Mapping Assignment

Zhen Sha, JungHwa Yeom, Zixuan Liu

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Loading Packages

Packages that we use

```
knitr::opts_chunk$set(echo = TRUE, results=FALSE, message=FALSE)
library(tidyverse)
library(drat)
library(hurricaneexposuredata)
library(hurricaneexposure)
library(tmap)
library(sp)
library(sf)
library(maps)
library(rmarkdown)
library(knitr)
library(usmap)
library(maps)
library(tmaptools)
library(dplyr)
library(tidyr)
library(drat)
library(ggplot2)
library(rgdal)
```

Introduction

Mapping assignment is to reproduce the Floyd-1999 and Allison-2001 hurricane maps by using hurricaneexposure package. The first map for Floyd-1999 and Allison-2001. We are trying 2 different methods to form two maps like this.
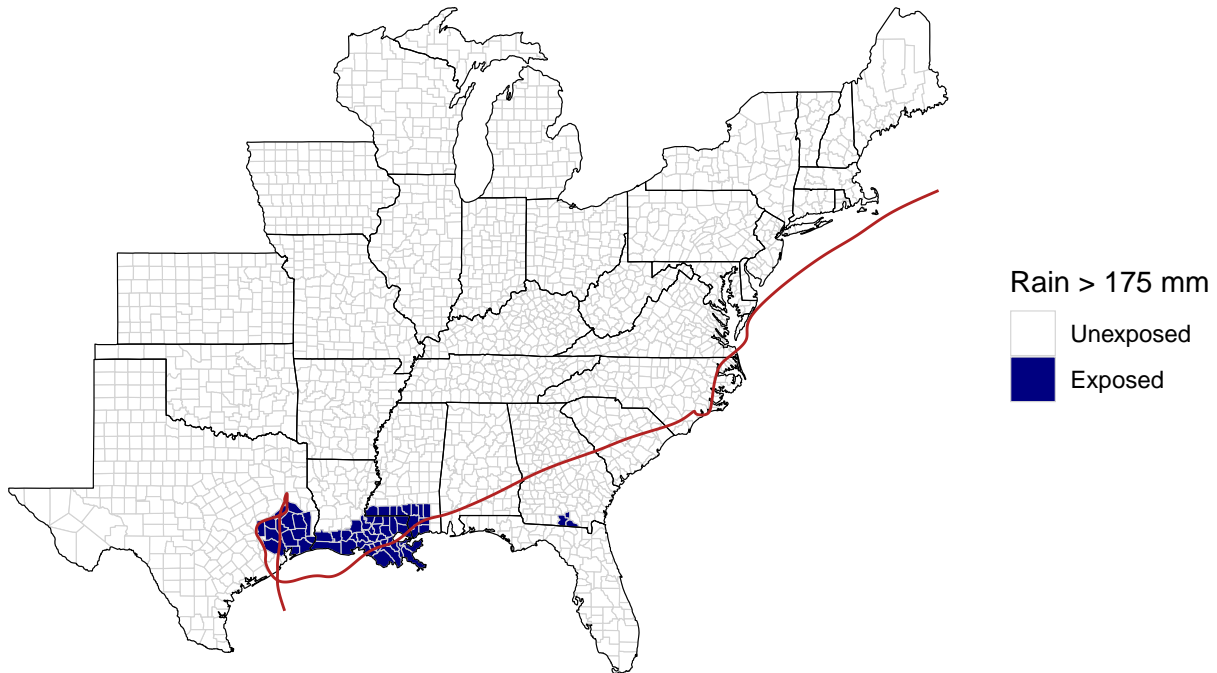
```
# sample map for Floyd-1999
map_counties(storm = "Floyd-1999", metric = "rainfall") +
    ggtitle("Floyd-1999") +
    theme(plot.title = element_text(hjust = 0.5))
```

