notebookR

December 18, 2018

In [1]:
```
library(ggplot2)
library(xtable)
library(dplyr)
```

```
Attaching package: dplyr

The following objects are masked from package:stats:

    filter, lag

The following objects are masked from package:base:

    intersect, setdiff, setequal, union
```

In [2]:
```
#Read data and remove NAs
nazare = na.omit(read.csv("data/Nazare.csv"))
jaws = na.omit(read.csv("data/Jaws.csv"))
```

In [3]:
```
summary(nazare[,2:3])
```

```
      Wave             Wind       
 Min.   : 0.000   Min.   : 0.000  
 1st Qu.: 1.600   1st Qu.: 5.000  
 Median : 2.100   Median : 8.000  
 Mean   : 2.414   Mean   : 8.666  
 3rd Qu.: 3.000   3rd Qu.:11.000  
 Max.   :11.400   Max.   :38.000  
```

In [4]:
```
# Save summary tables
print(xtable(summary(nazare[,2:3])), file = "tables/summary_nazare.tex", compress = FA
print(xtable(summary(jaws[,2:3])), file = "tables/summary_jaws.tex", compress = FALSE,
```

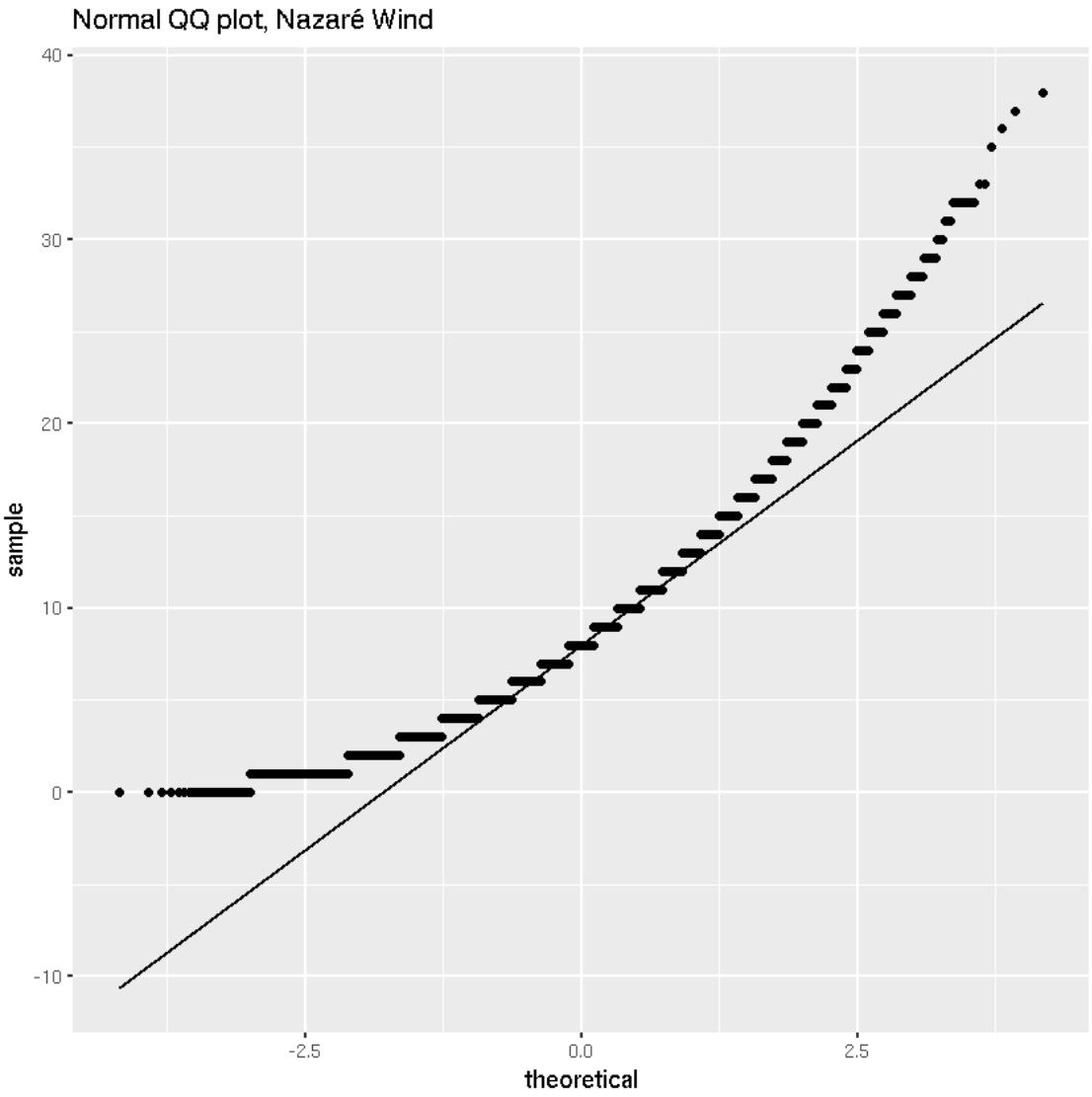
1 Plots

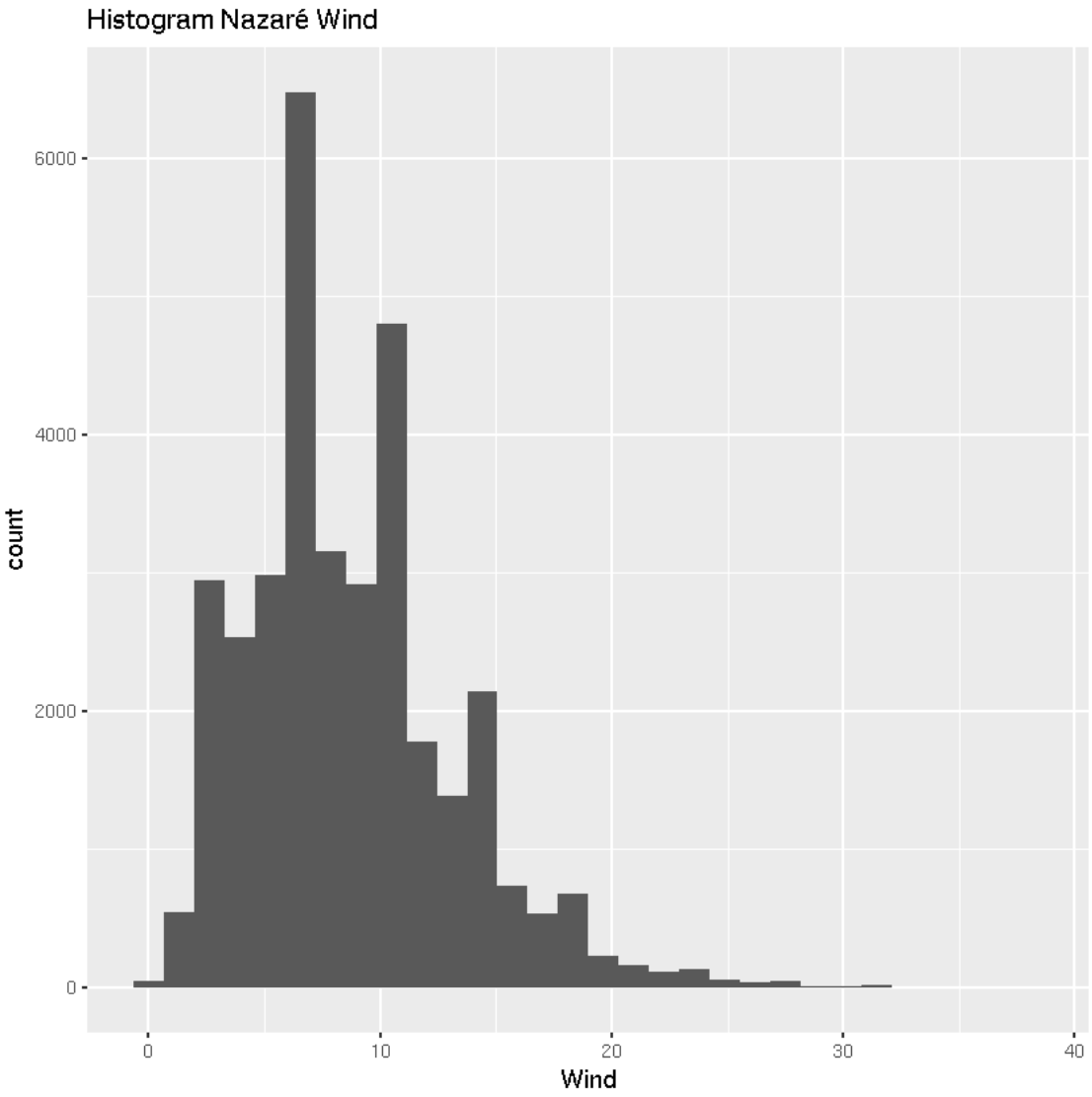
In [6]:
```
nazare.plt.gg <- ggplot(nazare)
```

```
        # WIND
        nazare.plt.qq_wind <- nazare.plt.gg +
            stat_qq(aes(sample=Wind)) + stat_qq_line(aes(sample=Wind)) +
            labs(title="Normal QQ plot, Nazaré Wind")

        nazare.plt.hist_wind <- nazare.plt.gg +
            geom_histogram(aes(x=Wind)) +
            labs(title="Histogram Nazaré Wind")

        #WAVE
        nazare.plt.qq_wave <- nazare.plt.gg +
            stat_qq(aes(sample=Wave)) + stat_qq_line(aes(sample=Wave)) +
            labs(title="Normal QQ plot, Nazaré Wave")

        nazare.plt.hist_wave <- nazare.plt.gg +
            geom_histogram(aes(x=Wave)) +
            labs(title="Histogram Nazaré Wave")

        # Scatter
        aes_ = aes(x=Wind, y=Wave)
        nazare.plt.smooth <- nazare.plt.gg +
            geom_jitter(aes_) + stat_density_2d(aes_) + geom_smooth(aes_) +
            labs(title="Nazare")

        nazare.plt.bin2d <- nazare.plt.gg +
            geom_bin2d(aes_, binwidth=c(1,0.1)) +
            scale_fill_viridis_c("", option="plasma") +
            labs(title="Nazare", x="Velocidad del viento (nudos)", y = "Altura Olas (m)")
```

