# CS_9

November 3, 2022

[ ]:
```
library(tidyverse)
library(sf)
library(ggmap)
library(rnoaa)
library(spData)
data(world)
data(us_states)
```

```
Registered S3 method overwritten by 'hoardr':
  method           from
  print.cache_info httr

To access larger datasets in this package, install the spDataLarge
package with: `install.packages('spDataLarge',
repos='https://nowosad.github.io/drat/', type='source')`
```

[ ]:
```
dataurl = "https://www.ncei.noaa.gov/data/
  ↪international-best-track-archive-for-climate-stewardship-ibtracs/v04r00/
  ↪access/shapefile/IBTrACS.NA.list.v04r00.points.zip"
tdir = tempdir()
download.file(dataurl, destfile = file.path(tdir,"temp.zip"))
unzip(file.path(tdir,"temp.zip"), exdir = tdir)
list.files(tdir)
storm_data = read_sf(list.files(tdir, pattern=".shp", full.names = T))
names(storm_data)
head(storm_data[1:3, 1:3])
```

1. 'IBTrACS.NA.list.v04r00.points.dbf' 2. 'IBTrACS.NA.list.v04r00.points.prj' 3. 'IBTrACS.NA.list.v04r00.points.shp' 4. 'IBTrACS.NA.list.v04r00.points.shx' 5. 'temp.zip'

1. 'SID' 2. 'SEASON' 3. 'NUMBER' 4. 'BASIN' 5. 'SUBBASIN' 6. 'NAME' 7. 'ISO_TIME' 8. 'NATURE' 9. 'LAT' 10. 'LON' 11. 'WMO_WIND' 12. 'WMO_PRES' 13. 'WMO_AGENCY' 14. 'TRACK_TYPE' 15. 'DIST2LAND' 16. 'LANDFALL' 17. 'IFLAG' 18. 'USA_AGENCY' 19. 'USA_ATCFID' 20. 'USA_LAT' 21. 'USA_LON' 22. 'USA_RECORD' 23. 'USA_STATUS' 24. 'USA_WIND' 25. 'USA_PRES' 26. 'USA_SSHS' 27. 'USA_R34_NE' 28. 'USA_R34_SE' 29. 'USA_R34_SW' 30. 'USA_R34_NW' 31. 'USA_R50_NE' 32. 'USA_R50_SE' 33. 'USA_R50_SW' 34. 'USA_R50_NW' 35. 'USA_R64_NE' 36. 'USA_R64_SE' 37. 'USA_R64_SW' 38. 'USA_R64_NW'