Floyd−1999
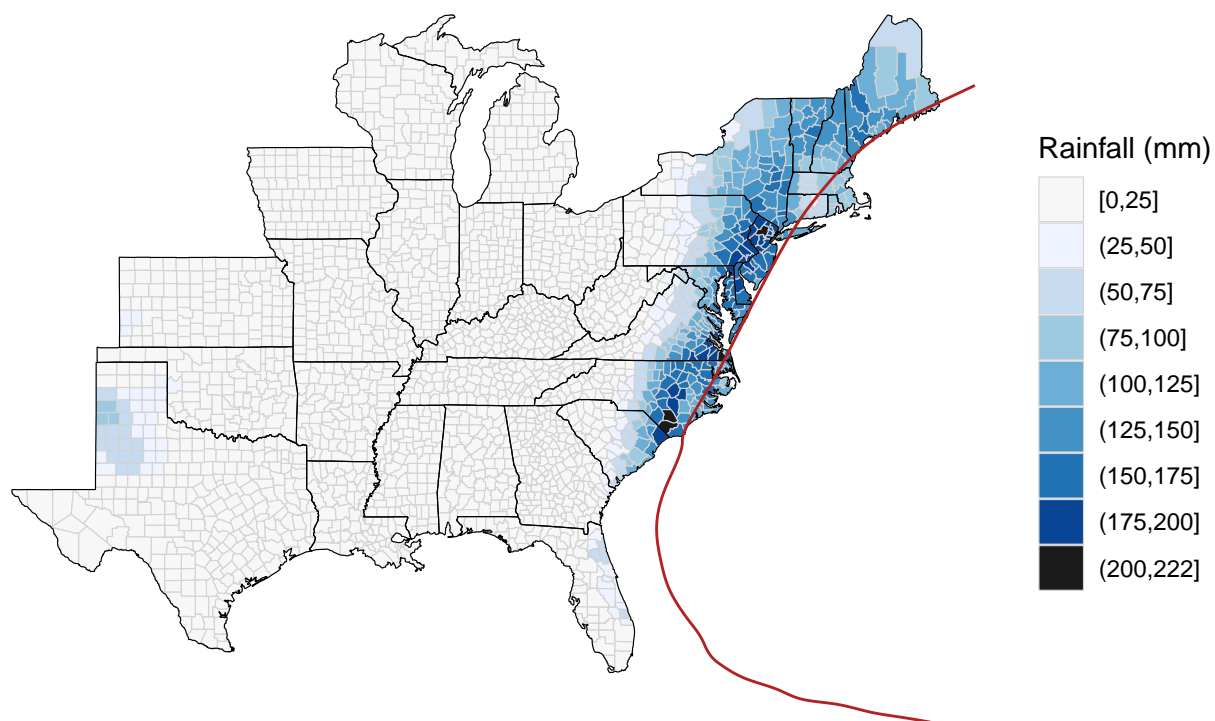

```r
# sample map for Allison-2001
map_rain_exposure(storm ="Allison-2001",
                  rain_limit = 175,
                  dist_limit = 500,
                  days_included =-5:3) +
    ggtitle("Allison-2001") +
    theme(plot.title = element_text(hjust = 0.5))
```

Allison–2001

Rain > 175 mm

☐ Unexposed

■ Exposed

Using ggplot

```
#read map data
data(county.fips)
library(maps)
ob = st_as_sf(map('county',plot=F,fill=T))
colnames(county.fips)[2]=colnames(ob)[1]
ob = left_join(ob,county.fips,'ID')
```

```
#filter data for Floyd-1999 and right join two datasets together
floyd_track <- force(hurr_tracks)%>% filter(storm_id=='Floyd-1999')
floyd_rain=force(rain)%>% filter(storm_id=='Floyd-1999')%>% group_by(fips) %>%
  mutate(fips=as.numeric(fips)) %>%
  summarise(storm_id=storm_id[1],precip=sum(precip))
floyd_rain=right_join(ob,floyd_rain,'fips')
```

ggplot2 for Floyd-1999

```
#ggplot2 mapping
ggplot()+ ggtitle("Floyd-1999") +
  geom_sf(data=floyd_rain,mapping=aes(fill=precip))+
  scale_fill_steps(low='white',high='purple',name='Rainfall (mm)')+
  geom_path(data=floyd_track,mapping=aes(x=longitude,y=latitude))+
  theme(plot.title=element_text(hjust=0.3))
```