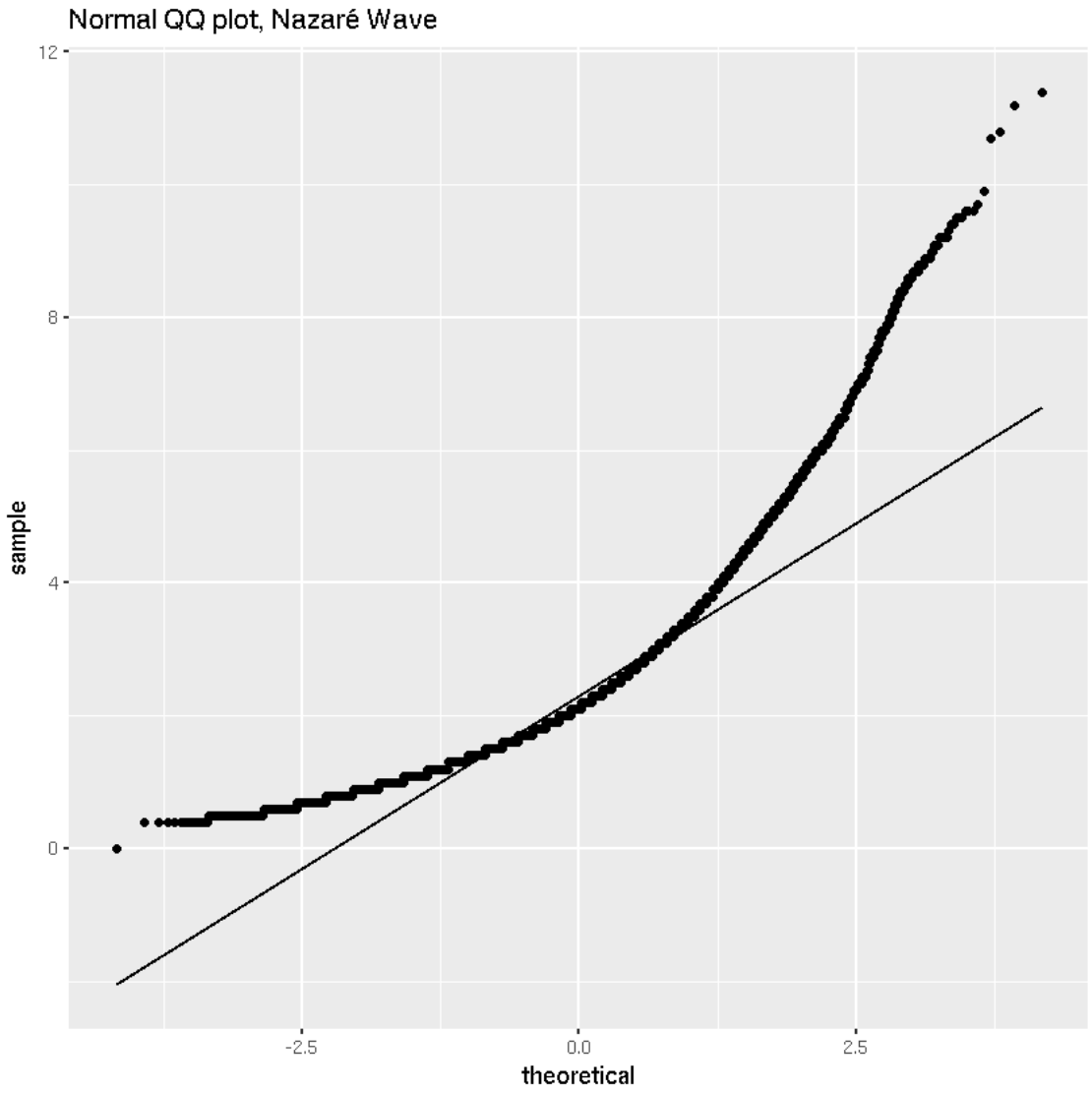
In [20]:
```
nazare.plt.qq_wind
nazare.plt.hist_wind
nazare.plt.qq_wave
nazare.plt.hist_wave
nazare.plt.smooth
nazare.plt.bin2d
```

```
`stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

