Hurricane Maps

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10/31/2020

1. Data Cleaning

```
# Extracting the general data for mapping
addRepo("geanders")
data("hurr_tracks")
data("rain")
```

```
# Filtering target data
floyd_track <- hurr_tracks %>% filter(storm_id == "Floyd-1999")
allison_track <- hurr_tracks %>% filter(storm_id == "Allison-2001")
```

```
# Making initial rain datasets
floyd_rain1 <- rain %>%
  filter(storm_id == "Floyd-1999") %>%
  group_by(fips, storm_id) %>%
  summarize(sum_precip = sum(precip))
allison_rain1 <- rain %>%
  filter(storm_id == "Allison-2001") %>%
  group_by(fips, storm_id) %>%
  summarize(sum_precip = sum(precip))
```

```
# Making adjustments on the fips
countyfips <- county.fips
countyfips$fips <- as.character(countyfips$fips)

# Transforming fips with extra zeros as first digit
countyfips$fips <- str_pad(countyfips$fips, 5, side = "left", pad = "0")
```

```
# Adjusting the data further
floyd_rain2 <- merge(floyd_rain1, countyfips, by = "fips") %>% separate(polyname, into = c("region", "su
allison_rain2 <- merge(allison_rain1, countyfips, by = "fips") %>% separate(polyname, into = c("region"
```

```
# Organizing the states
states_int <- c("texas", "oklahoma", "kansas", "louisiana", "arkansas", "missouri", "iowa", "wisconsin"
main_states <- map_data("county", states_int)
```

```
## Final datasets

# Floyd-1999
floyd_rain <- merge(main_states, floyd_rain2, by = c("region", "subregion"))
floyd_rain[floyd_rain == 0.0] <- 0
# Make cut
floyd_rain$rain_cut <- cut(floyd_rain$sum_precip, breaks = c(0,25,50,75,100,125,150,175,200,225))
```

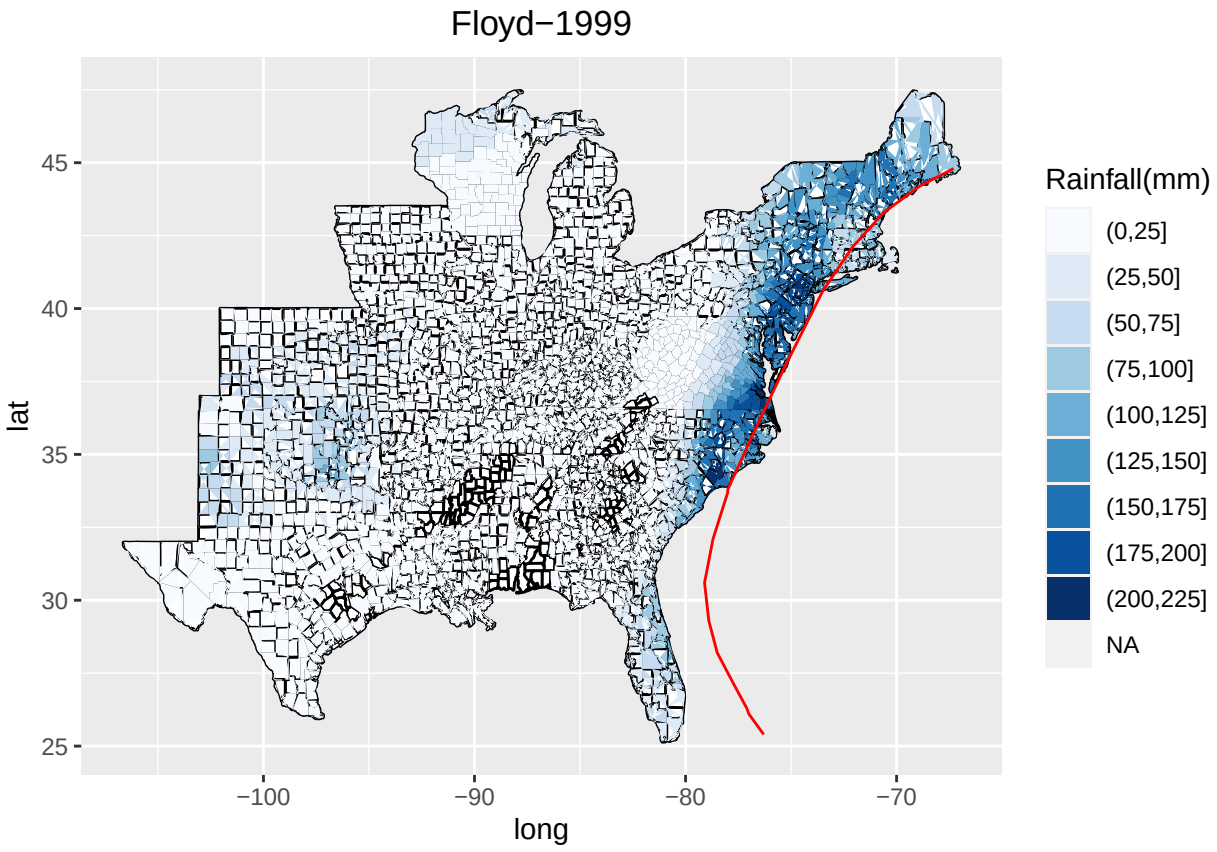
```r
# Allison-2001
allison_rain <- merge(main_states, allison_rain2, by = c("region","subregion"))
allison_rain[allison_rain == 0.0] <- 0
# Make cut
allison_rain$rain_cut <- ifelse(allison_rain$sum_precip > 175, "Exposed", "Unexposed")
```

