Australia Fire

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```
names(rainfall)
```

```
##  [1] "station_code" "city_name"    "year"         "month"
##  [5] "day"          "rainfall"     "period"       "quality"
##  [9] "lat"          "long"         "station_name"
```

```
range(rainfall$year)
```

```
## [1] 1858 2020
```

```
dim(rainfall)
```

```
## [1] 179273     11
```

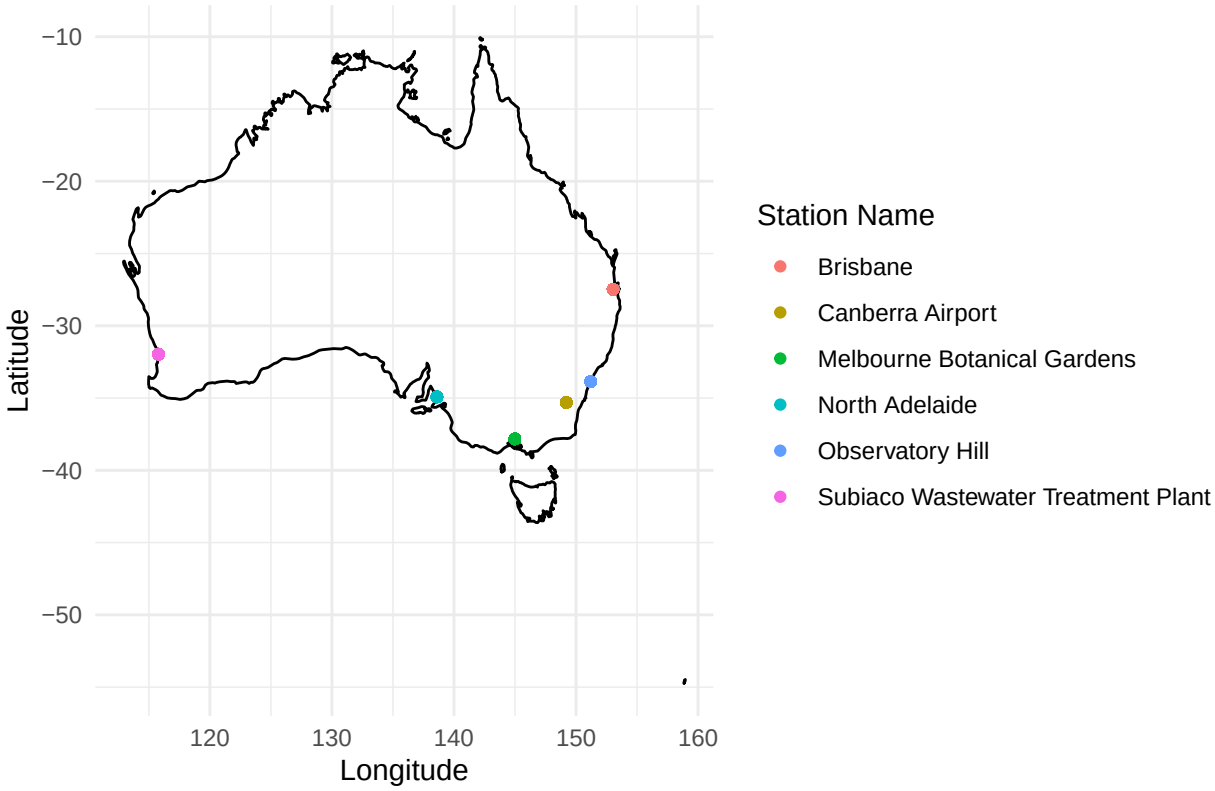
```
# select 2019 rainfall data
#rainfall2019 <-rainfall[which(rainfall$year == 2019),]
rainfall2019 <- filter(rainfall, year == 2019) %>% filter(!is.na(rainfall))
head(rainfall2019)
```

