pclimte

2023-06-21

```
library("tidyverse")
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.2 --
## v ggplot2 3.4.2     v purrr   1.0.1
## v tibble  3.2.1     v dplyr   1.1.2
## v tidyr   1.3.0     v stringr 1.5.0
## v readr   2.1.2     v forcats 0.5.2
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
burned_area=read.csv("modis_burned_area__ha.csv")
tree_loss=read.csv("treecover_loss_from_fires_by_region.csv")

colnames(burned_area)[2]="year"
colnames(tree_loss)[2]="year"
burned=burned_area %>%
 group_by(iso,year)%>%
 summarise(total_burned = sum(burned_area__ha))
```

```
## `summarise()` has grouped output by 'iso'. You can override using the `.groups`
## argument.
```

```
data=full_join(burned,tree_loss,by=c("iso","year"))
```

burned area

```
nrow(data)
```

```
## [1] 4335
```

```
data=na.omit(data)
nrow(data)
```

```
## [1] 1031
```

```
burned[order(burned$total_burned,decreasing=TRUE),]
```

```
## # A tibble: 1,211 x 3
## # Groups:   iso [150]
##    iso    year total_burned
##    <chr> <int>        <dbl>
##  1 SSD    2020     4491973.
##  2 SSD    2015     3315366.
##  3 SSD    2012     3153185.
##  4 SSD    2021     2894678.
##  5 SSD    2014     2632913.
##  6 SSD    2013     2540551.
##  7 SSD    2018     2372449.
##  8 CAF    2020     2319594.
##  9 AUS    2012     2046927.
## 10 AUS    2019     1938567.
## # i 1,201 more rows
```

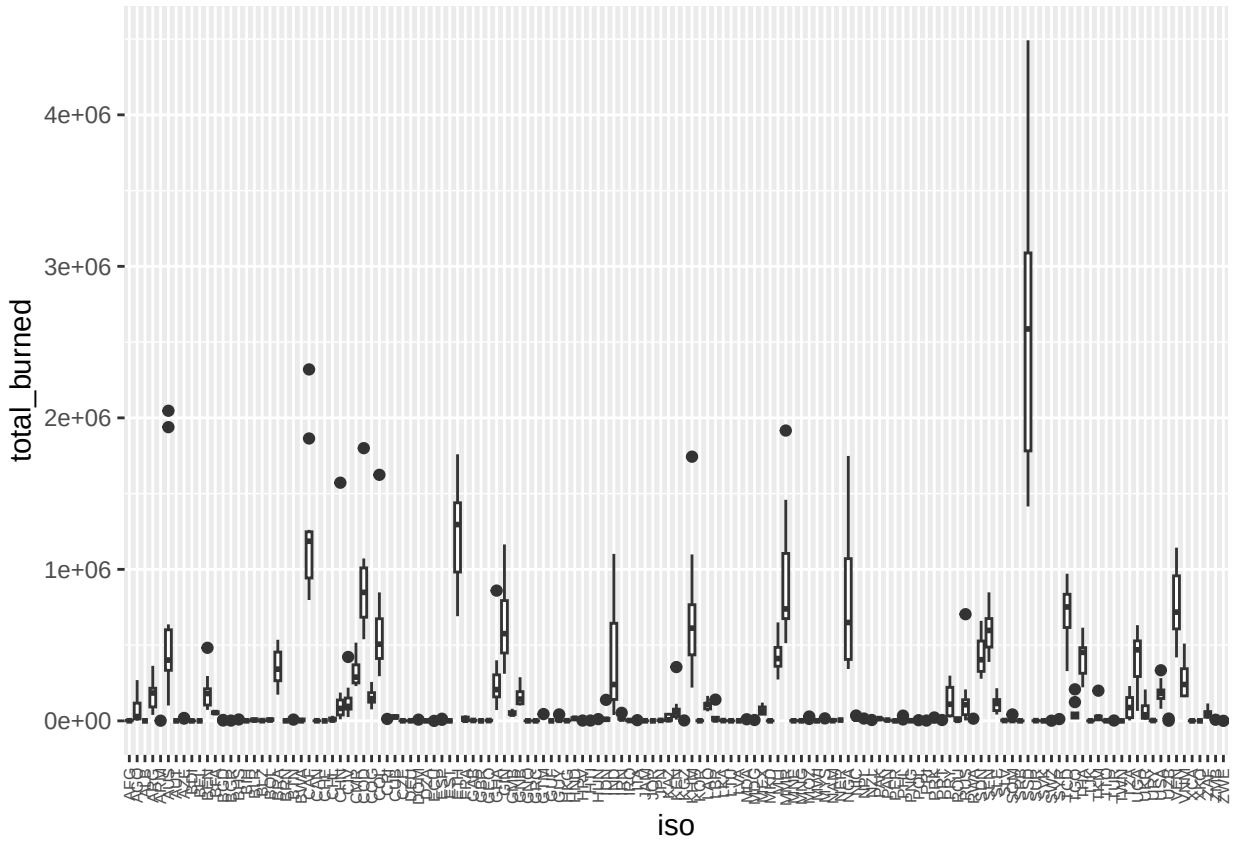
```
new=burned%>%group_by(iso)%>%
   summarise_at(vars(total_burned), list(name = mean))
head(new)
```

```
## # A tibble: 6 x 2
##   iso       name
##   <chr>    <dbl>
## 1 AFG     1566.
## 2 AGO    71547.
## 3 ALB       20.9
## 4 ARE      156.
## 5 ARG   217436.
## 6 ARM      399.
```

```
new[order(new$name,decreasing=TRUE),]
```

```
## # A tibble: 150 x 2
##    iso       name
##    <chr>    <dbl>
##  1 SSD   2510595.
##  2 CAF   1301042.
##  3 ETH   1208087.
##  4 COD    942074.
##  5 MMR    927455.
##  6 VEN    755681.
##  7 NGA    734620.
##  8 KHM    694685.
##  9 AUS    686625.
## 10 TCD    681495.
## # i 140 more rows
```

```
library(ggplot2)
#boxplot(data$total_burned~data$iso)
ggplot(data, aes(x=iso, y=total_burned)) +
  geom_boxplot()+theme(axis.text.x = element_text(angle = 90, vjust = 0.5, hjust=1,size=5.5))
```



