

Transfers

Data

Number of transfers of mobile uvi per month from different bases from a region in Spain

Libraries

```
library(ggplot2)
library(readxl)
library(tidyr)
library(highcharter)
library(lubridate)
library(dplyr)
```

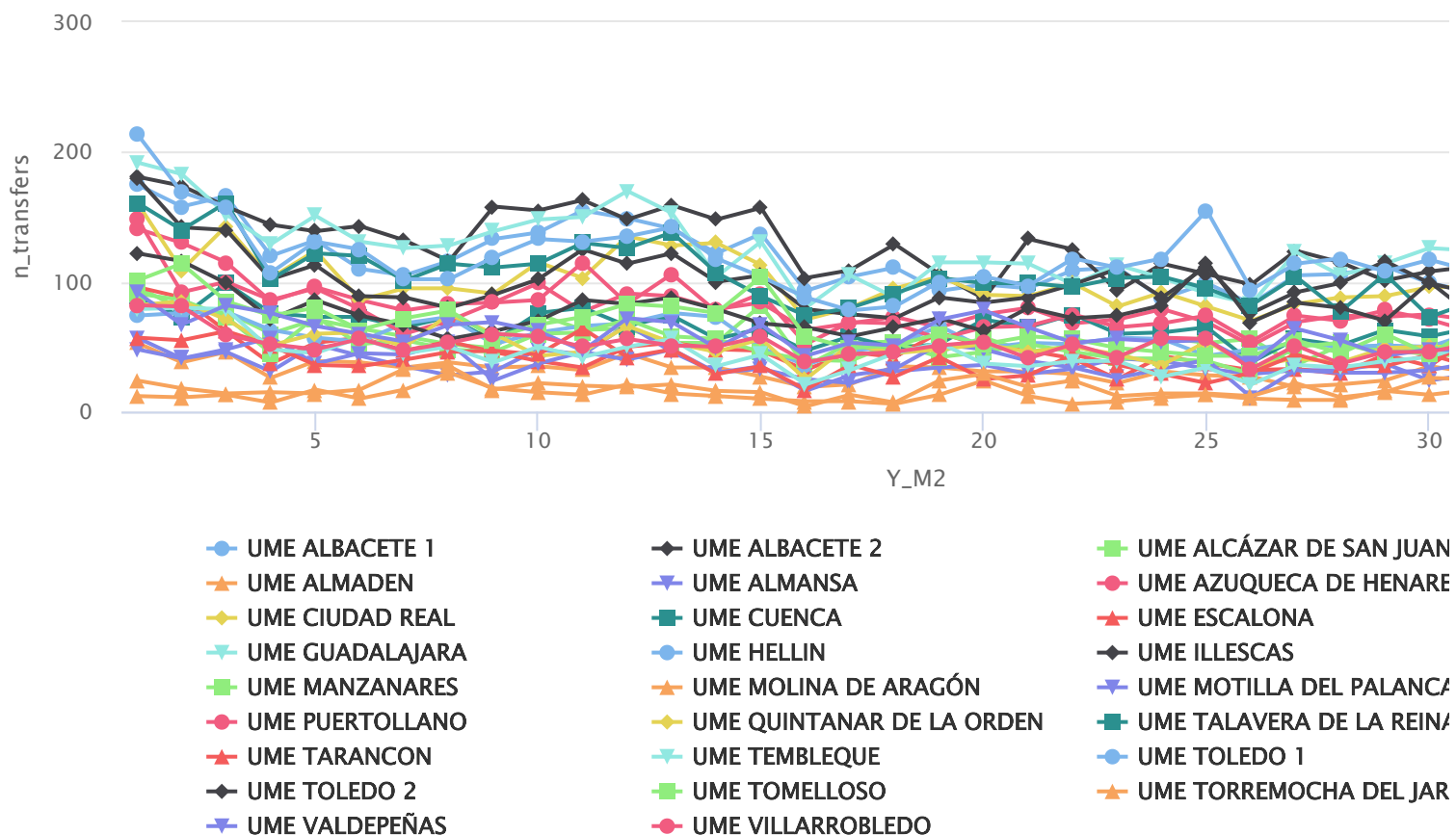
Data lecture

Time series

Time series of the total number of transfers for each month (1: January 2019,36:December 2021).