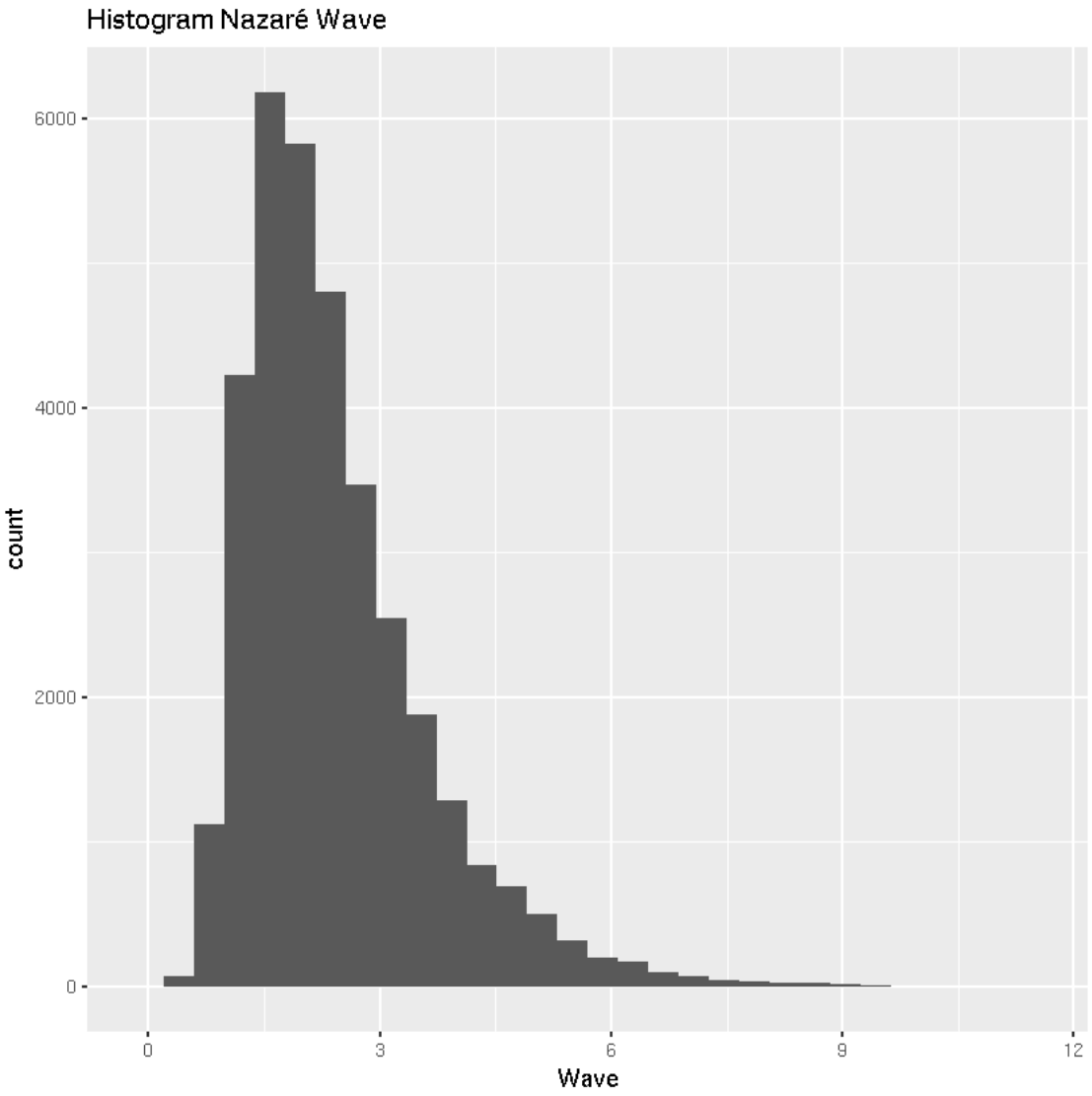

Normal QQ plot, Nazaré Wind
sample
theoretical
40
30
20
10
0
-10
-2.5
0.0
2.5

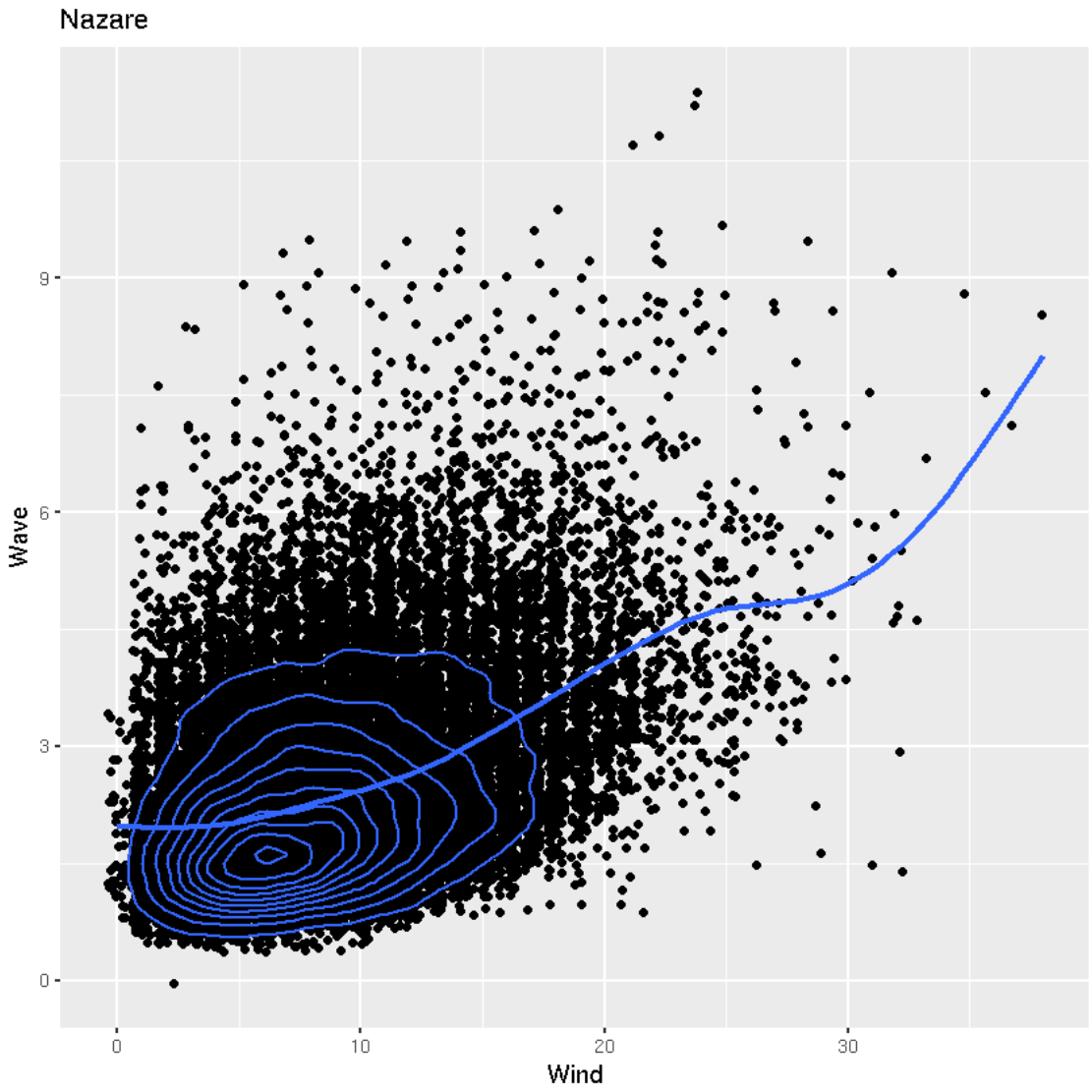


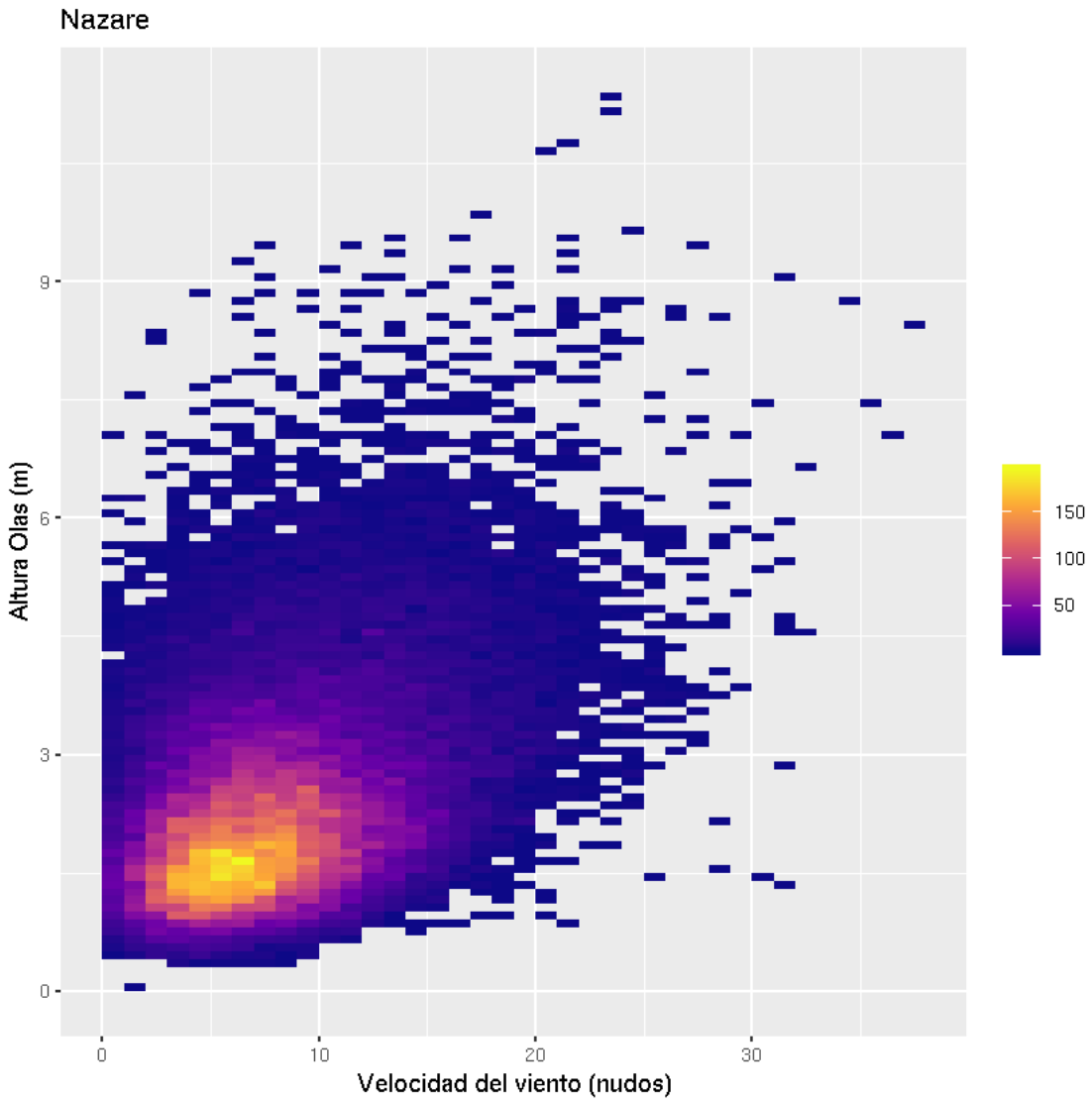

