

Report

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Prepare data

We use the maps to obtain the data of fips. And combine the this data with precip data. In order to obtain different levels of precip, using cut function to create a new column contain the information of levels.

```
#combine the fips with maps data
data(county.fips)
Map=st_as_sf(map('county',plot=F,fill=T))
colnames(county.fips)[2]=colnames(Map)[1]
Map=left_join(Map,county.fips,'ID')

#for storm Floyd-1999
Floyd_track=force(hurr_tracks) %>% filter(storm_id=='Floyd-1999')
frain=force(rain) %>% filter(storm_id=='Floyd-1999') %>% group_by(fips) %>%
  summarise(storm_id=storm_id[1],precip=sum(precip))%>%
  mutate(fips=as.numeric(fips))
frain=right_join(Map,frain,'fips')
labels <- c("[0,25]", "(25,50]", "(50,75]", "(75,100]", "(100,125]", "(125,150]",
            "(150,175]", "(175,200]", "(200,222]")
break1 <- c(-1,25,50,75,100,120,150,175,200,250)
frain$scale <- cut(frain$precip,break1,labels,ordered_result = T)

#for storm Allison-2001
Allison_track=force(hurr_tracks)%>%
  filter(storm_id=='Allison-2001')
arain=force(rain)%>%
  filter(storm_id=='Allison-2001')%>%
  group_by(fips)%>%
  summarise(storm_id=storm_id[1],precip=sum(precip))%>%
  mutate(fips=as.numeric(fips))
arain=right_join(Map,arain,'fips')
arain$scale <- cut(arain$precip,c(-1,175,500),c("Unexposed","Exposed"),ordered_result = T)
```

