Maps 2

Fernanda Sobrino

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Projection and extent

Scale bar and North arrow

Adding names

Themes

Saving maps

Projection and extent

Coordinates

Flashback: visualization slides

Layers of a graph:

- Data
- Aesthetic
- Face
- Geometric
- Stats
- Scales
- Coordinates

coord_sf

1. projection: way to flatten the earth into a plane
2. extent: portion of area of a region shown in a map

- ▶ by deafult the map will use the coordinate system of the first layer
- ▶ `crs` allows you to override and project on the fly to any projection

coord_sf

```
ggplot(data = world) +
    geom_sf() +
    coord_sf(crs = "+proj=laea +lat_0=52 +lon_0=10 +x_0=432
```
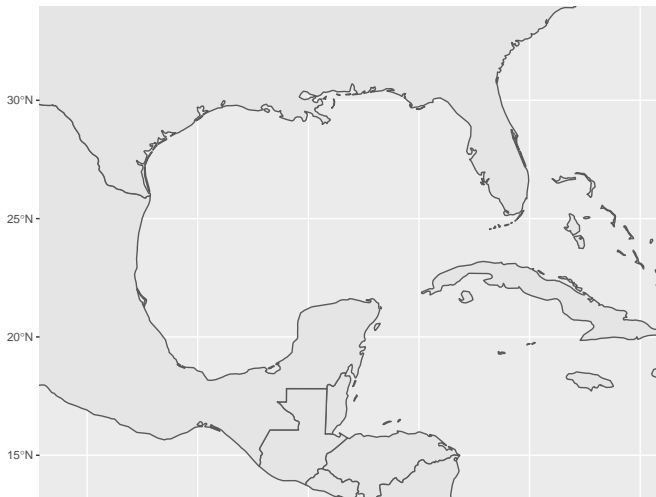
Coordinate systemas available

- PROJ4 string here
- Spatial Reference System Identifier (SRID) here
- European Petroleum Survey Group (EPSG) here

coord_sf also allows you to zoom in

```
ggplot(data = world) +
  geom_sf() +
  coord_sf(xlim = c(-102.15, -74.12),
           ylim = c(7.65, 33.97), expand = FALSE)
```

Scale bar and North arrow

What is a scale bar?

- ▶ provide a visual indication of distance and feature size on the map
- ▶ neither `ggplot2` nor `sf` have one
- ▶ we will use `ggspatial` to add one to our map

`scale_bar` inside `ggspatial`

1. allows to add simultaneously the north symbol and a scale bar into ggplot object
2. arguments need to be set manually: `lon`, `lat`, `distance_lon`, `distance_lon`, and `distance_legend`
3. you can customize your scale bar with different fonts, colors, etc.
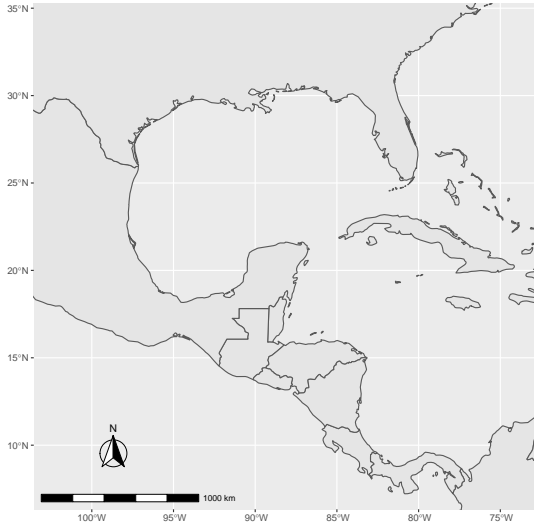
Example scale bar

```
library("ggspatial")
show_map <-
ggplot(data = world) +
    geom_sf() +
    annotation_scale(location = "bl",
                     width_hint = 0.5) +
    annotation_north_arrow(location = "bl",
                           which_north = "true",
                           pad_x = unit(0.75, "in"),
                           pad_y = unit(0.5, "in"),
        style = north_arrow_fancy_orienteering) +
    coord_sf(xlim = c(-102.15, -74.12),
             ylim = c(7.65, 33.97))
```

Example scale bar

```
show_map
```

Scale on map varies by more than 10%, scale bar may be i

Adding names

Country names
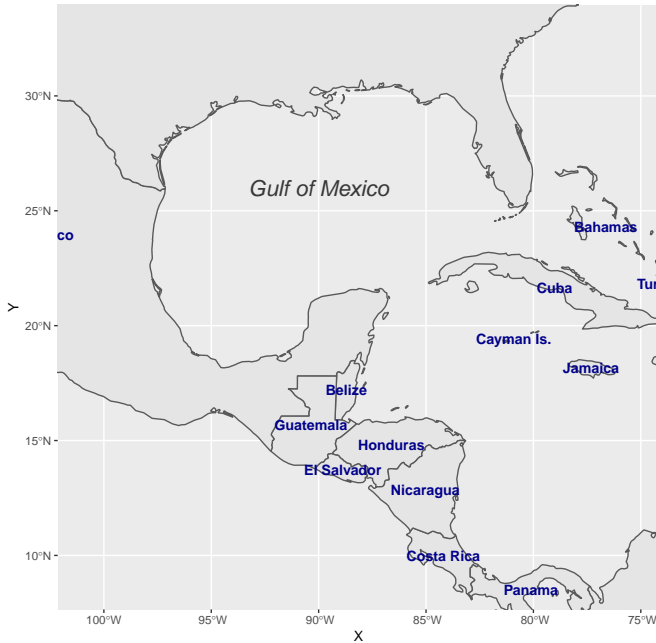
```r
world_centroids <- st_coordinates(st_centroid(world$geometry))
world <- world %>%
  mutate(X = world_centroids[,1],
         Y = world_centroids[,2])

map_names <- ggplot(data = world) +
geom_sf() +
geom_text(aes(x=X, y=Y, label=name),
    color = "darkblue",
    fontface = "bold",
    check_overlap = FALSE) +
annotate(geom = "text", x = -90, y = 26, label = "Gulf of Mexico",
    fontface = "italic", color = "grey22", size = 6) +
coord_sf(xlim = c(-102.15, -74.12),
         ylim = c(7.65, 33.97),
         expand = FALSE)
```

Country names

Themes

Themes

- ▶ you can change the map theme to make it more appealing
- ▶ ggplot has a lot of themes check them out using ?ggtheme
- ▶ specific theme elements can be tweaked to get a better map
  - ▶ position of legends
  - ▶ grid lines
  - ▶ map background

Example:

```
## Scale on map varies by more than 10%, scale bar may be i
```


Map of the Gulf of Mexico and the Caribbean Sea

Saving maps

ggsave

- ggsave allows a graphic to be saved in a variety of formats (png, pdf,etc).

```
ggsave("map.pdf")
ggsave("map.png", width = 6, height = 6, dpi = "screen")
```