

Análisis de la posición y distancia recorrida de los huracanes

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Análisis de la distancia (III)

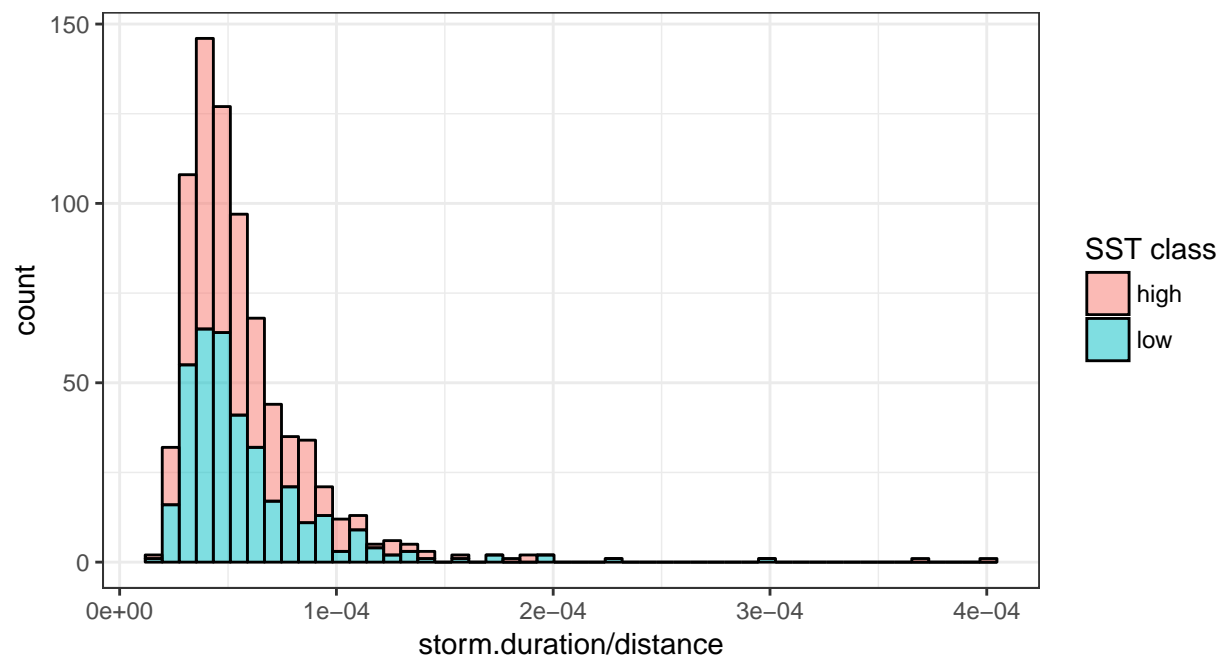
Comentario sobre el cálculo de la distancia

Usando la fórmula de Haversine (vs la Ley de Cosenos), se obtiene en el peor de los casos una diferencia de 0.37 metros, y de media 10^{-8} metros. Pero bueno, en realidad no hay ninguna justificación para usar Haversine en lugar de la Ley de Cosenos (no con la precisión computacional de hoy en día).