39. 'USA_POCI' 40. 'USA_ROCI' 41. 'USA_RMW' 42. 'USA_EYE' 43. 'TOK_LAT' 44. 'TOK_LON' 45. 'TOK_GRADE' 46. 'TOK_WIND' 47. 'TOK_PRES' 48. 'TOK_R50_DR' 49. 'TOK_R50_L' 50. 'TOK_R50_S' 51. 'TOK_R30_DR' 52. 'TOK_R30_L' 53. 'TOK_R30_S' 54. 'TOK_LAND' 55. 'CMA_LAT' 56. 'CMA_LON' 57. 'CMA_CAT' 58. 'CMA_WIND' 59. 'CMA_PRES' 60. 'HKO_LAT' 61. 'HKO_LON' 62. 'HKO_CAT' 63. 'HKO_WIND' 64. 'HKO_PRES' 65. 'NEW_LAT' 66. 'NEW_LON' 67. 'NEW_GRADE' 68. 'NEW_WIND' 69. 'NEW_PRES' 70. 'NEW_CI' 71. 'NEW_DP' 72. 'NEW_POCI' 73. 'REU_LAT' 74. 'REU_LON' 75. 'REU_TYPE' 76. 'REU_WIND' 77. 'REU_PRES' 78. 'REU_TNUM' 79. 'REU_CI' 80. 'REU_RMW' 81. 'REU_R34_NE' 82. 'REU_R34_SE' 83. 'REU_R34_SW' 84. 'REU_R34_NW' 85. 'REU_R50_NE' 86. 'REU_R50_SE' 87. 'REU_R50_SW' 88. 'REU_R50_NW' 89. 'REU_R64_NE' 90. 'REU_R64_SE' 91. 'REU_R64_SW' 92. 'REU_R64_NW' 93. 'BOM_LAT' 94. 'BOM_LON' 95. 'BOM_TYPE' 96. 'BOM_WIND' 97. 'BOM_PRES' 98. 'BOM_TNUM' 99. 'BOM_CI' 100. 'BOM_RMW' 101. 'BOM_R34_NE' 102. 'BOM_R34_SE' 103. 'BOM_R34_SW' 104. 'BOM_R34_NW' 105. 'BOM_R50_NE' 106. 'BOM_R50_SE' 107. 'BOM_R50_SW' 108. 'BOM_R50_NW' 109. 'BOM_R64_NE' 110. 'BOM_R64_SE' 111. 'BOM_R64_SW' 112. 'BOM_R64_NW' 113. 'BOM_ROCI' 114. 'BOM_POCI' 115. 'BOM_EYE' 116. 'BOM_POS_FL' 117. 'BOM_PRS_FL' 118. 'NAD_LAT' 119. 'NAD_LON' 120. 'NAD_CAT' 121. 'NAD_WIND' 122. 'NAD_PRES' 123. 'WEL_LAT' 124. 'WEL_LON' 125. 'WEL_WIND' 126. 'WEL_PRES' 127. 'DS8_LAT' 128. 'DS8_LON' 129. 'DS8_STAGE' 130. 'DS8_WIND' 131. 'DS8_PRES' 132. 'TD6_LAT' 133. 'TD6_LON' 134. 'TD6_STAGE' 135. 'TD6_WIND' 136. 'TD6_PRES' 137. 'TD5_LAT' 138. 'TD5_LON' 139. 'TD5_WIND' 140. 'TD5_PRES' 141. 'TD5_ROCI' 142. 'NEU_LAT' 143. 'NEU_LON' 144. 'NEU_CLASS' 145. 'NEU_WIND' 146. 'NEU_PRES' 147. 'MLC_LAT' 148. 'MLC_LON' 149. 'MLC_CLASS' 150. 'MLC_WIND' 151. 'MLC_PRES' 152. 'USA_GUST' 153. 'BOM_GUST' 154. 'BOM_GUSTP' 155. 'REU_GUST' 156. 'REU_GUSTP' 157. 'USA_SEAHGT' 158. 'USA_SEA_NE' 159. 'USA_SEA_SE' 160. 'USA_SEA_SW' 161. 'USA_SEA_NW' 162. 'STORM_SPD' 163. 'STORM_DR' 164. 'year' 165. 'month' 166. 'day' 167. 'hour' 168. 'min' 169. 'geometry'

```
ERROR while rich displaying an object: Error in loadNamespace(x): there is no
package called 'geojsonio'

Traceback:
1. tryCatch(withCallingHandlers({
 .     if (!mime %in% names(repr::mime2repr))
 .         stop("No repr_* for mimetype ", mime, " in repr::mime2repr")
 .     rpr <- repr::mime2repr[[mime]](obj)
 .     if (is.null(rpr))
 .         return(NULL)
 .     prepare_content(is.raw(rpr), rpr)
 . }, error = error_handler), error = outer_handler)
2. tryCatchList(expr, classes, parentenv, handlers)
3. tryCatchOne(expr, names, parentenv, handlers[[1L]])
4. doTryCatch(return(expr), name, parentenv, handler)
5. withCallingHandlers({
 .     if (!mime %in% names(repr::mime2repr))
 .         stop("No repr_* for mimetype ", mime, " in repr::mime2repr")
 .     rpr <- repr::mime2repr[[mime]](obj)
```

```
 .     if (is.null(rpr))
 .         return(NULL)
 .     prepare_content(is.raw(rpr), rpr)
 . }, error = error_handler)
6. repr::mime2repr[[mime]](obj)
7. repr_geojson.sf(obj)
8. repr_geojson(geojsonio::geojson_list(obj), …)
9. loadNamespace(x)
10. withRestarts(stop(cond), retry_loadNamespace = function() NULL)
11. withOneRestart(expr, restarts[[1L]])
12. doWithOneRestart(return(expr), restart)
```