```
`stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```




```
`geom_smooth()` using method = 'gam' and formula 'y ~ s(x, bs = "cs")'
Warning message in grid.Call.graphics(C_polygon, x$x, x$y, index):
semi-transparency is not supported on this device: reported only once per page
```


Histogram Nazaré Wave
6000
4000
2000
0
count
0
3
6
9
12
Wave


Nazare
Wave
Wind
0
3
6
9
0
10
20
30



In [7]:
```
# Save plots
ggsave("nazare_qq_wind.pdf", path="figures", plot=nazare.plt.qq_wind, width=15, height=
ggsave("nazare_hist_wind.pdf", path="figures", plot=nazare.plt.hist_wind, width=15, hei

ggsave("nazare_qq_wave.pdf", path="figures", plot=nazare.plt.qq_wave, width=15, height=
ggsave("nazare_hist_wave.pdf", path="figures", plot=nazare.plt.hist_wave, width=15, hei

ggsave("nazare_smooth.pdf", path="figures", plot=nazare.plt.smooth, width=15, height=15
ggsave("nazare_bin2d.pdf", path="figures", plot=nazare.plt.bin2d, width=15, height=15,
```

```
`stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
`stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
`geom_smooth()` using method = 'gam' and formula 'y ~ s(x, bs = "cs")'
```

