Probabilty Distribution Function: Climate Change Analysis

Elmera Azadpour

1/30/2022

```
## read in wailupe precip data from NOAA
wailupe_77_rain <- read.csv(here("climate_change_data", "probabilty_distribution", "NOAA_WailupeHawaiiKa

##Use lubridate to clean up the dates and times
wailupe_77_rain$DATE <- ymd(wailupe_77_rain$DATE)
```

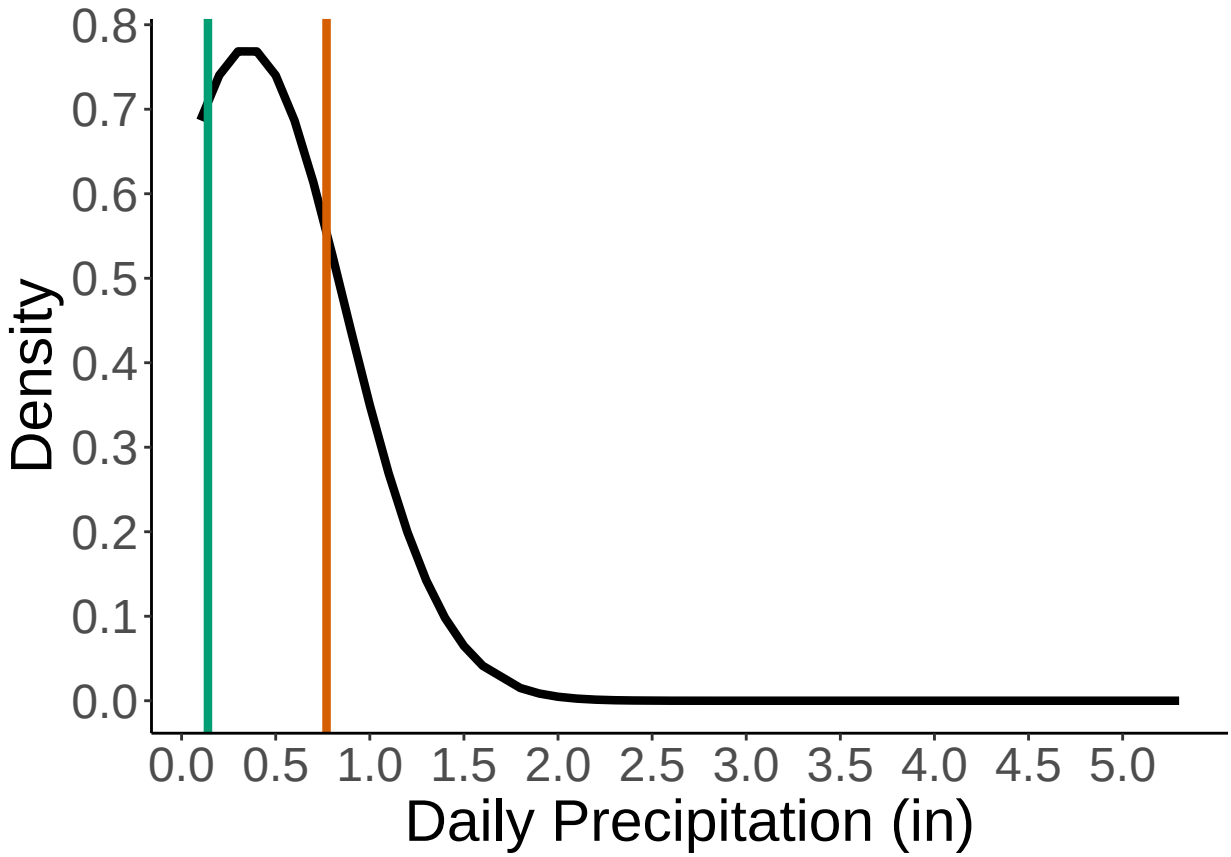
```
## for wailupe 1977-2014
wailupe_tidy_77 <- wailupe_77_rain %>%
  rename(station = STATION, station_name = STATION_NAME, elevation = ELEVATION,
         lat = LATITUDE, lon = LONGITUDE, date = DATE, time = TIME, qgag = QGAG,
         qgag_flag = Measurement.Flag, qgag_qual = Quality.Flag, qgag_units = Units,
         qpcp = QPCP, qpcp_flag = Measurement.Flag.1, qpcp_qual = Quality.Flag.1,
         qpcp_units = Units.1) %>% #renames columns
  filter(station_name == "WAILUPE VALLEY SCHOOL 723.6 HI US") %>% #filter to Wailupe gauge only
  filter(qpcp != "-9999",
         qpcp != "999",
         qpcp != "999.99",
         qpcp_flag != "g",
         qpcp_flag != "{",
         qpcp_flag != "}",
         qpcp_flag != "[",
         qpcp_flag != "]",
         qgag != "-9999.00",
         qgag != "-9999",
         qgag_flag != "g",
         qgag_flag != "V",
         qgag_flag != "P",
         qgag_flag != "{",
         qgag_flag != "}",
         qgag_flag != "[",
         qgag_flag != "]") ## removes all flagged data


## daily total precip
wailupe_daily_77 <- wailupe_tidy_77 %>%
  group_by(date) %>%
  summarize(
    daily_pcp = sum(qpcp),
    daily_vol = sum(qgag)) ## gives total summed precip data per day. HT is given in inches.

wailupe_daily_77$date <- ymd(wailupe_daily_77$date)
```

PDF code sourced from: https://rstudio-pubs-static.s3.amazonaws.com/100906_8e3a32dd11c14b839468db756cee7400.html

```
z=wailupe_daily_77$daily_pcp

dStandardNormal <- data.frame(daily_pcp=z,
                              Density=dnorm(z, mean=0.3498252, sd=0.5167536),
                              Distribution=pnorm(z, mean=0.3498252, sd=0.5167536),
                             Quantile = qnorm(z, mean=0.3498252, sd=0.5167536))
```

```
## Warning in qnorm(z, mean = 0.3498252, sd = 0.5167536): NaNs produced
```

```
## add color pallete
cbp2 <- c("#000000", "#009E73",
          "#D55E00")

## plot density distribution plot
pdf_plot_density <- ggplot(data=dStandardNormal, aes(x=daily_pcp, y= Density)) +
  geom_line(size=1.5) +
  theme_classic() +
  labs(x= "Daily Precipitation (in)") +
  geom_vline(xintercept = 0.77, linetype="solid",
               color = "#D55E00", size=1.5) +
  geom_vline(xintercept = 0.14, linetype="solid",
               color = "#009E73", size=1.5) +
  # annotate("text", x = 4.75, y = 0.75, label = "Max MCF * avg pcp", color = "#D55E00", size =5) +
  # annotate("text", x = 4.75, y = 0.70, label = "Min MCF * avg pcp", color = "#009E73",size =5) +
    theme(text = element_text(size=22)) +
scale_x_continuous(breaks=seq(0,5,0.5)) +
scale_y_continuous(breaks=seq(0,0.8,0.1))

pdf_plot_density
```




```
#  ggsave('pdf_MCF.png', pdf_plot_density, width = 16, height = 9, units = "in")
```