Copenhagen Winter

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Purpose

To test my qualitative assessment that winter has been warmer this year (24/25) compared to last (23/24).

Daily temperature data sourced from the DMI (Danish Meteorological Institute), weather station: Landbohøjskolen (Copenhagen).

Wrangle data

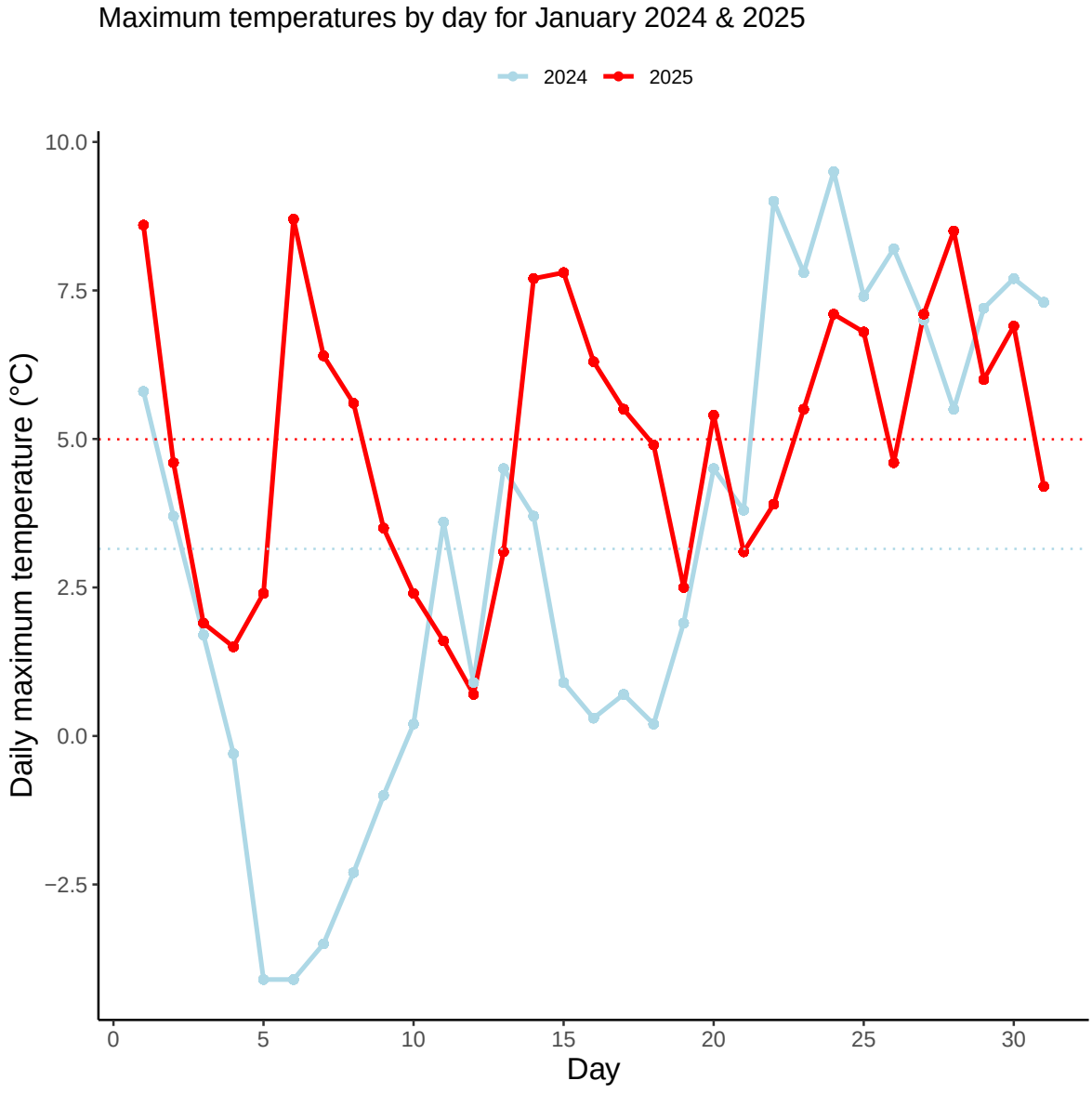
```
library(tidyverse)

df <- rbind(read_delim("dec_23.csv"),
              read_delim("dec_24.csv"),
              read_delim("jan_24.csv"),
              read_delim("jan_25.csv")
              ) %>%
  separate(.,
           DateTime,
           into = c("date", "time"),
           sep = " "
```

```
          ) %>%
  mutate(time = replace_na(time, "00:00:00"),
         time = str_replace(time, ":00:00", ""),
         year = str_replace(date, "-.*", ""),
         month = case_when(str_detect(date, "-01-") ~ "january",
                           str_detect(date, "-12-") ~ "december"),
         day = as.numeric(str_replace(date, "....-..-", ""))
         ) %>%
  group_by(date) %>%
  mutate(daily_max = max(Maksimumtemperatur),
         daily_min = min(Minimumtemperatur),
         daily_avg = mean(Middeltemperatur)) %>%
  ungroup()
```