In [8]:
```
jaws.plt.gg <- ggplot(jaws)

# WIND
jaws.plt.qq_wind <- jaws.plt.gg +
    stat_qq(aes(sample=Wind)) + stat_qq_line(aes(sample=Wind)) +
    labs(title="Normal QQ plot, Jaws Wind")

jaws.plt.hist_wind <- jaws.plt.gg +
    geom_histogram(aes(x=Wind)) +
    labs(title="Histogram Jaws Wind")

#WAVE
jaws.plt.qq_wave <- jaws.plt.gg +
    stat_qq(aes(sample=Wave)) + stat_qq_line(aes(sample=Wave)) +
    labs(title="Normal QQ plot, Jaws Wave")

jaws.plt.hist_wave <- jaws.plt.gg +
    geom_histogram(aes(x=Wave)) +
    labs(title="Histogram Jaws Wave")

# Scatter
aes_ = aes(x=Wind, y=Wave)
jaws.plt.smooth <- jaws.plt.gg +
    geom_jitter(aes_) + stat_density_2d(aes_) + geom_smooth(aes_) +
    labs(title="Jaws")

jaws.plt.bin2d <- jaws.plt.gg +
    geom_bin2d(aes_, binwidth=c(1,0.1)) +
    scale_fill_viridis_c("", option="plasma") +
    labs(title="Jaws", x="Velocidad del viento (nudos)", y = "Altura Olas (m)")
```

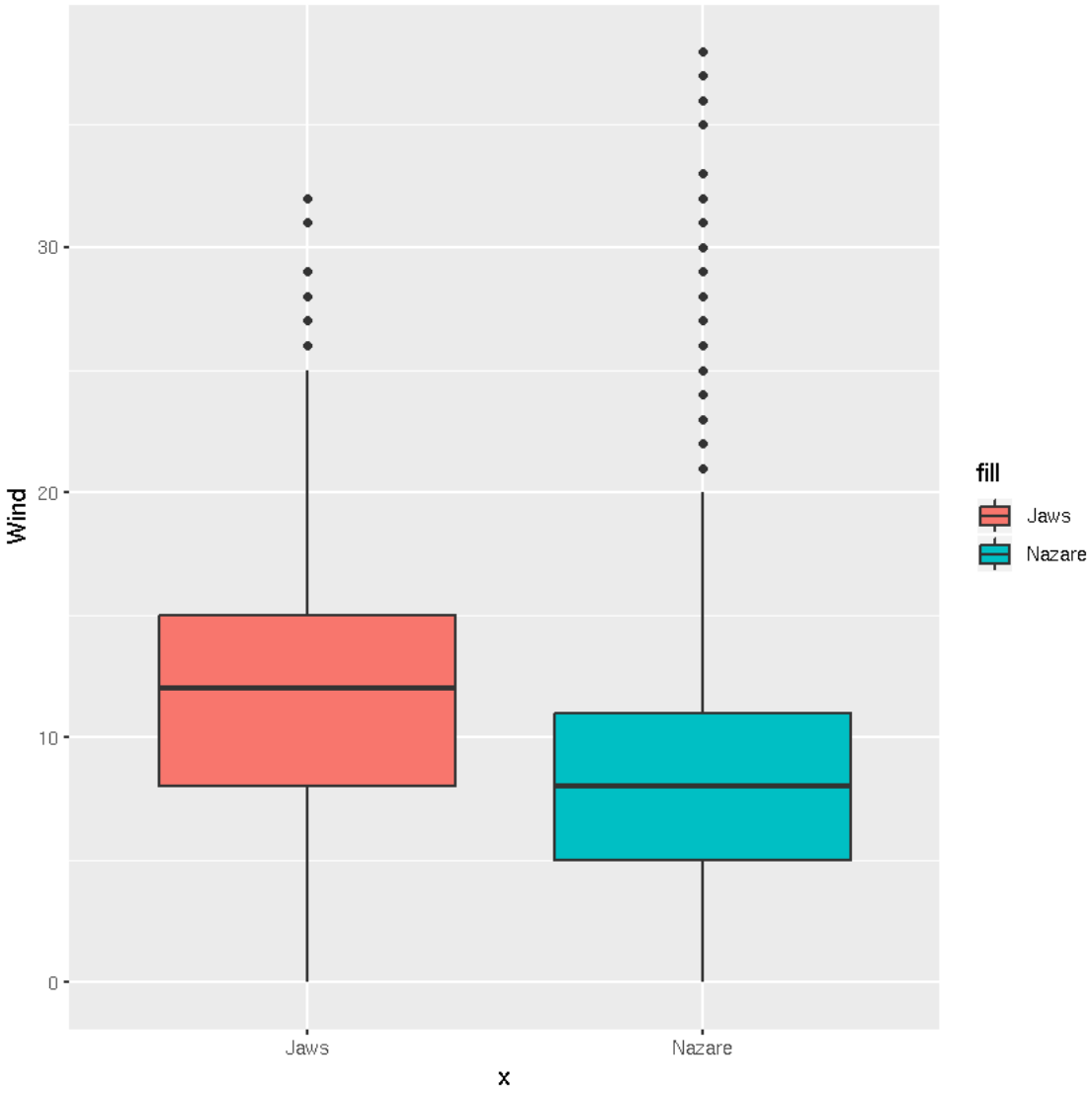
In [ ]:
```
jaws.plt.qq_wind
jaws.plt.hist_wind
jaws.plt.qq_wave
jaws.plt.hist_wave
jaws.plt.smooth
jaws.plt.bin2d
```

