled, inverse=T)  plot(Global\_RP\_JJA\_DJF\_excludeAE)  #apply necessary scale  Global\_RP\_JJA\_DJF\_excludeAE\_plot<-Global\_RP\_JJA\_DJF\_excludeAE  #Check value range  Global\_RP\_JJA\_DJF\_excludeAE\_plot  minV<-minValue(Global\_RP\_JJA\_DJF\_excludeAE\_plot)  maxV<-maxValue(Global\_RP\_JJA\_DJF\_excludeAE\_plot)  #Check required colour numbers  length(c(round(minV,digits=1),seq(50,400,50),round(maxV,digits=1)))  (c(round(minV,digits=1),seq(50,400,50),round(maxV,digits=1)))  #Set colour  blues<-colorRampPalette(brewer.pal(9,"Blues"))  #Plot (RP), save in Rstudio  library(RColorBrewer)  library(fields)  par(mgp=c(1.5,0.3,0),mar=c(3.1, 4.1, 3.1, 2.1),las=1)  image.plot(Global\_RP\_JJA\_DJF\_excludeAE\_plot,ylim=c(-60,80),zlim=c(minV,maxV),xlab="",ylab="",col=c(blues(9)),legend.shrink=1,legend.width=1.3,horizontal=T,tck=0,axes=F,axis.args=list(tck=0,mgp=c(3,0.25,0)),breaks=c(seq(0,450,50)),lab.breaks=c(seq(0,450,50)))  axis(side=1,at=c(-120,-60,0,60,120),labels=c("-120","-60","0","60","120"),tck=0.02)  axis(side=2,at=c(-60,-30,0,30,60),labels = c("-60","-30","0","30","60"),tck=0.02)  mtext(side=1,line=5.6,"Mean rainfall (mm/month)",font=2)  mtext(side=1,line=1.3,"Longitude (degree)",font=2)  mtext(side=2,line=1.3,"Laditude (degree)",font=2,las=3)  box() plot(country\_boundary,add=T,border="grey70",ylim=c(-60,80))  #plot(Global\_delta\_Tmean\_JJA\_DJF\_exclusion,add=T,col="grey90",axes=F,legend=F) plot(Koppen\_Geiger\_AE\_poly,col="grey90", border="grey70",add=T,axes=F,lwd=0.5) #plot(Koppen\_Geiger\_AE\_poly,density=10,angle=45,border="grey70",add=T,axes=F,lwd=0.5)  #plot(Koppen\_Geiger\_AE\_poly,density=10,angle=135,border="grey70",add=T,axes=F,lwd=0.5)  #plot(cities\_100\_point,add=T,pch=4,cex=1.2)  axis(side=3,at=c(-120,-60,0,60,120),labels=c("","","","",""),tck=0.02)  axis(side=4,at=c(-60,-30,0,30,60),labels=c("","","","",""),tck=0.02,pos=180)  abline(h=0,col="white",lwd=1)  abline(h=0.5)  abline(h=-0.5)  text("JJA",x=-170,y=5,font=2)  text("DJF",x=-170,y=-5,font=2)  legend(-170,-35,legend=c("No data"),pch=c(22),pt.bg="grey90",bty="n",pt.cex=1.6,cex=1.2)  title("b",adj=0) |

# #Area irrigated as percentage of area equipped for irrigation

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| irri\_map<-raster("gmia\_v5\_aai\_pct\_aei.asc")  par(mgp=c(1.5,0.3,0),mar=c(3.1, 4.1, 3.1, 2.1),las=1)  image.plot(irri\_map,ylim=c(-60,80),zlim=c(0,100),xlab="",ylab="",col=c(Greens(10)),legend.shrink=1,legend.width=1.3,horizontal=T,tck=0,axes=F,axis.args=list(tck=0,mgp=c(3,0.25,0)),breaks=c(seq(0,100,10)),lab.breaks=c(seq(0,100,10)))  axis(side=1,at=c(-120,-60,0,60,120),labels=c("-120","-60","0","60","120"),tck=0.02)  axis(side=2,at=c(-60,-30,0,30,60),labels = c("-60","-30","0","30","60"),tck=0.02)  mtext(side=1,line=5.6,"Irrigated area expressed as area equipped for irrigation (%)",font=2)  mtext(side=1,line=1.3,"Longitude (degree)",font=2)  mtext(side=2,line=1.3,"Laditude (degree)",font=2,las=3)  box()  plot(country\_boundary,add=T,border="grey70",ylim=c(-60,80))  axis(side=3,at=c(-120,-60,0,60,120),labels=c("","","","",""),tck=0.02)  axis(side=4,at=c(-60,-30,0,30,60),labels=c("","","","",""),tck=0.02,pos=180) |

