After a classic plot used on [Wikipedia](https://en.wikipedia.org/wiki/Keeling_Curve), we can explore another data visualization. The CO₂ concentration, one of the main cause of the climate warming, is following a seasonal cycle so it could be interesting (or ironic ?) to use a polar plot.

**Config and data**

We only keep two translations for brevity here…

# Required packages

library(tidyverse)

library(scales)

library(lubridate)

# Translations ------------------------------------------------------------

language <- list(

en\_US = list(

locale\_lc\_time = "en\_US.UTF-8",

title = bquote("Monthly mean"~CO[2]~"concentration"),

caption = paste("Data : P. Tans, NOAA/ESRL ([www.esrl.noaa.gov/gmd/ccgg/trends/](http://www.esrl.noaa.gov/gmd/ccgg/trends/))\nand R. Keeling, Scripps Institution of Oceanography ([scrippsco2.ucsd.edu/](http://scrippsco2.ucsd.edu/)). Accessed", Sys.Date()),

x = "Year",

y = bquote(CO[2]~"fraction in dry air ("\*mu\*"mol/mol)"),

x2 = "Month",

y2 = bquote(atop(CO[2]~"fraction in dry air ("\*mu\*"mol/mol)", "Departure from yearly average")),

title2 = "Seasonal variation"

),

fr\_FR = list(

locale\_lc\_time = "fr\_FR.UTF-8",

title = bquote("Moyenne mensuelle de la concentration de"~CO[2]),

caption = paste("données : P. Tans, NOAA/ESRL ([www.esrl.noaa.gov/gmd/ccgg/trends/](http://www.esrl.noaa.gov/gmd/ccgg/trends/))\net R. Keeling, Scripps Institution of Oceanography ([scrippsco2.ucsd.edu/](http://scrippsco2.ucsd.edu/)). Accédé le", Sys.Date()),

x = "année",

y = bquote("fraction de"~CO[2]~"dans l'air sec ("\*mu\*"mol/mol)"),

x2 = "mois",

y2 = bquote(atop("fraction de"~CO[2]~"dans l'air sec ("\*mu\*"mol/mol)", "en écart à la moyenne annuelle")),

title2 = "Variation saisonnière"

))

# Data --------------------------------------------------------------------

# [https://www.esrl.noaa.gov/gmd/ccgg/trends/](https://www.esrl.noaa.gov/gmd/ccgg/trends/co2ml" \t "_blank)

[co2ml](https://www.esrl.noaa.gov/gmd/ccgg/trends/co2ml" \t "_blank) <- read\_delim("<ftp://aftp.cmdl.noaa.gov/products/trends/co2/co2_mm_mlo.txt>",

delim = " ",

locale = locale(decimal\_mark = "."),

na = c("-99.99", "-1"),

col\_types = "iiddddi",

col\_names = c("year", "month", "decimal", "co2", "co2\_interpol", "co2\_trend", "days"),

comment = "#",

trim\_ws = TRUE) %>%

group\_by(year) %>%

mutate(year\_mean = mean(co2\_interpol, na.rm = TRUE),

delta = co2\_interpol - year\_mean,

vdate = ymd(paste0("2015-", month, "-01"))) %>%

ungroup()

**Create the plot for each language and save**

We use a virtual date to keep the data in the same January-December interval and we add a partial dataframe to smooth the Dec./Jan. transition and build the spiral.

# Polar plot

for (l in names(language)) {

message(l)

current <- language[[l]]

# format the date in local names

Sys.setlocale("LC\_TIME", current$locale\_lc\_time)

p3 <- co2ml %>%

filter(vdate == "2015-01-01") %>%

mutate(vdate = ymd("2015-12-31"),

year = year -1) %>%

bind\_rows(co2ml) %>%

ggplot(aes(vdate, co2\_interpol, group = year, color = year)) +

geom\_line(size = 1.2) +

scale\_x\_date(breaks = pretty\_breaks(12), labels = date\_format("%b")) +

scale\_color\_viridis\_c() +

labs(subtitle = current$title,

x = "",

y = current$y,

color = current$x,

title = paste("Mauna Loa", min(co2ml$year), "-", max(co2ml$year)),

caption = current$caption) +

coord\_polar() +

theme\_bw() +

theme(axis.title.y = element\_text(hjust = .85),

panel.grid.major.y = element\_blank(),

panel.grid.minor.x = element\_blank(),

panel.border = element\_blank(),

plot.caption = element\_text(size = 7))

ggsave(p3, file = paste("co2\_mauna\_loa\_polar", l, Sys.Date(), "wp.svg", sep = "\_"), width = 20, height = 20, units = "cm", device = svg)

}