Problema CO_2

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Hacer algunos modelos pronóstico y trazar algunas gráficas para investigar patrones temporales para nuestros datos sobre concentraciones de CO_2 en Mauna Loa, Hawái. Ve si puedes predecir la concentración de CO2 para junio de 2050

Abrimos y headeamos los datos y lobrerías

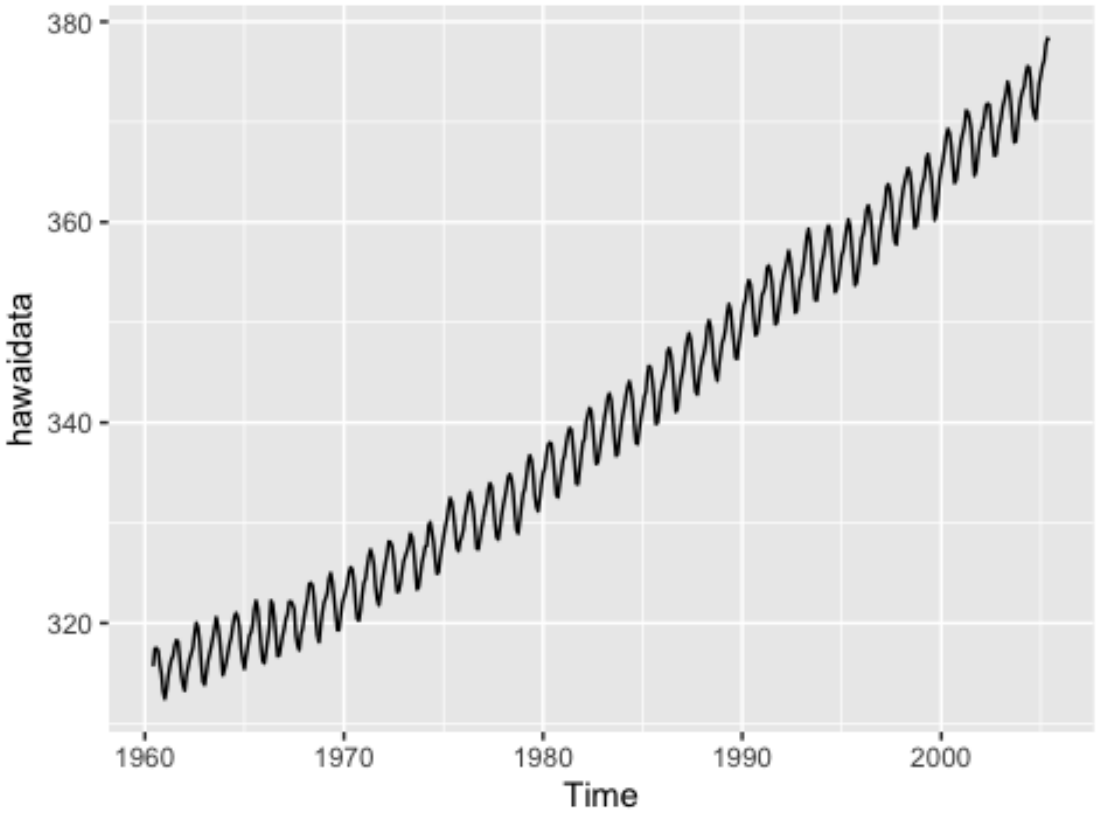
```
library(ggplot2)
library(forecast)

library(dplyr)

library(colortools)
hawai<- read.csv("/Volumes/macs/documentos mac 5marzo2022/Clase Rstudio/Series-de-tiempo-main/co2_loa.csv",  header=T)
head(hawai)
```

```
##        month co2_conc
## 1 1958-03-01   315.70
## 2 1958-04-01   317.45
## 3 1958-05-01   317.50
## 4 1958-06-01   317.26
## 5 1958-07-01   315.86
## 6 1958-08-01   314.93
```