Using ggplot2

We select the counties and using the data to draw the maps.

```
# prepare the map:select the counties
county <- map_data(map = "county",
                  region = c("texas","oklahoma","kansas","louisiana",
                             "arkansas",
                             "missouri", "iowa","wisconsin", "michigan",
                             "illinois","indiana",
```

```

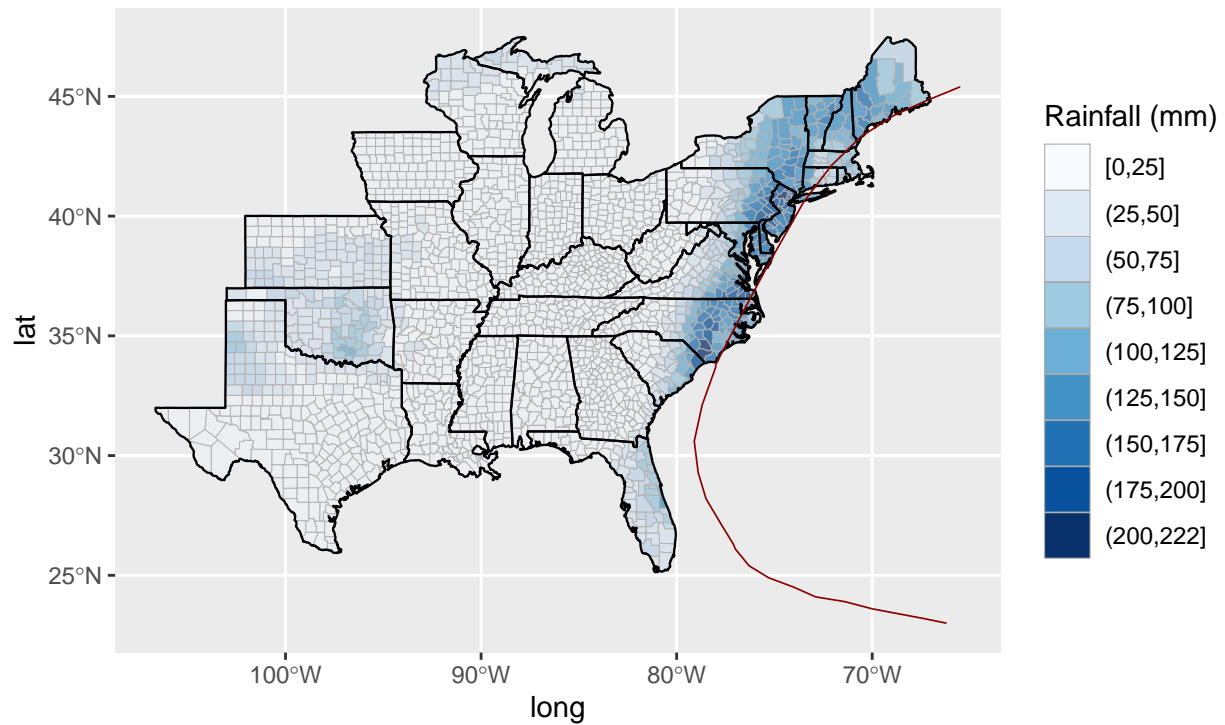
"ohio", "kentucky", "tennessee", "alabama",
"mississippi",
"florida", "georgia", "south carolina",
"north carolina", "virginia",
"west virginia", "maryland", "delaware",
"pennsylvania", "new jersey",
"new york", "connecticut", "rhode island",
"massachusetts", "vermont",
"new hampshire", "maine"))

state <- map_data(map = "state",
  region = c("texas","oklahoma","kansas","louisiana",
    "arkansas",
    "missouri", "iowa","wisconsin", "michigan",
    "illinois","indiana",
    "ohio", "kentucky", "tennessee", "alabama",
    "mississippi",
    "florida", "georgia", "south carolina",
    "north carolina", "virginia",
    "west virginia", "maryland", "delaware",
    "pennsylvania", "new jersey",
    "new york", "connecticut", "rhode island",
    "massachusetts", "vermont",
    "new hampshire", "maine"))

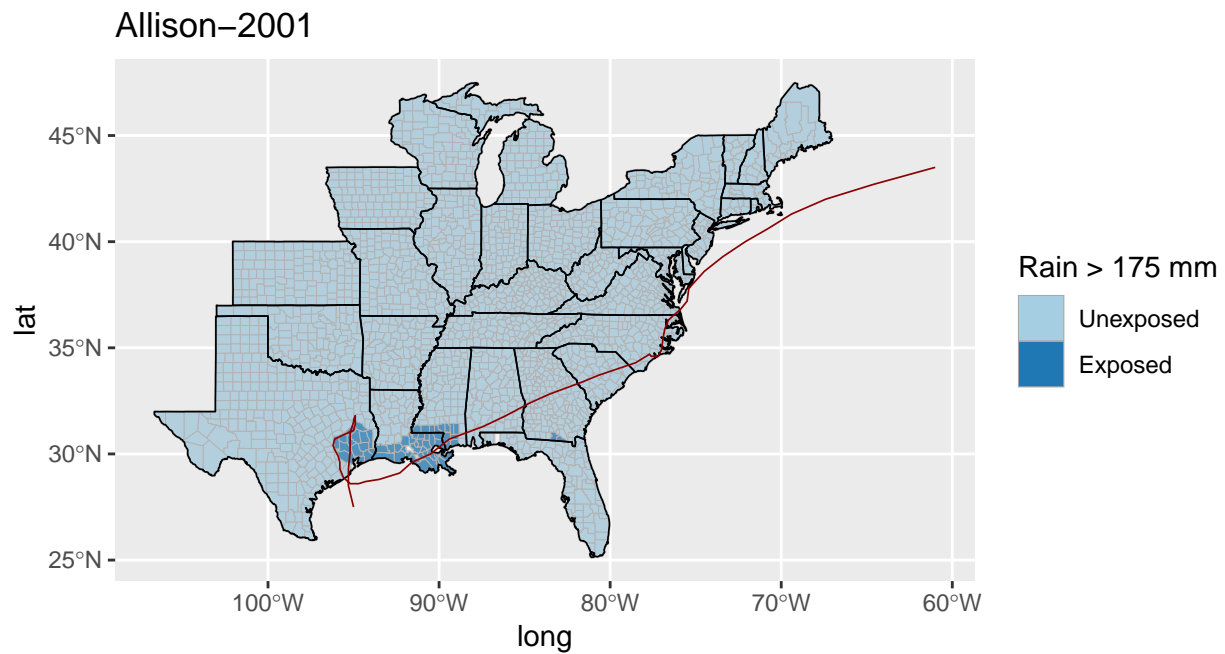
# Floyd-1999
ggplot()+
  ggtitle("Floyd-1999")+
  geom_polygon(data=county, aes(x=long, y=lat, group=group),
    color="snow3", fill="white") +
  geom_sf(data=frair, mapping=aes(fill=scale), color="gray65", size=0.1)+
  geom_polygon(data=state, aes(x=long, y=lat, group=group),
    color="black", fill="lightgray", size = 0.4, alpha = .3) +
  scale_fill_brewer(name="Rainfall (mm)")+
  geom_path( data=Floyd_track[20:45,], aes(x=longitude, y=latitude),
    color="red4",size=0.3)