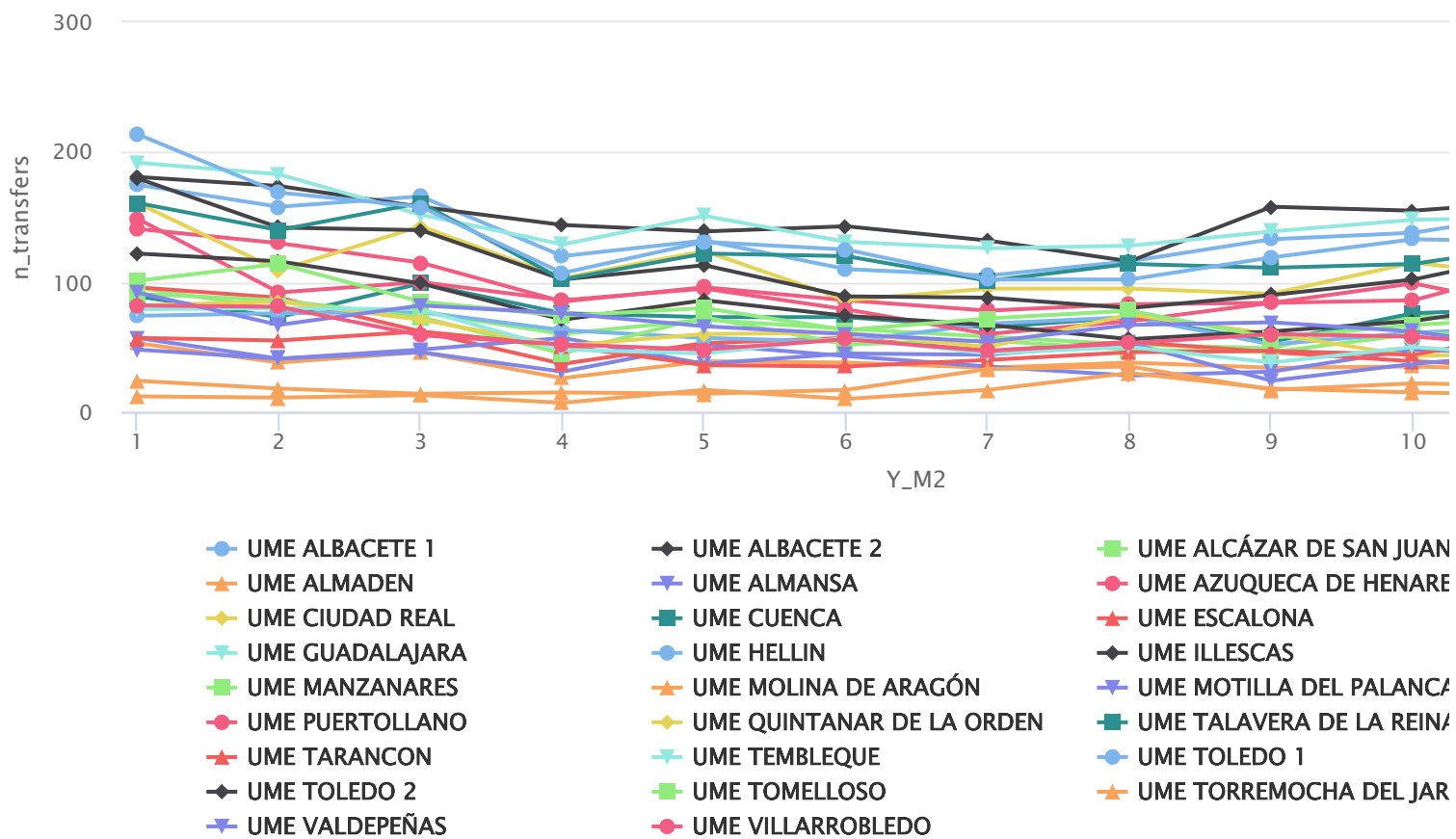
```
hchart(data_column, "line", hcaes(x = Y_M2, y = n_transfers , group = Base))%>%
  hc_title(
    text = "Number of transfers from january 2019 to december 2021"
  )
```