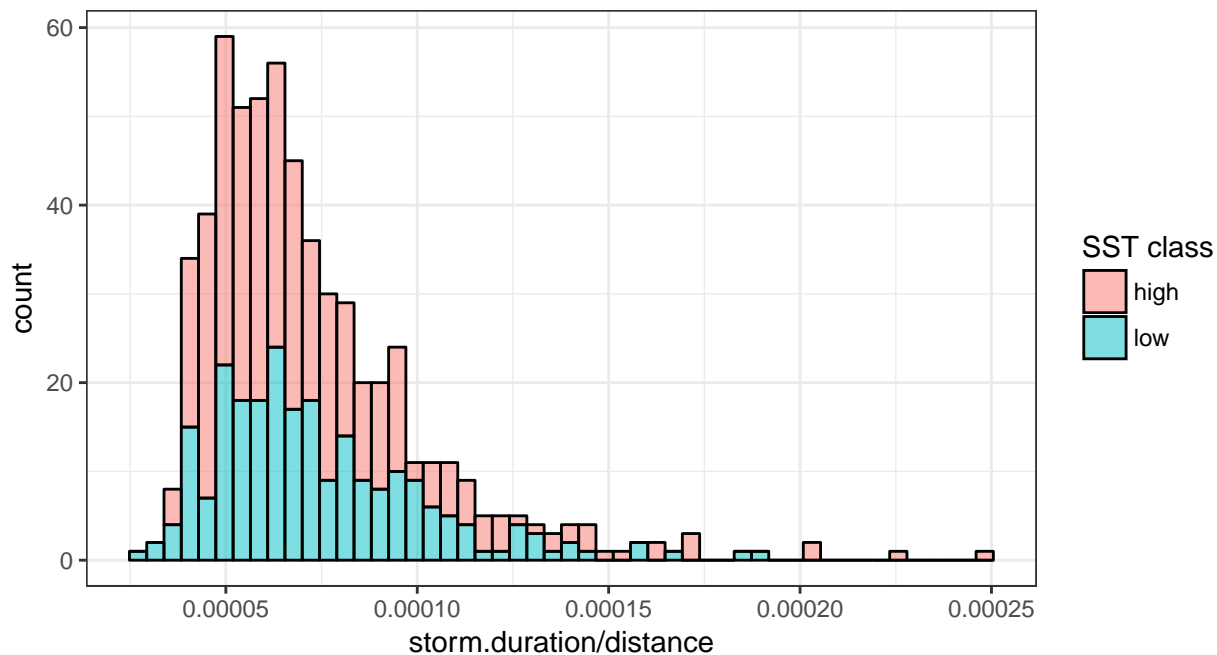
Histogramas de distancia/duración

Todas las tormentas

```
plot_distance_histogram("NATL") + theme_bw()
```

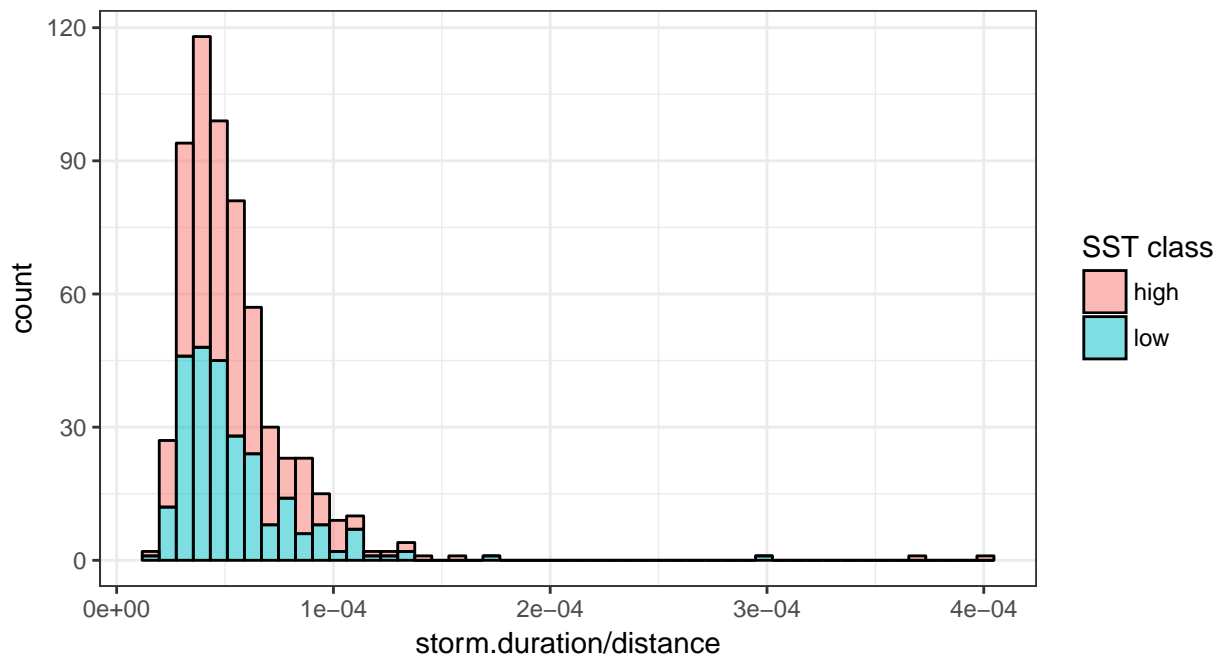


```
plot_distance_histogram("EPAC") + theme_bw()
```

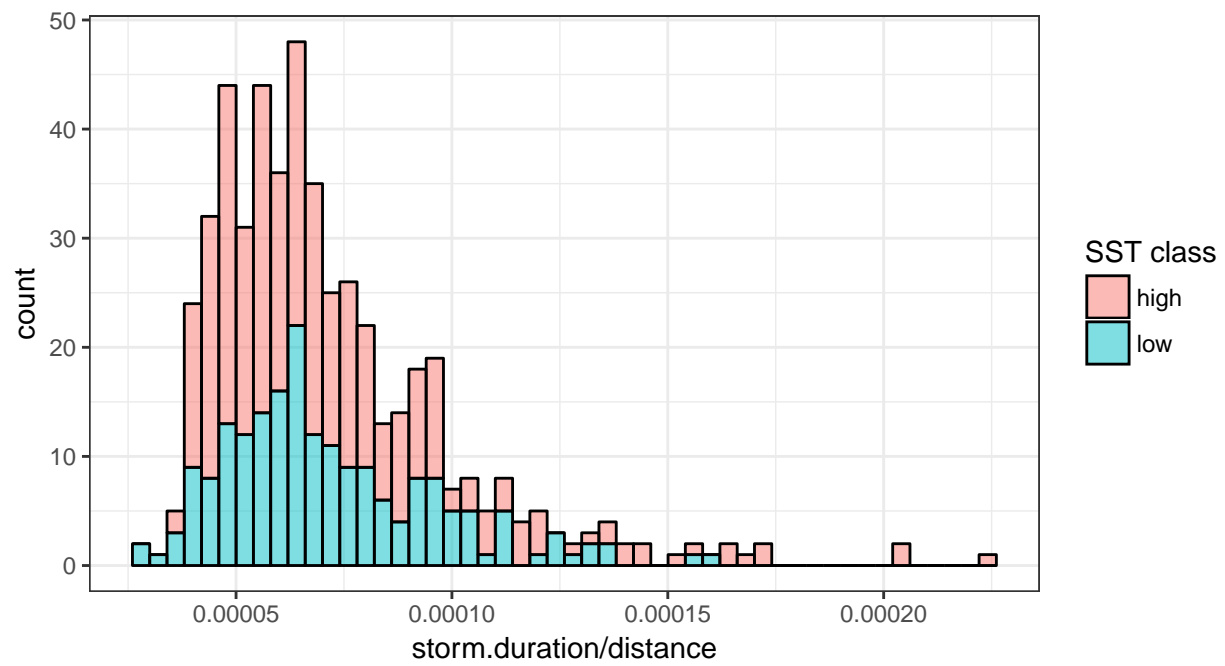


Developing systems

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



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



Análisis de posición inicial y final (III)

Mirando las medias

Todas las tormentas

```
get_location_mean_summary("NATL")
```

```
## # A tibble: 2 x 9
##   sst.class mean.first.lat sd.first.lat mean.last.lat sd.last.lat
##   <chr>          <dbl>          <dbl>          <dbl>          <dbl>
## 1 high           19.5           0.384           34.7           0.660
## 2 low            20.8           0.417           33.1           0.678
##   mean.first.long sd.first.long mean.last.long sd.last.long
##               <dbl>          <dbl>          <dbl>          <dbl>
## 1          -58.7           1.16          -59.4           1.32
## 2          -59.4           1.20          -59.4           1.26
```

```
get_location_mean_summary("EPAC")
```

```
## # A tibble: 2 x 9
##   sst.class mean.first.lat sd.first.lat mean.last.lat sd.last.lat
##   <chr>          <dbl>          <dbl>          <dbl>          <dbl>
## 1 high           13.1           0.142           20.7           0.342
## 2 low            13.8           0.202           19.6           0.330
##   mean.first.long sd.first.long mean.last.long sd.last.long
##               <dbl>          <dbl>          <dbl>          <dbl>
## 1          -112.           0.865          -120.           2.86
## 2          -108.           1.48          -118.           2.97
```

