EDS 230/ESM232: Assignment 2

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1 Read in Climate Data

```
climate_data <- read.table(here("data", "clim.txt"))
options(scipen = 999)
```

2 Subset Climate Data

```
#filter climate dataset for february minimum temperature
feb_min_temps <- climate_data %>%
  filter(month == 2) %>%
  group_by(wy) %>%
  summarise(feb_min_temp_c = mean(tmin_c))

#filter climate dataset for february precipitation
jan_precip <- climate_data %>%
  filter(month == 1) %>%
  group_by(wy) %>%
  summarise(total_jan_precip_mm = sum(precip))
```

3 Summarize Results

```
years_list <- jan_precip$wy
anomaly <- c()

for (i in 1:length(years_list)){

  anomaly[i] <- almond_yield(precip = jan_precip$total_jan_precip_mm[i], temp = feb_min_temps$feb_min_t

}
```

```
anomaly_df <- as.data.frame(cbind(years_list,
                                  anomaly,
                                  jan_precip$total_jan_precip_mm,
                                  feb_min_temps$feb_min_temp_c))

colnames(anomaly_df) <- c("years", "anomaly", "ppt", "temp")

anomaly_df %>%
  ggplot(aes(x = years)) +
```

```
  geom_line(aes(y = anomaly, color = "Almond Yield Anomaly (tons/acre)"),
            lwd = 1) +
  geom_line(aes(y = ppt, color = "Total January Precipitation (mm)"),
            lwd = 1) +
  xlab("Years") +
  ylab("Anomaly (tons/acre)") +
  scale_color_manual(values = c("red", "lightskyblue3")) +
  scale_y_continuous(sec.axis = sec_axis(trans = ~.*1,
                                         name = "Precipitation (mm)")) +
  ggtitle("Almond Yield Anomaly (1989-2010)") +
  labs(color = "Variable") +
  theme_light() +
  theme(axis.text.y.right = element_text(color = "lightskyblue3"),
        axis.title.y.right = element_text(color = "lightskyblue3"))
```