2. ggplot Method

2.1 Floyd-1999

```r
plot_floyd_rain <- ggplot() +
  geom_polygon(data = main_states, aes(x = long, y = lat, group = group), color = "black", fill = "white

  geom_polygon(data = floyd_rain, aes(x = long, y = lat, group = group, fill = rain_cut), color = "trans

  geom_path(data = floyd_track, aes(longitude, latitude), color = "red") +

  xlim(min(main_states$long), max(main_states$long)) +

  ylim(min(main_states$lat), max(main_states$lat))
```

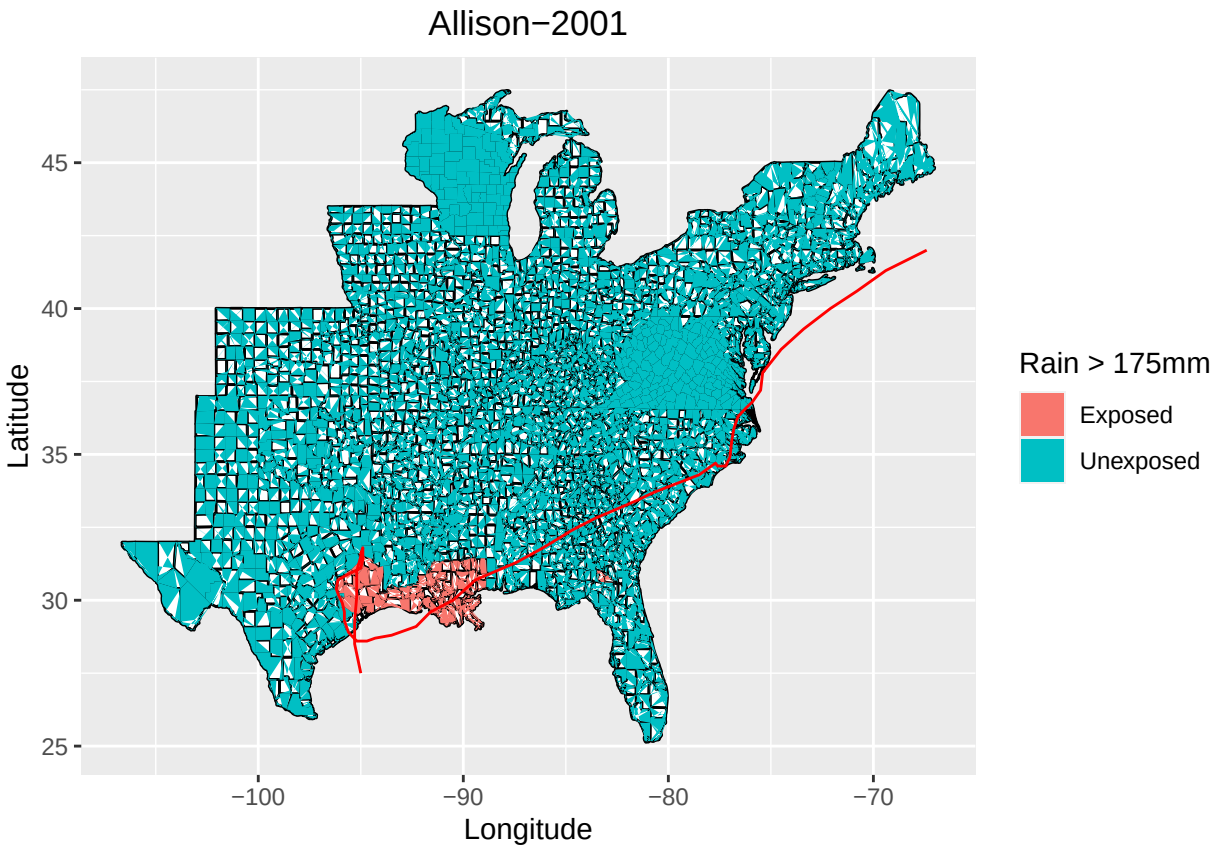
```r
# Adding titles and color scheme
plot_floyd_rain +
  labs(fill = "Rainfall(mm)") +
  scale_fill_brewer(palette = "Blues") +
  ggtitle("Floyd-1999") +
  scale_fill_brewer(palette = "Blues") +
  theme(plot.title = element_text(hjust = 0.5))
```



2.2 Allison-2001

```
plot_allison_rain <- ggplot() +
  geom_polygon(data = main_states, aes(x = long, y = lat, group = group), color = "black", fill = "white

  geom_polygon(data = allison_rain, aes(x = long, y = lat, group = group, fill = rain_cut), color = "tra

  geom_path(data = allison_track, aes(longitude, latitude), color = "red") +

  xlim(min(main_states$long),max(main_states$long)) +

  ylim(min(main_states$lat),max(main_states$lat))
```

```
# Adding titles and color scheme
plot_allison_rain +
  labs(fill = "Rain > 175mm") +
  xlab("Longitude") + ylab("Latitude") +
  ggtitle("Allison-2001") +
  theme(plot.title = element_text(hjust = 0.5))
```



