Stat479_Portfollio4

Haoxuan Sun

5/4/2022

```
library(maps)
library(sf)
```

```
## Linking to GEOS 3.9.1, GDAL 3.2.1, PROJ 7.2.1; sf_use_s2() is TRUE
```

```
library(ggmap)
```

```
## Loading required package: ggplot2

## Google's Terms of Service: https://cloud.google.com/maps-platform/terms/.

## Please cite ggmap if you use it! See citation("ggmap") for details.
```

```
library(ggplot2)
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --

## v tibble  3.1.6     v dplyr   1.0.8
## v tidyr   1.2.0     v stringr 1.4.0
## v readr   2.1.2     v forcats 0.5.1
## v purrr   0.3.4

## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## x purrr::map()    masks maps::map()
```

```
library(readr)
library(tsibble)
```

```
##
## Attaching package: 'tsibble'

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, union
```

```
library(patchwork)

meteor = read_csv("meteorite-landings.csv")
```

```
## Rows: 45716 Columns: 10

## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr (5): name, nametype, recclass, fall, GeoLocation
## dbl (5): id, mass, year, reclat, reclong
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

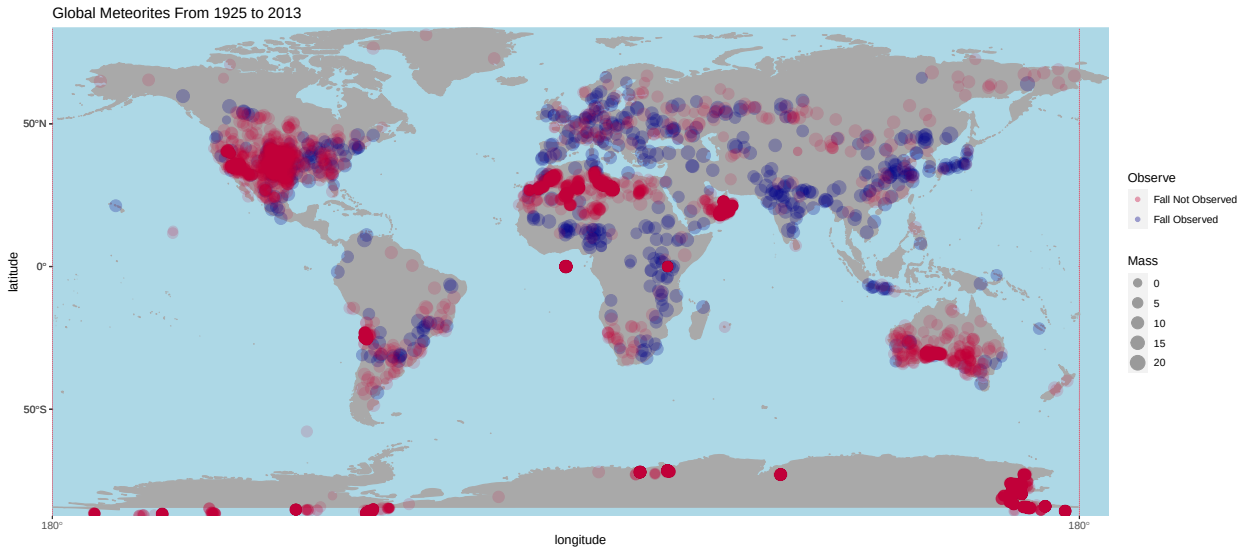
```
#create a base ggplot object
g = ggplot() +
  coord_fixed() +
  xlab("longitude") +
  ylab("latitude")

#specify the theme of maps
theme = theme(panel.grid.major = element_line(color = 2,
                                        size = 0.1,
                                        linetype = 2),
        panel.grid.minor = element_line(color = 2,
                                        size = 0.25,
                                        linetype = 1),
        panel.background = element_rect(fill = "white", colour = "white")
        )

#create a ggplot object contain map of US mainland
us_map = g +
  geom_polygon(data = map_data("county"),
               aes(long, lat, group = group),
               col = "dark grey",
               fill = "dark grey"
               ) +
  theme