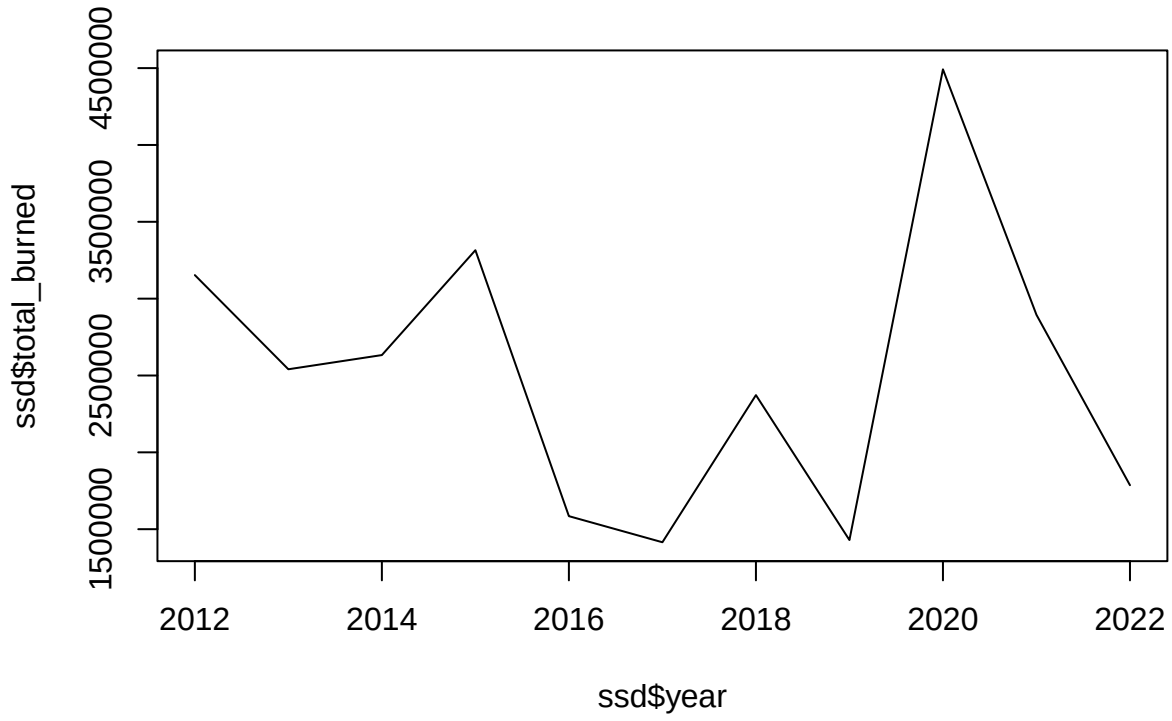

```
burned[burned$total_burned==max(burned$total_burned),]$iso
```

```
## [1] "SSD"
```

```
#max(burned$total_burned)
```

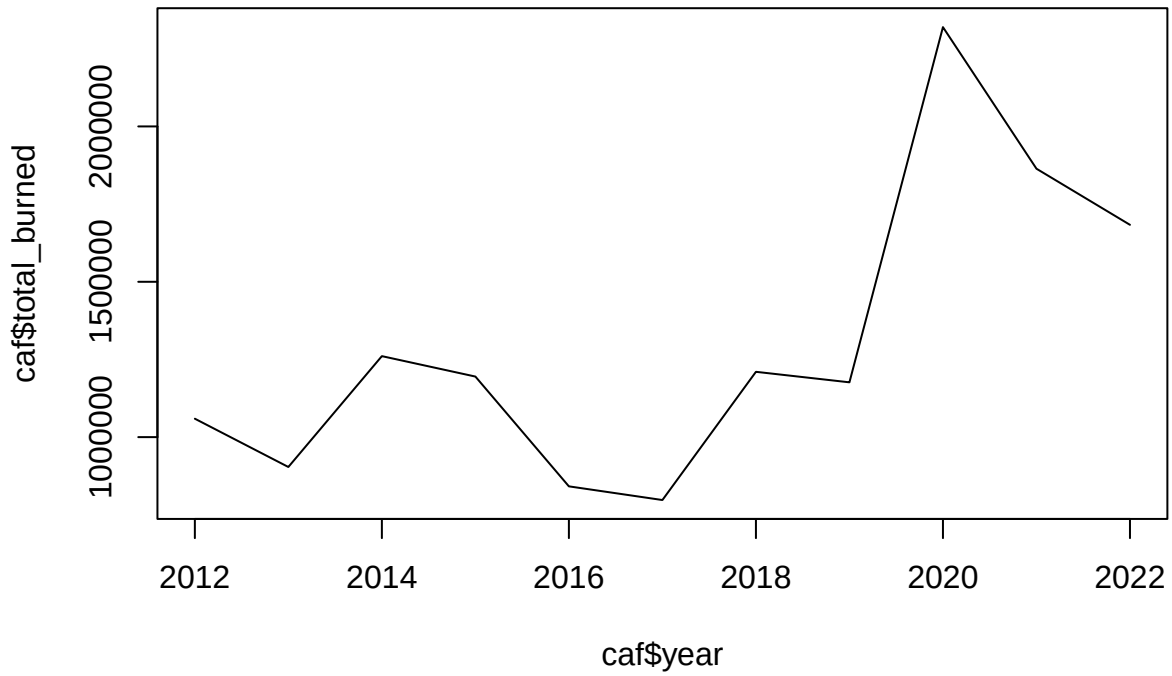
#burned in ssd most severe

```
ssd = burned[burned$iso=="SSD",]
plot(ssd$year,ssd$total_burned,type="l",pch=19)
```