Floyd−1999
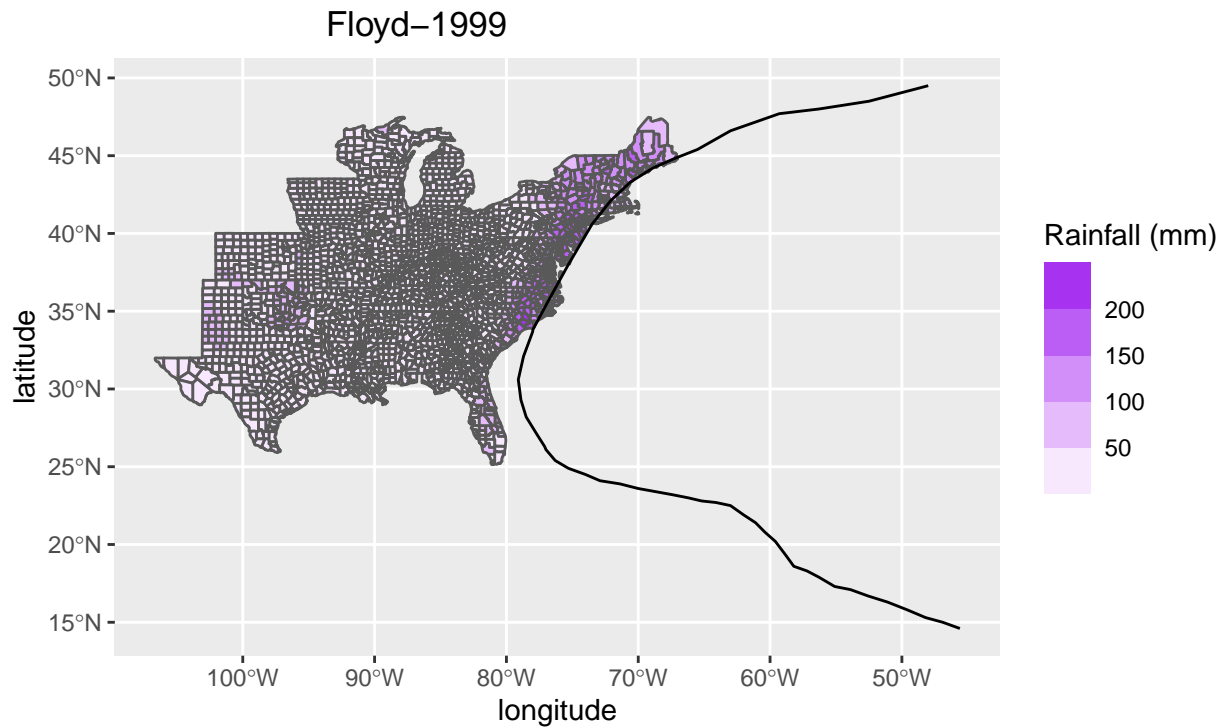
Allison-2001 Map

```
#filter data for Allison-2001 and right join datasets together
allison_track=force(hurr_tracks)%>% filter(storm_id=='Allison-2001')
allison_rain=force(rain)%>% filter(storm_id=='Allison-2001')%>% group_by(fips) %>%
  mutate(fips=as.numeric(fips)) %>%
