

Análisis de la posición y distancia recorrida de los huracanes

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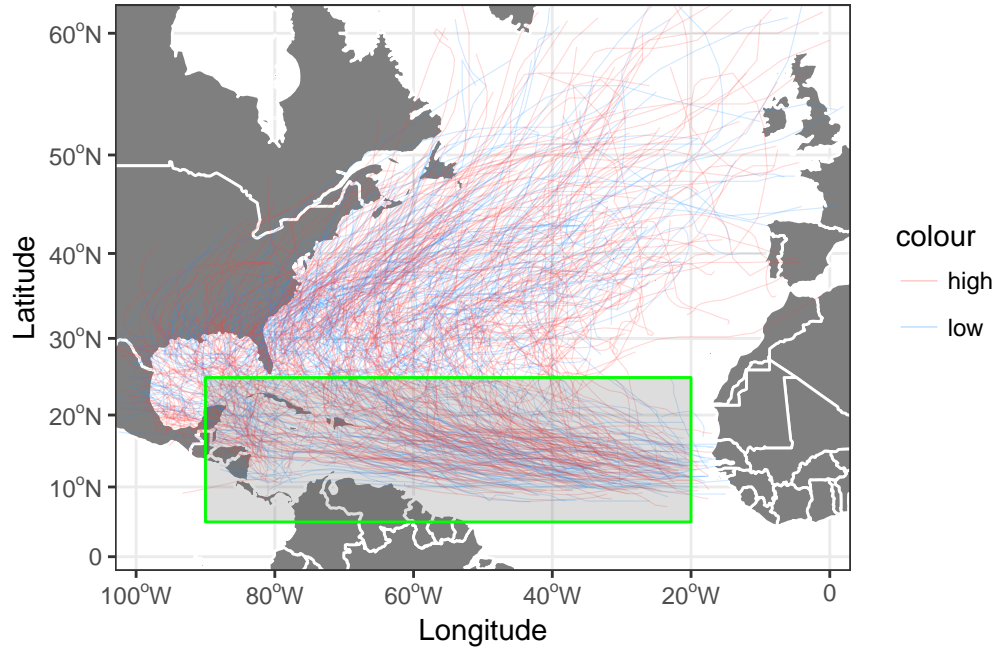
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Mapa de las trayectorias

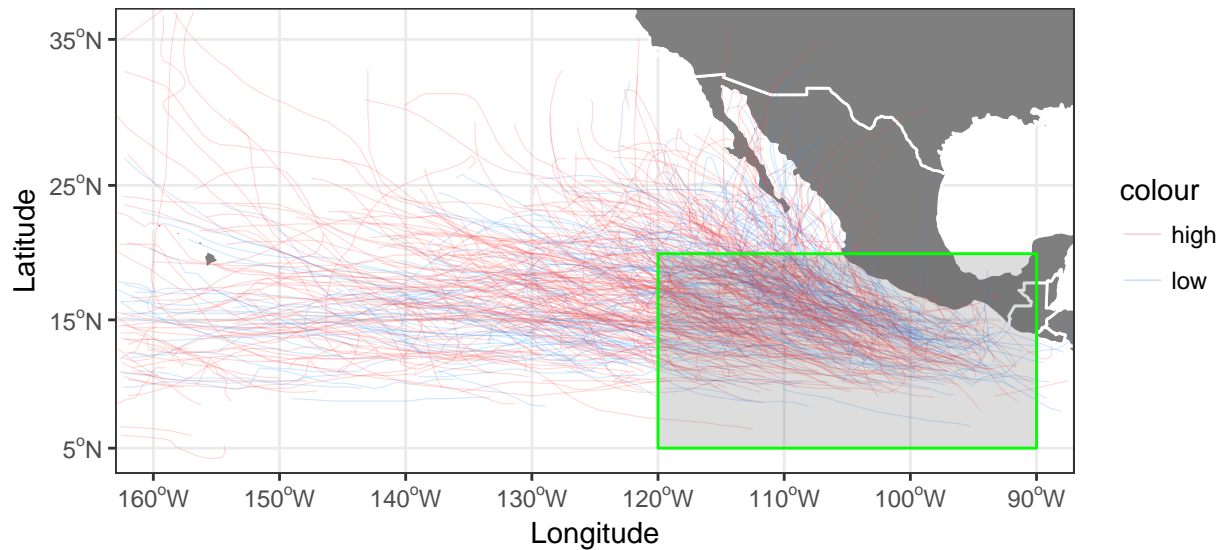
```
map_region_hurrs(storms.natl, coords.natl.map, coords.natl, steps = c(20, 10), xtra.lims = c(3,2)) + th
```

```
## Joining by: storm.id
```



```
map_region_hurrs(storms.epac, coords.epac.map, coords.epac, steps = c(10, 10), xtra.lims = c(3,2)) + th
```

```
## Joining by: storm.id
```