#caf is also severe

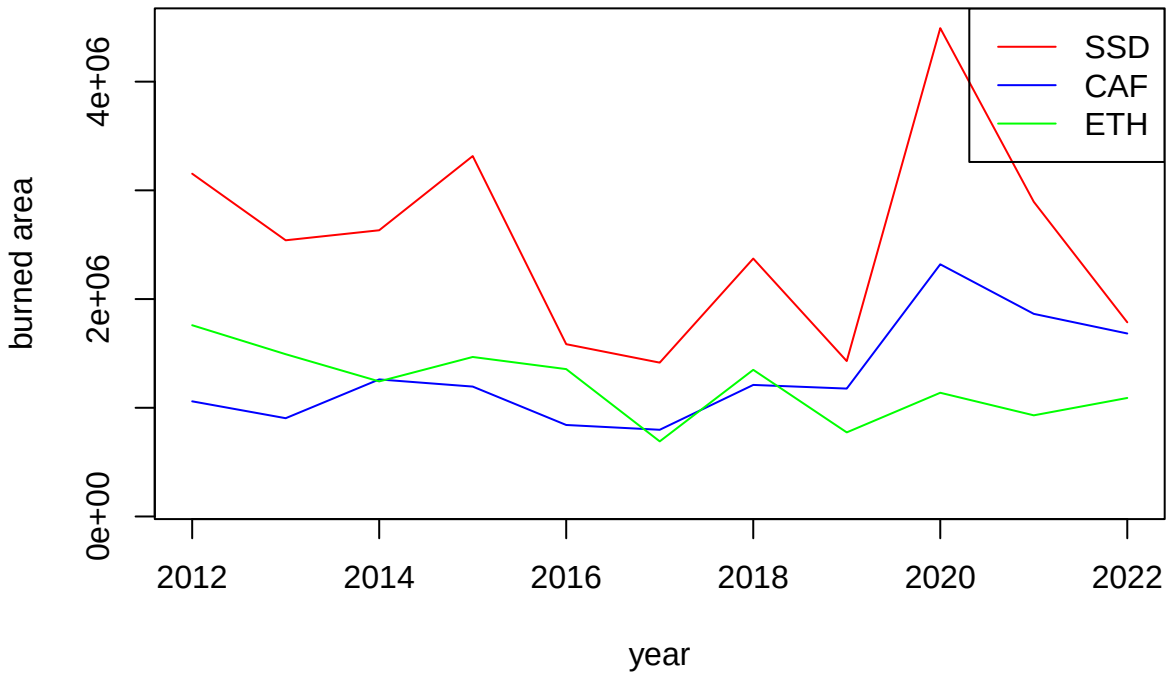
```
caf = burned[burned$iso=="CAF",]
plot(caf$year,caf$total_burned,type="l",pch=19)
```



#top(mean) 3 countries

```
#eth 3rd
eth=burned[burned$iso=="ETH",]
```

```
plot(2012:2022, seq(from=150000,to=4500000,length.out=11),pch=" ",xlab="year",
     ylab="burned area")
points(ssd$year,ssd$total_burned,type="l",col="red")
points(caf$year,caf$total_burned,type="l",col="blue")
points(eth$year,eth$total_burned,type="l",col="green")
legend("topright", legend = c("SSD", "CAF","ETH"),
       col = c("red","blue","green"), lty = 19)
```




```
#write_csv(data, "burnedarea_treecoverloss.csv")
```

tree loss

```
#tree_loss
tree_loss[tree_loss$umd_tree_cover_loss_from_fires__ha==max(tree_loss$umd_tree_cover_loss_from_fires__ha
```

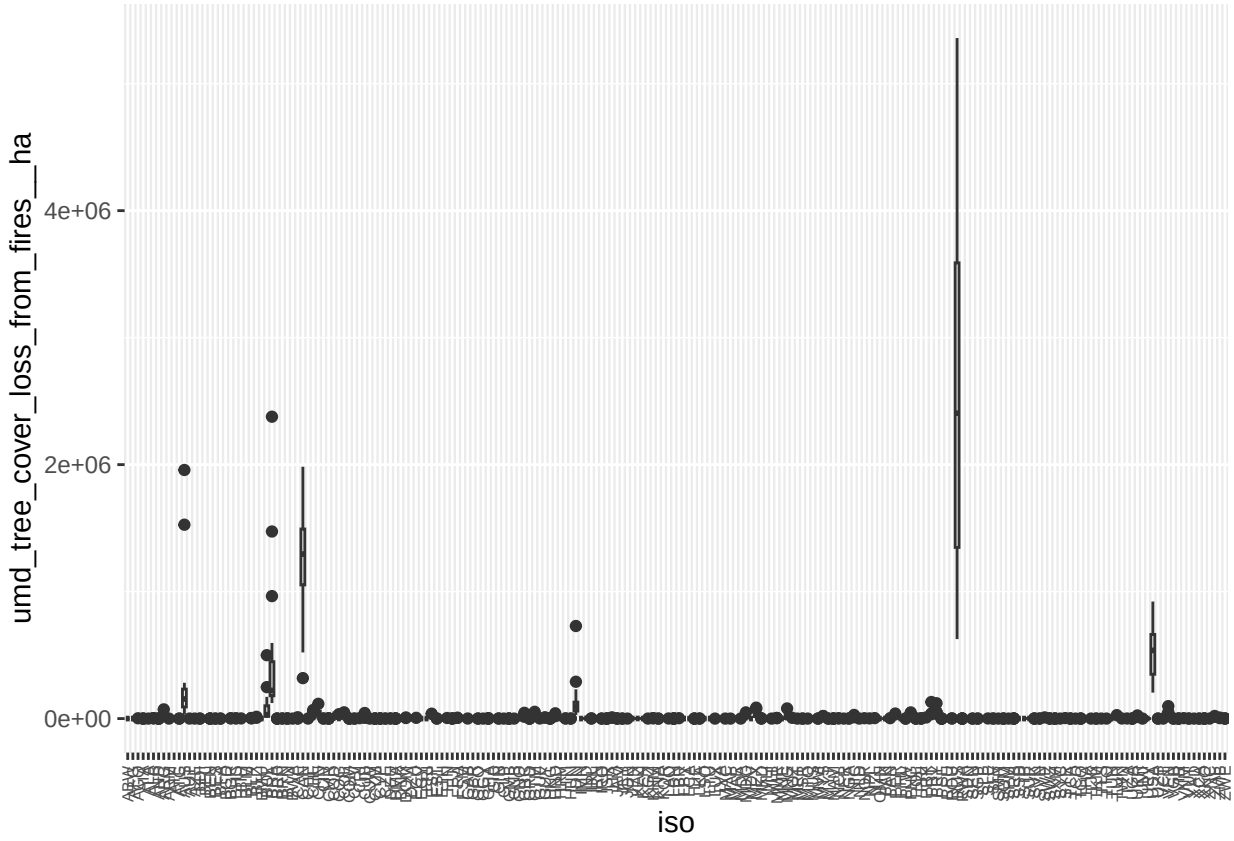
```
##      iso year umd_tree_cover_loss__ha umd_tree_cover_loss_from_fires__ha
## 4109 RUS 2021                 6518852                             5359432
```

```
new=tree_loss%>%group_by(iso)%>%
   summarise_at(vars(umd_tree_cover_loss_from_fires__ha), list(name = mean))
head(new[order(new$name,decreasing=TRUE),])
```

