615-map

Zhaosheng-Xie

2020/10/24

```
library(usmap)
```

```
## Warning: package 'usmap' was built under R version 4.0.3
```

```
library(ggplot2)
library(tmap)
```

```
## Warning: package 'tmap' was built under R version 4.0.3
```

```
library(hurricaneexposuredata)
library(hurricaneexposure)
library(tidyverse)
```

```
## -- Attaching packages ---------------------------------------------------------------------- tidyv
```

```
## v tibble  3.0.3     v dplyr   1.0.2
## v tidyr   1.1.2     v stringr 1.4.0
## v readr   1.3.1     v forcats 0.5.0
## v purrr   0.3.4
```

```
## -- Conflicts ------------------------------------------------------------------------- tidyverse_c
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(maps)
```

```
##
## Attaching package: 'maps'
```

```
## The following object is masked from 'package:purrr':
##
##     map
```

```
library(dplyr)
library(sp)
library(sf)
```

```
## Warning: package 'sf' was built under R version 4.0.3
```

```
## Linking to GEOS 3.8.0, GDAL 3.0.4, PROJ 6.3.1
```

```
knitr::opts_chunk$set(echo = TRUE)
```

Introduction

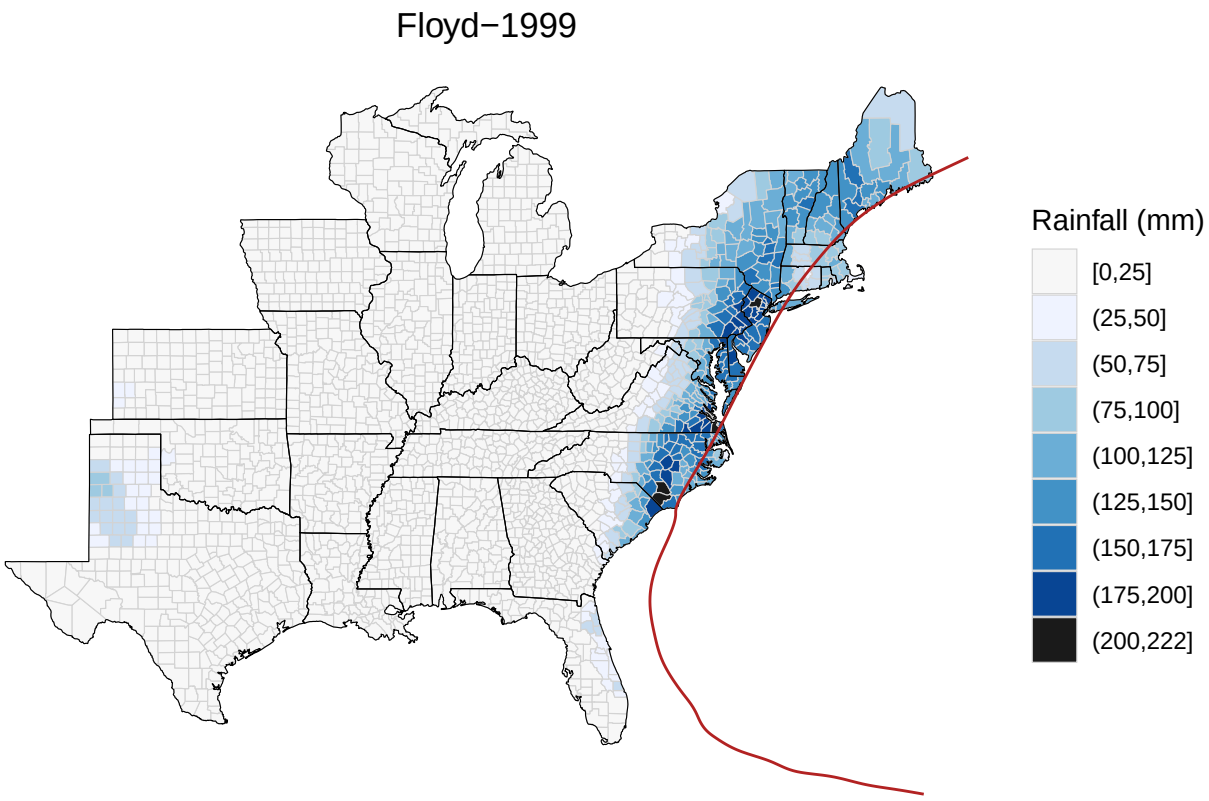
In this project, I make following goal maps by using ggplot2 and tmap.