Análisis de la distancia

Midiendo las distancias

Lo hacemos usando la fórmula de Haversine:

```
haversine_distance <- function(lat1, lat2, lon1, lon2) {  
  earth.radius = 6371000  
  
  lat1 = lat1 * (pi/180)  
  lat2 = lat2 * (pi/180)  
  lon1 = lon1 * (pi/180)  
  lon2 = lon2 * (pi/180)  
  delta.lat = lat2 - lat1  
  delta.lon = lon2 - lon1  
  
  a <- sin(delta.lat/2) * sin(delta.lat/2) + cos(lat1) * cos(lat2) * sin(delta.lon/2) * sin(delta.lon/2)  
  c <- 2 * atan2(sqrt(a), sqrt(1-a))  
  
  return(earth.radius * c)  
}
```

```
storms.tracks <- storms.all %>%  
  group_by(storm.id) %>%  
  mutate(distance = haversine_distance(lat, lag(lat), long, lag(long))) %>%  
  mutate(distance = ifelse(is.na(distance), 0, distance)) %>%  
  summarise(first.lat = first(lat), last.lat = last(lat),  
            first.long = first(long), last.long = last(long),  
            distance = sum(distance))
```

Huracanes con recorrido más largo

Estos resultados habría que compararlos con los de <http://www.aoml.noaa.gov/hrd/tcfaq/E7.html>

```
storms.joint %>%  
  group_by(basin) %>%  
  summarise(dist.mean = mean(distance))
```

```
## # A tibble: 2 x 2  
##   basin dist.mean  
##   <chr>      <dbl>  
## 1 EPAC    2540171.  
## 2 NATL    3511879.
```

```
get_longest_paths("NATL")
```

```
##   storm.id storm.name storm.year distance  
## 1 AL032000   ALBERTO      2000 13519322  
## 2 AL061966    FAITH      1966 13439349  
## 3 AL122011    KATIA      2011 12481694  
## 4 AL092004    IVAN       2004 12374371  
## 5 AL131998    MITCH      1998 11942367  
## 6 AL071995    FELIX      1995 11672628
```

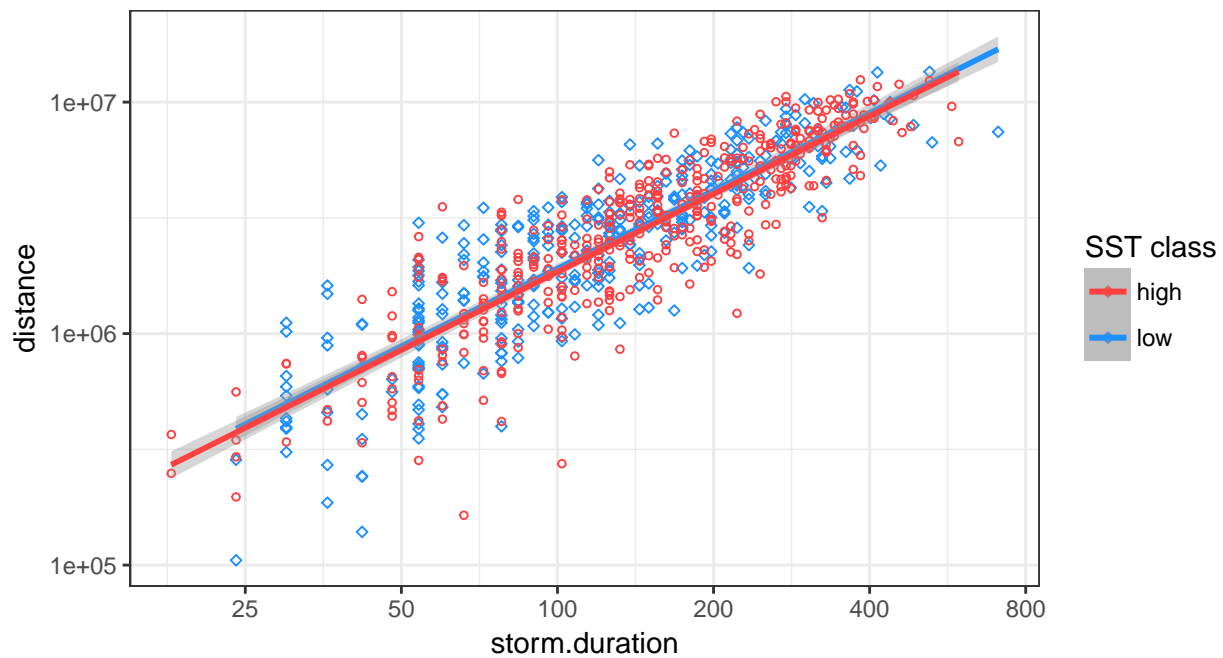
```
get_longest_paths("EPAC")
```

```
##   storm.id storm.name storm.year distance
## 1 EP101994      JOHN      1994 13406365
## 2 EP091997  GUILLERMO      1997 12336583
## 3 EP071999      DORA       1999 10487965
## 4 CP012006      IOKE       2006 10061157
## 5 EP072014  GENEVIEVE      2014  9854077
## 6 CP021997     OLIWA       1997  8516060
```