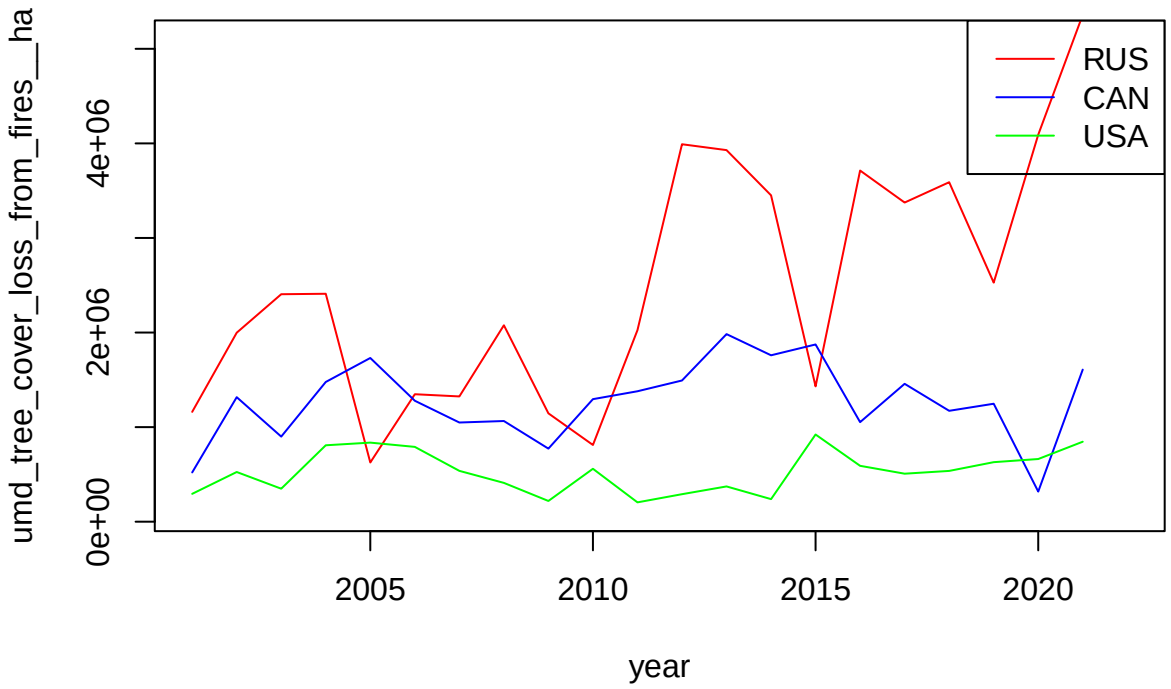
```
## # A tibble: 6 x 2
##   iso       name
##   <chr>    <dbl>
## 1 RUS   2513761.
## 2 CAN   1273862.
```

```
## 3 USA    530092.
## 4 BRA    453047.
## 5 AUS    298221.
## 6 IDN    135398.
```

```
ggplot(tree_loss, aes(x=iso, y=umd_tree_cover_loss_from_fires__ha)) +
  geom_boxplot()+theme(axis.text.x = element_text(angle = 90, vjust = 0.5, hjust=1,size=5.5))
```




```
rus=tree_loss[tree_loss$iso=="RUS",]
can=tree_loss[tree_loss$iso=="CAN",]
usa=tree_loss[tree_loss$iso=="USA",]
plot(2001:2022, seq(from=100000,to=5100000,length.out=22),pch=" ",xlab="year",
     ylab="umd_tree_cover_loss_from_fires__ha")
points(rus$year,rus$umd_tree_cover_loss_from_fires__ha,type="l",col="red")
points(can$year,can$umd_tree_cover_loss_from_fires__ha,type="l",col="blue")
points(usa$year,usa$umd_tree_cover_loss_from_fires__ha,type="l",col="green")
legend("topright", legend = c("RUS", "CAN","USA"),
       col = c("red","blue","green"), lty = 19)
```