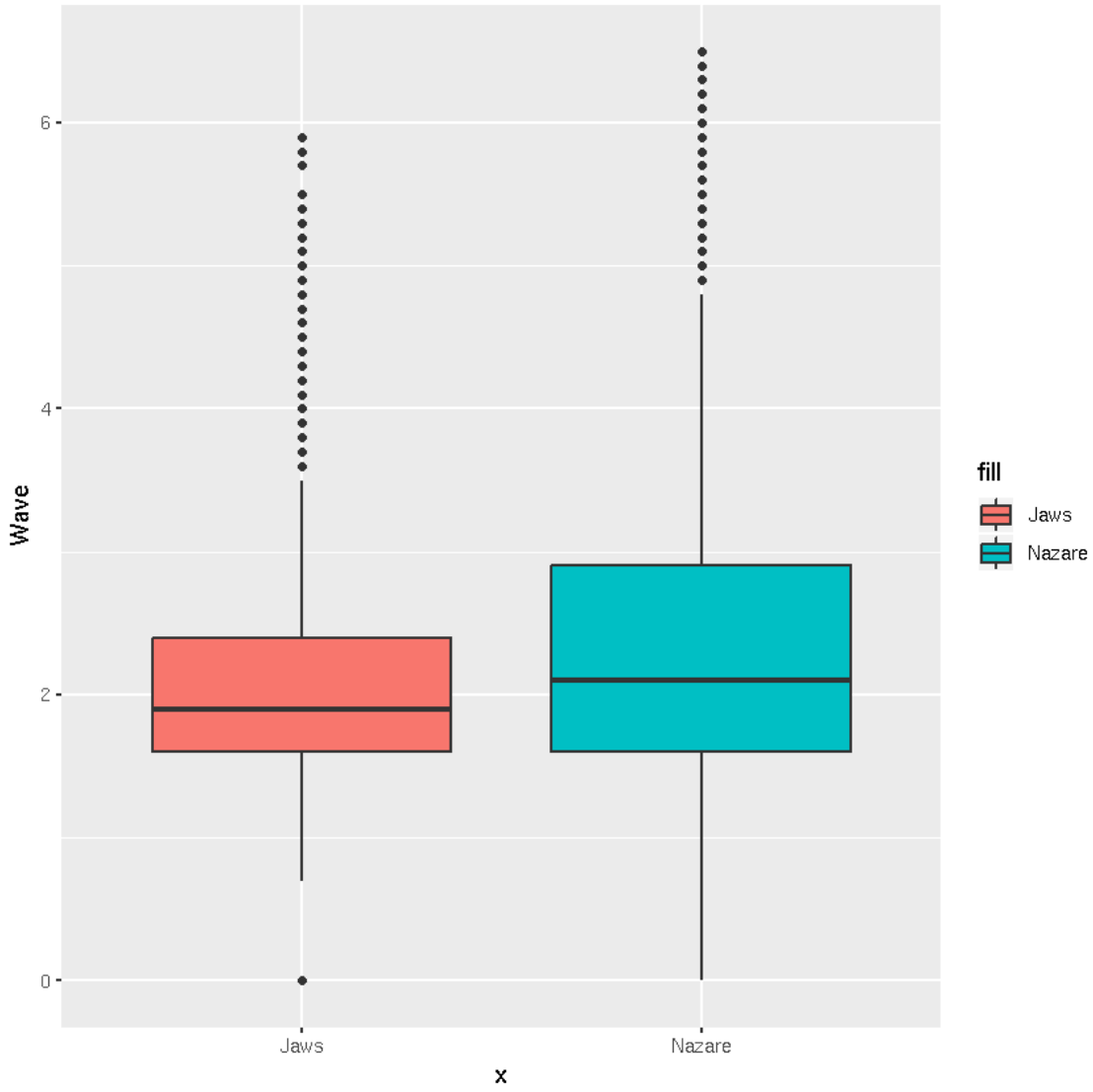
In [9]:
```
# Save plots
ggsave("jaws_qq_wind.pdf", path="figures", plot=jaws.plt.qq_wind, width=15, height=15,
ggsave("jaws_hist_wind.pdf", path="figures", plot=jaws.plt.hist_wind, width=15, height=

ggsave("jaws_qq_wave.pdf", path="figures", plot=jaws.plt.qq_wave, width=15, height=15,
ggsave("jaws_hist_wave.pdf", path="figures", plot=jaws.plt.hist_wave, width=15, height=


ggsave("jaws_smooth.pdf", path="figures", plot=jaws.plt.smooth, width=15, height=15, u
ggsave("jaws_bin2d.pdf", path="figures", plot=jaws.plt.bin2d, width=15, height=15, uni
```

```
`stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
`stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
`geom_smooth()` using method = 'gam' and formula 'y ~ s(x, bs = "cs")'
```

1.1 Box Plots

```
In [10]: boxplot_wave <- nazare.plt.gg +
             geom_boxplot(aes(y=Wave, x="Nazare", fill="Nazare")) +
             geom_boxplot(data=jaws, aes(y=Wave, x="Jaws", fill="Jaws")) + ylim(0, 6.5) +
             scale_colour_manual(name="Location",
             values=c(Nazare="red", Jaws="blue"))

         boxplot_wind <- nazare.plt.gg +
             geom_boxplot(data=nazare, aes(y=Wind, x="Nazare", fill="Nazare")) +
             geom_boxplot(data=jaws, aes(y=Wind, x="Jaws", fill="Jaws")) +
             scale_colour_manual(name="Location",
             values=c(Nazare="red", Jaws="blue"))

In [21]: boxplot_wind
         boxplot_wave

Warning message:
Removed 288 rows containing non-finite values (stat_boxplot).
```