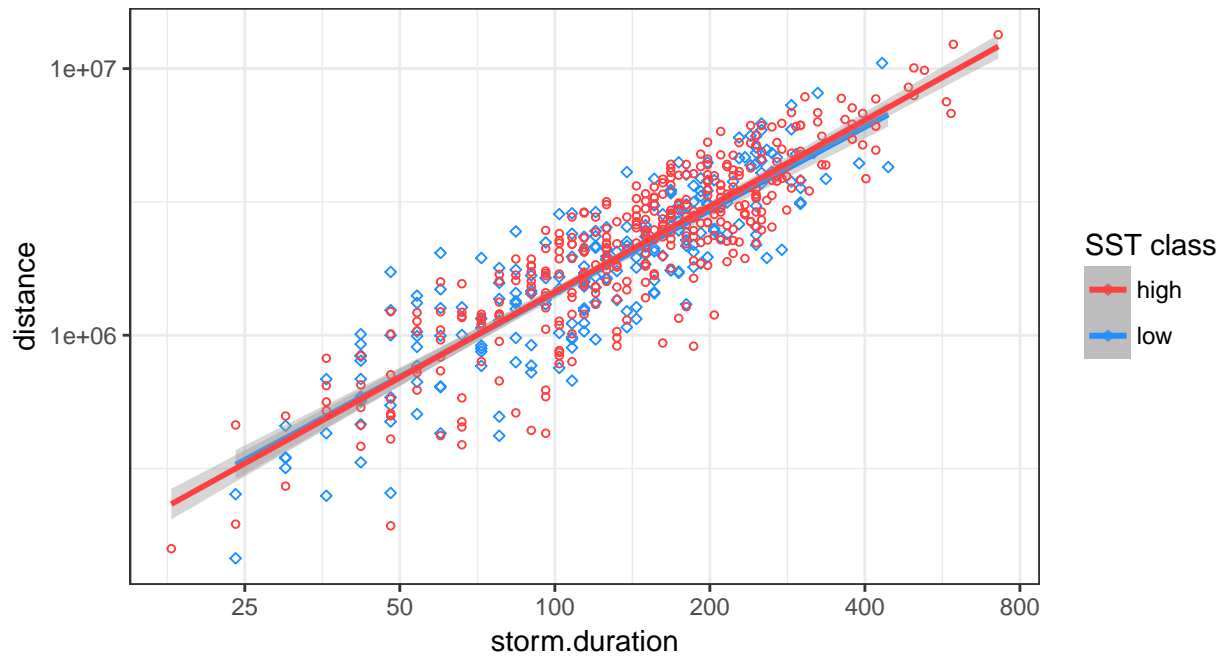
Scatterplot of distance vs duration

Todas las tormentas

```
plot_distance_scatterplot("NATL") + theme_bw()
```

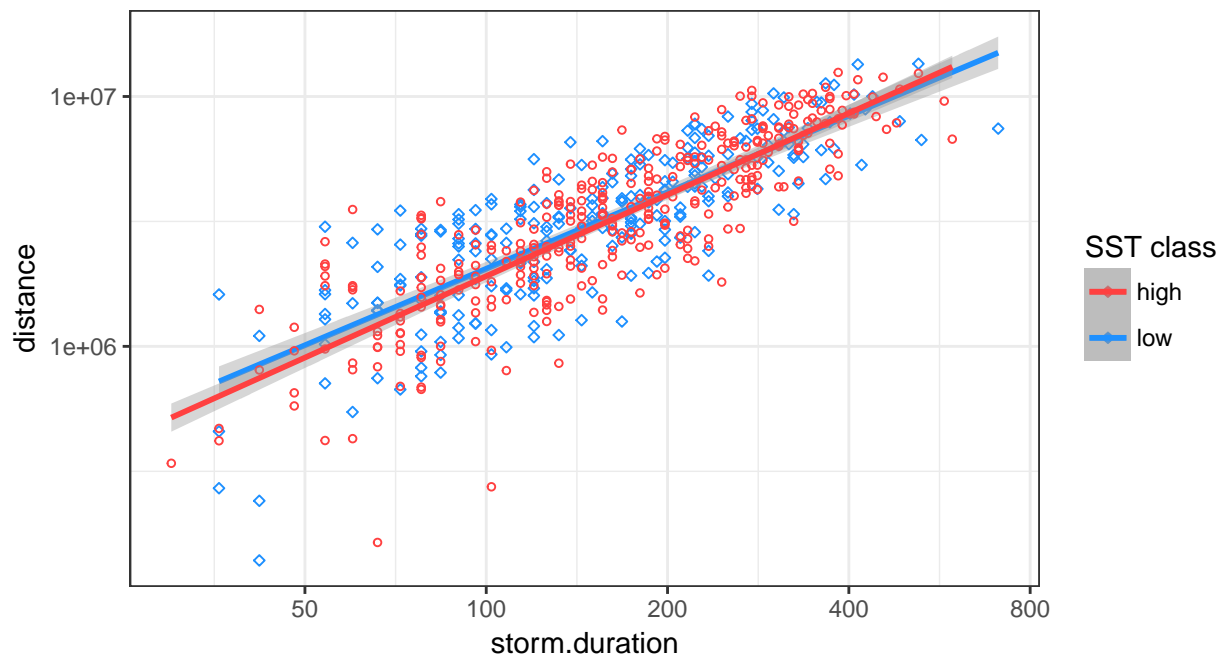


```
plot_distance_scatterplot("EPAC") + theme_bw()
```