#create a ggplot object contain a world map
world_map = g +
  geom_polygon(data = map_data("world"),
               aes(long, lat, group = group),
               col = "dark grey",
               fill = "dark grey"
               ) +
  scale_x_continuous(expand = c(0, 0)) +
  scale_y_continuous(expand = c(0, 0)) +
  theme(panel.grid.major = element_line(color = 2,
                                        size = 0.1,
                                        linetype = 2),
        panel.grid.minor = element_line(color = 2,
                                        size = 0.25,
```

```
                                        linetype = 1),
        panel.background = element_rect(fill = "light blue",
                                        colour = "light blue")
        )
```

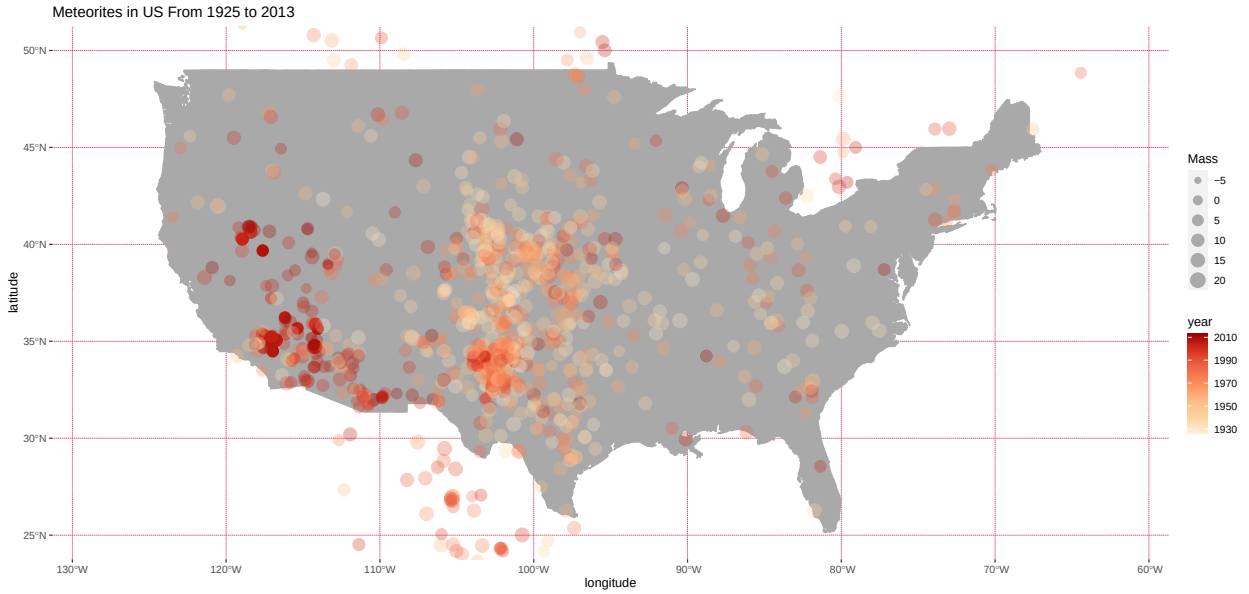
```
#convert original data set into sf format
meteor_omit_sf = meteor %>%
  na.omit() %>%
  select(c(-GeoLocation)) %>%
  st_as_sf(coords = c("reclong", "reclat"), crs = 4269) %>%
  mutate_if(., is.character, as.factor) %>%
  filter((year > 1925) & (year < 2014))

#convert original data set into tsibble format
meteor_omit_tsibble = meteor %>%
  na.omit() %>%
  group_by(year, fall) %>%
  summarise(count = n()) %>%
  mutate_if(., is.character, as.factor) %>%
  filter((year > 1925) & (year < 2014))
```

###Visualization of Meteor Landing Spatial Data

```
#filter meteors which their landings are observed
meteor_Obs = meteor_omit_sf %>%
  filter(fall == "Fell") %>%
  mutate(fall = "Fall Observed")

#filter meteors which their landings are not observed
meteor_nObs = meteor_omit_sf %>%
  filter(fall == "Found") %>%
  mutate(fall = "Fall Not Observed")