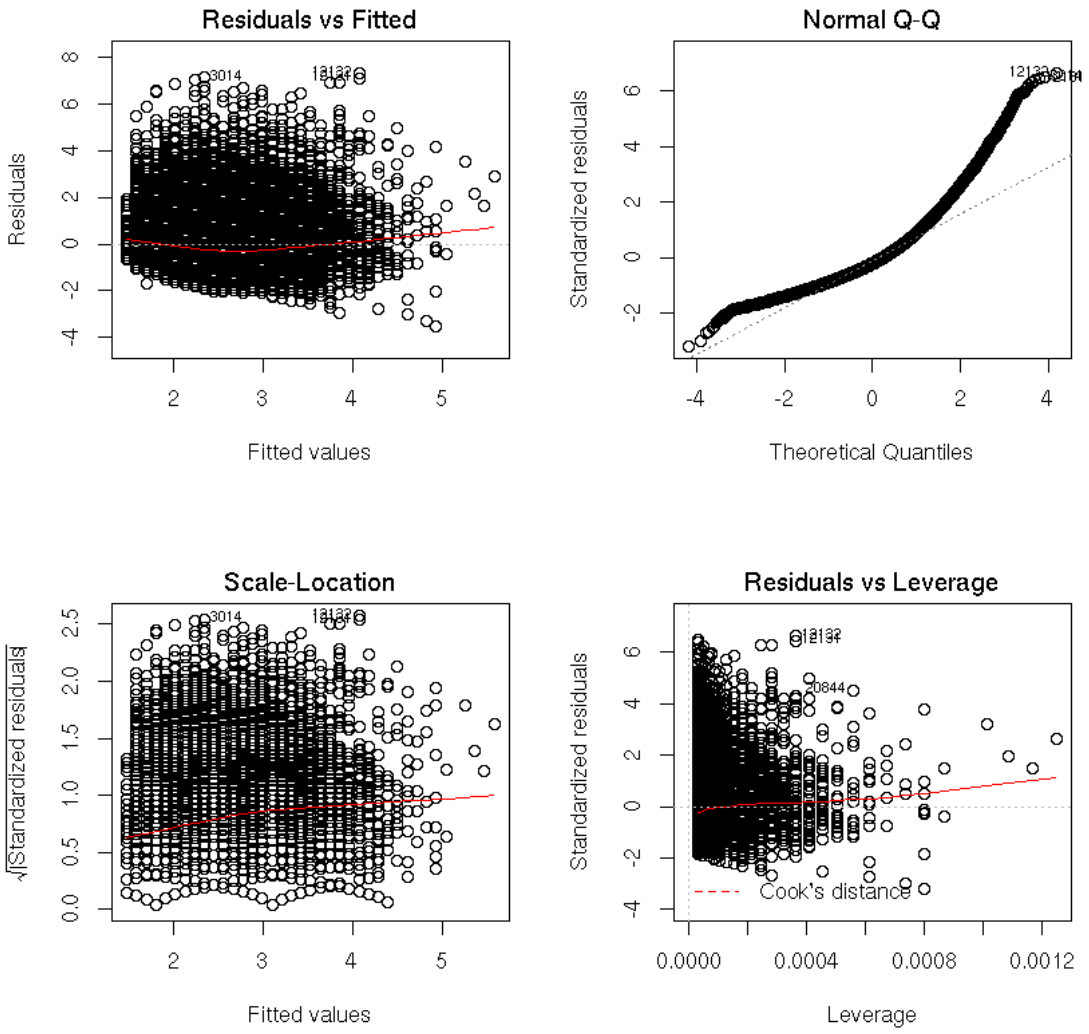

Wind
30
20
10
0
Jaws
Nazare
x
fill
Jaws
Nazare



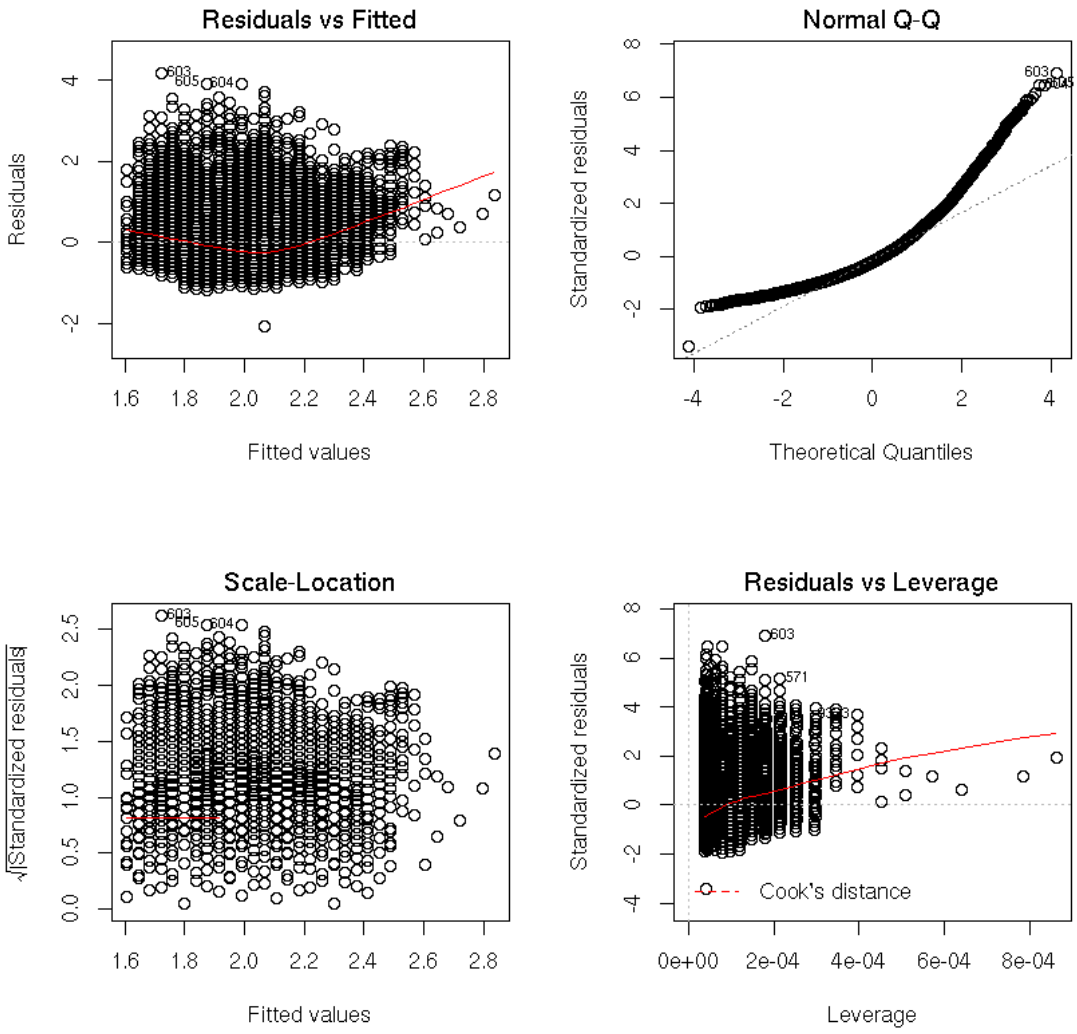

```
In [11]: # Save plots
         ggsave("boxplot_wind.pdf", path="figures", plot=boxplot_wind, width=15, height=15, uni
         ggsave("boxplot_wave.pdf", path="figures", plot=boxplot_wave, width=15, height=15, uni
```

```
Warning message:
Removed 288 rows containing non-finite values (stat_boxplot).
```

```
In [23]: # Nazare all lineal regression
         nazare.lr = lm(Wave ~ Wind, data = nazare)
         par(mfrow = c(2, 2))
         plot(nazare.lr)
```




```
In [22]: # Jaws all lineal regression
         jaws.lr = lm(Wave ~ Wind, data = jaws)
         par(mfrow = c(2, 2))
         plot(jaws.lr)
```