Developing systems

```
get_location_mean_summary("NATL", 33)
```

```
## # A tibble: 2 x 9
##   sst.class mean.first.lat sd.first.lat mean.last.lat sd.last.lat
##   <chr>          <dbl>          <dbl>          <dbl>          <dbl>
## 1 high           19.7           0.428           36.6           0.702
## 2 low            21.3           0.496           36.6           0.790
##   mean.first.long sd.first.long mean.last.long sd.last.long
##               <dbl>          <dbl>          <dbl>          <dbl>
## 1          -58.6           1.25          -58.4           1.46
## 2          -62.4           1.33          -59.3           1.64
```

```
get_location_mean_summary("EPAC", 33)
```

```
## # A tibble: 2 x 9
##   sst.class mean.first.lat sd.first.lat mean.last.lat sd.last.lat
##   <chr>          <dbl>          <dbl>          <dbl>          <dbl>
## 1 high           12.9           0.145           21.3           0.368
## 2 low            13.6           0.226           20.2           0.379
##   mean.first.long sd.first.long mean.last.long sd.last.long
##               <dbl>          <dbl>          <dbl>          <dbl>
## 1          -111.           0.843          -120.           3.10
```

```
## 2          -106.          1.75          -118.          3.26
```

Mirando las medianas

Todas las tormentas

```
get_location_median_summary("NATL")
```

```
## # A tibble: 2 x 9
##   sst.class median.first.lat sd.first.lat median.last.lat sd.last.lat
##   <chr>          <dbl>          <dbl>          <dbl>          <dbl>
## 1 high           17.5           0.481           34.4           0.827
## 2 low            20.5           0.523           33.8           0.849
##   median.first.long sd.first.long median.last.long sd.last.long
##   <dbl>          <dbl>          <dbl>          <dbl>
## 1      -60.1           1.46          -59.2           1.65
## 2      -62.5           1.50          -59.1           1.58
```

```
get_location_median_summary("EPAC")
```

```
## # A tibble: 2 x 9
##   sst.class median.first.lat sd.first.lat median.last.lat sd.last.lat
##   <chr>          <dbl>          <dbl>          <dbl>          <dbl>
## 1 high           12.7           0.178           20.0           0.429
## 2 low            13.4           0.253           19.2           0.414
##   median.first.long sd.first.long median.last.long sd.last.long
##   <dbl>          <dbl>          <dbl>          <dbl>
## 1      -108.           1.08          -125.           3.58
## 2      -106.           1.86          -120.           3.72
```

Developing systems

```
get_location_median_summary("NATL", 33)
```

```
## # A tibble: 2 x 9
##   sst.class median.first.lat sd.first.lat median.last.lat sd.last.lat
##   <chr>          <dbl>          <dbl>          <dbl>          <dbl>
## 1 high           18.0           0.536           37.3           0.880
## 2 low            21.5           0.621           38.0           0.990
##   median.first.long sd.first.long median.last.long sd.last.long
##   <dbl>          <dbl>          <dbl>          <dbl>
## 1      -60.4           1.57          -57.9           1.84
## 2      -65.5           1.66          -60.3           2.05
```

```
get_location_median_summary("EPAC", 33)
```

```
## # A tibble: 2 x 9
##   sst.class median.first.lat sd.first.lat median.last.lat sd.last.lat
##   <chr>          <dbl>          <dbl>          <dbl>          <dbl>
## 1 high           12.5           0.182           20.5           0.461
## 2 low            13.2           0.283           20.0           0.475
##   median.first.long sd.first.long median.last.long sd.last.long
##   <dbl>          <dbl>          <dbl>          <dbl>
```

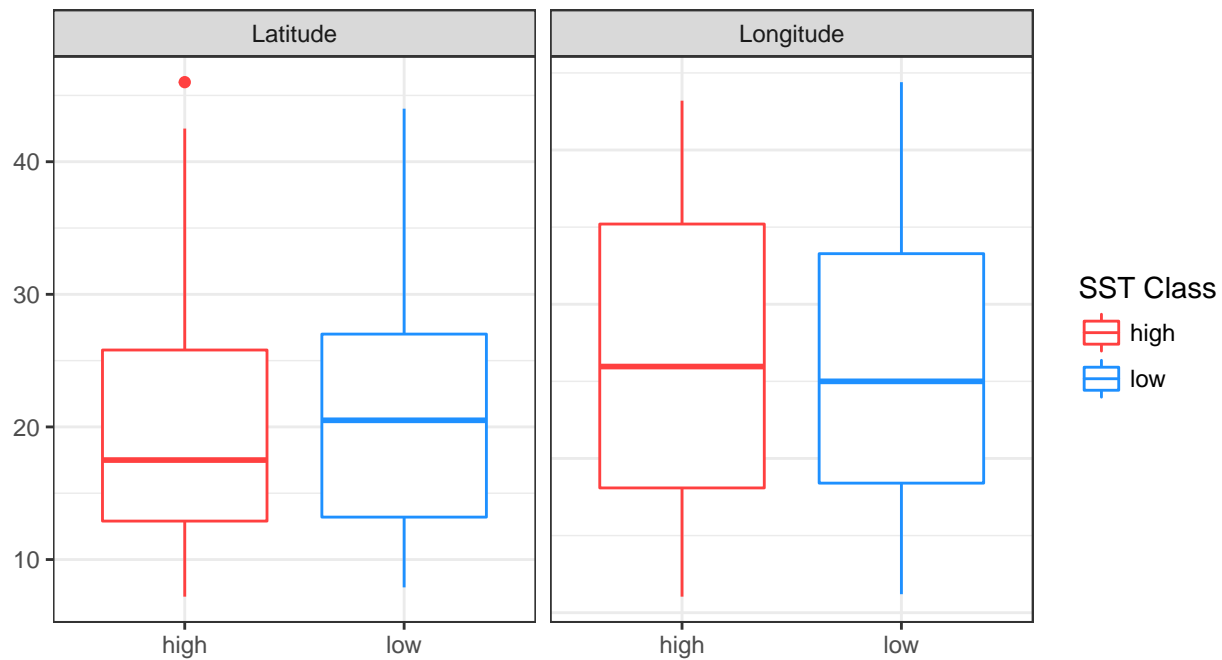
## 1	-107.	1.06	-125.	3.89
## 2	-105.	2.19	-120.	4.09