temperature change

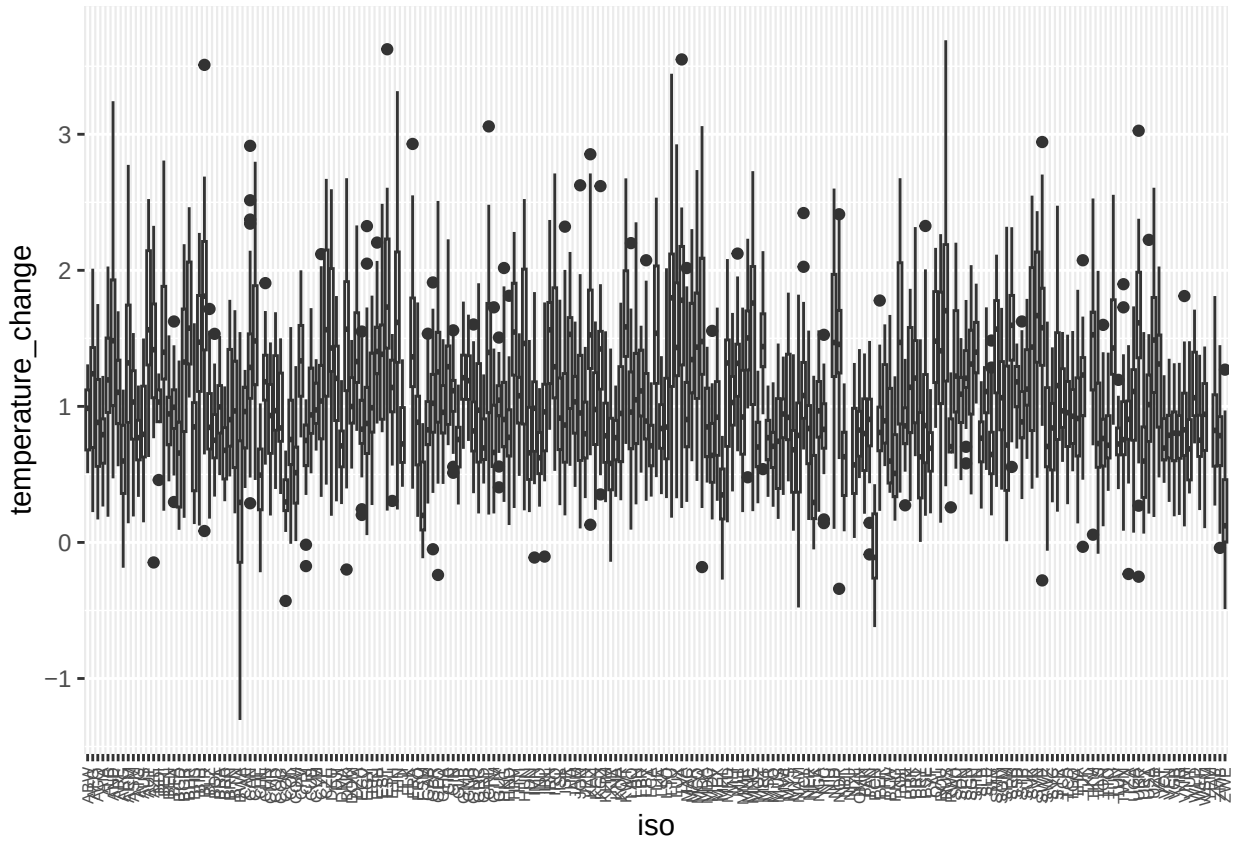
```
temp = read.csv("Annual_Surface_Temperature_Change.csv")
library(tidyr)
temp_reshaped <- pivot_longer(temp, cols = -c("iso"),
                              names_to = "year",
                              values_to = "temperature_change")
temp_reshaped$year<-gsub("X","",as.character(temp_reshaped$year))
temp_reshaped$year=as.numeric(temp_reshaped$year)
```

```
head(temp_reshaped)
```

```
## # A tibble: 6 x 3
##   iso    year temperature_change
##   <chr> <dbl>              <dbl>
## 1 AFG    1999              1.20
## 2 AFG    2000              0.993
## 3 AFG    2001              1.31
## 4 AFG    2002              1.36
## 5 AFG    2003              0.587
## 6 AFG    2004              1.37
```

```
ggplot(temp_reshaped, aes(x=iso, y=temperature_change)) +
  geom_boxplot()+theme(axis.text.x = element_text(angle = 90, vjust = 0.5, hjust=1,size=5.5))
```

```
## Warning: Removed 281 rows containing non-finite values (`stat_boxplot()`).
```




```
data=full_join(data,temp_reshaped,by=c("iso","year"))
```

co2 emissions

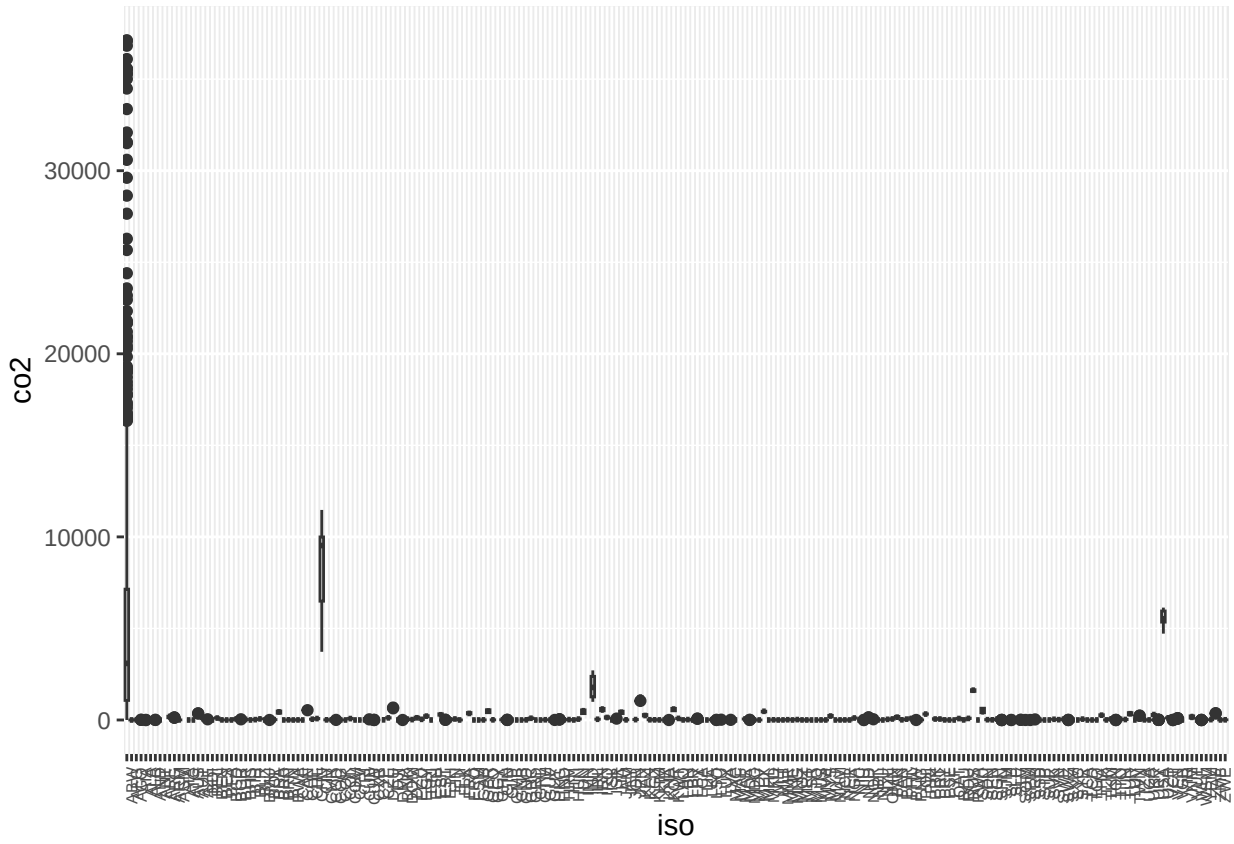
```
co2=read.csv("owid-co2-data.csv")
head(co2)
```

```
##   year iso population gdp cement_co2 cement_co2_per_capita co2
## 1 1850 AFG    3752993  NA         NA                     NA  NA
## 2 1851 AFG    3769828  NA         NA                     NA  NA
## 3 1852 AFG    3787706  NA         NA                     NA  NA
## 4 1853 AFG    3806634  NA         NA                     NA  NA
## 5 1854 AFG    3825655  NA         NA                     NA  NA
## 6 1855 AFG    3844769  NA         NA                     NA  NA
```