  summarise(storm_id=storm_id[1],precip=sum(precip))
allison_rain=right_join(ob,allison_rain,'fips')
```
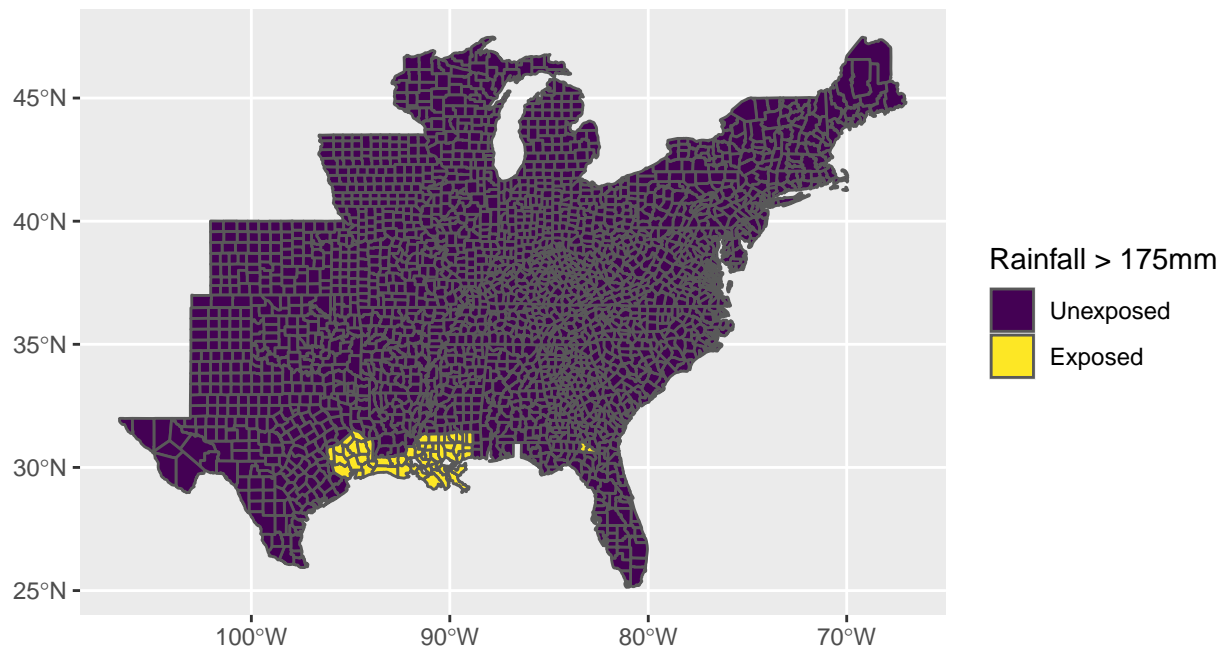
```
#select Allison with storm_dist<500 & rainfall>175

allison_rain$'Rainfall > 175mm' <- cut(allison_rain$precip,c(-1,175,500),c("Unexposed","Exposed"),ordere
```