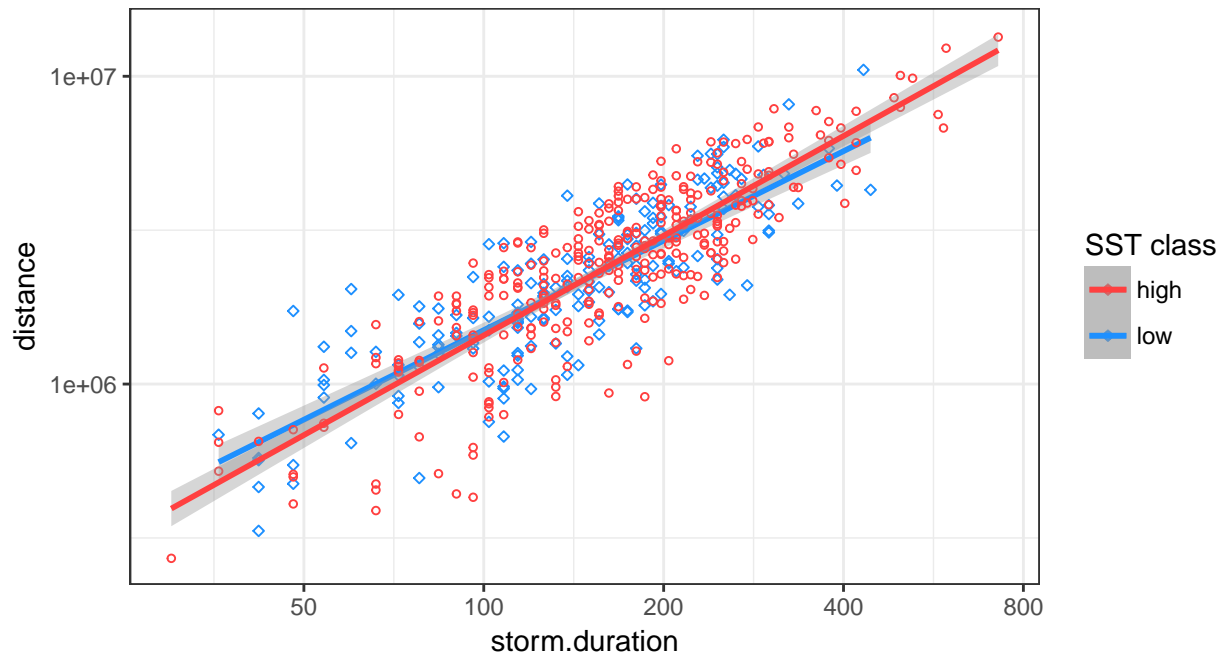


Developing systems

```
plot_distance_scatterplot("NATL", 33) + theme_bw()
```



```
plot_distance_scatterplot("EPAC", 33) + theme_bw()
```



Sobretudo en los developing systems (eliminando tormentas pequeñas), parece bastante claro que la velocidad de avance del huracán es superior para los años calientes.