Goal maps

```
map_counties(storm = "Floyd-1999", metric = "rainfall") +
    ggtitle("Floyd-1999") +
    theme(plot.title = element_text(hjust = 0.5))
```

```
## Warning: `tbl_df()` is deprecated as of dplyr 1.0.0.
## Please use `tibble::as_tibble()` instead.
## This warning is displayed once every 8 hours.
## Call `lifecycle::last_warnings()` to see where this warning was generated.
```

```
## Warning: `mutate_()` is deprecated as of dplyr 0.7.0.
## Please use `mutate()` instead.
## See vignette('programming') for more help
## This warning is displayed once every 8 hours.
## Call `lifecycle::last_warnings()` to see where this warning was generated.
```




```
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))
```

Data prepare

```
## Obtain map data
# There are two ways to obtain map data.
# The first one is to type each county and state. It is tedious.But I did it and it worked.
f_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"))
f_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"))

# The second one is to use "left_join" to join two data tables.
data(county.fips)
M=st_as_sf(map('county',plot=F,fill=T))
```

```
colnames(county.fips)[2]=colnames(M)[1]
M=left_join(M,county.fips,'ID')

## obtain data of Floyd-1999 and Allison-2001
Floyd_track=force(hurr_tracks)%>%
  filter(storm_id=='Floyd-1999')
Floyd_rain=force(rain)%>%
  filter(storm_id=='Floyd-1999')%>%
  group_by(fips)%>%
  summarise(storm_id=storm_id[1],precip=sum(precip))%>%
  mutate(fips=as.numeric(fips))
```

```
## `summarise()` ungrouping output (override with `.groups` argument)
```

```
Floyd_rain=right_join(M,Floyd_rain,'fips')

Allison_track=force(hurr_tracks)%>%
  filter(storm_id=='Allison-2001')
Allison_rain=force(rain)%>%
  filter(storm_id=='Allison-2001')%>%
  group_by(fips)%>%
  summarise(storm_id=storm_id[1],precip=sum(precip))%>%
  mutate(fips=as.numeric(fips))
```

