Sunrise and sunset times

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```
make_local <- function(time, tz) {
  as.character(with_tz(time, tz)) |>
    as.POSIXct() |>
    strftime(x = _, format = "%H:%M:%S")
}
```

```
the_date <- "2019-04-05"

big_cities <-
  world.cities |>
  filter(pop > 2e5) |>
  mutate(date = as.Date(the_date)) |>
  rename(lon = long) |>
  mutate(tz = tz_lookup_coords(lat, lon, warn = FALSE)) |>
  as_tibble()
```

```
sunrise_times <-
  big_cities |>
  getSunlightTimes(data = _, keep = "sunrise") |>
  as_tibble()

sunrise <-
  big_cities |>
  inner_join(sunrise_times, by = join_by(lat, lon, date)) |>
  select(name, country.etc, sunrise, date, tz, pop) |>
  rowwise() %>%
  mutate(local_time = make_local(sunrise, tz)) |>
  mutate(local_time = as.POSIXct(paste(date, local_time)))
```

```
sunrise |>
  ggplot(aes(x = local_time)) +
  geom_histogram(binwidth = 5 * 60) +
  geom_text_repel(data =
                    subset(sunrise,
                           name == "Boston" | (pop > 1e6 &
                           (local_time > as.POSIXct(paste(date, "07:50.00")) |
                                  country.etc %in% c("Australia")))),
                  mapping = aes(y = 10, label = name, color = country.etc),
                  angle = 90, vjust = 1, hjust = 1) +
  theme(legend.position = "bottom")
```

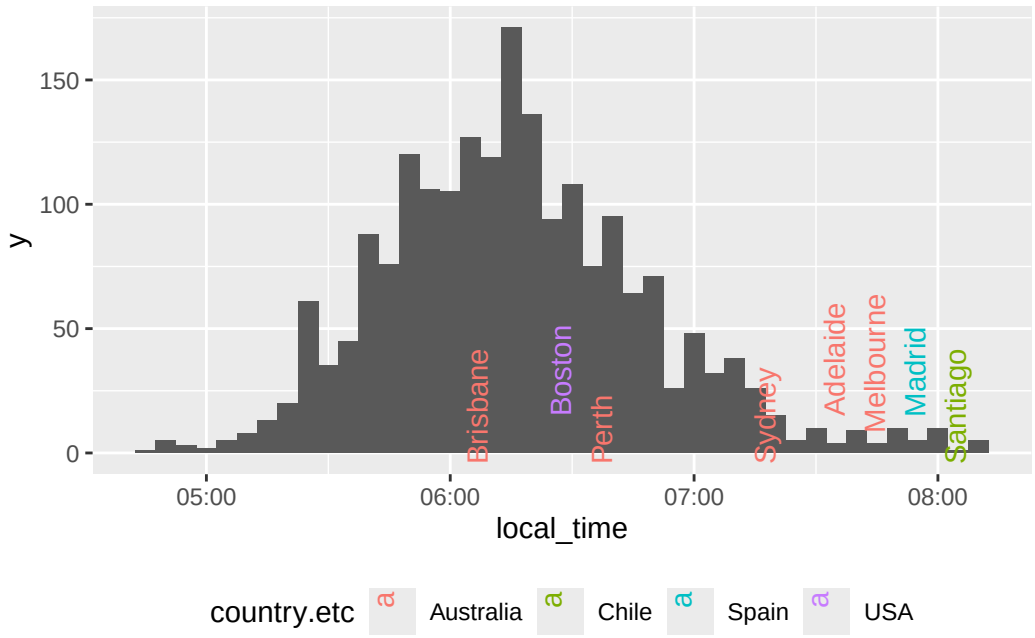

Figure 1: Sunrise on 2019-04-05 (UTC)

```
the_year <- year(the_date)

sample_cities <-
    crossing(
      world.cities %>%
        filter(name %in% "Tokyo" |
                 (name %in% c("Boston", "Sydney")
                  & country.etc %in% c("USA", "Australia")) |
```

```
                  (name == "Melbourne" & country.etc == "Australia")) %>%
        rename(lon = long) %>%
        mutate(tz = tz_lookup_coords(lat, lon, warn = FALSE)) %>%
        as_tibble(),
      date = seq(as.Date(str_glue("{the_year}-01-01")),
                 to = as.Date(str_glue("{the_year}-12-31")),
                 by = 1))

make_time <- function(a_time, tz) {
  res <- strftime(a_time, format="%H:%M:%S", tz = tz)
  res <- as.POSIXct(paste("2019-01-01", res))
  res
}

sample_cities_times <-
  sample_cities |>
  getSunlightTimes(data = _, keep = c("sunset", "sunrise")) |>
  as_tibble() |>
  inner_join(sample_cities, by = join_by(date, lat, lon)) |>
  rowwise() |>
  mutate(sunrise = make_time(sunrise, tz),
         sunset = make_time(sunset, tz))
```