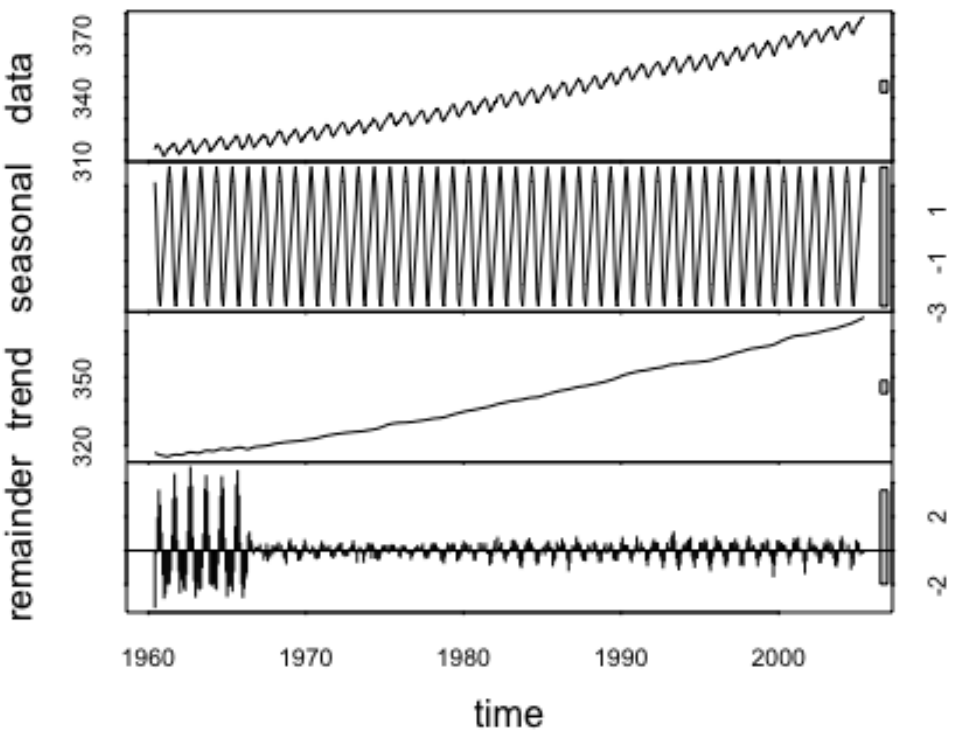
```
hawai$Date <- as.Date(hawai$month, format = "%Y-%m-%d")
head(hawai)
```

```
##        month co2_conc       Date
## 1 1958-03-01   315.70 1958-03-01
## 2 1958-04-01   317.45 1958-04-01
## 3 1958-05-01   317.50 1958-05-01
## 4 1958-06-01   317.26 1958-06-01
## 5 1958-07-01   315.86 1958-07-01
## 6 1958-08-01   314.93 1958-08-01
```