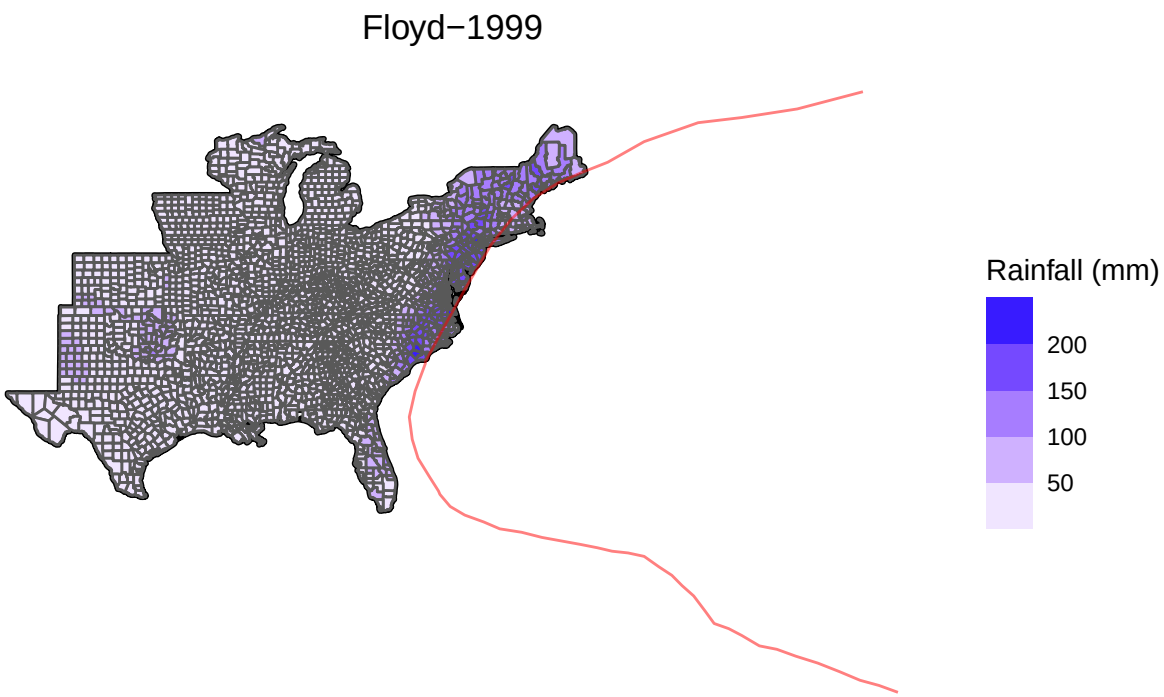
```
## `summarise()` ungrouping output (override with `.groups` argument)
```

```
Allison_rain=right_join(M,Allison_rain,'fips')
## select Allison-2001 with limitation storm_dist<500 & rainfall>175
Allison_dist=force(closest_dist)%>%
  filter(storm_id=='Allison-2001',storm_dist<500)
Allison_rain_limit=Allison_rain%>%
  filter(precip>175,fips%in%Allison_dist$fips)
## prepare data for tmap
t_Floyd_track=cbind(Floyd_track$longitude,Floyd_track$latitude)%>%
  Line()%>%Lines(ID='Floyd-1999')%>%
  list()%>%SpatialLines()
t_Allison_track=cbind(Allison_track$longitude,Allison_track$latitude)%>%
  Line()%>%Lines(ID='Allison-2001')%>%
  list()%>%SpatialLines()
```

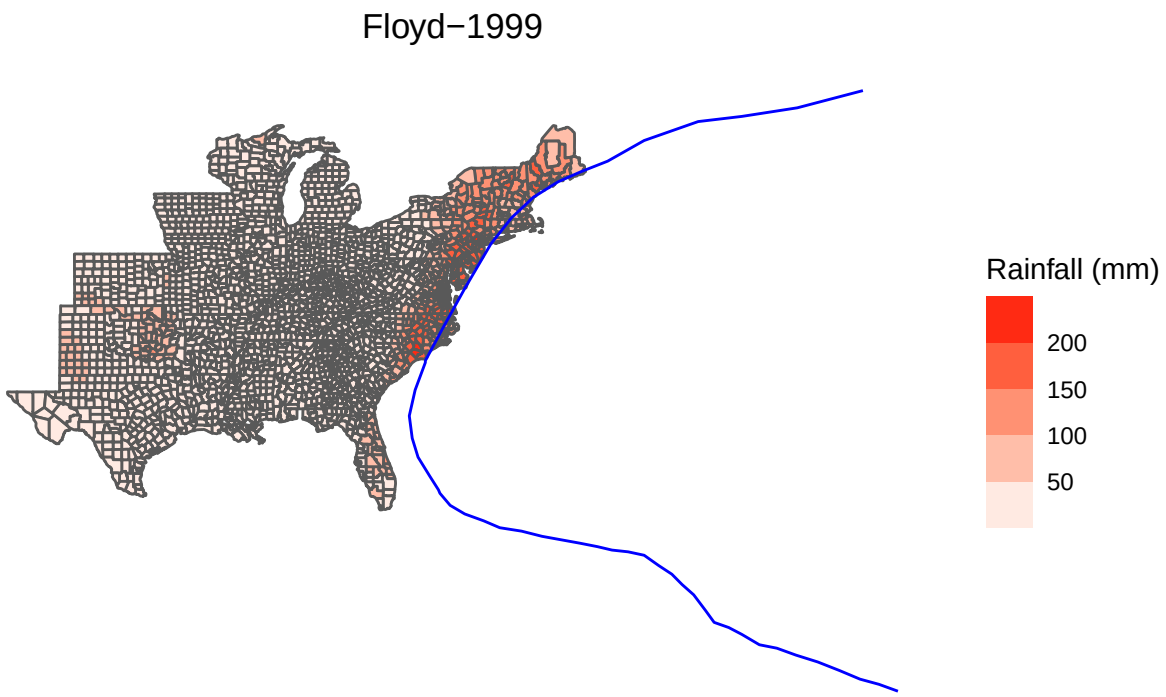
Maping

```
### ggplot2
## Floyd-1999
# use f_county and f_state data to draw
ggplot() +
    ggtitle("Floyd-1999") +
    geom_polygon( data=f_county, aes(x=long, y=lat, group=group),
                          color="lightgray", fill="white", size = .1 ) +
    geom_polygon( data=f_state, aes(x=long, y=lat, group=group),
                  color="black", fill="lightgray",  size = 1, alpha = .3) +
    geom_sf(data=Floyd_rain,mapping=aes(fill=precip))+
    scale_fill_steps(low='white',high='blue',name='Rainfall (mm)')+
    geom_path( data=Floyd_track, aes(x=longitude, y=latitude),
```