# XX#Global Qnet map

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| #Check value range  Global\_Qnet\_JJA\_DJF\_plot  minV<-minValue(Global\_Qnet\_JJA\_DJF\_plot)  maxV<-maxValue(Global\_Qnet\_JJA\_DJF\_plot)  #Check required colour numbers  length(c(round(minV,digits=1),seq(85,145,20),round(maxV,digits=1)))  #Set colour purples<-colorRampPalette(brewer.pal(9,"Purples"))  #Plot (Qnet), save in Rstudio  library(RColorBrewer)  library(fields)  par(mgp=c(1.5,0.3,0),mar=c(3.1, 4.1, 3.1, 2.1),las=1)  image.plot(Global\_Qnet\_JJA\_DJF\_plot,ylim=c(-60,80),zlim=c(minV,maxV),xlab="",ylab="",nlevel=5,col=c(purples(5)),legend.shrink=1,legend.width=1.3,horizontal=T,tck=0,axes=F,axis.args=list(tck=0,mgp=c(3,0.25,0)),breaks=c(minV,seq(85,145,20),maxV),lab.breaks=c(round(minV,digits=1),seq(85,145,20),round(maxV,digits=1)))  axis(side=1,at=c(-120,-60,0,60,120),labels=c("-120","-60","0","60","120"),tck=0.02)  axis(side=2,at=c(-60,-30,0,30,60),labels = c("-60","-30","0","30","60"),tck=0.02)  mtext(side=1,line=5.9,expression(bold("Near surface mean net radiation (W/m"^"2"\*")",font=2)))  mtext(side=1,line=1.3,"Longitude (degree)",font=2)  mtext(side=2,line=1.3,"Laditude (degree)",font=2,las=3)  box()  #plot(Global\_delta\_Tmean\_JJA\_DJF\_exclusion,add=T,col="grey90",axes=F,legend=F) plot(Koppen\_Geiger\_AE\_resampled,add=T,col="grey90",axes=F,legend=F)  plot(country\_boundary,add=T,border="grey70",ylim=c(-60,80))  #plot(cities\_100\_point,add=T,pch=4,cex=1.2)  axis(side=3,at=c(-120,-60,0,60,120),labels=c("","","","",""),tck=0.02)  axis(side=4,at=c(-60,-30,0,30,60),labels=c("","","","",""),tck=0.02,pos=180)  abline(h=0,col="white",lwd=1)  abline(h=0.5)  abline(h=-0.5)  text("JJA",x=-170,y=5,font=2)  text("DJF",x=-170,y=-5,font=2)  legend(-170,-35,legend=c("No data"),pch=c(22),pt.bg="grey90",bty="n",pt.cex=1.6,cex=1.2)  title("b",adj=0) |