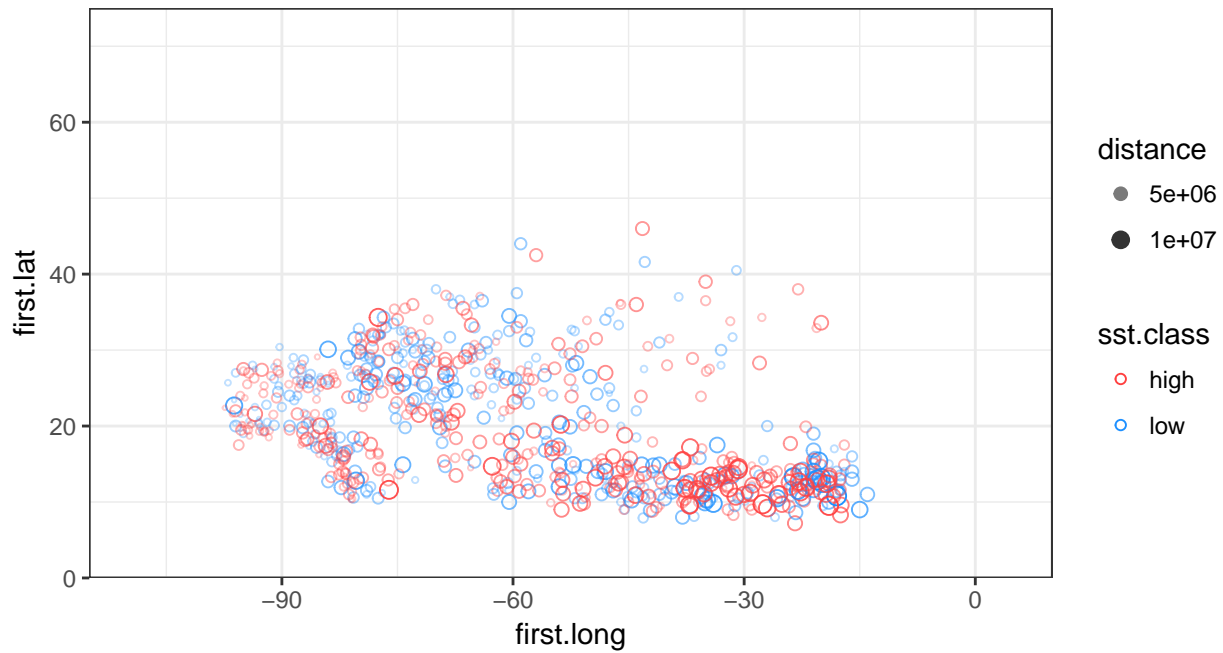
Análisis de posición inicial y final

En los gráficos (no he puesto el continente de fondo) tenemos básicamente un scatterplot de la posición inicial y final (separado por años calientes y fríos), además he hecho que la transparencia de los puntos así como el tamaño dependan de la distancia recorrida por los huracanes.

North Atlantic

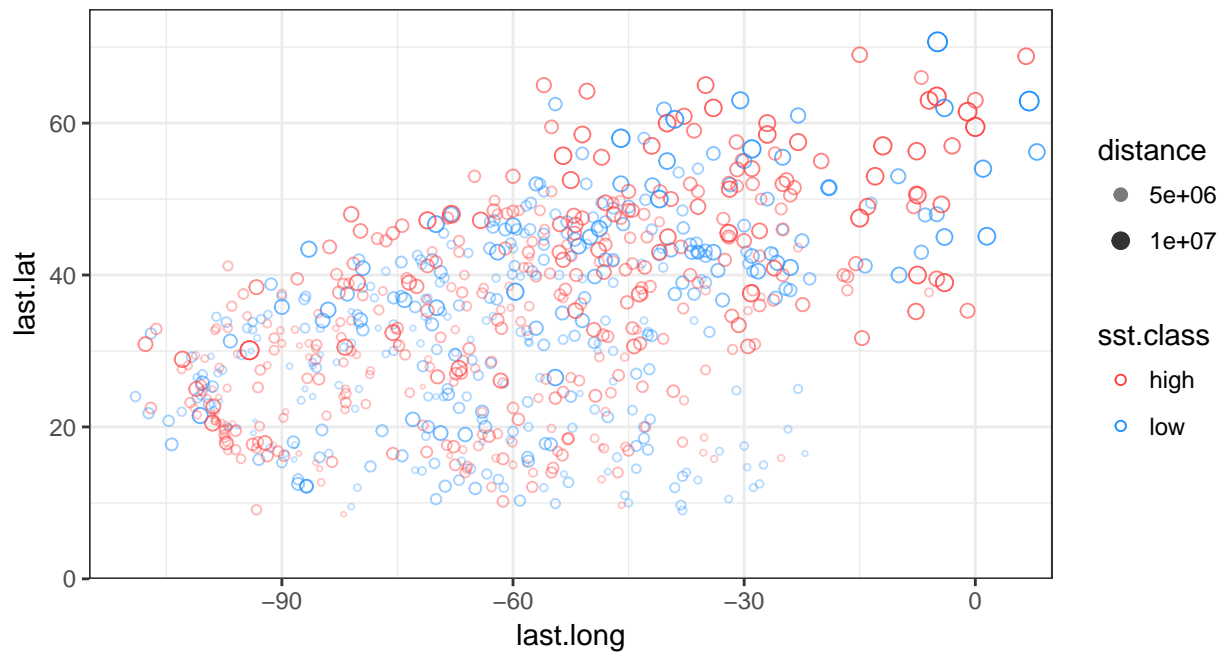
Todas las tormentas (NATL)

```
plot_positions("NATL", "first") + scale_x_continuous( limits = c(-115,10), expand = c(0,0) ) + scale_y_
```