Análisis de posición inicial y final (IV): Boxplots and Wilcoxon Tests

North Atlantic

Todas las tormentas (NALT)

```
plot_positions_boxplot("NATL", "first") + theme_bw()
```



```
perform_wilcox_test("first.lat", "NATL")
```

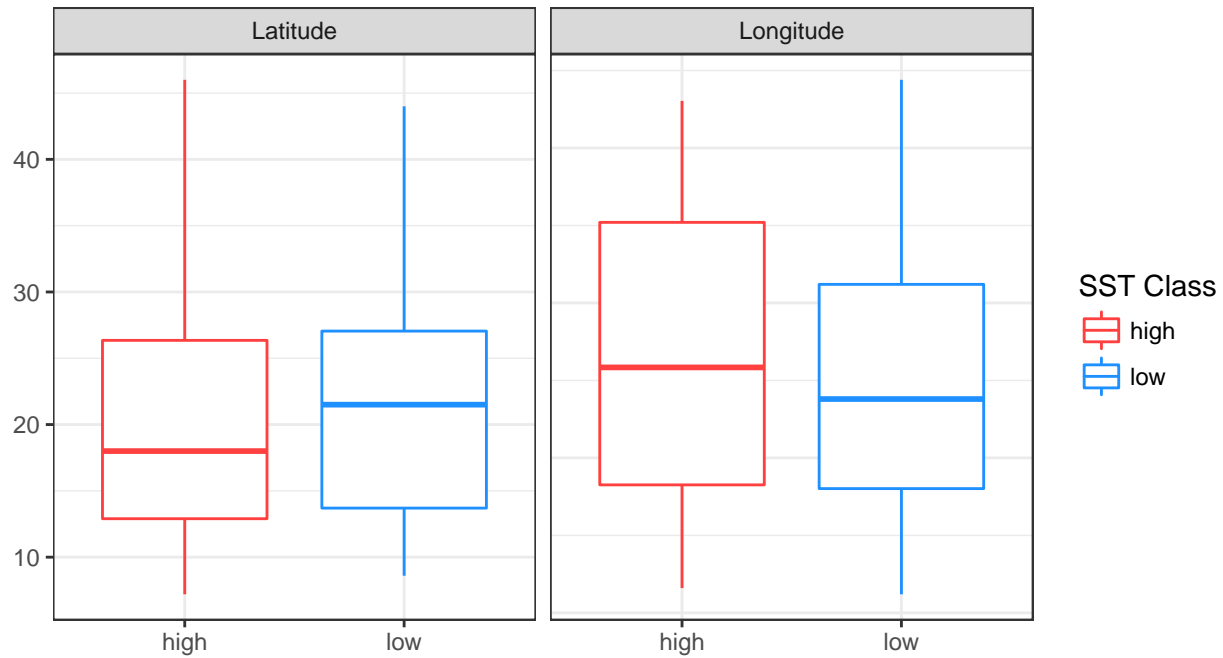
```
##
## Wilcoxon rank sum test with continuity correction
##
## data: df[, var] by df[, "sst.class"]
## W = 67150, p-value = 0.0245
## alternative hypothesis: true location shift is not equal to 0
```

```
perform_wilcox_test("first.long", "NATL")
```

```
##
## Wilcoxon rank sum test with continuity correction
##
## data: df[, var] by df[, "sst.class"]
## W = 75016, p-value = 0.7657
## alternative hypothesis: true location shift is not equal to 0
```


Developing systems (NALT)

```
plot_positions_boxplot("NATL", "first", 33) + theme_bw()
```



```
perform_wilcox_test("first.lat", "NATL", 33)
```

```
##
## Wilcoxon rank sum test with continuity correction
##
## data: df[, var] by df[, "sst.class"]
## W = 39363, p-value = 0.02067
## alternative hypothesis: true location shift is not equal to 0
```

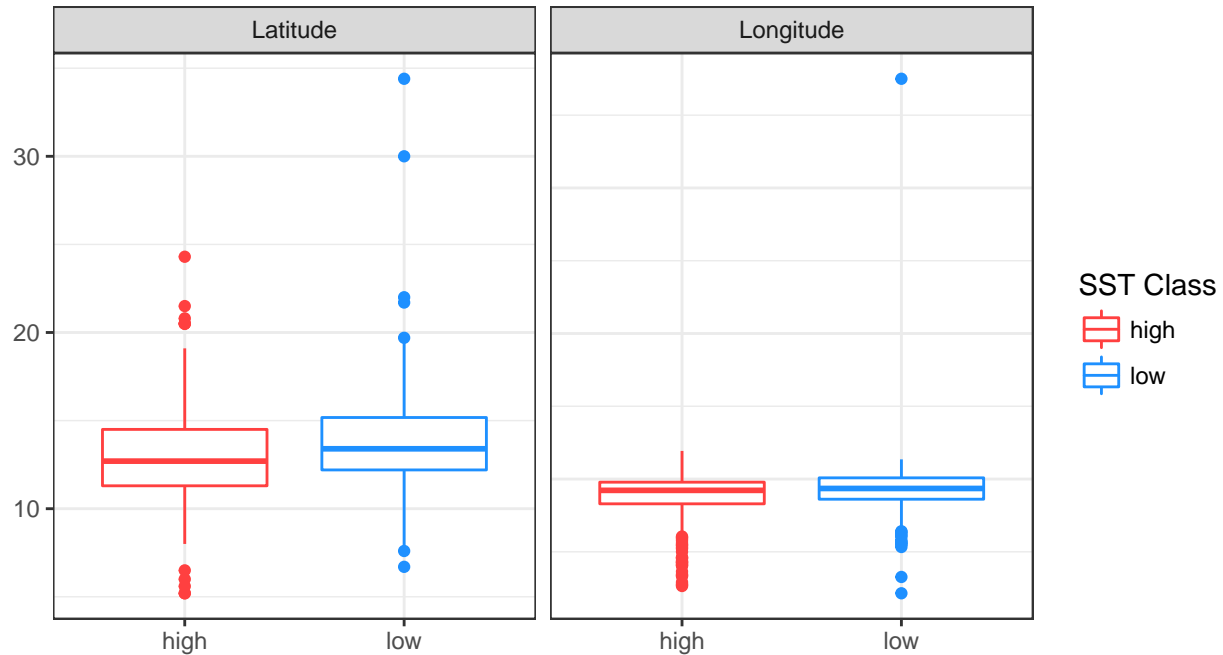
```
perform_wilcox_test("first.long", "NATL", 33)
```

```
##
## Wilcoxon rank sum test with continuity correction
##
## data: df[, var] by df[, "sst.class"]
## W = 48140, p-value = 0.06458
## alternative hypothesis: true location shift is not equal to 0
```