```
##   station_code city_name year month day rainfall period quality    lat
## 1         9151     Perth 2019     1   1      0.0     NA       N -31.96
## 2         9151     Perth 2019     1   2      0.0     NA       N -31.96
## 3         9151     Perth 2019     1   3      1.6      1       N -31.96
## 4         9151     Perth 2019     1   4      0.0     NA       N -31.96
## 5         9151     Perth 2019     1   5      0.0     NA       N -31.96
## 6         9151     Perth 2019     1   6      0.0     NA       N -31.96
##     long                        station_name
## 1 115.79 Subiaco Wastewater Treatment Plant
## 2 115.79 Subiaco Wastewater Treatment Plant
## 3 115.79 Subiaco Wastewater Treatment Plant
## 4 115.79 Subiaco Wastewater Treatment Plant
## 5 115.79 Subiaco Wastewater Treatment Plant
## 6 115.79 Subiaco Wastewater Treatment Plant
```

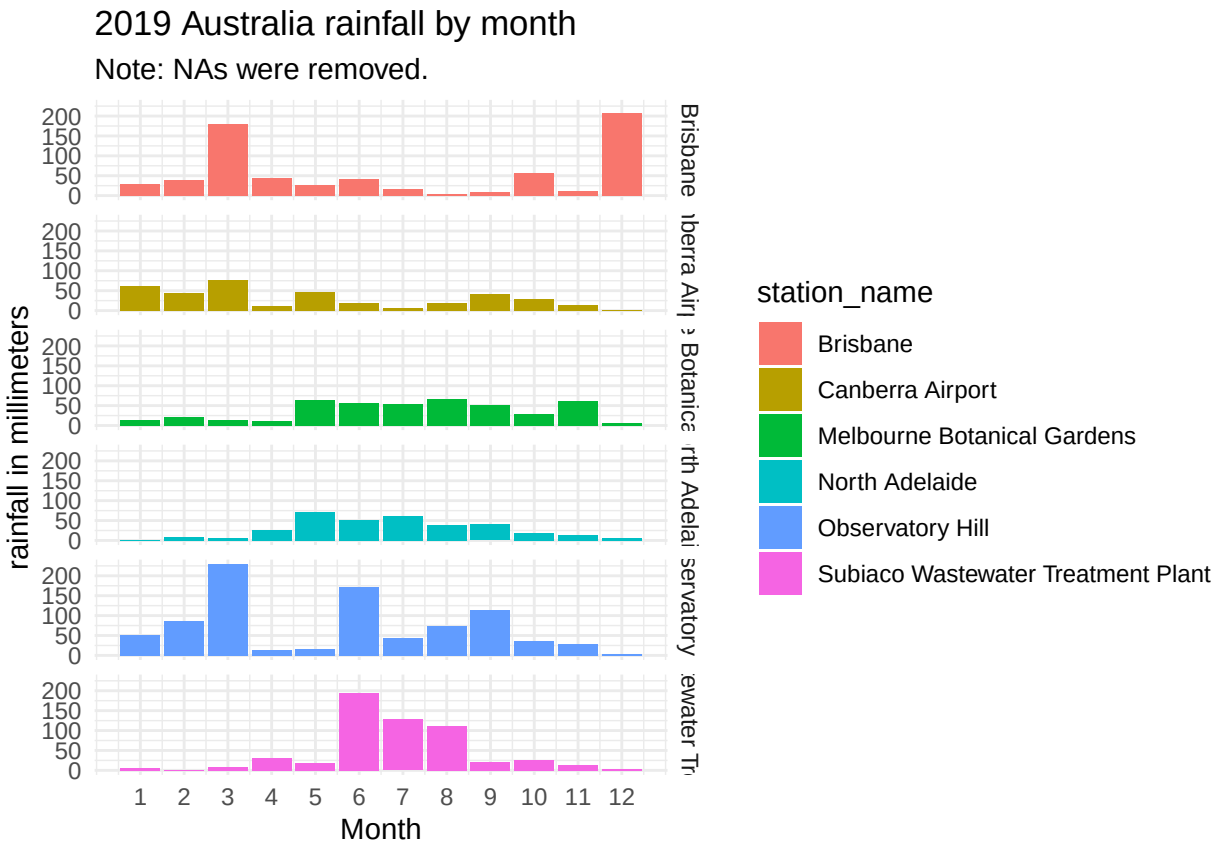
```
# Let's see where the four stations located:

world <- getMap(resolution = "low")

aus <- world[world$ADMIN == "Australia", ]

 ggplot() +
  geom_polygon(data = aus,
               aes(x = long, y = lat, group = group),
               fill = NA, colour = "black") +
```