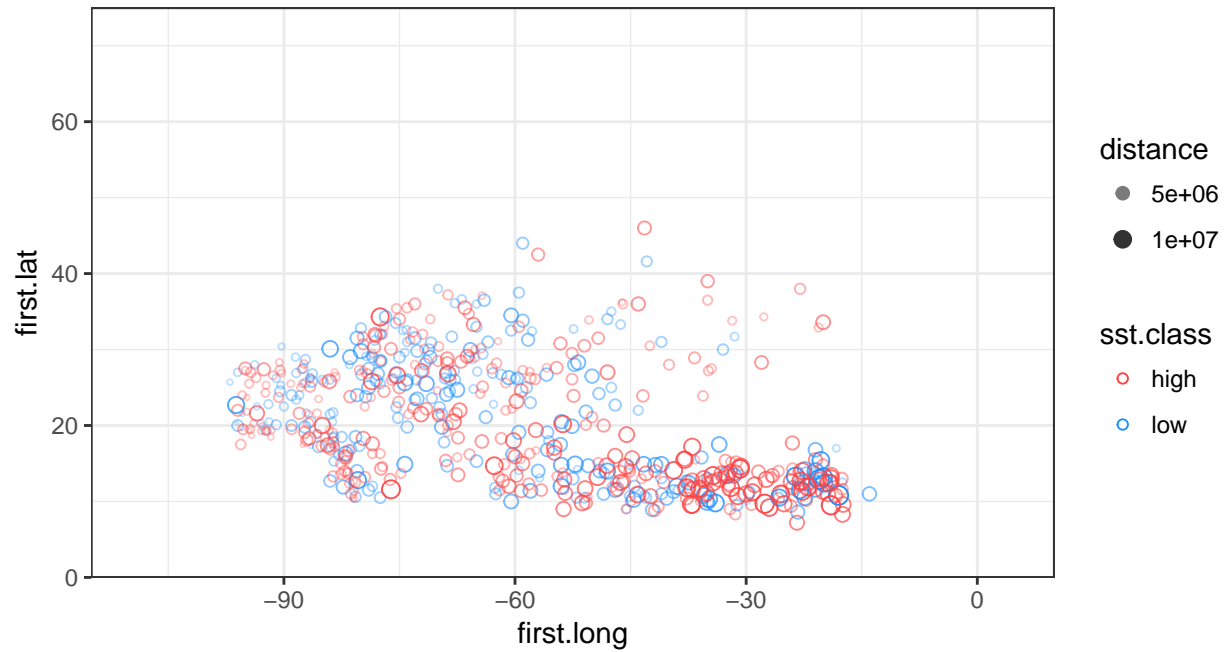
```
plot_positions("NATL", "last") + scale_x_continuous( limits = c(-115,10), expand = c(0,0) ) + scale_y_c
```

```
## Warning: Removed 1 rows containing missing values (geom_point).
```



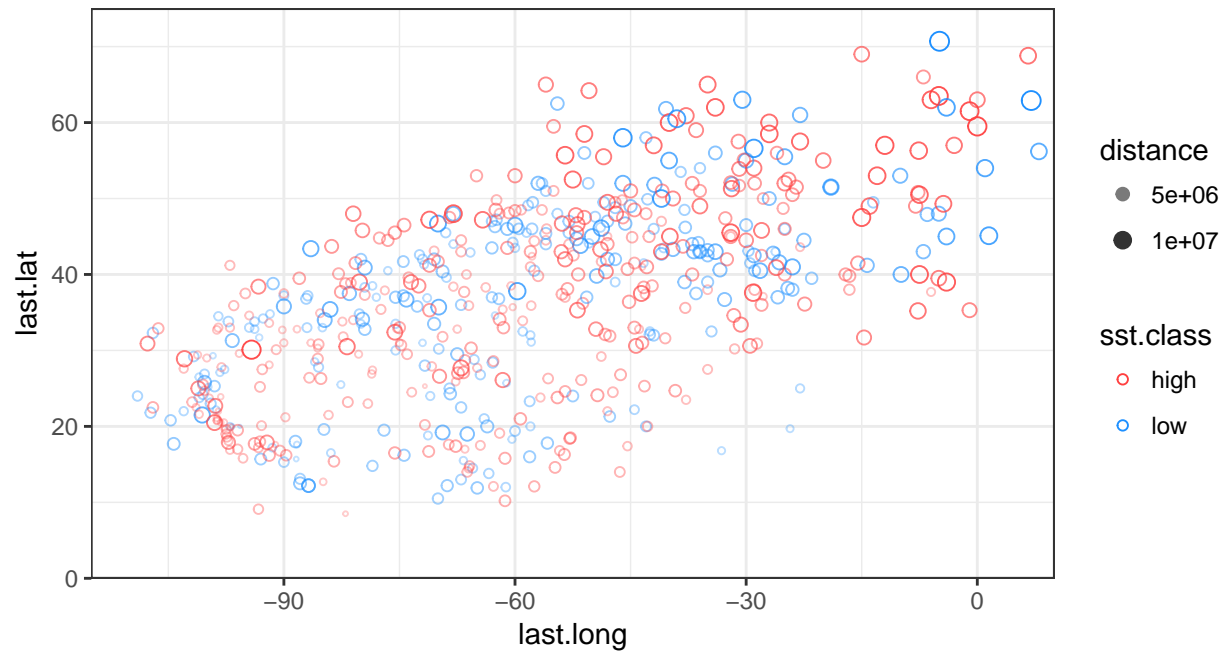
Developing systems (NATL)

```
plot_positions("NATL", "first", 33) + scale_x_continuous( limits = c(-115,10), expand = c(0,0) ) + scale
```



```
plot_positions("NATL", "last", 33) + scale_x_continuous( limits = c(-115,10), expand = c(0,0) ) + scale
```