#plot the global meteor landing maps,
#size of the points is encoded with meteor size,
#color of of the points is encoded with whether the meteor's landing is observed;
#blue is observed, red is non-observed
world_map_meteor = world_map +
  geom_sf(data = meteor_Obs,
          aes(size = log(mass, 2),
          color = fall),
          alpha = I(0.25)
          ) +
  geom_sf(data = meteor_nObs,
          aes(size = log(mass),
          color = fall),
          alpha = I(0.15)
          ) +
  scale_color_manual(values = c("#C70039", "dark blue")) +
  ggtitle("Global Meteorites From 1925 to 2013") +
  labs(size = "Mass", color = "Observe")
world_map_meteor
```

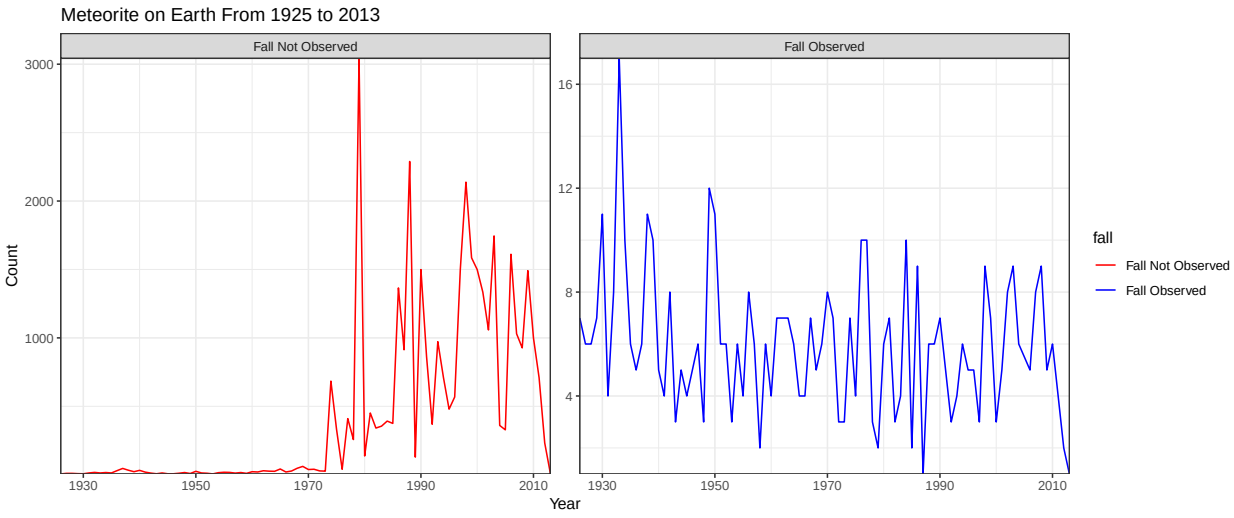



```
#plot the meteor landing in the U.S.
#size of the points is encoded with meteor size,
#color of the points is encoded with year
us_map_meteor = us_map +
  geom_sf(data = meteor_omit_sf,
          aes(color = year,
          size = log(mass, 2)),
          alpha = I(0.3)
          ) +
  scale_colour_distiller(palette = 8, direction = 1) +
  coord_sf(xlim = c(-128, -62),
           ylim = c(25, 50)
           ) +
  ggtitle("Meteorites in US From 1925 to 2013") +
  labs(size = "Mass")
us_map_meteor
```



###Visualization of Meteor Landing Time Series Data

```
#create a time series visualization with observed/non-observed meteors
meteor_omit_tsibble_1 = meteor_omit_tsibble %>%
  filter(fall == "Fell") %>%
  mutate(fall = "Fall Observed")

meteor_omit_tsibble_2 = meteor_omit_tsibble %>%
  filter(fall == "Found") %>%
  mutate(fall = "Fall Not Observed")

meteor_tsibble = rbind(meteor_omit_tsibble_1, meteor_omit_tsibble_2)

ggplot(meteor_tsibble) +
  geom_line(aes(year, count, col = fall)) +
  facet_wrap(.~ fall, scales = "free") +
  scale_x_continuous(expand = c(0,0)) +
  scale_y_continuous(expand = c(0,0)) +
  theme_bw() +
  scale_colour_manual(values = c("red", "blue")) +
  ggtitle("Meteorite on Earth From 1925 to 2013") +
  xlab("Year") +
  ylab("Count")
```


Meteorite on Earth From 1925 to 2013
Fall Not Observed
Fall Observed
Count
Year
3000
2000
1000
16
12
8
4
1930
1950
1970
1990
2010
fall
Fall Not Observed
Fall Observed