3. tmap Method

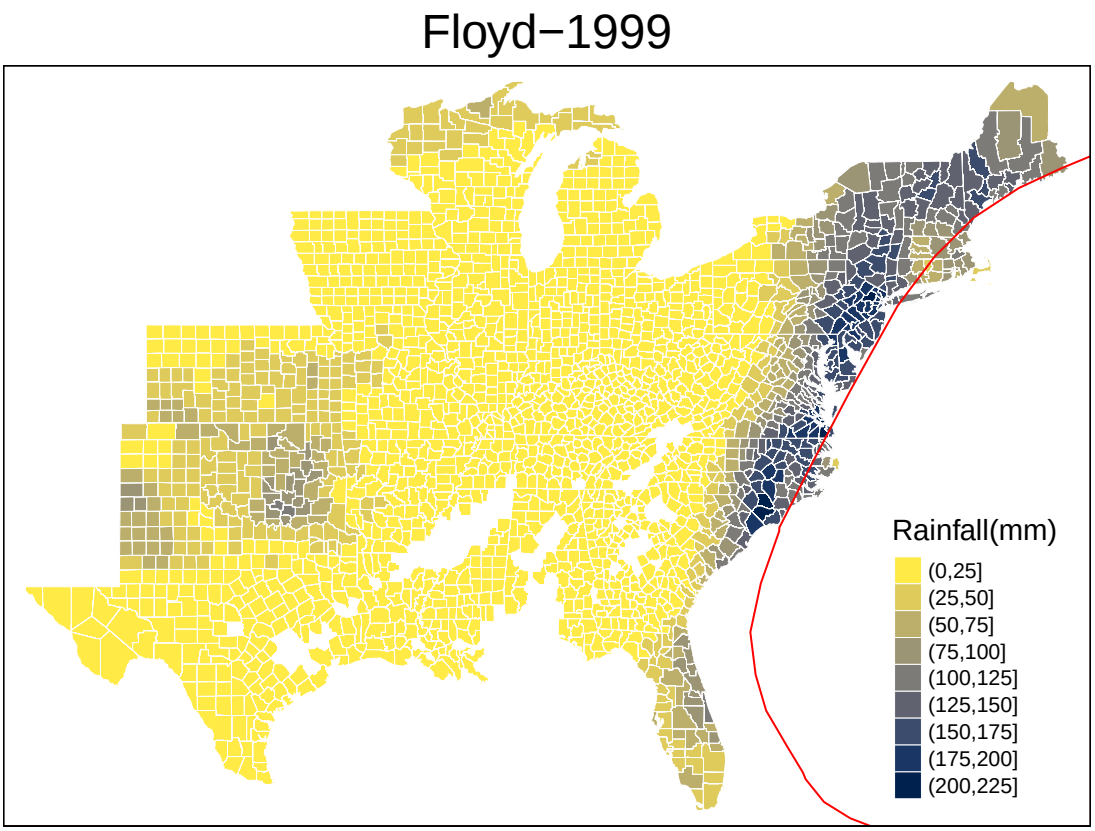
3.1 Floyd-1999

```
# Transferring the data into spatial version
tMap <- st_as_sf(map("county", states_int, plot = FALSE, fill = TRUE))

# Transferring floyd_rain into spatial format
tmap_floyd_rain1 <- floyd_rain %>%
  select(region, subregion, rain_cut) %>%
  mutate(ID = str_c(region, subregion, sep = ",")) %>%
  select(ID, rain_cut) %>%
  rename(`Rainfall(mm)` = rain_cut)
tmap_floyd_rain <- left_join(tMap, tmap_floyd_rain1, by = "ID")

# Transferring floyd_track into spatial format
tmap_floyd_track <- cbind(floyd_track$longitude, floyd_track$latitude) %>%
  Line() %>% Lines(ID = 'Floyd-1999') %>%
  list() %>% SpatialLines()
```

3.1.1 Organizing Data Further

```
plot_tmap_floyd_rain <-
tm_shape(tmap_floyd_rain)+
```

```
  tm_polygons(border.col = "white", lwd = 0.1, colorNA = NULL,
              col = 'Rainfall(mm)', style = "cont",
              title = "Rainfall(mm)",
              palette = cividis(n = 7, direction = -1)) +
  tm_shape(tmap_floyd_track) +
  tm_lines(col = 'red')

# Adding title
plot_tmap_floyd_rain +
  tm_layout(main.title = 'Floyd-1999',
            main.title.position = "center")
```