East Pacific

Todas las tormentas (EPAC)

```
plot_positions_boxplot("EPAC", "first") + theme_bw()
```



```
perform_wilcox_test("first.lat", "EPAC")
```

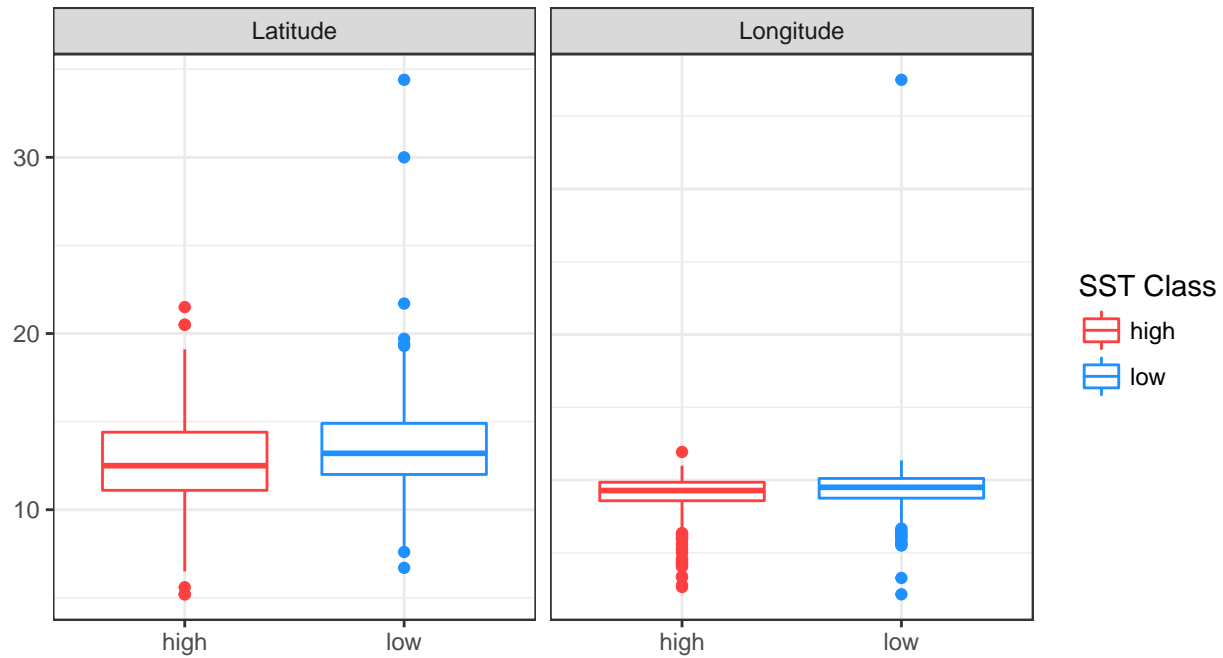
```
##  
## Wilcoxon rank sum test with continuity correction  
##  
## data: df[, var] by df[, "sst.class"]  
## W = 35518, p-value = 0.0008379  
## alternative hypothesis: true location shift is not equal to 0
```

```
perform_wilcox_test("first.long", "EPAC")
```

```
##  
## Wilcoxon rank sum test with continuity correction  
##  
## data: df[, var] by df[, "sst.class"]  
## W = 37072, p-value = 0.009825  
## alternative hypothesis: true location shift is not equal to 0
```

Developing systems (EPAC)

```
plot_positions_boxplot("EPAC", "first", 33) + theme_bw()
```



```
perform_wilcox_test("first.lat", "EPAC", 33)
```

```
##  
## Wilcoxon rank sum test with continuity correction  
##  
## data: df[, var] by df[, "sst.class"]  
## W = 25558, p-value = 0.00457  
## alternative hypothesis: true location shift is not equal to 0
```

```
perform_wilcox_test("first.long", "EPAC", 33)
```

```
##  
## Wilcoxon rank sum test with continuity correction  
##  
## data: df[, var] by df[, "sst.class"]  
## W = 25926, p-value = 0.009199  
## alternative hypothesis: true location shift is not equal to 0
```