```
  geom_point(data =rainfall2019,  # Add and plot speices data
             aes(x = long, y = lat,
                 colour = factor(station_name))) +
  coord_quickmap() +
  theme_classic() +  # Remove ugly grey background
  xlab("Longitude") +
  ylab("Latitude") +
  guides(colour=guide_legend(title="Station Name")) +
   theme_minimal()
```

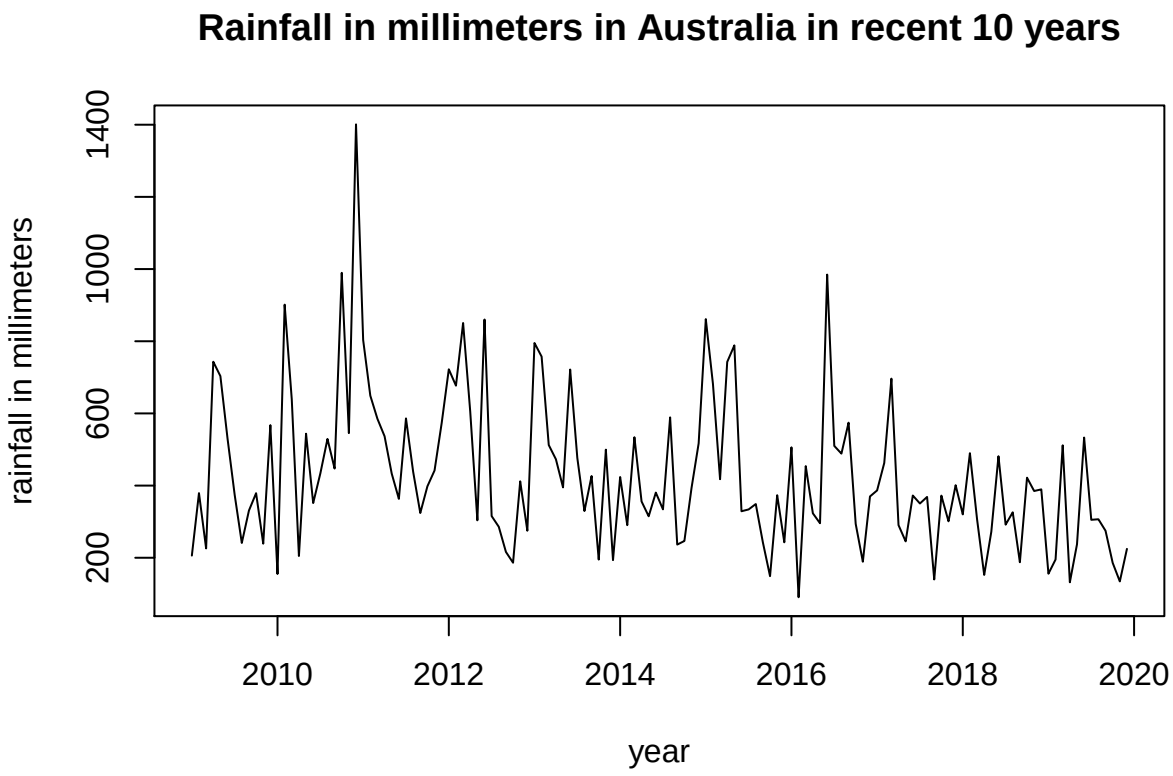
Regions defined for each Polygons



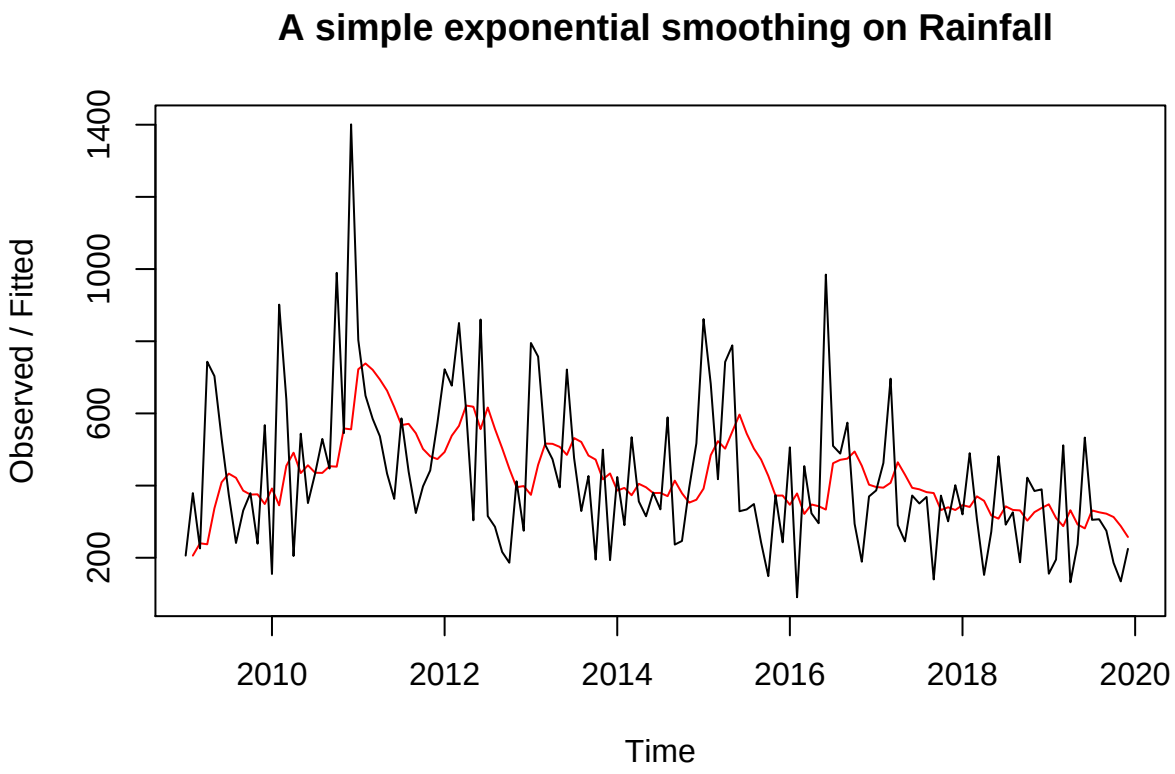