3.1.2 Making map

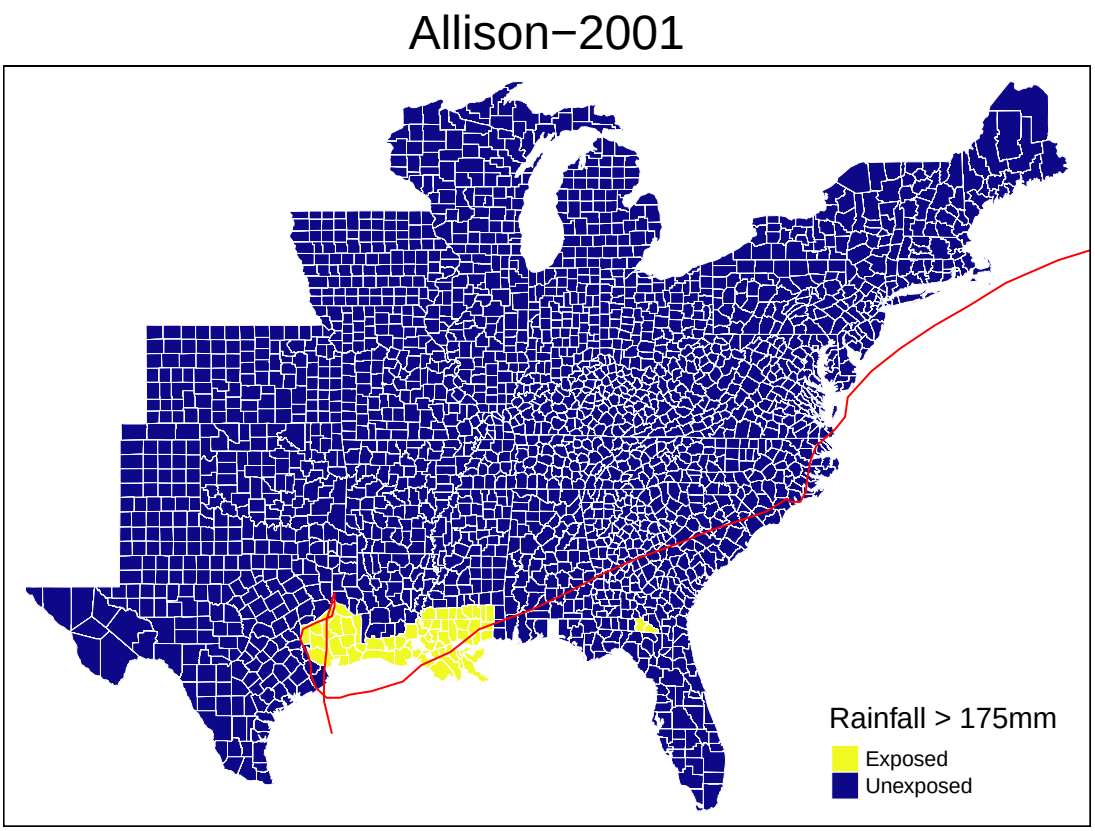
3.2 Allison-2001

```
# Transferring allison_rain into spatial format
tmap_allison_rain1 <- allison_rain %>%
  select(region, subregion, rain_cut) %>%
  mutate(ID = str_c(region, subregion, sep = ",")) %>%
  select(ID, rain_cut) %>%
  rename(`Rainfall > 175mm` = rain_cut)
tmap_allison_rain <- left_join(tMap, tmap_allison_rain1, by = "ID")

# Transfer allison_track into spatial format
tmap_allison_track <- cbind(allison_track$longitude, allison_track$latitude) %>%
  Line() %>% Lines(ID = 'Floyd-1999') %>%
```

```
  list() %>% SpatialLines()
```

3.2.1 Organizing Data Further

```
plot_tmap_allison_rain <-
tm_shape(tmap_allison_rain) +
  tm_polygons(border.col = "white", lwd = 0.1, colorNA = NULL,
              col = 'Rainfall > 175mm', style = "cont",
              title = "Rainfall > 175mm",
              palette = plasma(n = 2, direction = -1)) +
  tm_shape(tmap_allison_track) +
  tm_lines(col = 'red')

# Adding title
plot_tmap_allison_rain +
  tm_layout(main.title = 'Allison-2001',
            main.title.position = "center")
```



3.2.2 Making map