Análisis de posición (V)

```
plot_clusters <- function(basin.name, type, min.speed = 0, n.clust = 2) {
  storms.small <- storms.joint %>%
    dplyr::filter(basin == basin.name) %>%
    dplyr::filter(max.wind > min.speed)

  if (type == "first") {
    mat <- storms.small %>% select(sst.class, first.lat, first.long, distance)
  } else if (type == "last") {
    mat <- storms.small %>% select(sst.class, last.lat, last.long, distance)
  }

  # High SST
  mat.high <- mat %>%
    dplyr::filter(sst.class == "high") %>%
    select(-sst.class)
  clust.high <- hclust(dist(mat.high), method = "complete")
  tree.high <- cutree(clust.high, n.clust)

  # Low SST
  mat.low <- mat %>%
    dplyr::filter(sst.class == "low") %>%
    select(-sst.class)
  clust.low <- hclust(dist(mat.low), method = "complete")
  tree.low <- cutree(clust.low, n.clust)

  # Merge data with clustering results
  data.high <- as_tibble(cbind(mat.high, clust = as.factor(tree.high), sst.class = "high"))
  data.low <- as_tibble(cbind(mat.low, clust = as.factor(tree.low), sst.class = "low"))
  data.all <- rbind(data.high, data.low)

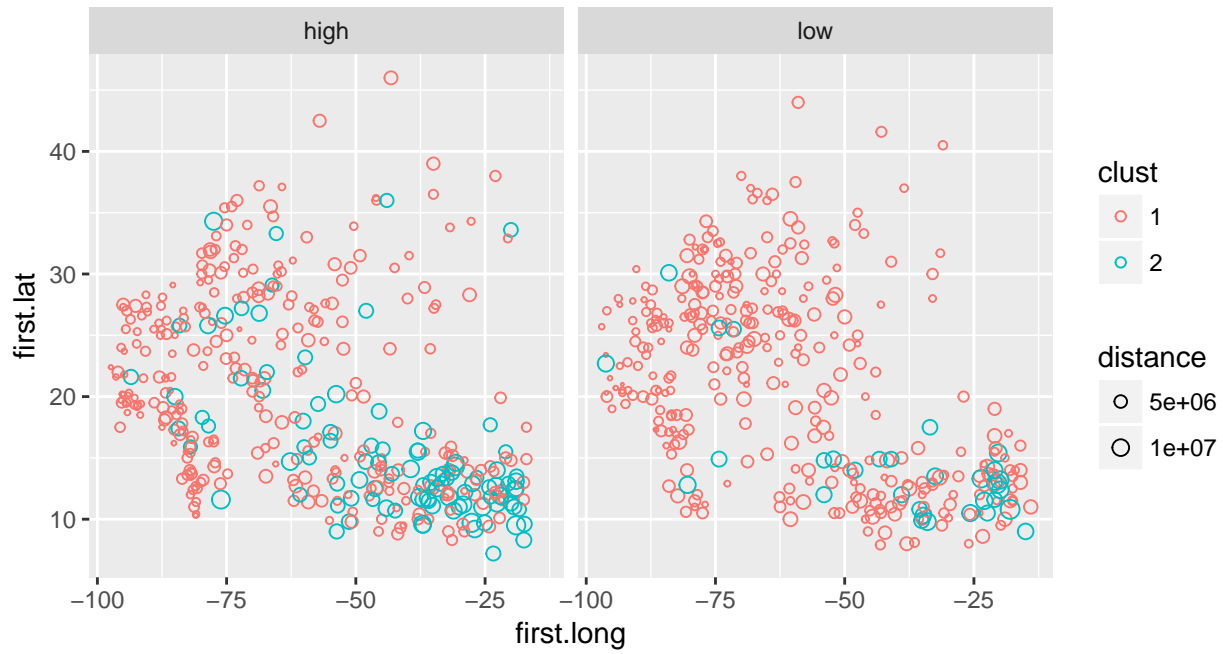
  # Plot
  gg <- ggplot(data.all) +
    aes(colour = clust, size = distance) +
    scale_size_continuous(range = c(0.2, 3)) +
    facet_wrap( ~ sst.class)

  if (type == "first") {
    gg <- gg +
      geom_point(aes(x = first.long, y = first.lat), shape = 1)
  } else if (type == "last") {
    gg <- gg +
      geom_point(aes(x = last.long, y = last.lat), shape = 1)
  }

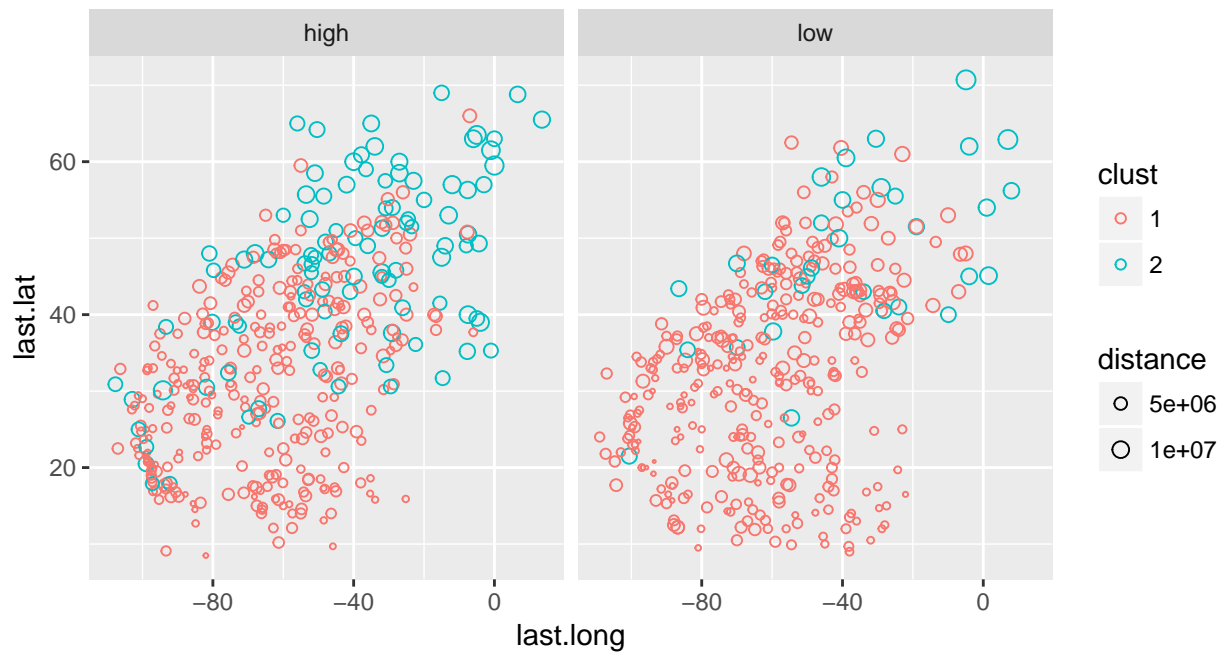
  return(gg)
}
```