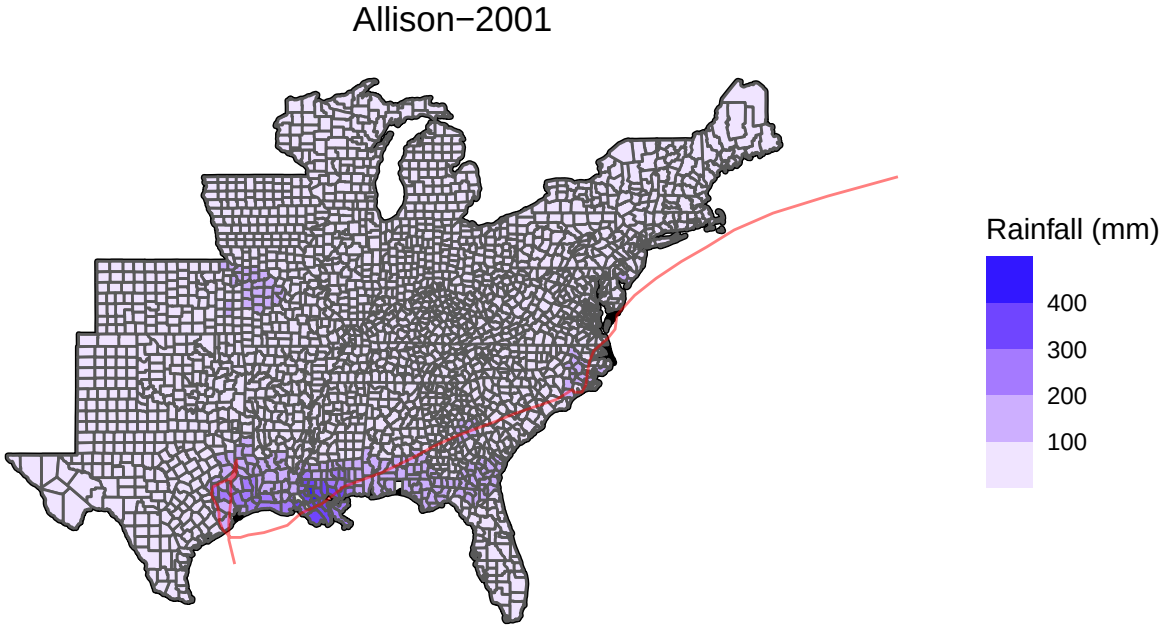
```
                  color="red",alpha = 0.5)+
  theme(plot.title=element_text(hjust=0.5),
        panel.background=element_blank(),
        panel.border=element_blank(),
        axis.title=element_blank(),
        axis.text=element_blank(),
        axis.ticks=element_blank())
```