```
# Monthly rainfall in Australia 2019 by station
ggplot(rainfall2019, aes(month, rainfall, fill = station_name)) +
  geom_bar(stat = "identity") +
  scale_x_continuous(name="Month", breaks = seq(1,12,1)) +
  labs(title = "2019 Australia rainfall by month",
       subtitle = "Note: NAs were removed.",
       y = "rainfall in millimeters",x = "Month")+
  facet_grid(vars(station_name)) +
  theme_minimal()
```




```
# filtering rainfall data to the most recent 10 years
rainfall_10yr <-rainfall[which(rainfall$year <=2019 & rainfall$year >= 2009 ),]
# sum rainfall by month
new_dt = rainfall_10yr %>%
  group_by(`year`,`month`) %>%
  summarize(month_total = sum(`rainfall`, na.rm = TRUE))
ts1<- ts(new_dt$month_total,start=c(2009, 1), end=c(2019, 12), frequency = 12)

plot(ts1, xlab = "year", ylab = "rainfall in millimeters",
     main = "Rainfall in millimeters in Australia in recent 10 years")
```




```
rain_forecasts <- HoltWinters(ts1, beta=FALSE, gamma=FALSE)
# plot the original time series as a black line, with the forecasted values as a red line on top of tha
plot(rain_forecasts, main = " A simple exponential smoothing on Rainfall")
```