Plot January comparison

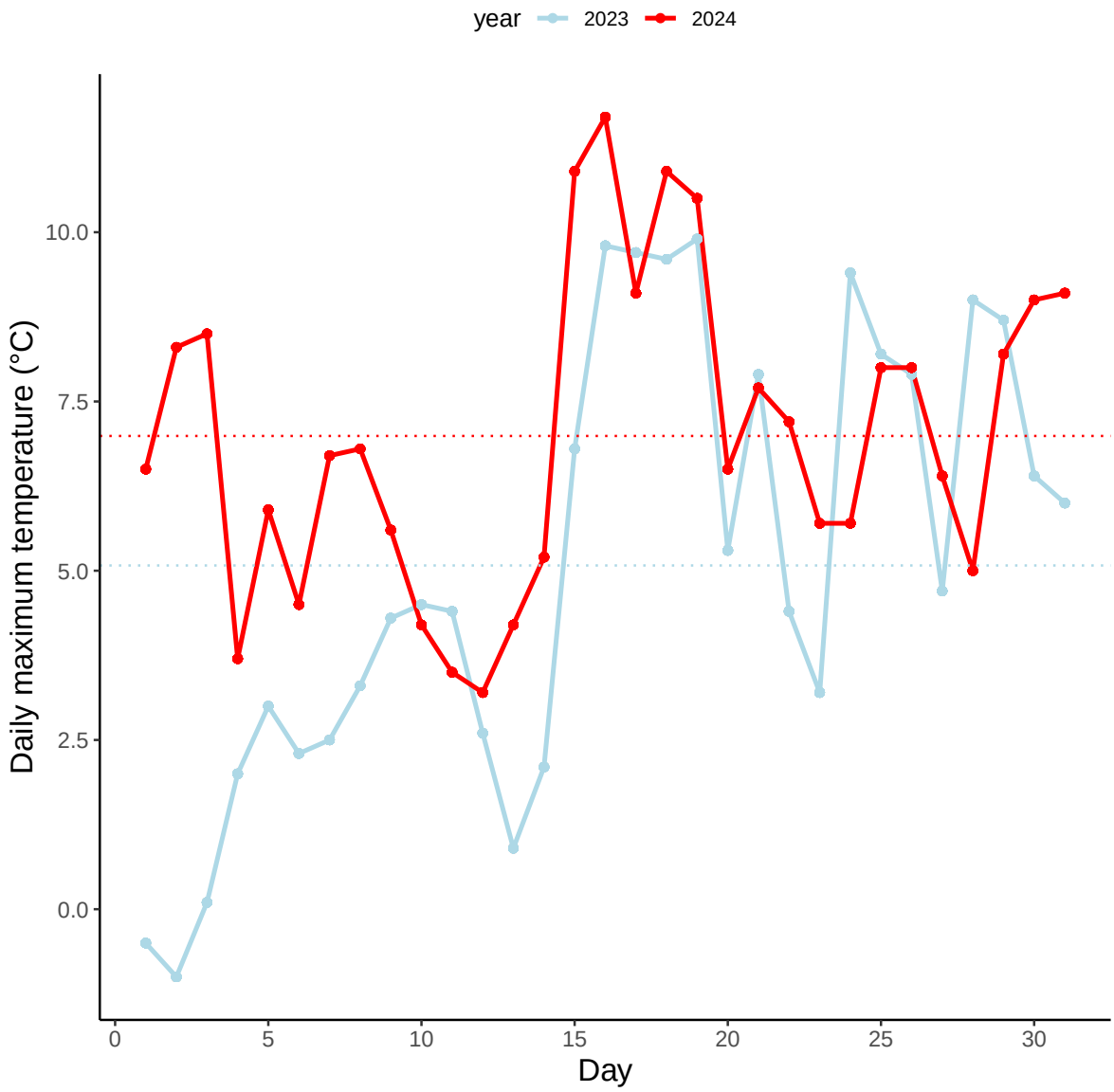
```
df %>%
  filter(month == "january") %>%
  ggplot(aes(x = day,
             y = daily_max,
             colour = year,
             group = year)
         ) +
  geom_line(linewidth = 1) +
  geom_point() +
  scale_colour_manual(values = c("2024" = "lightblue",
                                 "2025" = "red")
                      ) +
  geom_hline(yintercept = mean(df %>% filter(year == "2024" & month == "january") %>% pull(da
             colour = "lightblue",
             linetype = "dotted"
             ) +
  geom_hline(yintercept = mean(df %>% filter(year == "2025" & month == "january") %>% pull(da
             colour = "red",
             linetype = "dotted"
             ) +
  scale_x_continuous(n.breaks = 7) +
  scale_y_continuous(n.breaks = 7) +
  theme_classic() +
  theme(legend.position = "top",
```

```
        legend.title = element_blank(),
        axis.title = element_text(size = 14),
        axis.text = element_text(size = 10),
        ) +
  labs(x = "Day", y = "Daily maximum temperature (°C)") +
  ggtitle("Maximum temperatures by day for January 2024 & 2025")
```