graphs for co2 emission for each country

```
ggplot(co2[co2$year>2000,], aes(x=iso, y=co2)) +
  geom_boxplot()+theme(axis.text.x = element_text(angle = 90, vjust = 0.5, hjust=1,size=5.5))
```

```
## Warning: Removed 484 rows containing non-finite values (‘stat_boxplot()‘).
```



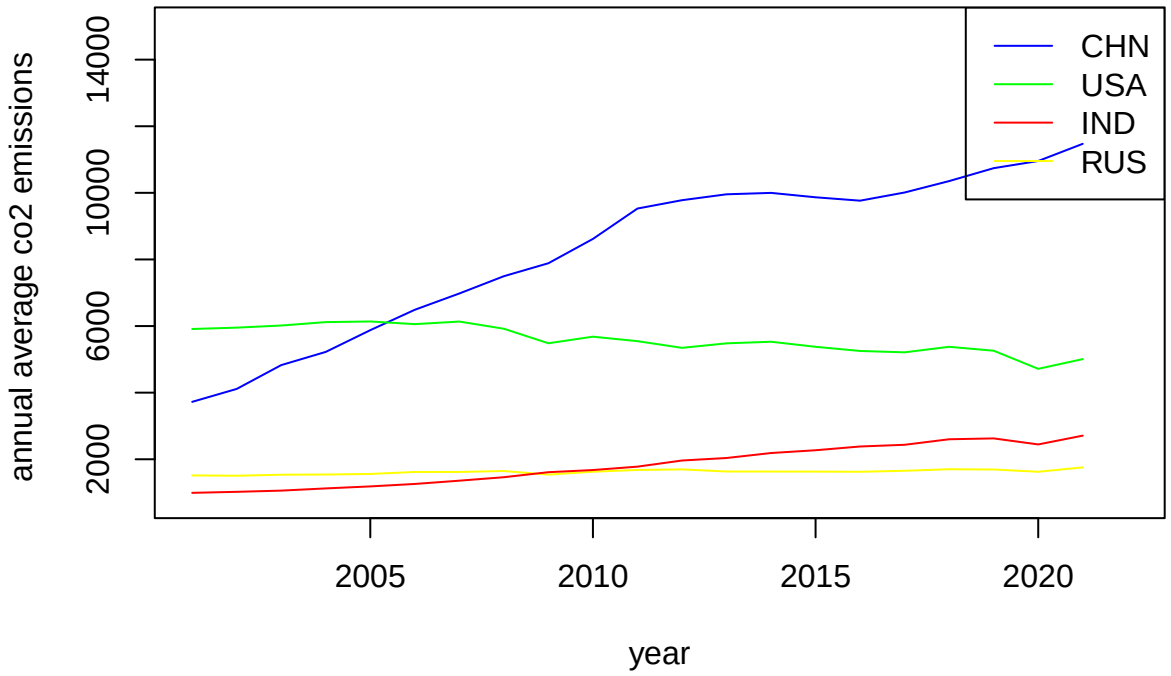

```
new=co2[co2$year>2000,]%>%group_by(iso)%>%
   summarise_at(vars(co2), list(name = mean))
head(new[order(new$name,decreasing=TRUE),])
```

```
## # A tibble: 6 x 2
##   iso    name
##   <chr> <dbl>
## 1 CHN   8270.
## 2 USA   5596.
## 3 IND   1818.
## 4 RUS   1620.
## 5 JPN   1224.
## 6 DEU    813.
```

```
emit=co2[co2$year>2000,]

chn=emit[emit$iso=="CHN",]
usa=emit[emit$iso=="USA",]
ind=emit[emit$iso=="IND",]
rus=emit[emit$iso=="RUS",]
plot(2001:2022, seq(from=800,to=15000,length.out=22),pch=" ",xlab="year",
     ylab="annual average co2 emissions ")
points(rus$year,rus$co2,type="l",col="yellow")
points(chn$year,chn$co2,type="l",col="blue")
points(usa$year,usa$co2,type="l",col="green")
points(ind$year,ind$co2,type="l",col="red")
```

```
legend("topright", legend = c("CHN","USA","IND", "RUS"),
       col = c("blue","green","red","yellow"), lty = 19)
```