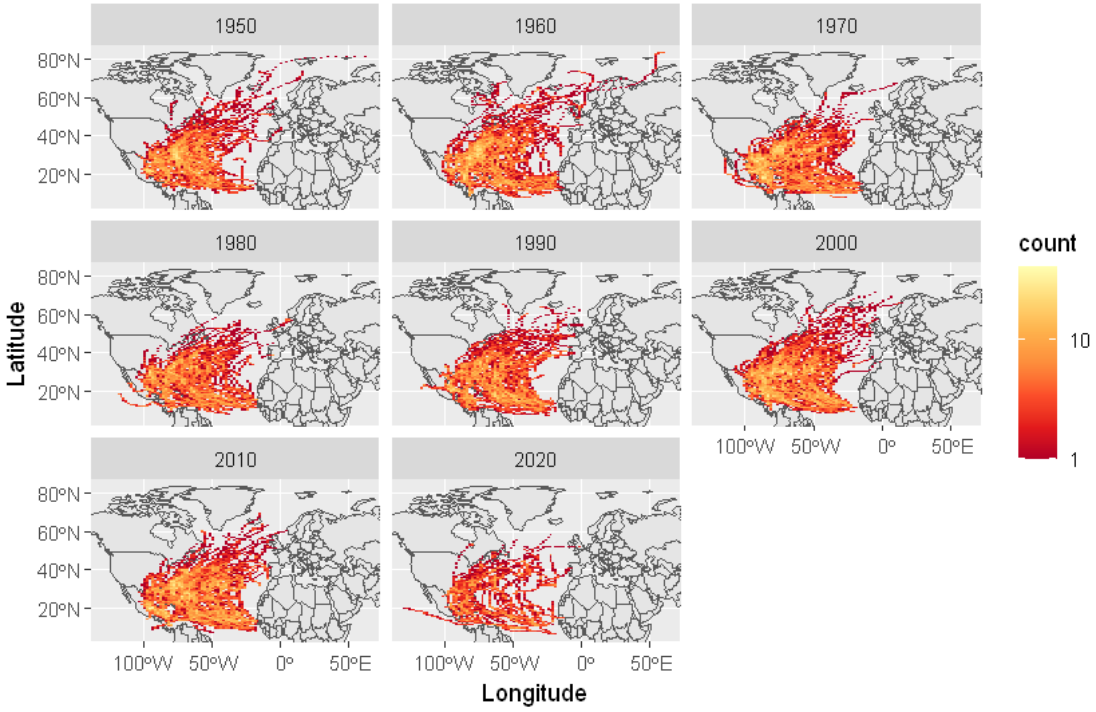
A sf: 3 × 4

| SID | SEASON | NUMBER | geometry |
|---|---|---|---|
| <chr> | <int> | <int> | <POINT [°]> |
| 1851175N26270 | 1851 | 5 | POINT (-90.4 26.1) |
| 1851175N26270 | 1851 | 5 | POINT (-90.7 26.2) |
| 1851175N26270 | 1851 | 5 | POINT (-91 26.3) |

[ ]:
```
storms = storm_data %>%
  filter(year >= 1950) %>%
  mutate_if(is.numeric, function(x) ifelse(x == -999.0, NA, x)) %>%
  mutate(decade = (floor(year/10)*10))

region = st_bbox(storm_data)

ggplot() +
  geom_sf(data = world) +
  stat_bin2d(data = storms, aes(y = st_coordinates(storms)[,2], x =␣
 ↪st_coordinates(storms)[,1]), bins = 100) +
  facet_wrap(~decade) +
  scale_fill_distiller(palette="YlOrRd",
                       trans="log",
                       direction=-1,
                       breaks = c(1,10,100,1000)) +
  coord_sf(ylim=region[c(2,4)], xlim=region[c(1,3)]) +
  labs(x = "Longitude", y = "Latitude")
```




[ ]:
```
states = us_states %>%
  st_transform(crs = st_crs(storms)) %>%
  rename(state = NAME)

storm_states = st_join(storms, states, join = st_intersects, left = F)

top5_states = storm_states %>%
  st_set_geometry(NULL) %>%
  group_by(state) %>%
  dplyr::summarize(storms = length(unique(NAME))) %>%
  arrange(desc(storms)) %>%
  slice(1:5)
```

```
top5_states
```

A tibble: 5 × 2

| state<br><chr> | storms<br><int> |
|---|---|
| Florida | 86 |
| North Carolina | 66 |
| Georgia | 58 |
| Texas | 54 |
| Louisiana | 52 |