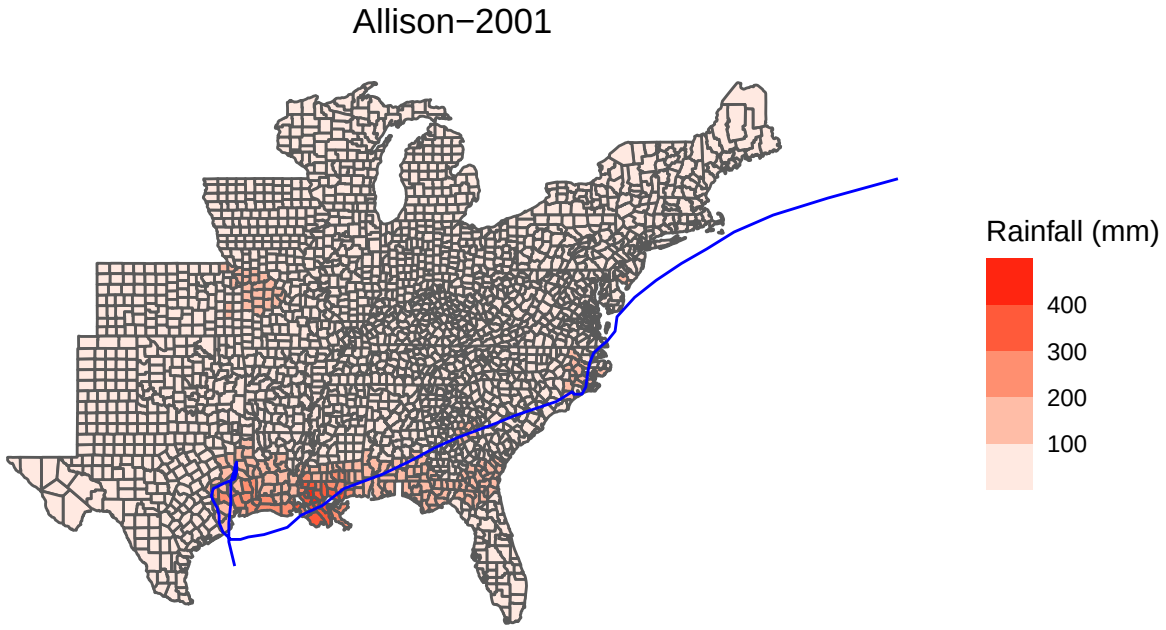

```
# use Floyd_rain and  data to draw
ggplot()+
  geom_sf(data=Floyd_rain,mapping=aes(fill=precip))+
  scale_fill_steps(low='white',high='red',name='Rainfall (mm)')+
  geom_path(data=Floyd_track,mapping=aes(x=longitude,y=latitude),color="blue")+
  ggtitle('Floyd-1999')+
  theme(plot.title=element_text(hjust=0.5),
        panel.background=element_blank(),
        panel.border=element_blank(),
        axis.title=element_blank(),
        axis.text=element_blank(),
        axis.ticks=element_blank())
```




```
## Allison-2001
# use f_county and f_state data to draw
ggplot() +
    ggtitle("Allison-2001") +
    geom_polygon( data=f_county, aes(x=long, y=lat, group=group),
                          color="lightgray", fill="white", size = .1 ) +
    geom_polygon( data=f_state, aes(x=long, y=lat, group=group),
                  color="black", fill="lightgray",  size = 1, alpha = .3) +
    geom_sf(data=Allison_rain,mapping=aes(fill=precip))+
    scale_fill_steps(low='white',high='blue',name='Rainfall (mm)')+
    geom_path( data=Allison_track, aes(x=longitude, y=latitude),
                  color="red",alpha = 0.5)+
  theme(plot.title=element_text(hjust=0.5),
        panel.background=element_blank(),
        panel.border=element_blank(),
        axis.title=element_blank(),
        axis.text=element_blank(),
        axis.ticks=element_blank())
```




```
# use Floyd_rain and  data to draw
ggplot()+
  geom_sf(data=Allison_rain,mapping=aes(fill=precip))+
  scale_fill_steps(low='white',high='red',name='Rainfall (mm)')+
  geom_path(data=Allison_track,mapping=aes(x=longitude,y=latitude),color="blue")+
  ggtitle('Allison-2001')+
  theme(plot.title=element_text(hjust=0.5),
        panel.background=element_blank(),
        panel.border=element_blank(),
        axis.title=element_blank(),
        axis.text=element_blank(),
        axis.ticks=element_blank())
```