# XX#Global RP map

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| #Check value range  Global\_RP\_JJA\_DJF\_plot  minV<-minValue(Global\_RP\_JJA\_DJF\_plot)  maxV<-maxValue(Global\_RP\_JJA\_DJF\_plot)  #Check required colour numbers  length(c(round(minV,digits=1),seq(25,125,25),round(maxV,digits=1)))  #Set colour  blues<-colorRampPalette(brewer.pal(9,"Blues"))  #Plot (RP), save in Rstudio  library(RColorBrewer)  library(fields)  par(mgp=c(1.5,0.3,0),mar=c(3.1, 4.1, 3.1, 2.1),las=1)  image.plot(Global\_RP\_JJA\_DJF\_plot,ylim=c(-60,80),zlim=c(minV,maxV),xlab="",ylab="",nlevel=5,col=c(blues(6)),legend.shrink=1,legend.width=1.3,horizontal=T,tck=0,axes=F,axis.args=list(tck=0,mgp=c(3,0.25,0)),breaks=c(minV,seq(25,125,25),maxV),lab.breaks=c(round(minV,digits=1),seq(25,125,25),round(maxV,digits=1)))  axis(side=1,at=c(-120,-60,0,60,120),labels=c("-120","-60","0","60","120"),tck=0.02)  axis(side=2,at=c(-60,-30,0,30,60),labels = c("-60","-30","0","30","60"),tck=0.02)  mtext(side=1,line=5.5, "Mean rainfall (mm/month)",font=2)  mtext(side=1,line=1.3,"Longitude (degree)",font=2)  mtext(side=2,line=1.3,"Laditude (degree)",font=2,las=3)  box()  #plot(Global\_delta\_Tmean\_JJA\_DJF\_exclusion,add=T,col="grey90",axes=F,legend=F) plot(Koppen\_Geiger\_AE\_resampled,add=T,col="grey90",axes=F,legend=F)  plot(country\_boundary,add=T,border="grey70",ylim=c(-60,80))  #plot(cities\_100\_point,add=T,pch=4,cex=1.2)  axis(side=3,at=c(-120,-60,0,60,120),labels=c("","","","",""),tck=0.02)  axis(side=4,at=c(-60,-30,0,30,60),labels=c("","","","",""),tck=0.02,pos=180)  abline(h=0,col="white",lwd=1)  abline(h=0.5)  abline(h=-0.5)  text("JJA",x=-170,y=5,font=2)  text("DJF",x=-170,y=-5,font=2)  legend(-170,-35,legend=c("No data"),pch=c(22),pt.bg="grey90",bty="n",pt.cex=1.6,cex=1.2)  title("c",adj=0) |

# #Boxplot

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| #Exclude delta\_Tmean=NA cities\_100\_raw\_noNA<-cities\_100\_raw[!is.na(cities\_100\_raw$delta\_Tmean),]  #Check sample size  summary(as.factor(cities\_100\_raw\_noNA$Climate\_broad))  #Boxplot by broad climate  cities\_100\_raw\_noNA$Climate\_broad<-as.factor(cities\_100\_raw\_noNA$Climate\_broad)  BCD\_means<-tapply(cities\_100\_raw\_noNA$delta\_Tmean,cities\_100\_raw\_noNA$Climate\_broad,mean) BCD\_boxplot<-boxplot(cities\_100\_raw\_noNA$delta\_Tmean~cities\_100\_raw\_noNA$Climate\_broad,axes=F,ylim=c(-3,2),xlab="",ylab="", col=c(rgb(0.95,0,0),rgb(0.95,0.95,0),rgb(0.95,0,0.95)))  par(mgp=c(3,1,0),mar=c(5.1, 4.1, 4.1, 2.1))  boxplot(cities\_100\_raw\_noNA$delta\_Tmean~cities\_100\_raw\_noNA$Climate\_broad,axes=F,ylim=c(-3,2),xlab="",ylab="", col=c(rgb(0.95,0,0),rgb(0.95,0.95,0),rgb(0.95,0,0.95)))  points(BCD\_means,col="black",pch=16)  mtext(side=1,"Koppen-Geiger climate classification",font=2,line=2.5)  mtext(side=2,"Estimated irrigation-induced change in air temperature (\u00B0C)",font=2,line=2.5,las=3)  axis(side=1,at=c(1,2,3),labels=c("B: Arid","C: Temperate","D: Continental"))  axis(side=2,at=c(seq(-6,5,1)),labels=c(seq(-6,5,1)),las=1)  axis(side=3,at=c(1,2,3),labels=c("N=27","N=49","N=24"),tck=0,line=-2.5,col="white")  box()    #Table by individual climate  cooling\_by\_KGCC<-data.frame()  KGCC<-names(summary(as.factor(cities\_100\_raw\_noNA$Climate[!is.na(cities\_100\_raw\_noNA$delta\_Tmean)])))  i=1  while(i<(length(KGCC)+1)){  cooling\_by\_KGCC[1:5,i]<-c(length(cities\_100\_raw\_noNA$delta\_Tmean[cities\_100\_raw\_noNA$Climate==KGCC[i]]),unname(summary(cities\_100\_raw\_noNA$delta\_Tmean[cities\_100\_raw\_noNA$Climate==KGCC[i]]))[c(1,4,5)],sd(cities\_100\_raw\_noNA$delta\_Tmean[cities\_100\_raw\_noNA$Climate==KGCC[i]]))  i=i+1  }  cooling\_by\_KGCC<-cooling\_by\_KGCC[c(1,3,5,2,4),]  row.names(cooling\_by\_KGCC)<-c("N","Mean","SD","Min.","Max")  cities\_100\_raw\_noNA$Climate\_code\_name<-paste(cities\_100\_raw\_noNA$Climate,": ",cities\_100\_raw\_noNA$name)  colnames(cooling\_by\_KGCC)<-names(summary(as.factor(cities\_100\_raw\_noNA$Climate\_code\_name)))  cooling\_by\_KGCC<-data.frame(t(cooling\_by\_KGCC))  write.csv(cooling\_by\_KGCC,"C:/Users/Cheung Pui Kwan/Desktop/Temp/cooling\_by\_KGCC.csv")  write.csv(cities\_100\_raw\_noNA,"C:/Users/Cheung Pui Kwan/Desktop/Temp/cities\_100\_delta\_Tmean.csv") |