Number of transfers from january 2019 to december 2021



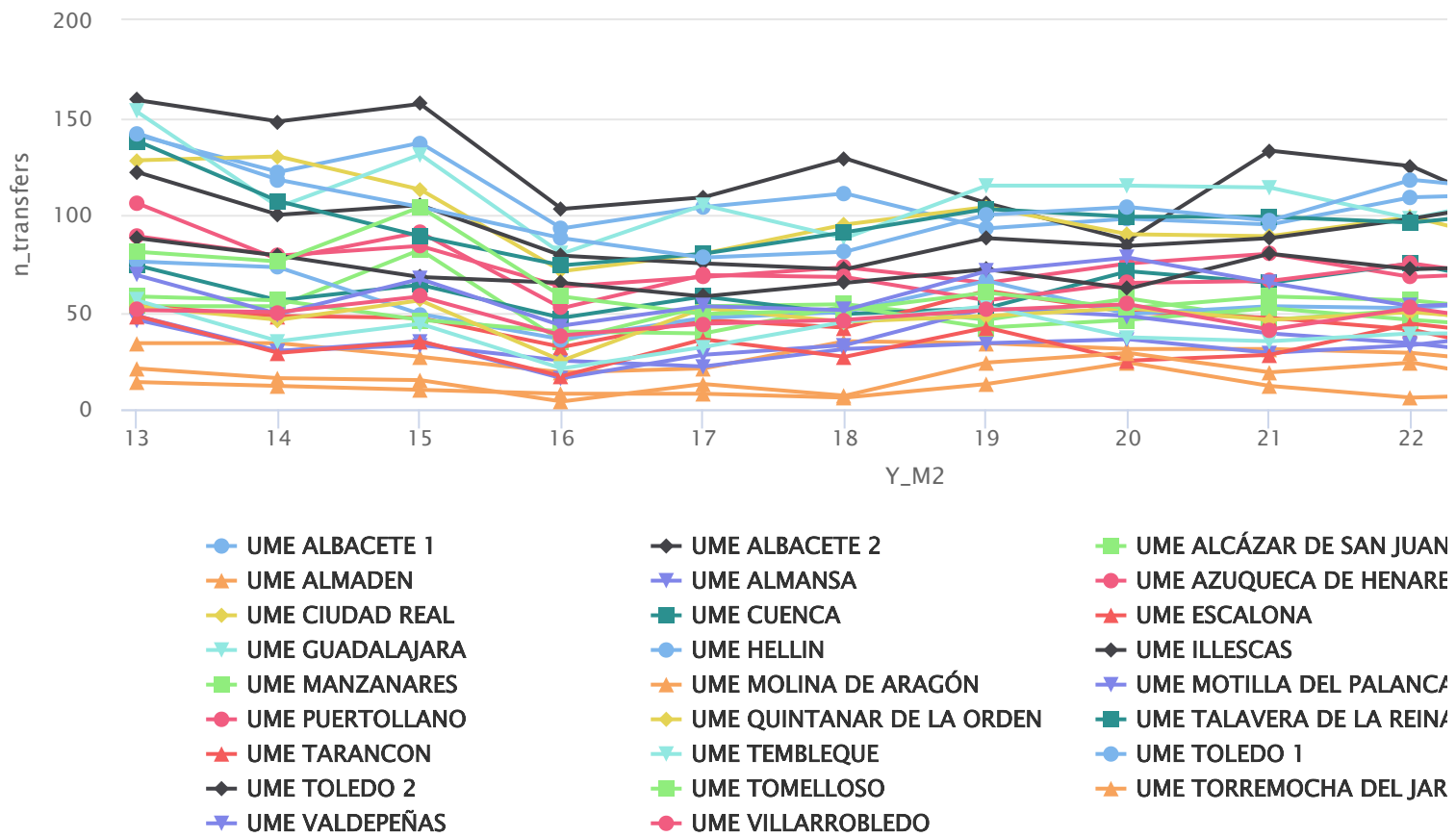
```
data_column2<-subset(data_column,data_column$Year==2019)
hchart(data_column2, "line", hcaes(x = Y_M2, y = n_transfers , group = Base))%>%
  hc_title(
    text = "Number of transfers from january 2019 to december 2019"
  )
```

Number of transfers from january 2019 to december 2019



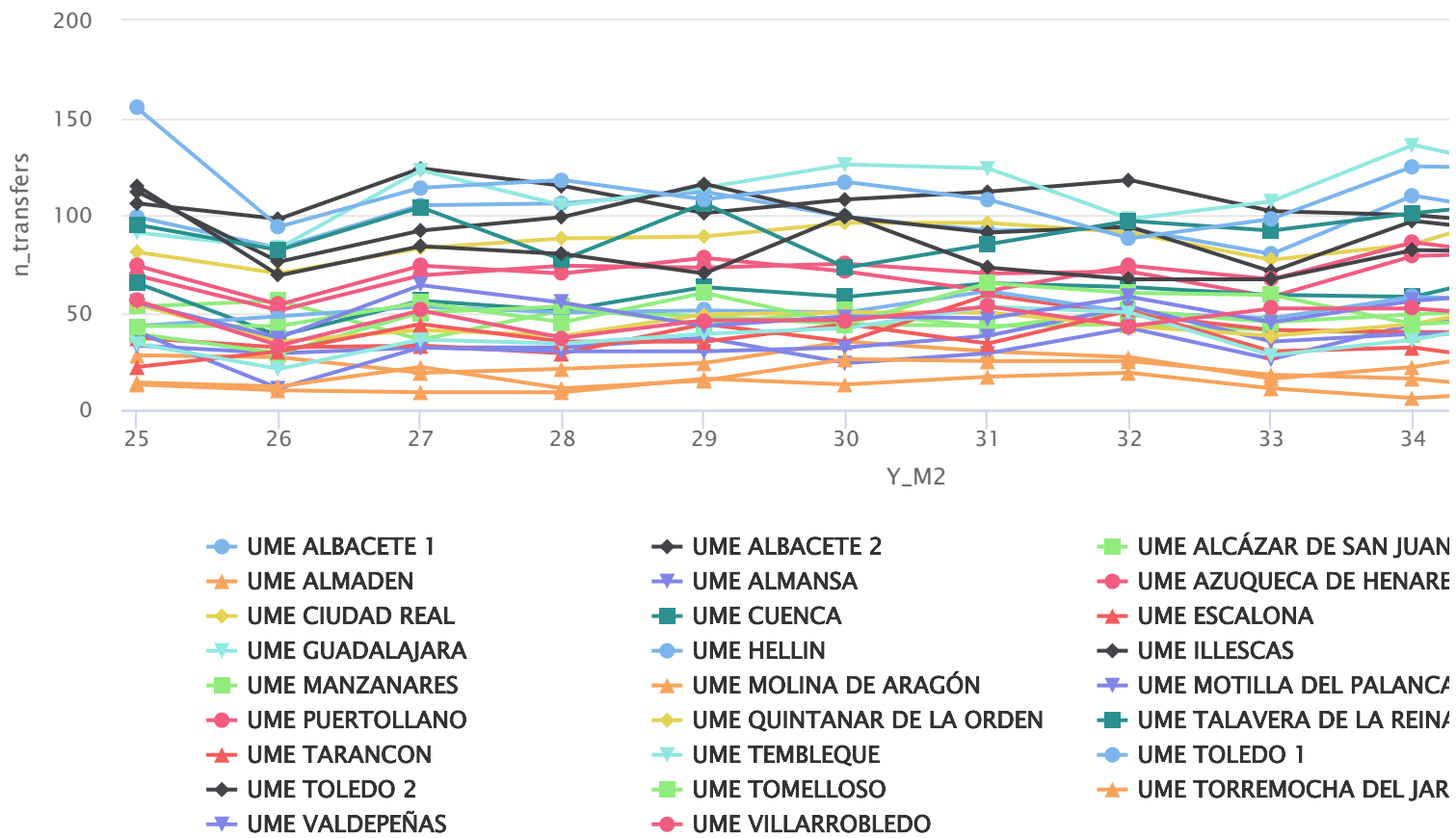
```
data_column2<-subset(data_column,data_column$Year==2020)
hchart(data_column2, "line", hcaes(x = Y_M2, y = n_transfers , group = Base))%>%
  hc_title(
    text = "Number of transfers from january 2020 to december 2020"
  )
```