North Atlantic

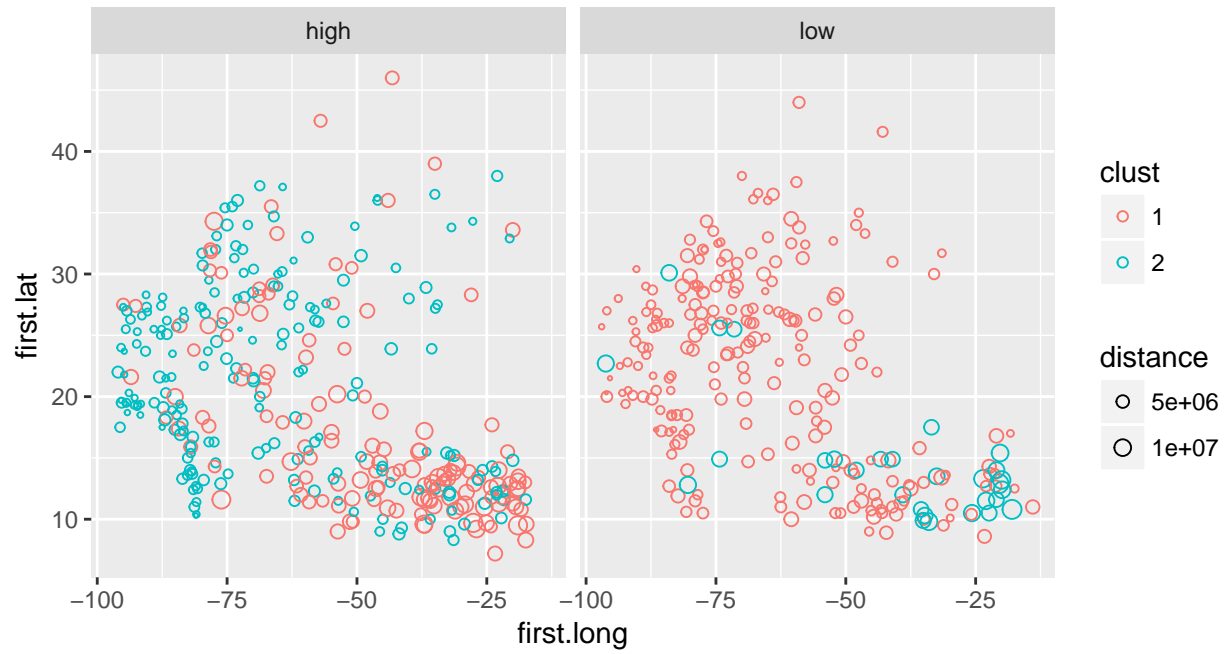
```
plot_clusters("NATL", "first", n.clust = 2)
```



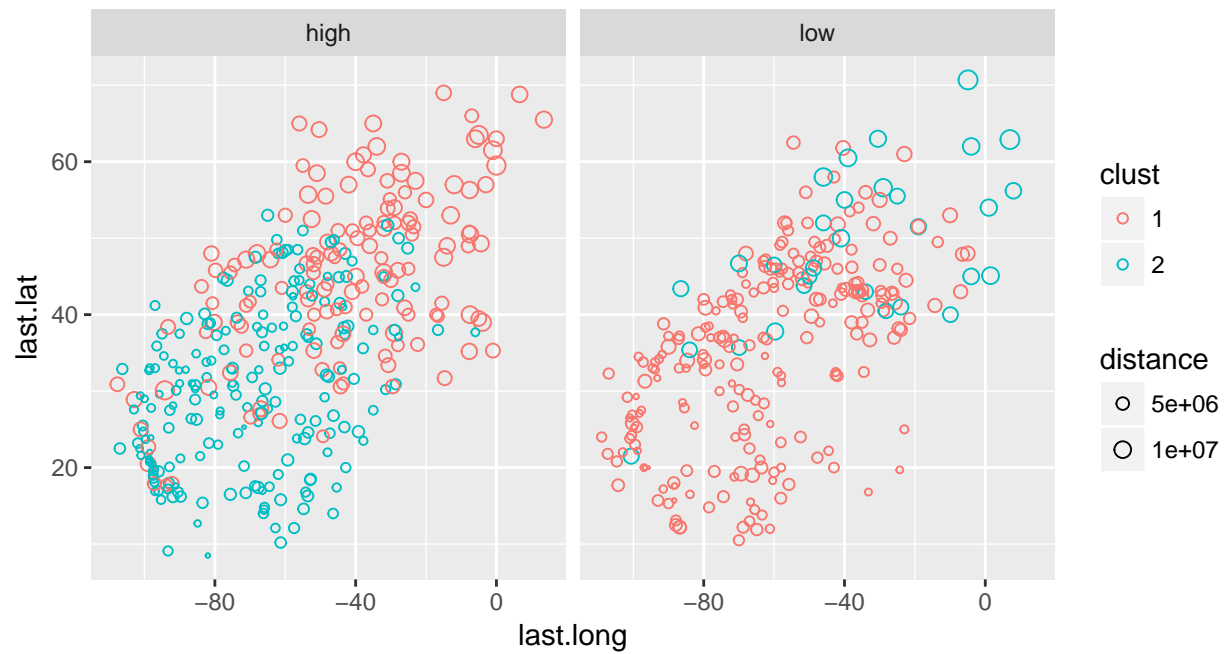
```
plot_clusters("NATL", "last", n.clust = 2)
```



```
plot_clusters("NATL", "first", 33, n.clust = 2)
```

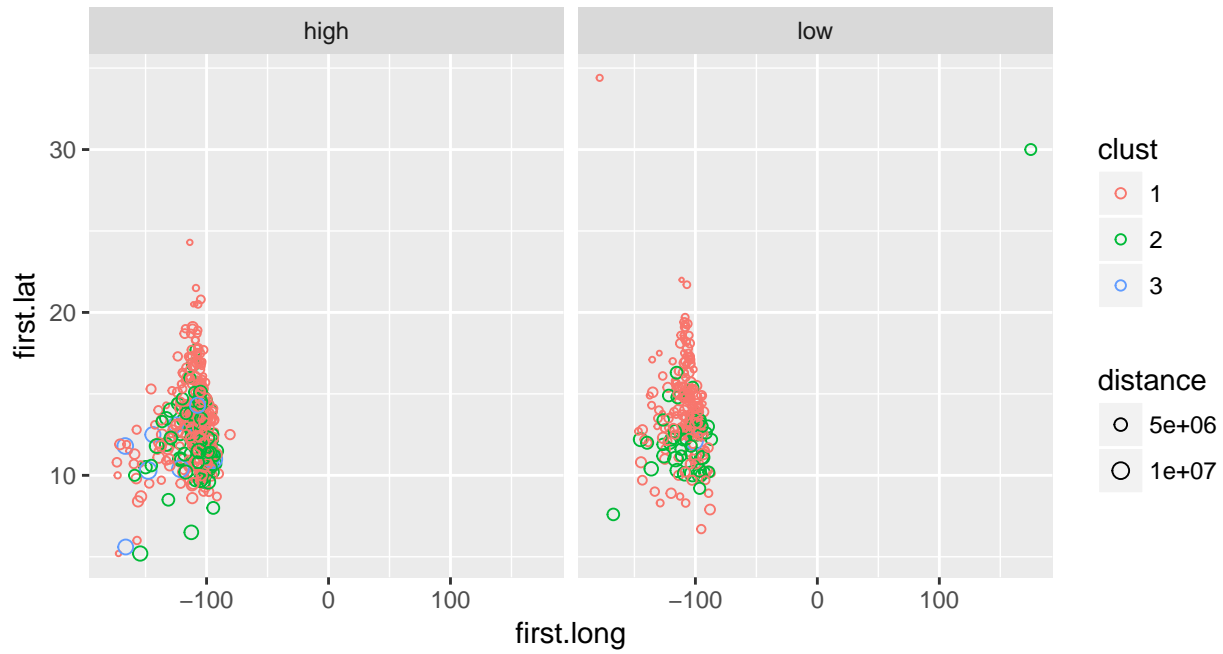


```
plot_clusters("NATL", "last", 33, n.clust = 2)
```