Plot December comparison

```
df %>%
  filter(month == "december") %>%
  ggplot(aes(x = day,
             y = daily_max,
             colour = year,
             group = year)
         ) +
  geom_line(linewidth = 1) +
  geom_point() +
  scale_colour_manual(values = c("2023" = "lightblue",
                                 "2024" = "red")
                      ) +
  geom_hline(yintercept = mean(df %>% filter(year == "2023" & month == "december") %>% pull(
             colour = "lightblue",
             linetype = "dotted"
             ) +
  geom_hline(yintercept = mean(df %>% filter(year == "2024" & month == "december") %>% pull(
             colour = "red",
             linetype = "dotted"
             ) +
  scale_x_continuous(n.breaks = 7) +
  scale_y_continuous(n.breaks = 7) +
  theme_classic() +
  theme(legend.position = "top",
        axis.title = element_text(size = 14),
        axis.text = element_text(size = 10),
        ) +
  labs(x = "Day", y = "Daily maximum temperature (°C)")
```

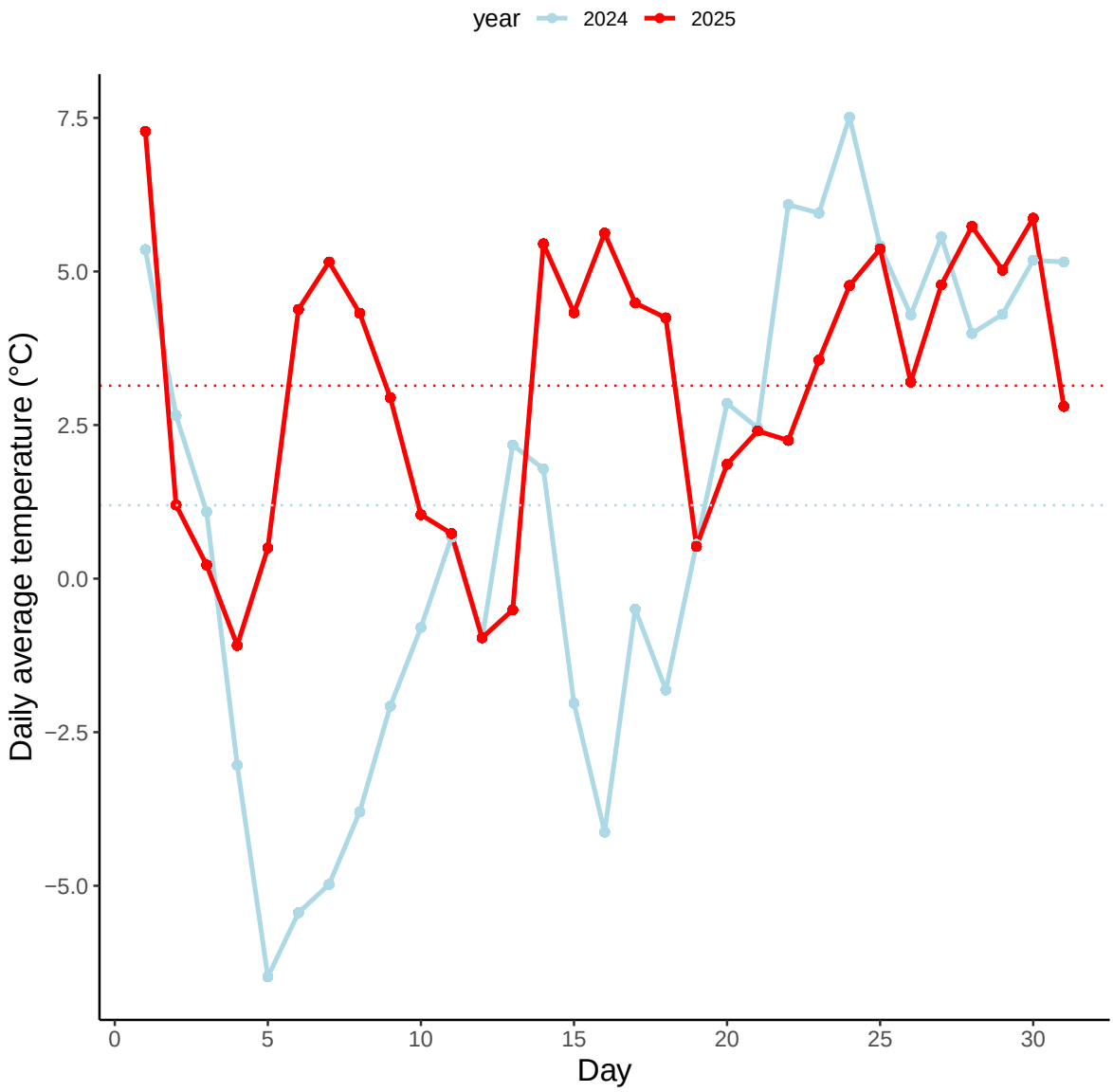


Plot January comparison (mean temps)

Looks like mean temperatures give more or less the same answer compared to maximum temps.

```
df %>%
  filter(month == "january") %>%
  ggplot(aes(x = day,
```

```
            y = daily_avg,
            colour = year,
            group = year)
        ) +
  geom_line(linewidth = 1) +
  geom_point() +
  scale_colour_manual(values = c("2024" = "lightblue",
                                 "2025" = "red")
                      ) +
  geom_hline(yintercept = mean(df %>% filter(year == "2024" & month == "january") %>% pull(da
             colour = "lightblue",
             linetype = "dotted"
             ) +
  geom_hline(yintercept = mean(df %>% filter(year == "2025" & month == "january") %>% pull(da
             colour = "red",
             linetype = "dotted"
             ) +
  scale_x_continuous(n.breaks = 7) +
  scale_y_continuous(n.breaks = 7) +
  theme_classic() +
  theme(legend.position = "top",
        axis.title = element_text(size = 14),
        axis.text = element_text(size = 10),
        ) +
  labs(x = "Day", y = "Daily average temperature (°C)")
```


year
2024
2025
Daily average temperature (°C)
7.5
5.0
2.5
0.0
−2.5
−5.0
0
5
10
15
20
25
30
Day