Number of transfers from january 2020 to december 2020



```
data_column2<-subset(data_column,data_column$Year==2021)
hchart(data_column2, "line", hcaes(x = Y_M2, y = n_transfers , group = Base))%>%
  hc_title(
    text = "Number of transfers from january 2021 to december 2021"
  )
```

Number of transfers from january 2021 to december 2021



Descriptive of each base

In this section we obtain basic information for each base which is the minimum, first quartile (representing 25% of the data ordered from smallest to largest), median (value in the middle of the series ordered from smallest to largest), mean, third quartile (representing 75% of the data ordered from smallest to largest) and maximum number.

Some of these values will be represented later in boxplots.

```
tapply(data_column$n_transfers,data_column$Base,summary)
```

```

## $`UME ALBACETE 1`
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      80.0   98.0   110.0   115.2   132.2   175.0
##
## $`UME ALBACETE 2`
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      87.0   106.0   121.0   126.9   148.0   181.0
##
## $`UME ALCÁZAR DE SAN JUAN`
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      35.00   45.50   53.00   55.03   60.75   96.00
##
## $`UME ALMADEN`
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      16.00   25.50   31.00   30.72   35.00   53.00
##
## $`UME ALMANSA`
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      22.00   30.75   34.50   37.17   43.25   67.00
##
## $`UME AZUQUECA DE HENARES`
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      51.00   70.75   78.50   81.11   85.25  141.00
##
## $`UME CIUDAD REAL`
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      70.00   87.50   95.00   99.92  107.50  161.00
##
## $`UME CUENCA`
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      38.00   58.00   64.50   64.94   73.00   99.00
##
## $`UME ESCALONA`
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      25.00   38.50   46.00   47.06   53.00   96.00
##
## $`UME GUADALAJARA`
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      80.0   105.0   123.5   124.2   136.8   192.0
##
## $`UME HELLIN`
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      36.00   50.00   56.00   57.78   66.00   77.00
##
## $`UME ILLESCAS`
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      71.0    88.0    97.0   100.2   110.5   180.0
##
## $`UME MANZANARES`
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      29.00   44.75   49.50   51.97   55.25   91.00
##
## $`UME MOLINA DE ARAGÓN`
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      6.00    9.75   12.00   12.75   15.25   30.00
##
## $`UME MOTILLA DEL PALANCAR`
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      11.00   32.00   38.50   37.78   45.25   57.00

```

```

##
## $`UME PUERTOLLANO`
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   52.00  67.75   74.50   78.36  86.00  149.00
##
## $`UME QUINTANAR DE LA ORDEN`
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   25.00  44.00   50.00   51.31  56.50   85.00
##
## $`UME TALAVERA DE LA REINA`
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   73.00  94.25  103.00  106.19  115.00  161.00
##
## $`UME TARANCON`
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   17.00  30.00   36.00   38.75  44.50   64.00
##
## $`UME TEMBLEQUE`
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   21.00  35.75  42.00   44.14  50.00   80.00
##
## $`UME TOLEDO 1`
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   78.0   102.0   117.5   118.6  131.0   214.0
##
## $`UME TOLEDO 2`
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   56.00  67.75  74.00   78.86  84.50  122.00
##
## $`UME TOMELLOSO`
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   43.00  50.50  59.50   64.06  74.50  114.00
##
## $`UME TORREMOCHA DEL JARAMA`
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    4.00  14.00  17.00   18.17  22.50  35.00
##
## $`UME VALDEPEÑAS`
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   37.00  52.50  59.00   59.92  67.00   92.00
##
## $`UME VILLARROBLEDO`
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   33.00  46.00  51.00   51.42  56.00   82.00