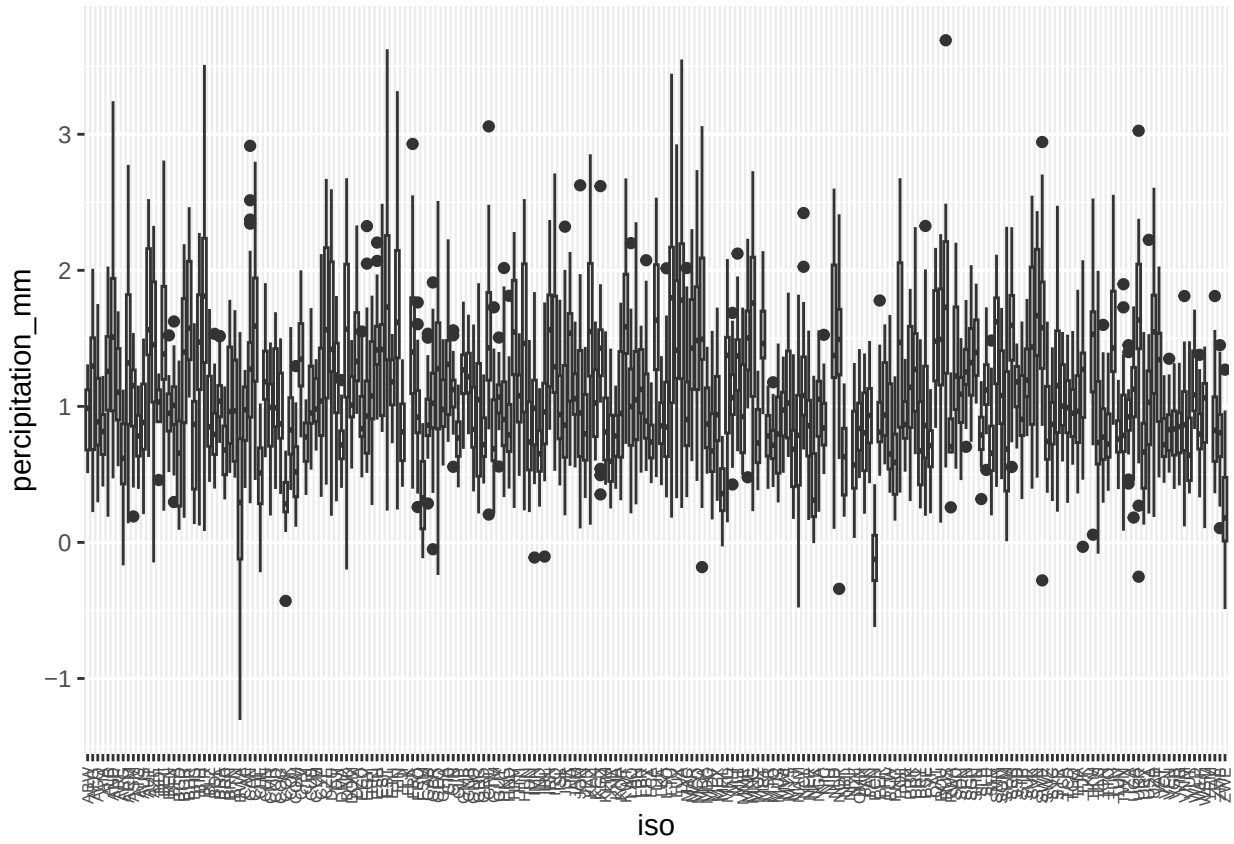

```
data=left_join(data,co2,by=c("iso","year"))
```

percipitation

```
rain= read.csv("avg_percipitation_mm_per_year.csv")
rain = pivot_longer(temp, cols = -c("iso"),
                            names_to = "year",
                            values_to = "percipitation_mm")
rain$year<-gsub("X","",as.character(rain$year))
rain$year=as.numeric(rain$year)
```

```
ggplot(rain[rain$year>2000,], aes(x=iso, y=percipitation_mm)) +
  geom_boxplot()+theme(axis.text.x = element_text(angle = 90, vjust = 0.5, hjust=1,size=5.5))
```

```
## Warning: Removed 249 rows containing non-finite values (‘stat_boxplot()‘).
```




```
new=rain[rain$year>2000,]%>%group_by(iso)%>%
   summarise_at(vars(percipitation_mm), list(name = mean))
head(new[order(new$name,decreasing=TRUE),])
```

```
## # A tibble: 6 x 2
##   iso    name
##   <chr> <dbl>
## 1 EST    1.78
## 2 RUS    1.77
## 3 BLR    1.76
## 4 LVA    1.73
## 5 FIN    1.73
## 6 KWT    1.71
```

```
data=left_join(data,rain,by=c("iso","year"))
```

```
data=data[with(data,order(iso, year)),]
```

```
write_csv(data, "merged_dataset.csv")
```

```
head(data)
```

```
## # A tibble: 6 x 12
## # Groups:   iso [1]
```