```
# Sum of rainfall per station in 2019
aggregate(rainfall2019$rainfall,
          by = list(station_name = rainfall2019$station_name),
          sum)
```

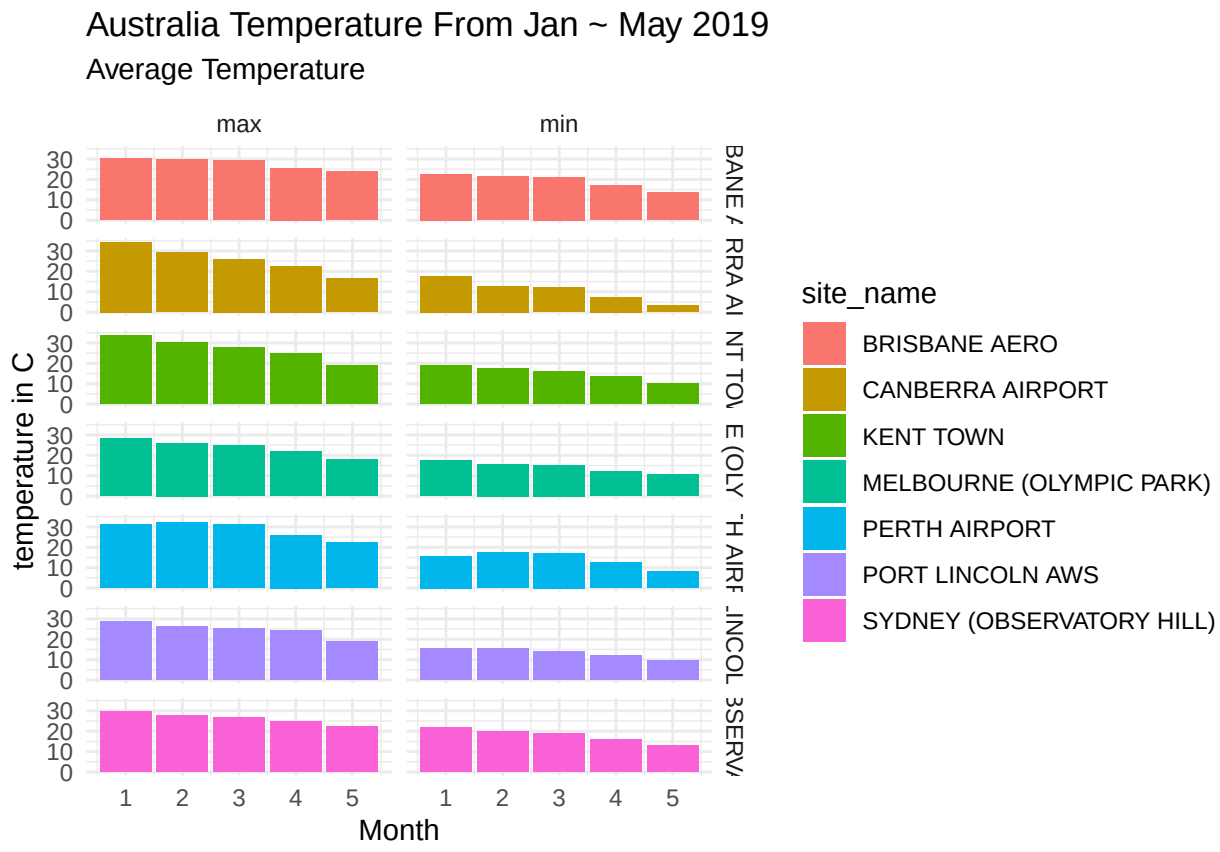
```
##                          station_name     x
## 1                            Brisbane 654.6
## 2                   Canberra Airport 358.6
## 3        Melbourne Botanical Gardens 441.5
## 4                     North Adelaide 339.6
## 5                   Observatory Hill 851.8
## 6 Subiaco Wastewater Treatment Plant 550.5
```

```
temperature$date<- as.Date(temperature$date)

temperature2019<- filter(temperature, year(date) == 2019) %>% filter(!is.na(temperature))
```

```
dt = aggregate(temperature2019$temperature,
          by = list(month = month(temperature2019$date),
                    type= temperature2019$temp_type,
                    site_name = temperature2019$site_name), mean)
dt = as.data.frame(dt)
names(dt)
```

```
## [1] "month"     "type"      "site_name" "x"
```

```r
temperature2019$month <- month(temperature2019$date)