```

The box of a boxplot starts at the first quartile (25%) and ends at the third quartile (75%). Therefore, the box represents 50% of the central data, with a line inside representing the median. On each side of the box, a segment is drawn with the furthest data without counting the outliers of the box plot, which in this case are outside the range of the lines.

```

hcbboxplot(
  outliers = FALSE,
  x = data_column$n_transfers,
  var = data_column$Base,
  name = "Length"
) %>%
  hc_title(text = "Number of transfers for each base") %>%
  hc_yAxis(title = list(text = "Número de traslados")) %>%
  hc_chart(type = "column") %>%
  hc_add_series(
    data = data_column,
    type = "scatter",
    hcaes(x = "Base", y = "data_column$n_transfers", group = "Base")
  ) %>%
  hc_plotOptions(scatter = list(
    color = "red",
    marker = list(
      radius = 1,
      symbol = "circle",
      lineWidth = .5
    )
  )) %>%
  hc_plotOptions(scatter = list(jitter = list(x = .1, y = 0)))

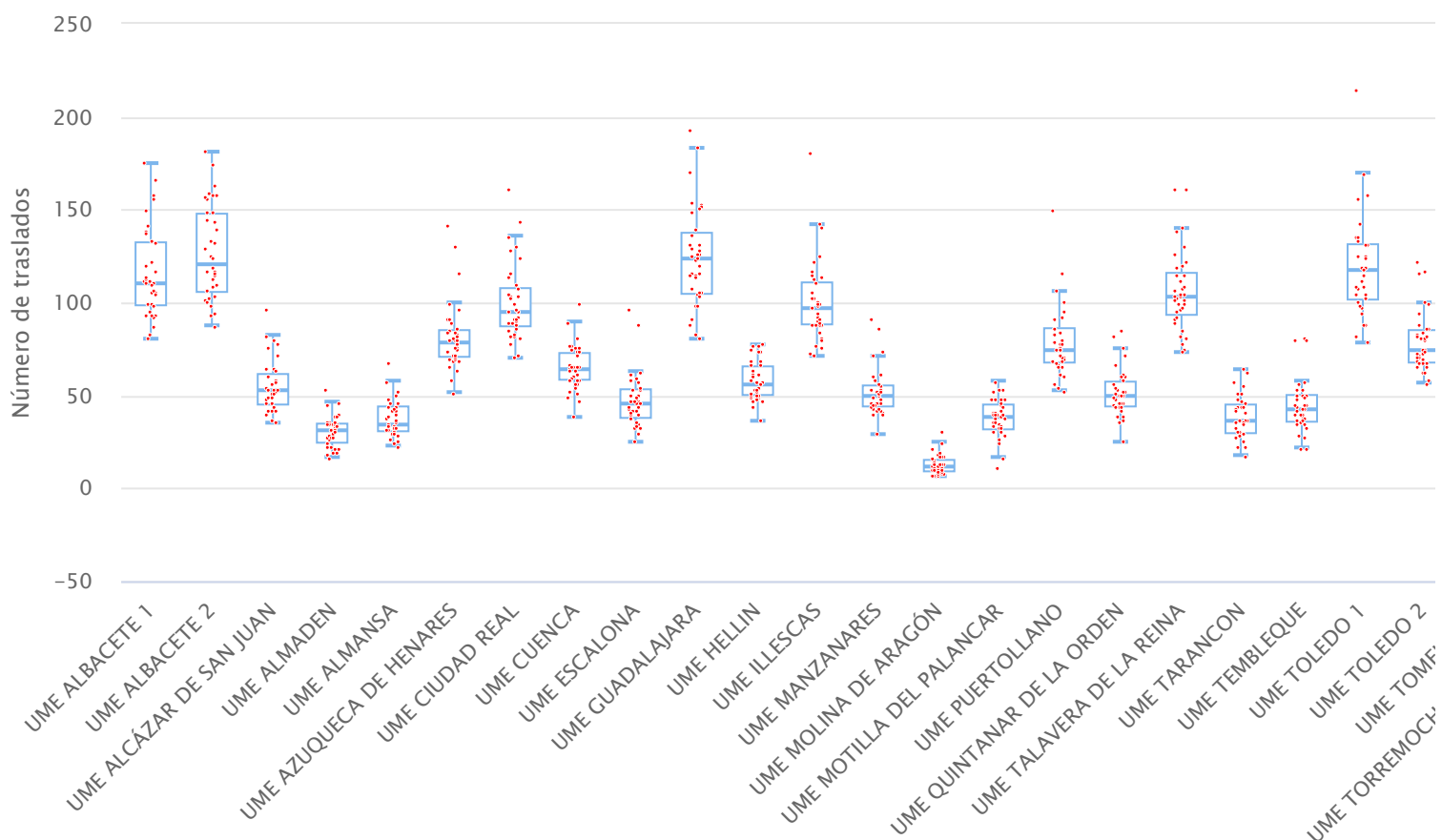
```

```

## Warning: 'hcbboxplot' is deprecated.
## Use 'data_to_boxplot' instead.
## See help("Deprecated")