```
sample_cities_times |>
  gather(key = "event", value = "time", sunrise, sunset) |>
  ggplot(aes(x = date, y = time, group = event, color = event)) +
  geom_line() +
  facet_wrap(~ name) +
  scale_x_date(date_labels = "%b") +
  scale_y_datetime(labels = function(x) strftime(x, format="%H:%M"),
                   date_breaks = "1 hour") +
  theme(legend.position = "bottom")
```

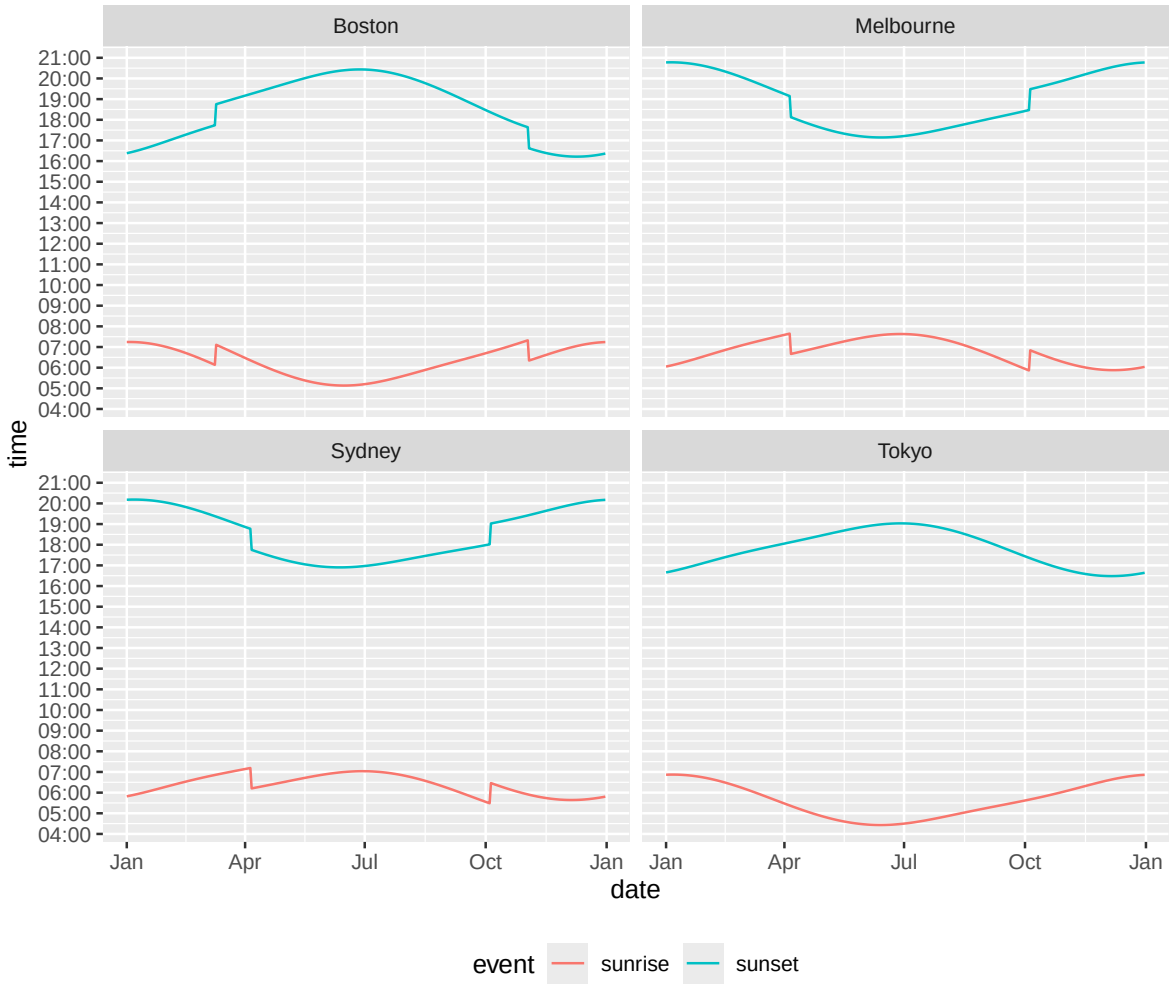

Figure 2: Sunrise and sunset times over 2019