# #ANOVA and TukeyHSD

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| TukeyHSD(aov(cities\_100\_raw\_noNA$delta\_Tmean~cities\_100\_raw\_noNA$Climate\_broad)) |

# #plot 100 cities

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| require("rgdal")  require("rgeos")  require("dplyr")  country\_boundary\_dissolved<-gUnaryUnion(country\_boundary,id=country\_boundary@data$featurecla) country\_boundary\_line<-as(country\_boundary,"SpatialLinesDataFrame") cities\_100\_point\_withData<-cities\_100\_point[!is.na(cities\_100\_point@data$delta\_Tmean),]  cities\_100\_point\_withoutData<-cities\_100\_point[is.na(cities\_100\_point@data$delta\_Tmean),]  par(mgp=c(1.5,0.3,0),mar=c(3.1, 4.1, 3.1, 2.1),las=1)  plot(country\_boundary,xlim=c(-180,180),ylim=c(-60,80),xaxs="i",yaxs="i",xlab="",ylab="",axes=F,col="darkolivegreen1",border="grey",lwd=0.2)  plot(Global\_delta\_Tmean\_JJA\_DJF\_exclusion,border=NULL,add=T,col="grey90",axes=F,legend=F)  plot(country\_boundary,col=NA,border="white",add=T)  plot(country\_boundary\_dissolved,col=NA,border="grey",add=T)  plot(cities\_100\_point\_withData,ylim=c(-60,80),add=T,pch=4)  plot(cities\_100\_point\_withoutData,ylim=c(-60,80),add=T,pch=16)  axis(side=1,at=c(-120,-60,0,60,120),labels=c("-120","-60","0","60","120"),tck=0.02)  axis(side=2,at=c(-60,-30,0,30,60),labels = c("-60","-30","0","30","60"),tck=0.02)  axis(side=3,at=c(-120,-60,0,60,120),labels=c("","","","",""),tck=0.02)  axis(side=4,at=c(-60,-30,0,30,60),labels=c("","","","",""),tck=0.02,pos=180)  mtext(side=1,line=1.3,"Longitude (degree)",font=2)  mtext(side=2,line=1.3,"Laditude (degree)",font=2,las=3)  legend(-170,-25,legend=c("City with data","City without data","Region with data","Region without data"),pch=c(4,16,22,22),pt.bg=c("black","black","darkolivegreen1","grey90"),bty="n",pt.cex=c(1,1,1.6,1.6),cex=1.1)  box() |

# #Useful websites

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| #expand no. of colours in colorBrewer # <https://www.datanovia.com/en/blog/easy-way-to-expand-color-palettes-in-r/> #adjust axis label position # <https://stackoverflow.com/questions/38935704/how-to-reduce-space-between-axis-ticks-and-axis-labels-in-r> #<http://rfunction.com/archives/1302> #modify axis in R # <https://www.statmethods.net/advgraphs/axes.html> #superscript # <https://stackoverflow.com/questions/10628547/use-superscripts-in-r-axis-labels> #modify legend  # <https://stackoverflow.com/questions/9436947/legend-properties-when-legend-only-t-raster-package> # <http://www.image.ucar.edu/GSP/Software/Fields/Help/image.plot.html> # graphical parameters # <https://www.statmethods.net/advgraphs/parameters.html>  #Plotting colour in R #<https://bookdown.org/rdpeng/exdata/plotting-and-color-in-r.html>  # <https://colorspace.r-forge.r-project.org/articles/hcl_palettes.html> |