Warning: Removed 1 rows containing missing values (geom_point).

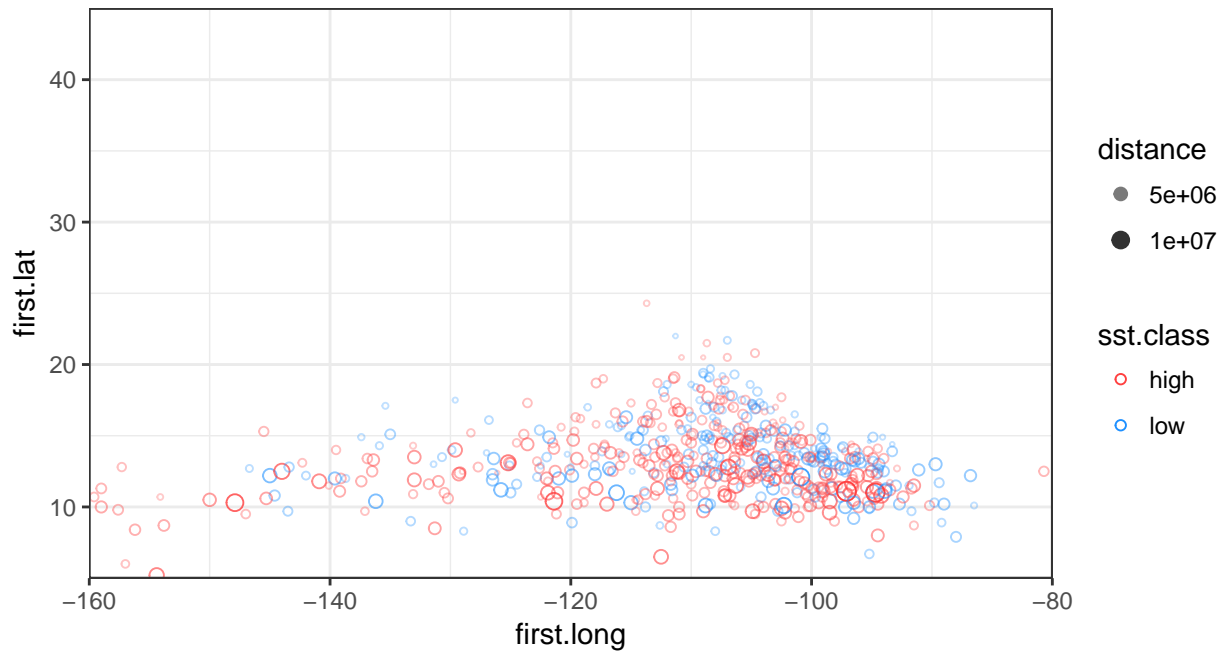


East Pacific

Todas las tormentas (EPAC)