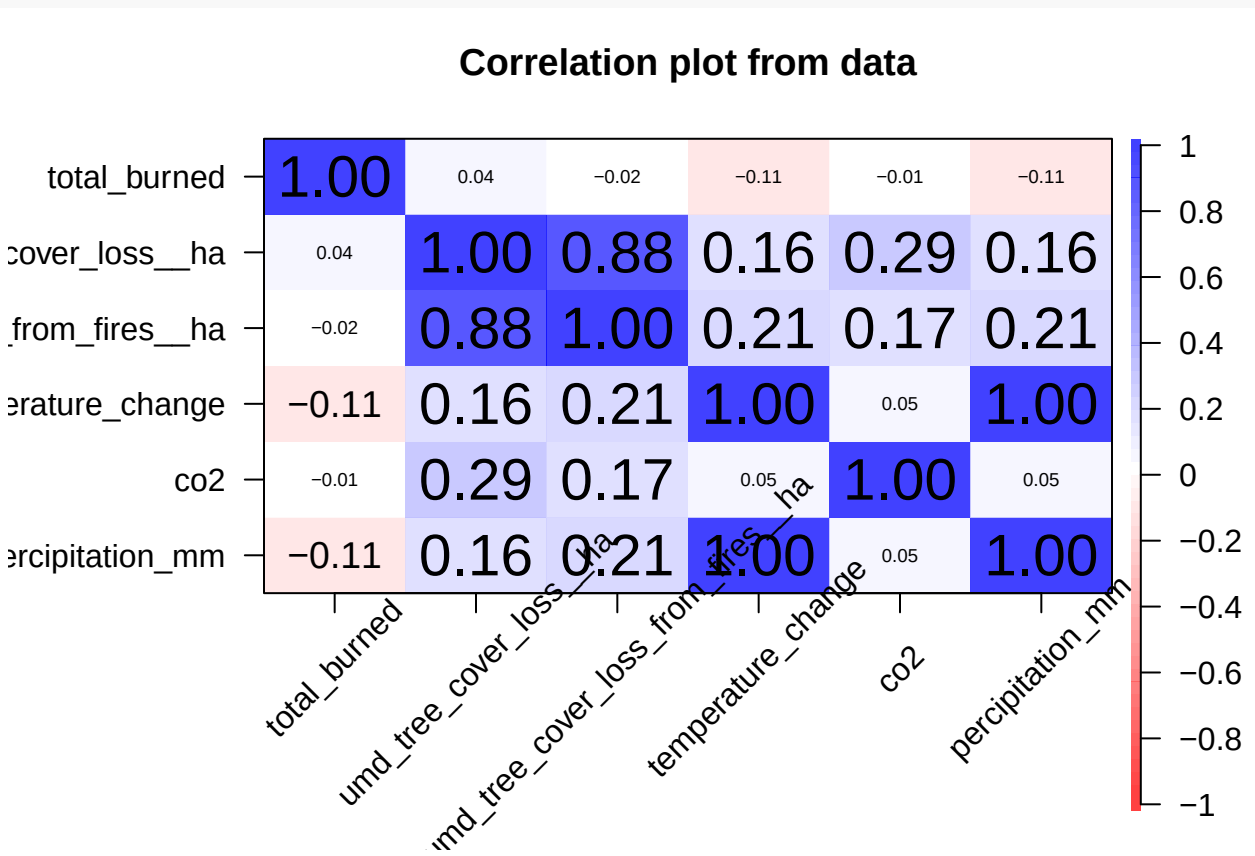
```
##   iso    year total_burned umd_tree_cover_loss__ha umd_tree_cover_loss_from_fi~1
##   <chr> <dbl>        <dbl>                   <dbl>                          <dbl>
## 1 ABW    1999           NA                      NA                             NA
## 2 ABW    2000           NA                      NA                             NA
## 3 ABW    2001           NA                      NA                             NA
## 4 ABW    2002           NA                      NA                             NA
## 5 ABW    2003           NA                      NA                             NA
## 6 ABW    2004           NA                      NA                             NA
## # i abbreviated name: 1: umd_tree_cover_loss_from_fires__ha
## # i 7 more variables: temperature_change <dbl>, population <dbl>, gdp <dbl>,
## #   cement_co2 <dbl>, cement_co2_per_capita <dbl>, co2 <dbl>,
## #   percipitation_mm <dbl>
```

```
library(psych)
```

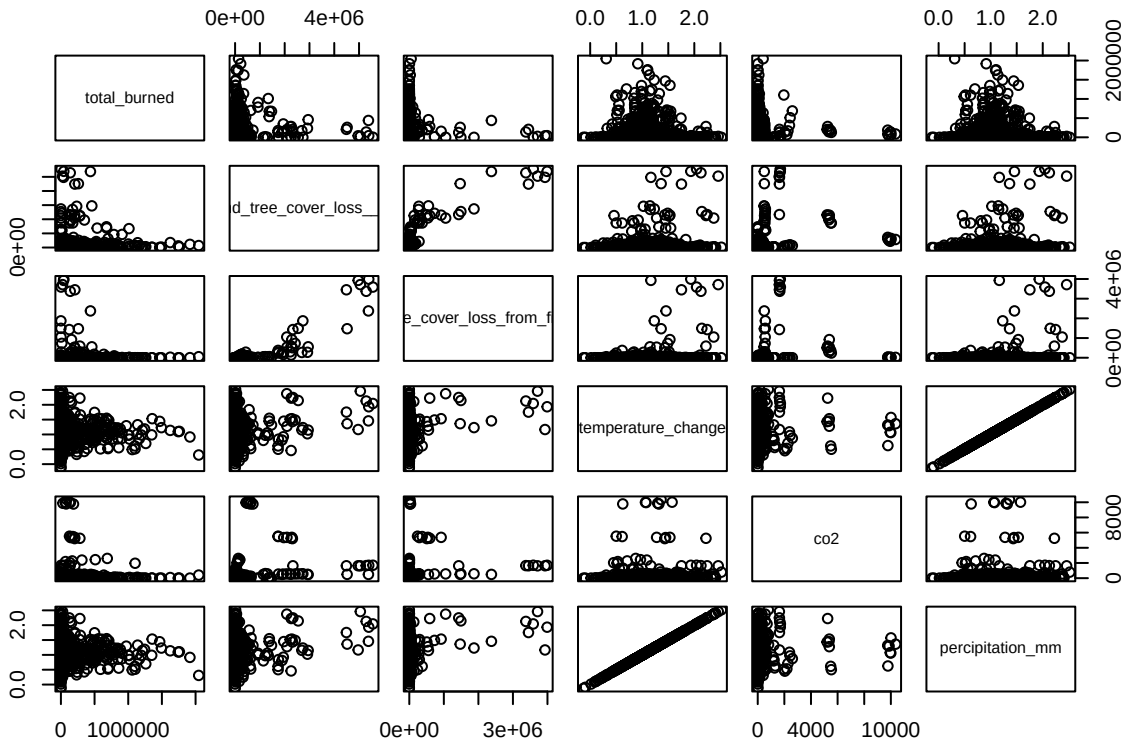
```
##
## Attaching package: 'psych'
```

```
## The following objects are masked from 'package:ggplot2':
##
##     %+%, alpha
```

```
new=data[data$year>2001,]
new=na.omit(new)
corPlot(new[c("total_burned","umd_tree_cover_loss__ha","umd_tree_cover_loss_from_fires__ha","temperature
```



```
pairs(new[c("total_burned","umd_tree_cover_loss__ha","umd_tree_cover_loss_from_fires__ha","temperature_
              "co2","percipitation_mm")])
```




```
hist(new$total_burned)
```