ggplot2 mapping for Allison-2001

```
ggplot()+  ggtitle("Allison-2001")+

  geom_sf(data=allison_rain,mapping=aes(fill=`Rainfall > 175mm`))
```

Allison−2001


```
geom_sf(data=allison_rain)+
geom_path(data=allison_track,mapping=aes(x=longitude,y=latitude))+
theme(plot.title=element_text(hjust=0.3))
```

Using tmap

The second map for Floyd-1999 with tmap Get hurr_tracks data and rain data for both Floyd-1999 and Allison-2001

```
#get data
addRepo("geanders")

data("hurr_tracks")

data("rain")

head(hurr_tracks)

head(rain)
```

Getting data and filter for mapping Floyd-1999

```
# get map data
ob <- st_as_sf(map('county',plot=F,fill=T))
colnames(county.fips)[2] = 'ID'
ob <- merge(ob, county.fips, by="ID")

# filter Floyd-1999 in hurr_tracks data and rain data
dt <- hurr_tracks %>% filter(storm_id == "Floyd-1999")
```

```r
ra <- rain %>% filter(storm_id == "Floyd-1999") %>% group_by(fips) %>%
  summarise('storm_id'=storm_id[1],'precip'=sum(precip))
ra$fips <- as.numeric(ra$fips)

#merge data by fips variable
ra <- merge(ob, ra,by="fips")

Floyd <- cbind(dt$longitude,dt$latitude)%>%
  Line()%>%Lines(ID='Floyd-1999')%>%
  list()%>%SpatialLines()
```
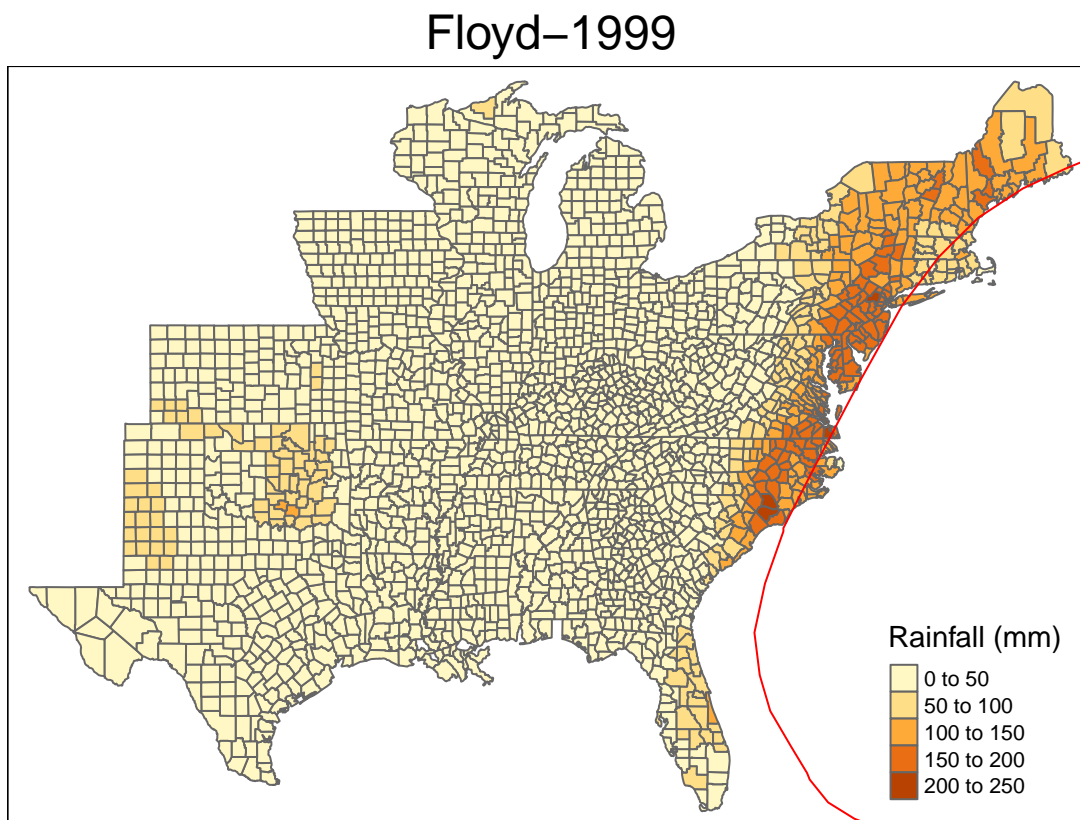
Plotting tmap for Floyd-1999

```r
#Plot tmap
t_F = tm_shape(ra)+
  tm_polygons(col='precip',title="Rainfall (mm)")+
  tm_legend(position=c("right","bottom"))+
  tm_shape(Floyd)+
  tm_lines(col='red')+
  tm_layout(main.title='Floyd-1999',main.title.position = "center")
t_F
```


Floyd−1999

Reproducing the second map for Allison-2001 with tmap Getting data and filter for mapping Allison-2001

```r
# get map data
dt <- hurr_tracks %>% filter(storm_id == "Allison-2001")
```

```
ra <- rain %>% filter(storm_id == "Allison-2001") %>% group_by(fips) %>%
  summarise(storm_id=storm_id[1],precip=sum(precip))
ra.new <- as.data.frame(ra)
ra.new$precip[ra.new$precip<=175] <- 'Unexposed'
ra.new$precip[ra.new$precip != "Unexposed"] <- 'Exposed'

ra.new$fips <- as.numeric(ra.new$fips)

# merge data by fips variable

ra.new <- merge(ob, ra.new,by="fips")

Allison <- cbind(dt$longitude,dt$latitude)%>%
  Line()%>%Lines(ID='Allison-2001')%>%
  list()%>%SpatialLines()
```

Plotting tmap for Allison-2001

```
#Plotting tmap
t_F = tm_shape(ra.new)+
  tm_polygons(col='precip',title="Rain > 175 (mm)", style="pretty")+
  tm_legend(position=c("right","bottom"))+
  tm_shape(Allison)+
  tm_lines(col='red')+
  tm_layout(main.title='Allison-2001',main.title.position="center")
t_F
```

Allison−2001