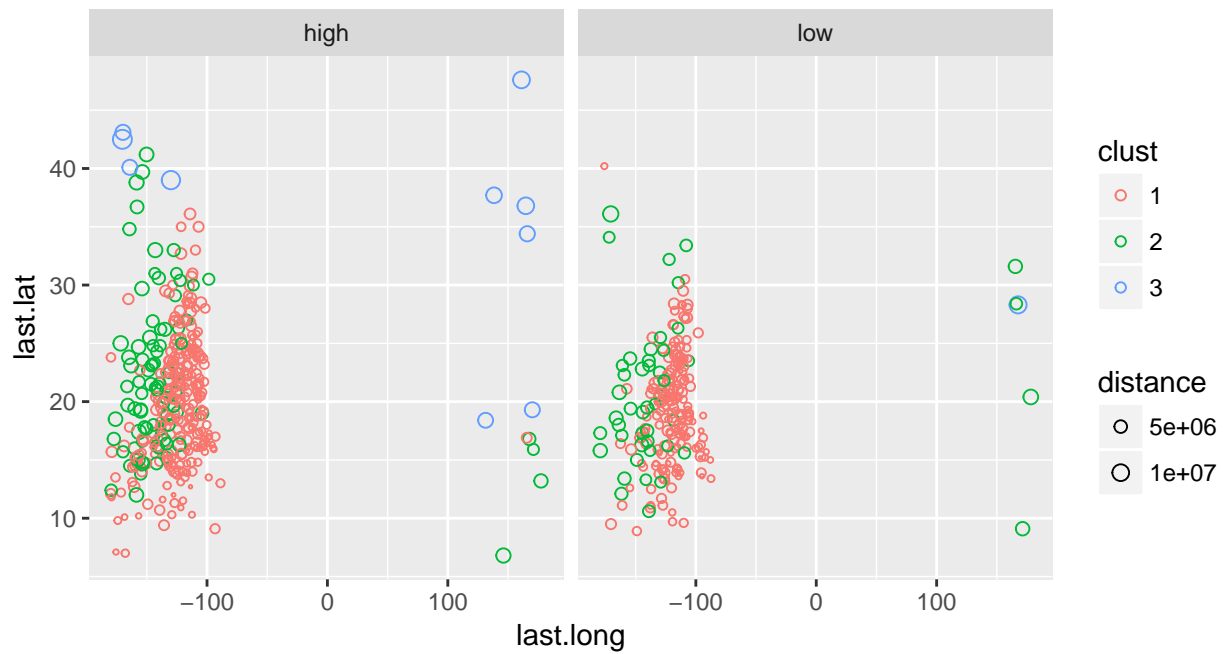


East Pacific

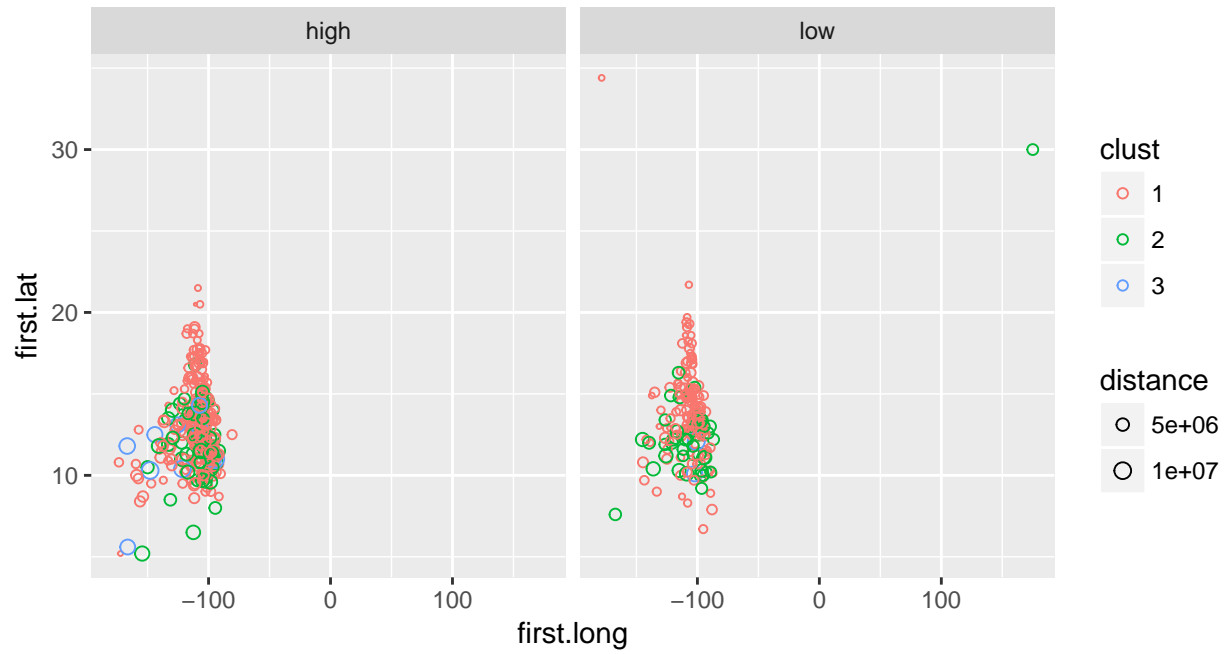
```
plot_clusters("EPAC", "first", n.clust = 3)
```



```
plot_clusters("EPAC", "last", n.clust = 3)
```



```
plot_clusters("EPAC", "first", 33, n.clust = 3)
```



```
plot_clusters("EPAC", "last", 33, n.clust = 3)
```