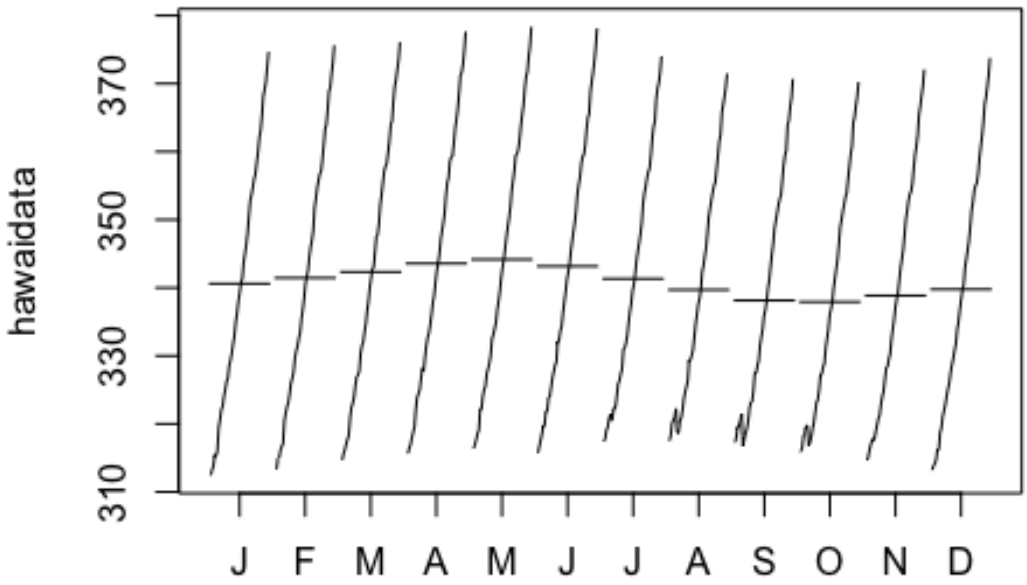
```
hawaidata = ts(hawai$co2_conc, start = c(1960, 6), end = c(2005, 6), frequency = 12)
autoplot(hawaidata)
```



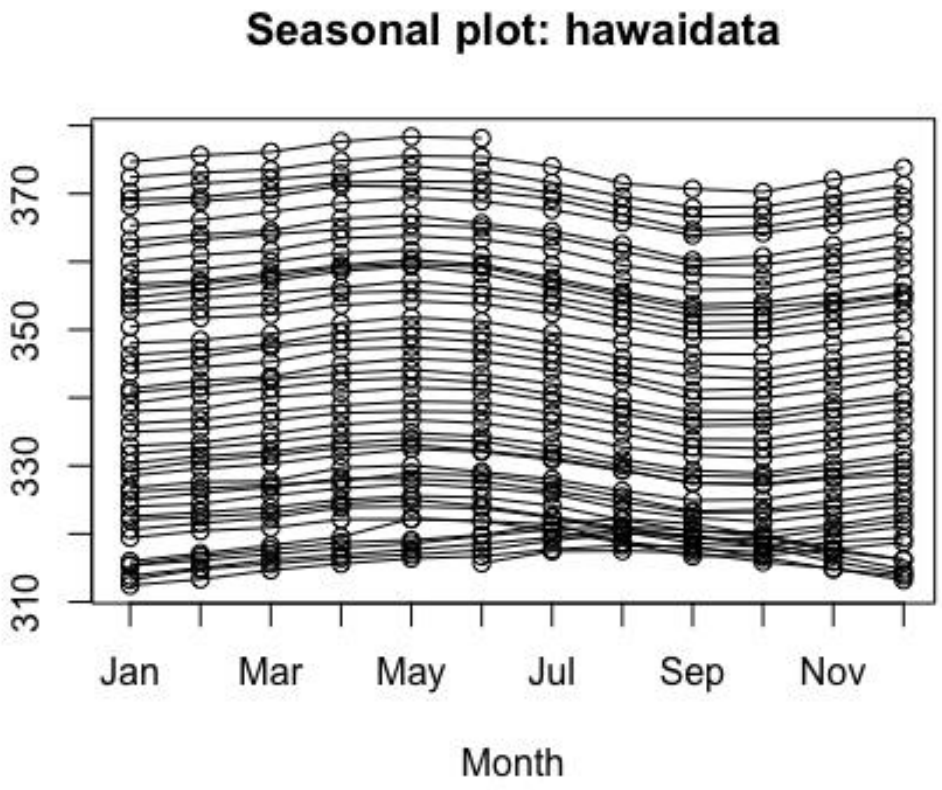

```
hawaidatastl <- stl(hawaidata, s.window = "period")
plot(hawaidatastl)
```




```
monthplot(hawaidata)
```