```

Number of transfers for each base



```

data_column2<-subset(data_column,data_column$Year==2019)
hcboxplot(
  outliers = FALSE,
  x = data_column2$n_transfers,
  var = data_column2$Base,
  name = "Length"
) %>%
  hc_title(text = "Number of transfers for each base in 2019") %>%
  hc_yAxis(title = list(text = "Número de traslados")) %>%
  hc_chart(type = "column")%>%
  hc_add_series(
    data = data_column2,
    type = "scatter",
    hcaes(x = "Base", y = "data_column2$n_transfers", group = "Base")
  ) %>%
  hc_plotOptions(scatter = list(
    color = "red",
    marker = list(
      radius = 1,
      symbol = "circle",
      lineWidth = .5
    )
  )) %>%
  hc_plotOptions(scatter = list(jitter = list(x = .1, y = 0)))

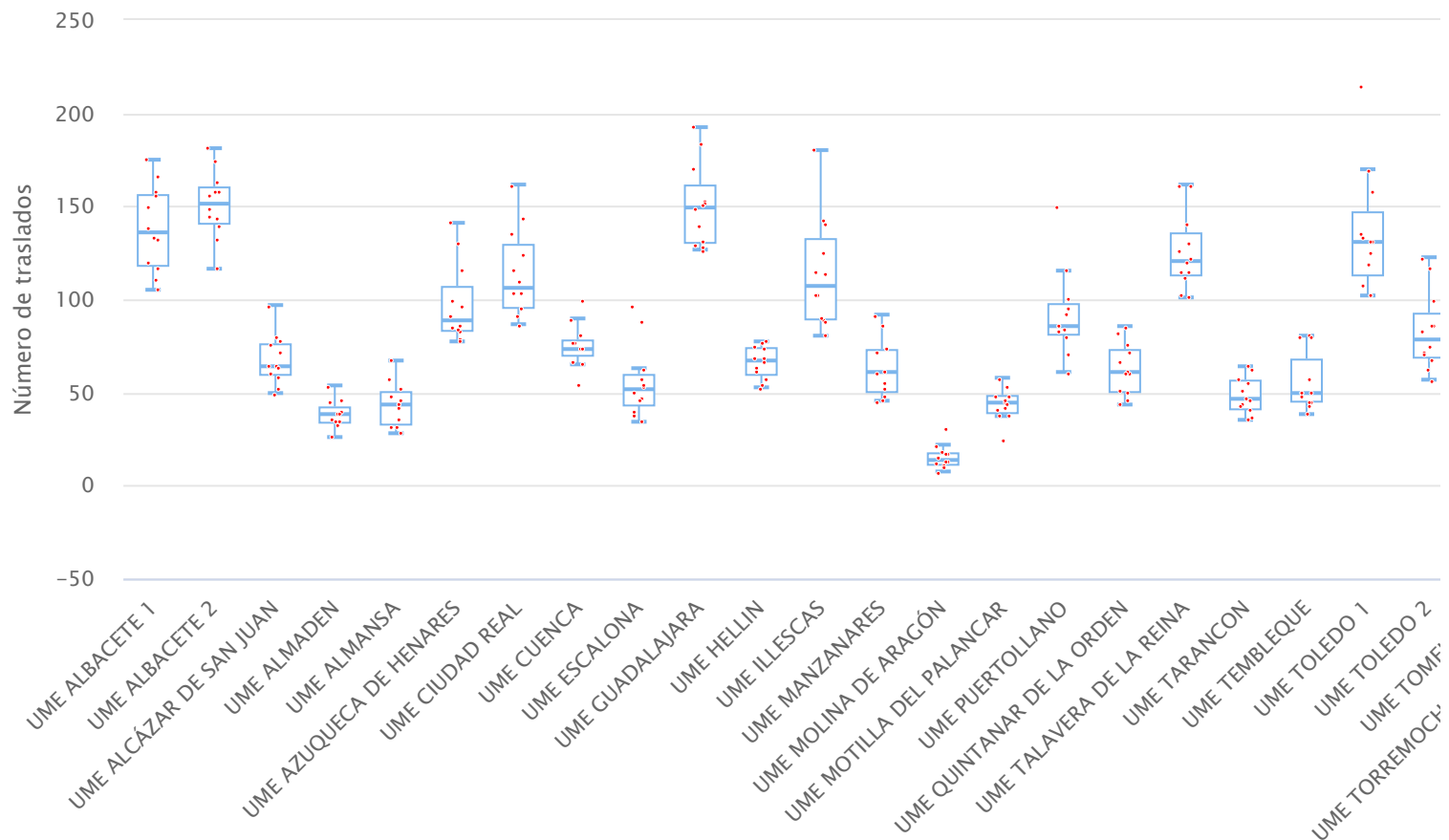
```

```

## Warning: 'hcboxplot' is deprecated.
## Use 'data_to_boxplot' instead.
## See help("Deprecated")