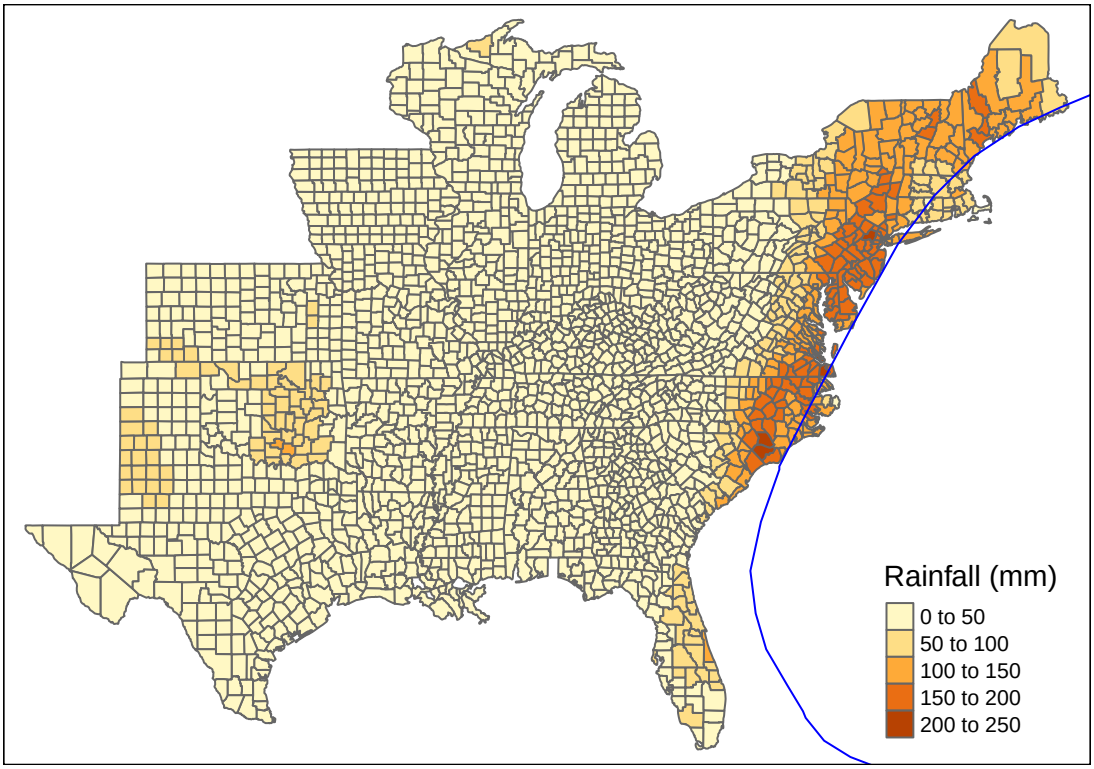



```
### tmap
## Floyd-1999
Floyd_t=tm_shape(Floyd_rain)+
  tm_polygons(col='precip',title="Rainfall (mm)")+
  tm_legend(position=c("right","bottom"))+
  tm_shape(t_Floyd_track)+
  tm_lines(col='blue')+
  tm_layout(main.title=t_Floyd_track@lines[[1]]@ID,
            main.title.position="center")
Floyd_t
```

```
## Warning: The shape Floyd_rain contains empty units.
```

```
## Warning: Currect projection of shape t_Floyd_track unknown. Long-lat (WGS84) is
## assumed.
```

Floyd−1999




```
## Allison-2001
Allison_t=tm_shape(Allison_rain)+
  tm_polygons(col='precip',title="Rainfall (mm)")+
  tm_legend(position=c("right","bottom"))+
  tm_shape(t_Allison_track)+
  tm_lines(col='blue')+
  tm_layout(main.title=t_Allison_track@lines[[1]]@ID,
            main.title.position="center")
Allison_t
```

```
## Warning: The shape Allison_rain contains empty units.
```

```
## Warning: Currect projection of shape t_Allison_track unknown. Long-lat (WGS84)
## is assumed.
```

Allison−2001