```

Floyd-1999



```
# Allison-2001
ggplot()+
  ggtitle("Allison-2001")+
  geom_polygon(data=county, aes(x=long, y=lat, group=group),
    color="snow3", fill="white")+
  geom_sf(data=arain, mapping=aes(fill=scale), color="gray65", size=0.1)+
  geom_polygon(data=state, aes(x=long, y=lat, group=group),
    color="black", fill="lightgray", size = 0.3, alpha = .3) +
  scale_fill_brewer(name="Rain > 175 mm", palette="Paired")+
  geom_path( data=Allison_track, aes(x=longitude, y=latitude),
    color="red4", size=0.3)
```



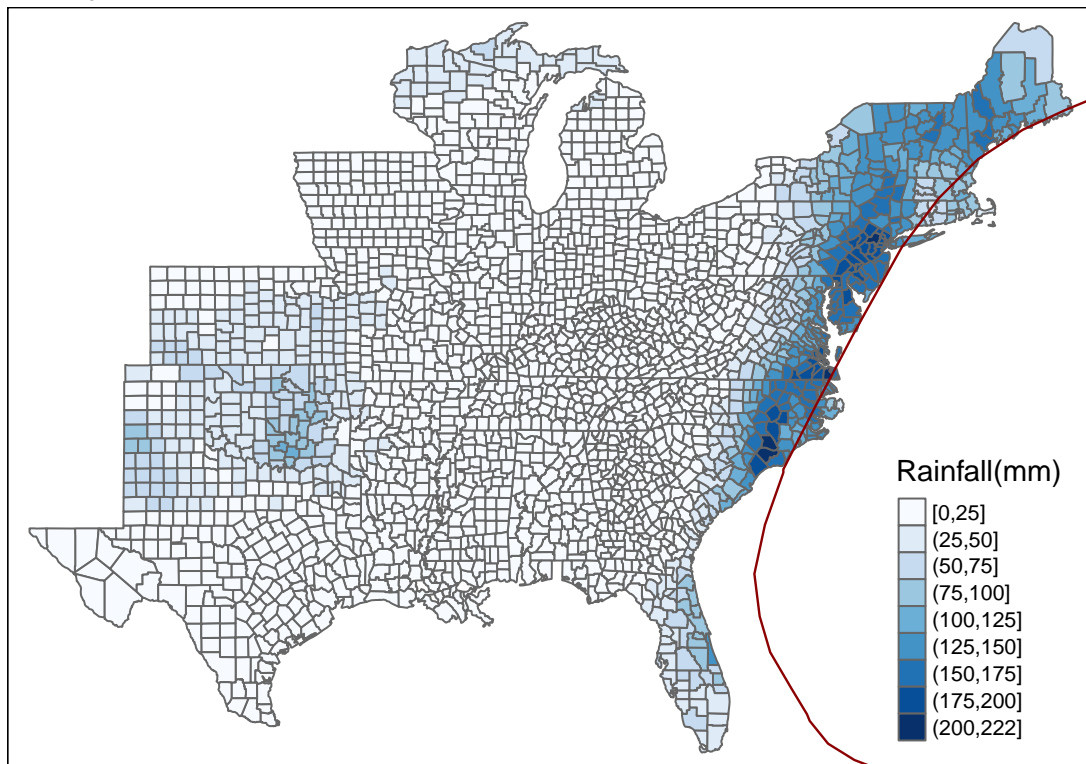
Using tmap

Transfer the data of tracks to make it match with the tmap package.

```
t_Floyd_track=cbind(Floyd_track$longitude,Floyd_track$latitude)%>%Line()%>%
  Lines(ID='Floyd-1999')%>%list()%>%SpatialLines()

tm_shape(frain,title="Floyd-1999",col="gray")+
  tm_polygons("scale",palette="Blues",title="Rainfall(mm)")+
  tm_shape(t_Floyd_track)+tm_lines(col='red4',lwd =1.2)+
  tm_layout(main.title='Floyd-1999')
```

Floyd-1999



```
t_Allison_track=cbind(Allison_track$longitude,Allison_track$latitude)%>%  
  Line()%>%Lines(ID='Allison-2001')%>%list()%>%SpatialLines()  
  
tm_shape(arain,title="Floyd-1999",col="gray")+  
  tm_polygons("scale",palette=c("white","dodgerblue3"),title="Rain > 175 mm")+  
  tm_shape(t_Allison_track)+tm_lines(col='red4',lwd=1.2)+tm_style("watercolor")+  
  tm_layout(main.title='Allison-2001')
```

Allison-2001