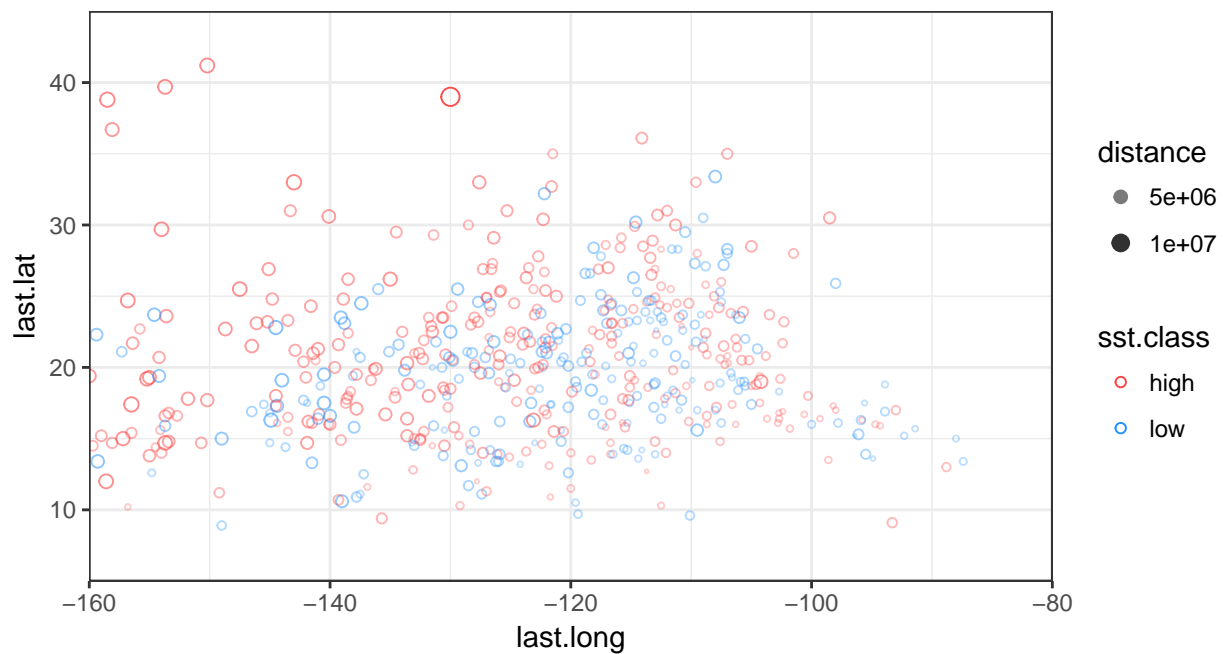
```
plot_positions("EPAC", "first") + scale_x_continuous( limits = c(-160,-80), expand = c(0,0) ) + scale_y_
```

```
## Warning: Removed 11 rows containing missing values (geom_point).
```



```
plot_positions("EPAC", "last") + scale_x_continuous( limits = c(-160,-80), expand = c(0,0) ) + scale_y_
```

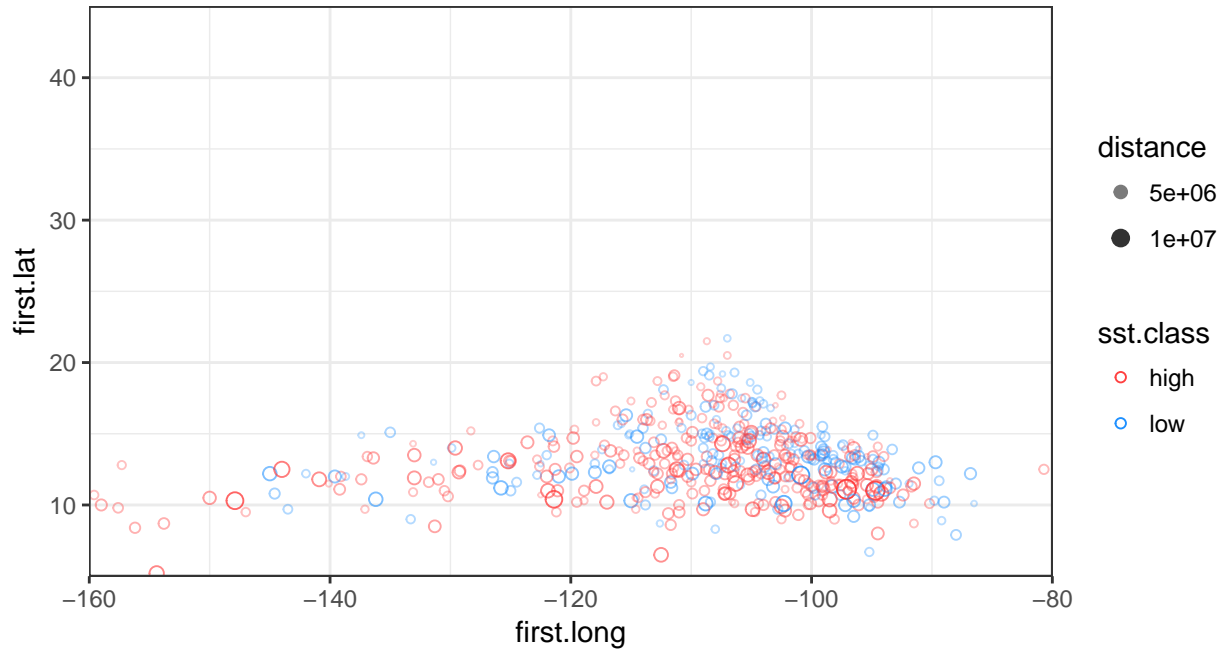
```
## Warning: Removed 61 rows containing missing values (geom_point).
```



Developing systems (EPAC)

```
plot_positions("EPAC", "first", 33) + scale_x_continuous( limits = c(-160,-80), expand = c(0,0) ) + sca
```

```
## Warning: Removed 7 rows containing missing values (geom_point).
```



```
plot_positions("EPAC", "last", 33) + scale_x_continuous( limits = c(-160,-80), expand = c(0,0) ) + scal
```

```
## Warning: Removed 52 rows containing missing values (geom_point).
```