```

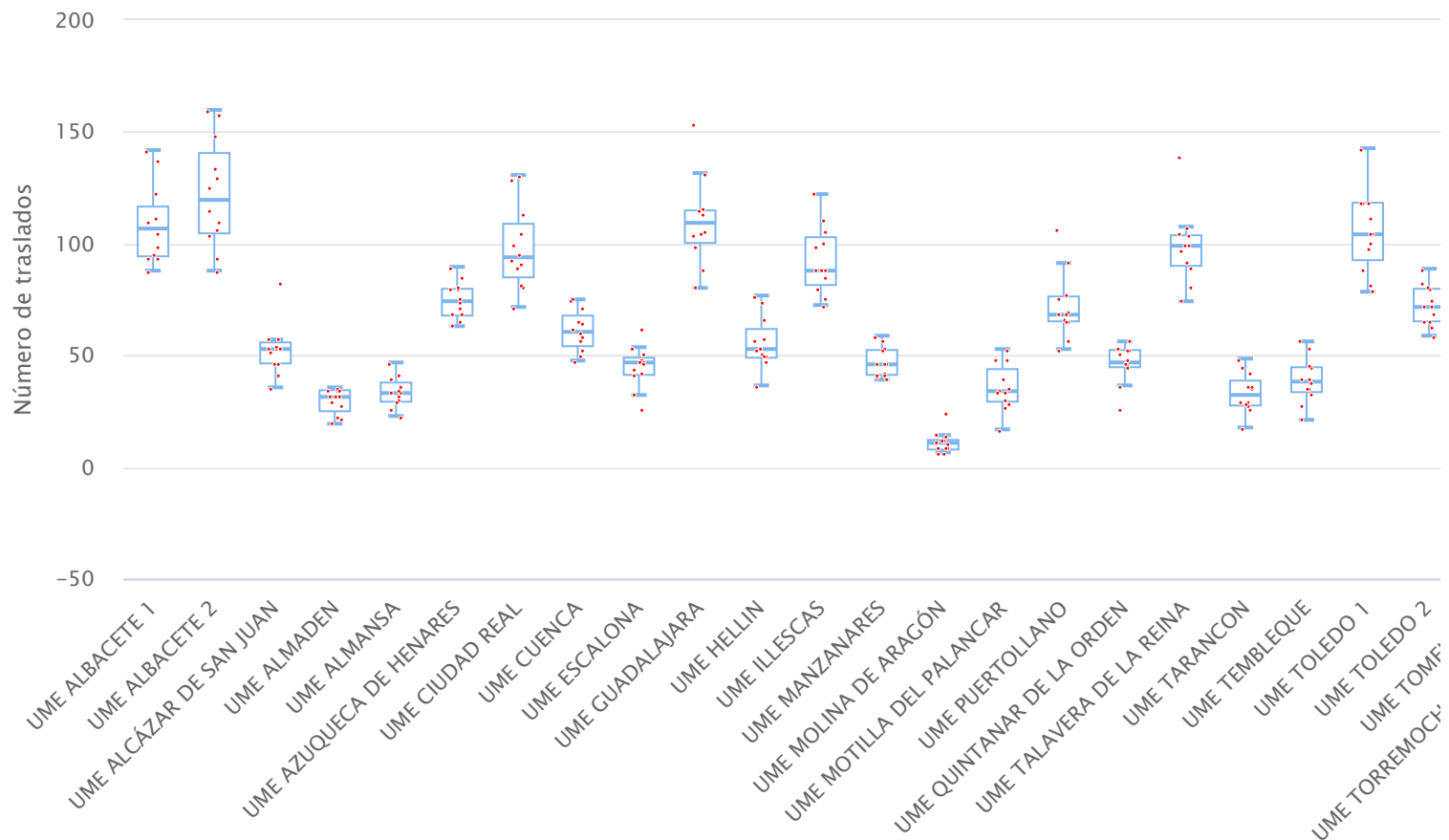
Number of transfers for each base in 2019




```
data_column2<-subset(data_column,data_column$Year==2020)
hcboxplot(
  outliers = FALSE,
  x = data_column2$n_transfers,
  var = data_column2$Base,
  name = "Length"
) %>%
hc_title(text = "Number of transfers for each base in 2020") %>%
hc_yAxis(title = list(text = "Número de traslados")) %>%
hc_chart(type = "column")%>%
hc_add_series(
  data = data_column2,
  type = "scatter",
  hcaes(x = "Base", y = "data_column2$n_transfers", group = "Base")
) %>%
hc_plotOptions(scatter = list(
  color = "red",
  marker = list(
    radius = 1,
    symbol = "circle",
    lineWidth = .5
  )
)) %>%
hc_plotOptions(scatter = list(jitter = list(x = .1, y = 0)))
```

```
## Warning: 'hcboxplot' is deprecated.
## Use 'data_to_boxplot' instead.
## See help("Deprecated")
```