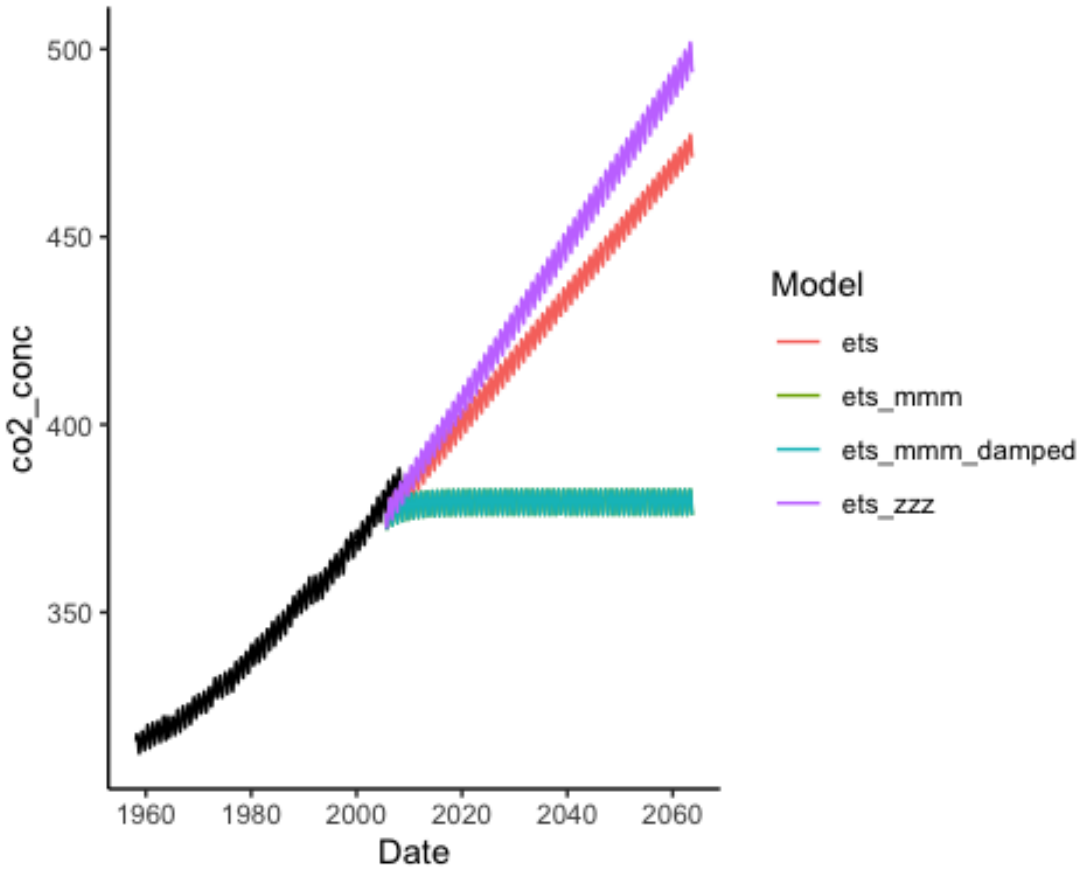



```
seasonplot(hawaidata)
```




```
hawai_ets_auto <- ets(hawaidata, model = "AAA")
hawai_ets_mmm <- ets(hawaidata, model = "MMM")
hawai_ets_zzz<- ets(hawaidata, model = "ZZZ")
hawai_ets_mmm_damped <- ets(hawaidata, model = "MMM", damped = TRUE)

hawai_ets_fc <- forecast(hawai_ets_auto, h=700)
hawai_ets_mmm_fc <- forecast(hawai_ets_mmm, h=700)
hawai_ets_zzz_fc <- forecast(hawai_ets_zzz, h=700)
hawai_ets_mmm_damped_fc <- forecast(hawai_ets_mmm_damped, h=700)

hawai_ets_fc_df <- cbind("Month" = rownames(as.data.frame(hawai_ets_fc)),
as.data.frame(hawai_ets_fc))
names(hawai_ets_fc_df) <- gsub(" ", "_", names(hawai_ets_fc_df))
hawai_ets_fc_df$Date <- as.Date(paste("01-", hawai_ets_fc_df$Month, sep =
""),format = "%d-%b %Y")
hawai_ets_fc_df$Model <- rep("ets")


hawai_ets_mmm_fc_df <- cbind("Month" = rownames(as.data.frame(hawai_ets_m
mm_fc) ), as.data.frame(hawai_ets_mmm_fc))
names(hawai_ets_mmm_fc_df) <- gsub(" ", "_", names(hawai_ets_mmm_fc_df))
hawai_ets_mmm_fc_df$Date <- as.Date(paste("01-", hawai_ets_mmm_fc_df$Mont
h, sep = ""), format = "%d-%b %Y")
```

```r
hawai_ets_mmm_fc_df$Model <- rep("ets_mmm")


hawai_ets_zzz_fc_df <- cbind("Month" = rownames(as.data.frame(hawai_ets_z
zz_fc) ), as.data.frame(hawai_ets_zzz_fc))
names(hawai_ets_zzz_fc_df) <- gsub(" ", "_", names(hawai_ets_zzz_fc_df))
hawai_ets_zzz_fc_df$Date <- as.Date(paste("01-", hawai_ets_zzz_fc_df$Mont
h, sep = ""), format = "%d-%b %Y")
hawai_ets_zzz_fc_df$Model <- rep("ets_zzz")


hawai_ets_mmm_damped_fc_df <- cbind("Month" = rownames(as.data.frame(hawa
i_ets_mmm_damped_fc)), as.data.frame(hawai_ets_mmm_damped_fc))