ggplot(dt, aes(month,x, fill = site_name)) +
  geom_bar(stat = "identity")  +
  labs(title = "Australia Temperature From Jan ~ May 2019",
       subtitle = "Average Temperature",
       y = "temperature in C",x = "Month")+
  facet_grid(site_name ~ type)+
  theme_minimal()
```

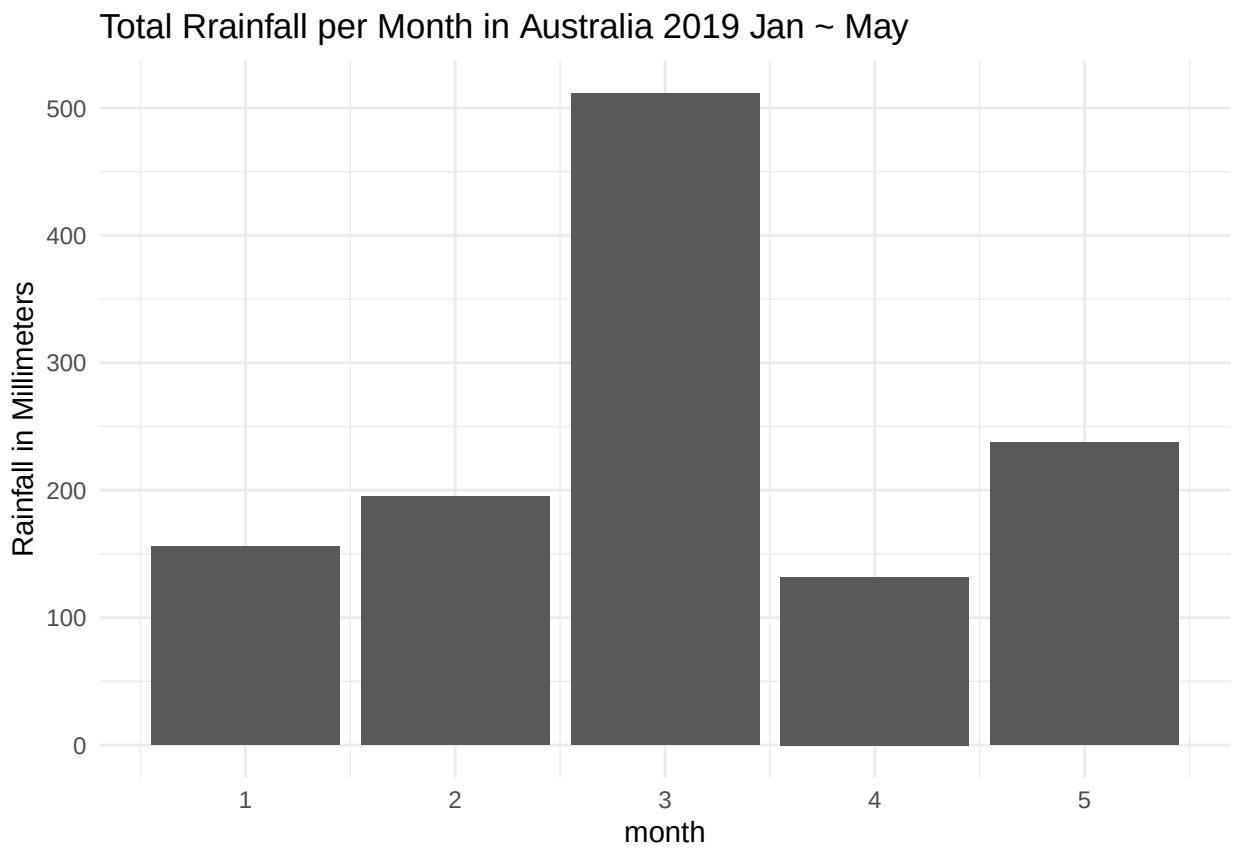



```r
# since we just looked at the average temp from Jan till May,
# let's now look at the rainfall amount during the same time period.

# sum rainfall by month
rainfall_sub = rainfall2019%>%
  group_by(`year`,`month`) %>%
  summarize(month_total = sum(`rainfall`, na.rm = TRUE)) %>% filter(`month`< 6 & `month` >=1)

head(rainfall_sub)
```

```
## # A tibble: 5 x 3
## # Groups:   year [1]
##    year month month_total
##   <int> <int>       <dbl>
## 1  2019     1        156.
```

```
## 2  2019     2        195.
## 3  2019     3        512.
## 4  2019     4        132
## 5  2019     5        237.
```

```r
ggplot(rainfall_sub, aes(month,month_total)) + geom_bar(stat = "identity") +
  labs(title = "Total Rrainfall per Month in Australia 2019 Jan ~ May",  y = "Rainfall in Millimeters")
  theme(text = element_text(size = 15, family = "Berlin Sans FB"))+
  theme_minimal()
```




```r
plot(aus, main = "Australia Most Recent Fire Locations")
plot(aus_fires$geometry, add = TRUE,  col = "red")
```

Australia Most Recent Fire Locations