2 SubSample

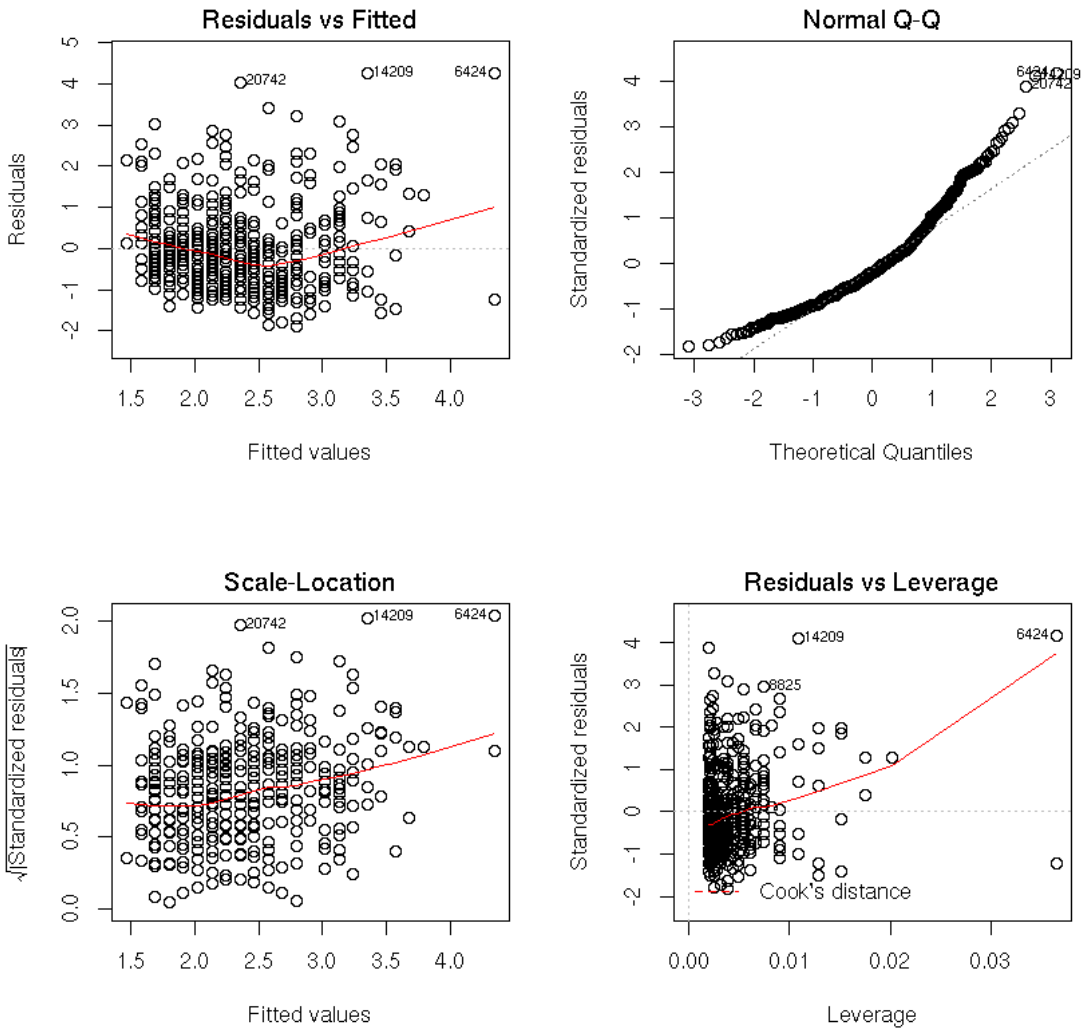
```
In [24]: # Filter by hour of the day
         time_between <- function (time, a, b) {
             h <- as.numeric(format(as.POSIXct(time), "%H"))
             (h >= a & h <= b)
         }

         set.seed(42)
         nazare_500 <- sample_n(subset(nazare, time_between(Time, 8, 17)), 500) # 500 samples
         summary(nazare_500[,2:3])
```

```
        set.seed(43)
        jaws_500 <- sample_n(subset(nazare, time_between(Time, 8, 17)), 500) # 500 samples be
        summary(jaws_500[,2:3])
```

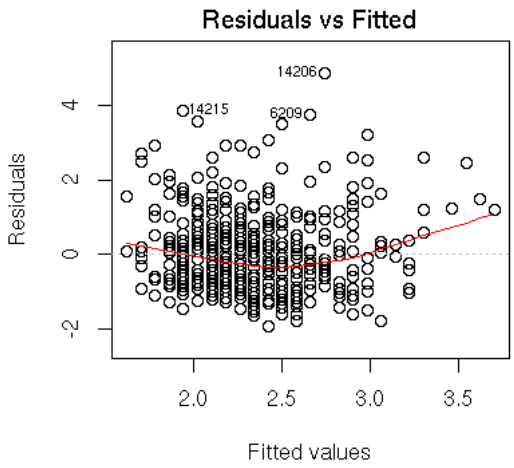
```
     Wave            Wind
 Min.   :0.400   Min.   : 1.000
 1st Qu.:1.500   1st Qu.: 5.000
 Median :2.100   Median : 8.000
 Mean   :2.325   Mean   : 8.732
 3rd Qu.:2.800   3rd Qu.:11.000
 Max.   :8.600   Max.   :27.000
```

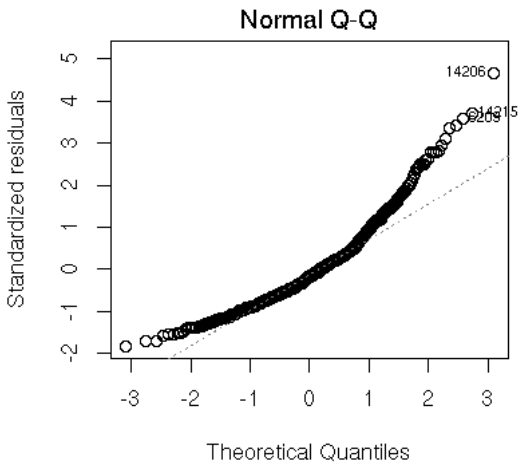
```
     Wave            Wind
 Min.   :0.500   Min.   : 0.000
 1st Qu.:1.500   1st Qu.: 6.000
 Median :2.100   Median : 8.000
 Mean   :2.331   Mean   : 8.864
 3rd Qu.:2.800   3rd Qu.:11.000
 Max.   :7.600   Max.   :26.000
```

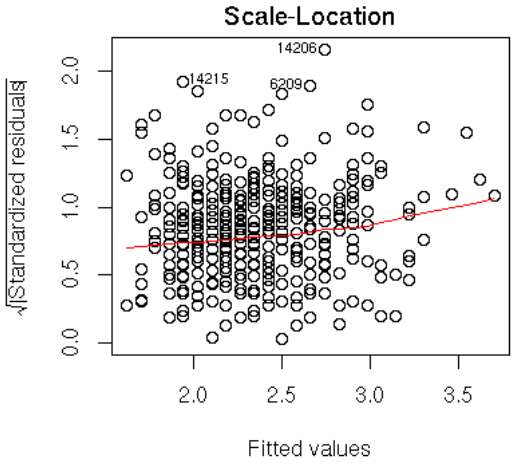
```
In [19]: nazare_500.lr = lm(Wave ~ Wind, data = nazare_500)
         par(mfrow = c(2, 2))
         plot(nazare_500.lr)
```

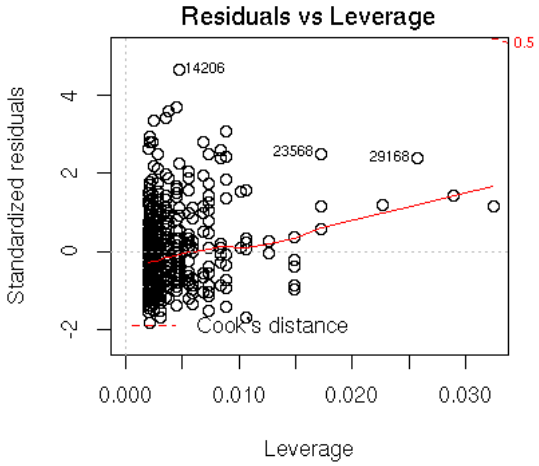



```
In [18]: jaws_500.lr = lm(Wave ~ Wind, data = jaws_500)
         par(mfrow = c(2, 2))
         plot(jaws_500.lr)
```


Residuals vs Fitted
Residuals
Fitted values
14206
14215
6209


Normal Q-Q
Standardized residuals
Theoretical Quantiles
14206
14215
6209


Scale-Location
√|Standardized residuals|
Fitted values
14206
14215
6209


Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
14206
23568
29168
0.5