names(hawai_ets_mmm_damped_fc_df) <- gsub(" ", "_", names(hawai_ets_mmm_d
amped_fc_df))
hawai_ets_mmm_damped_fc_df$Date <- as.Date(paste("01-", hawai_ets_mmm_dam
ped_fc_df$Month, sep = ""), format = "%d-%b %Y")
hawai_ets_mmm_damped_fc_df$Model <- rep("ets_mmm_damped")


forecast_all <- rbind(hawai_ets_fc_df, hawai_ets_mmm_fc_df, hawai_ets_zzz
_fc_df,
                      hawai_ets_mmm_damped_fc_df)

(forecast_plot <- ggplot() +
    geom_line(data = hawai, aes(x = Date, y = co2_conc)) + #la informació
n original
    geom_line(data = forecast_all, aes(x = Date, y = Point_Forecast, colo
ur = Model)) + # el pronóstico
    theme_classic())
```




```
pfc<- hawai_ets_fc_df %>% filter (Month == "Jun 2050") %>% select (Month,
Point_Forecast)
pmmm<- hawai_ets_mmm_fc_df %>% filter(Month == "Jun 2050") %>% select (Mo
nth, Point_Forecast)
pzzz<- hawai_ets_zzz_fc_df %>% filter(Month == "Jun 2050") %>% select (Mo
nth, Point_Forecast)
pdam<- hawai_ets_mmm_damped_fc_df%>% filter(Month == "Jun 2050") %>% sele
ct (Month, Point_Forecast)
```

se realizó el pronóstico. y los datos son:

```
print(c(pfc,pmmm,pzzz,pdam))
```

```
## $Month
## [1] "Jun 2050"
##
## $Point_Forecast
## [1] 454.7363
##
## $Month
## [1] "Jun 2050"
##
## $Point_Forecast
## [1] 382.2684
```

```
##
## $Month
## [1] "Jun 2050"
##
## $Point_Forecast
## [1] 473.6725
##
## $Month
## [1] "Jun 2050"
##
## $Point_Forecast
## [1] 382.2684
```

Cabe mencionar que hay una recurrencia de datos con respecto a las metodologías de pronóstico aditivos y los multiplicativos. Se concluye que en junio de 2050 se estima que los datos de CO_2 en Hawái podrían ser de 454.7363 a 473.6725