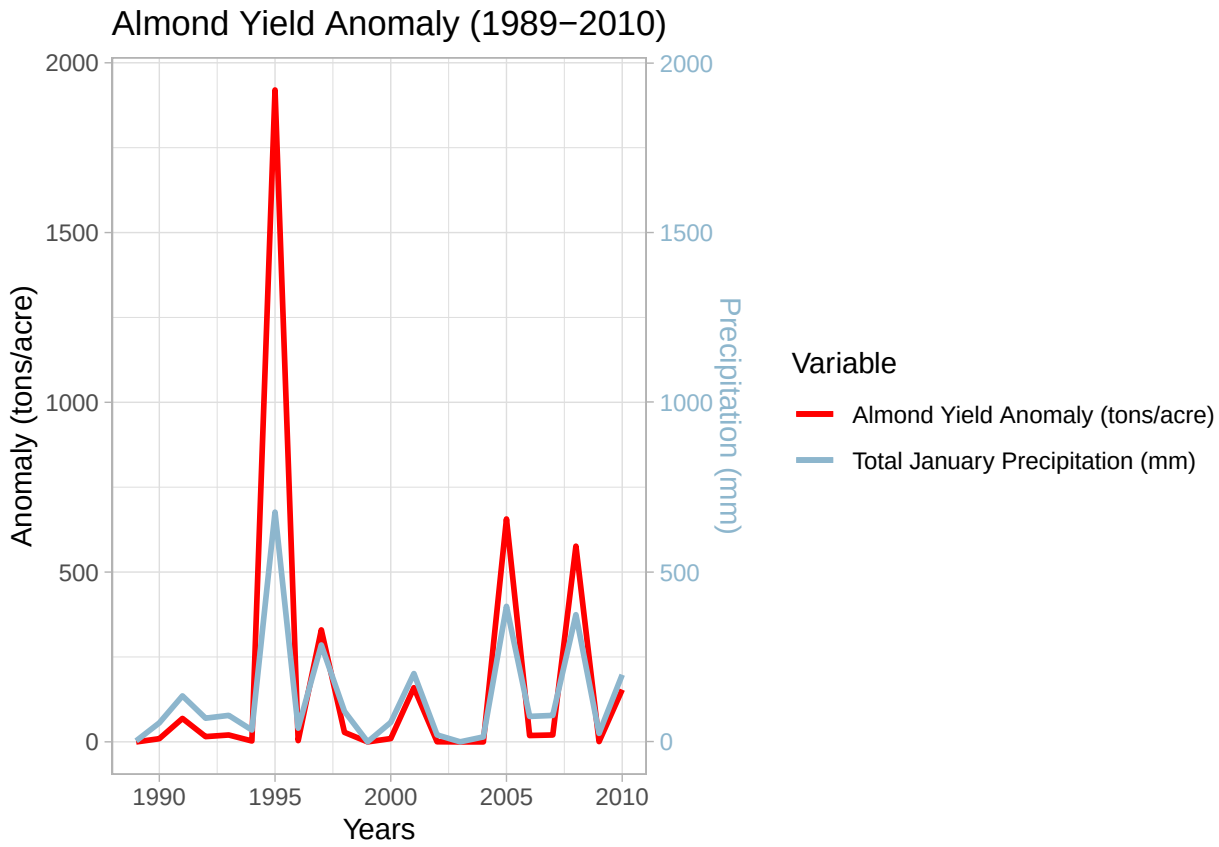

Figure 1. Almond Yield Anomalies compared to total January precipitation from the years 1989 to 2010 using data provided by Dr. Naomi Tague (ESM 232/EDS 230) and modeled using equations from published paper Lobell et al. 2006. The red line indicates the yield anomalies for each year modeled and the blue line describes the total precipitation in January for each year.

```
anomaly_df %>%
  ggplot(aes(x = years)) +
  geom_line(aes(y = anomaly, color = "Almond Yield Anomaly (tons/acre)"),
            lwd = 1) +
  geom_line(aes(y = temp*100, color = "Minimum Temperature (C)"),
            lwd = 1) +
  xlab("Years") +
```

```
ylab("Anomaly (tons/acre)") +
scale_color_manual(values = c("red", "lightskyblue3"))+
scale_y_continuous(sec.axis = sec_axis(trans = ~./100,
                                       name = "Minimum Temperature (C)")) +
labs(color = "Variable") +
ggtitle("Almond Yield Anomaly (1989-2010)") +
theme_light() +
theme(axis.text.y.right = element_text(color = "lightskyblue3"),
      axis.title.y.right = element_text(color = "lightskyblue3"))
```

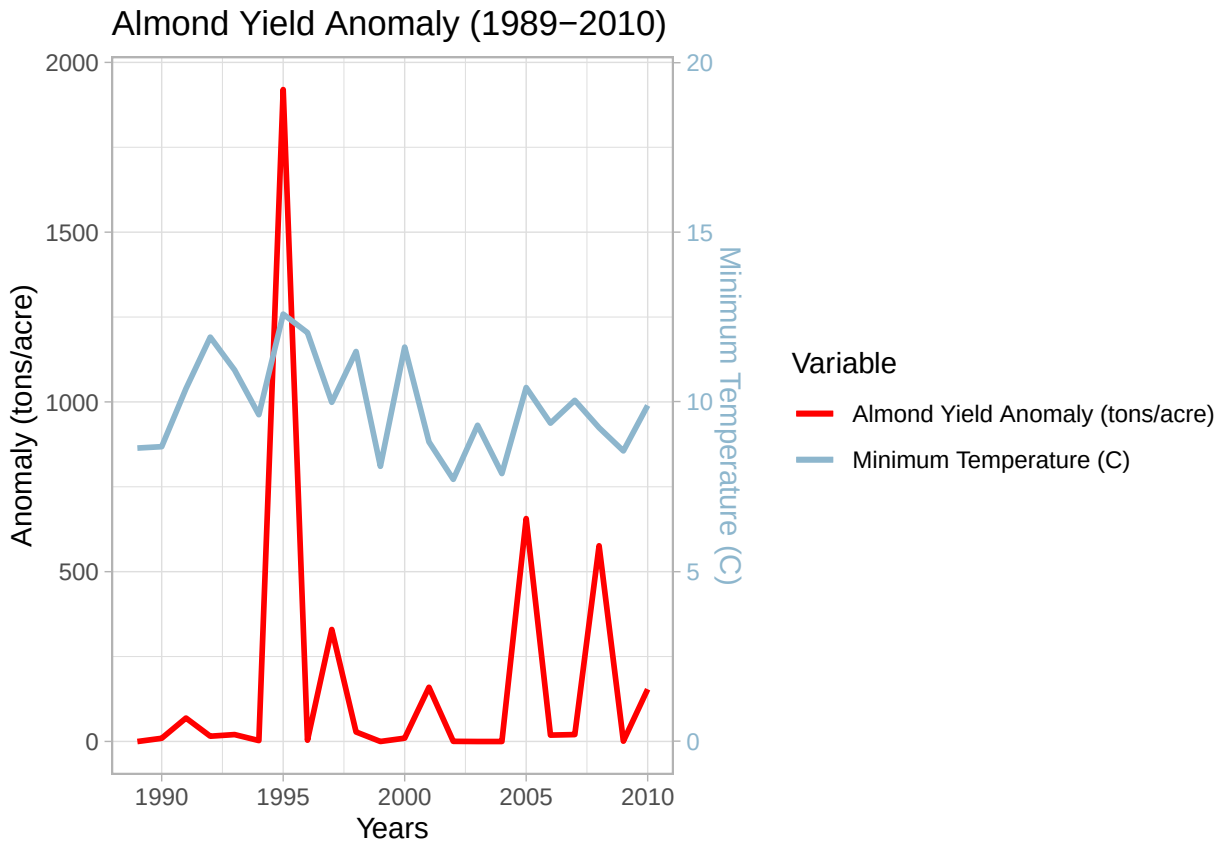

Figure 2. Almond Yield Anomalies compared to minimum February temperature (C) from the years 1989 to 2010 using data provided by Dr. Naomi Tague (ESM 232/EDS 230) and modeled using equations from published paper Lobell et al. 2006. The red line indicates the yield anomalies for each year modeled and the blue line describes the minimum temperature in February for each year.

4 Summary of Findings

When calculating the anomalies in almond yield based on Lobel et al. 2006 from climate data provided by Dr. Naomi Tague, we found that the largest anomaly was in 1995 and has a value of 1919.981 tons/acre. We included the total January precipitation values in this graph and found they follow a similar trend. In 1995 the total January precipitation was 676.512 mm. We also visualized the minimum February temperature in comparison with the yield anomalies (Figure 2.) and found that it had a similar trend but was not quite as visually compelling as Figure 1.