ESM 262 Assignment 2 - Almond Yield

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```
# read in the clim data
clim <- read.table(here("data", "clim_original.txt"))
```

```
yield_anomalies <- almond_yield(clim)

yield_anomalies %>%
  kable(col.names = c("Year", "Almond Yield")) %>%
  kable_styling(bootstrap_options = "striped",
                full_width = FALSE)
```

Table 1. The above table shows annual almond yield anomaly (tons/acre) estimated by linear regression using precipitation and temperature data.

```
yield_plot <- ggplot(yield_anomalies, aes(x = year, y = yield)) +
  geom_line() +
  labs(title = "Annual Almond Yield Anomalies",
       y = "Yield (tons/acre)", x = "Year",
       tag = "a") +
  theme_minimal() +
  theme(plot.title = element_text(hjust = 0.5))
```

```
sum_precip <- clim %>%
  filter(month == 1) %>%
  group_by(year, month) %>%
  summarize(sum_precip = sum(precip))

mean_min_temp <- clim %>%
  filter(month == 2) %>%
  group_by(year, month) %>%
  summarize(mean_min_temp = mean(tmin_c))
```

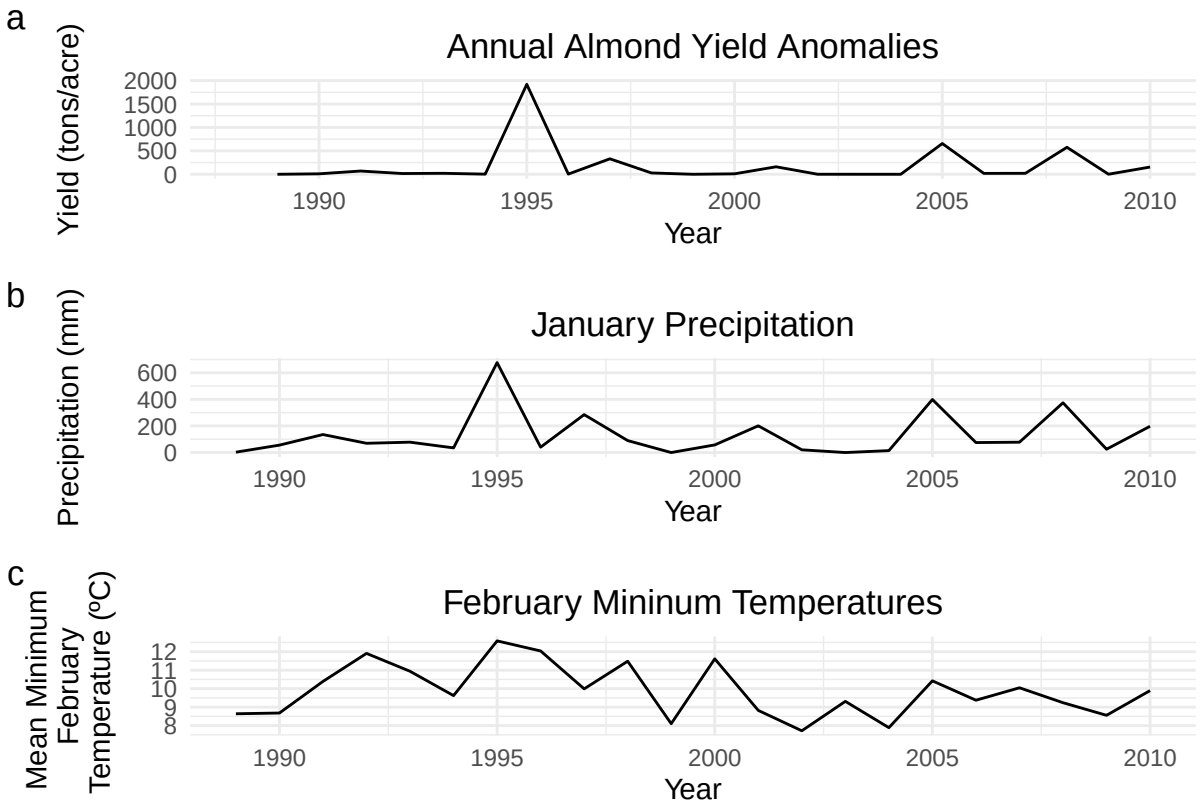
```
precip_plot <- ggplot(sum_precip, aes(x = year, y = sum_precip)) +
  geom_line() +
  labs(title = "January Precipitation",
       y = "Precipitation (mm)", x = "Year",
       tag = "b") +
  theme_minimal() +
  theme(plot.title = element_text(hjust = 0.5))

temp_plot <- ggplot(mean_min_temp, aes(x = year, y = mean_min_temp)) +
```

Year	Almond Yield
1988	NA
1989	-0.3552237
1990	9.2906757
1991	68.9130633
1992	15.4280698
1993	20.2083803
1994	2.4820009
1995	1919.9811511
1996	3.5818399
1997	329.6938750
1998	27.8636956
1999	-0.1436364
2000	9.5999883
2001	159.5119587
2002	0.2450914
2003	-0.2585997
2004	-0.2367722
2005	656.3724121
2006	18.6324135
2007	20.2007396
2008	576.2821943
2009	0.7367438
2010	153.7655092

```
  geom_line() +
  labs(title = "February Mininum Temperatures",
       y = "Mean Minimum \n February \n Temperature (ºC)", x = "Year",
       tag = "c") +
  theme_minimal() +
  theme(plot.title = element_text(hjust = 0.5))
```

```
yield_plot / precip_plot / temp_plot
```



Graph 1. Plot (a) shows estimated annual almond yield anomaly based on temperature and precipitation data. Plot (b) shows summed precipitation in January of each year. Plot (c) shows mean minimum daily temperatures in February of each year.

Our results show the almond yield anomaly from 1988 to 2010 is largely positive. The negative values are very close to 0, while the positive values can be rather large in comparison. There was a spike in almond yield in 1995 which matches up with the spike in precipitation the same year. The precipitation is likely due to the moderate El Niño event in 1994-1995. Temperature and precipitation values were not available for the months in 1988 and therefore there is no yield anomaly available.