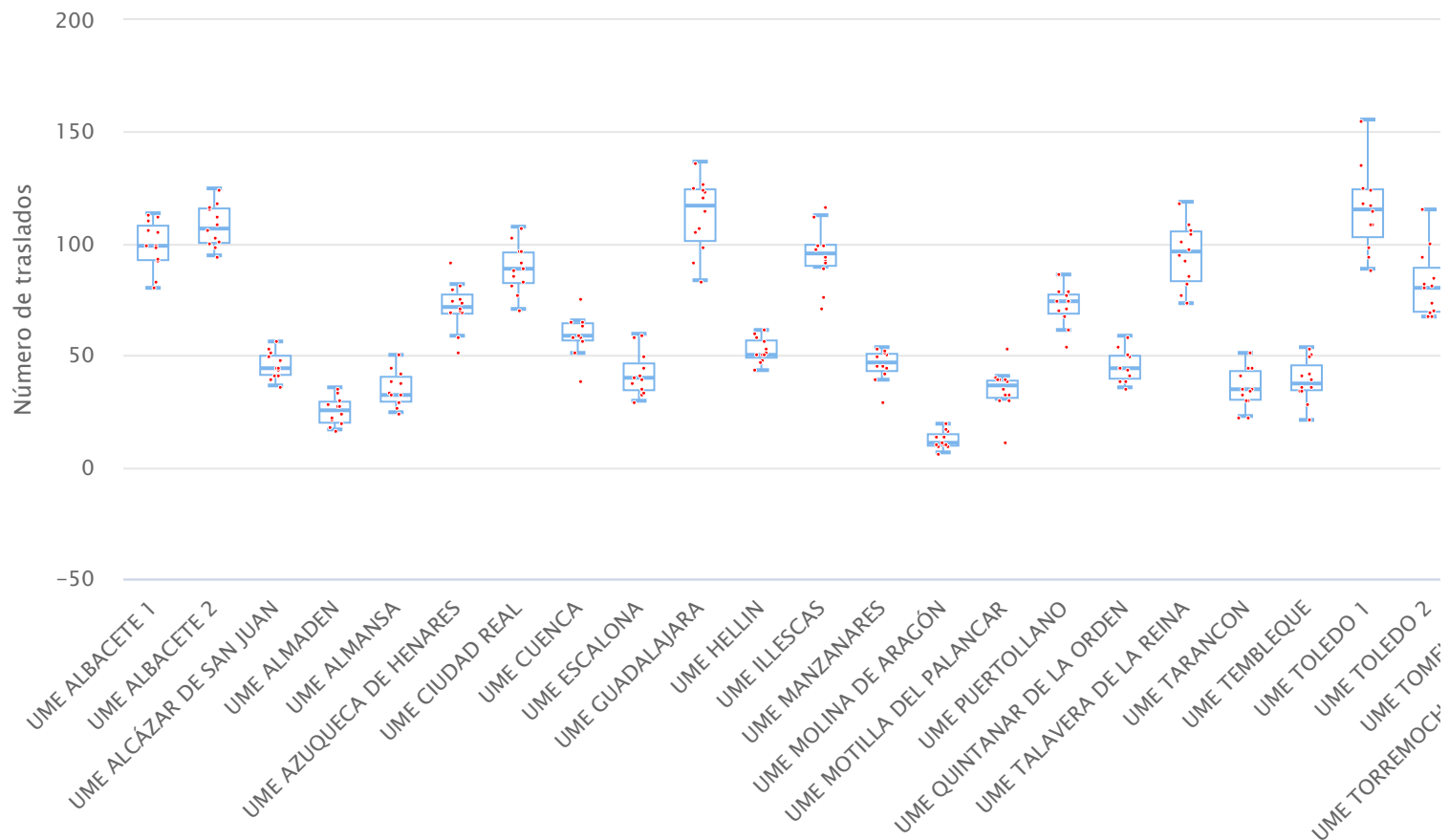
Number of transfers for each base in 2020



```
data_column2<-subset(data_column,data_column$Year==2021)
hcboxplot(
  outliers = FALSE,
  x = data_column2$n_transfers,
  var = data_column2$Base,
  name = "Length"
) %>%
  hc_title(text = "Number of transfers for each base in 2021") %>%
  hc_yAxis(title = list(text = "Número de traslados")) %>%
  hc_chart(type = "column")%>%
  hc_add_series(
    data = data_column2,
    type = "scatter",
    hcaes(x = "Base", y = "data_column2$n_transfers", group = "Base")
  ) %>%
  hc_plotOptions(scatter = list(
    color = "red",
    marker = list(
      radius = 1,
      symbol = "circle",
      lineWidth = .5
    )
  )) %>%
  hc_plotOptions(scatter = list(jitter = list(x = .1, y = 0)))
```

```
## Warning: 'hcboxplot' is deprecated.
## Use 'data_to_boxplot' instead.
## See help("Deprecated")
```

Number of transfers for each base in 2021



Total number of transfers per year

The total number of transfers was obtained of each base per Year in two types of graphs, interactive as we have been able to test before and then more detailed but without interaction.

```
a1 = list()
a2 = list()
for (i in c(2019:2021)){
  print(paste("Year ",i))
  data_column2<-subset(data_column,data_column$Year==i)
  resultado<-tapply(data_column2$n_transfers,data_column2$Base,sum)
  print(resultado)
  df<-data.frame(Base=data_column2$Base,resultado)
  hc<-hchart(df,'column', hcaes(x = Base, y = resultado,group=Base))%>%hc_title(text = paste("Suma de t
raslados del Year de forma interactiva: ",i))

  a1[[i+1]]<-hc
  hc<-hchart(df,'column', hcaes(x = Base, y = resultado))%>%hc_title(text = paste("Suma de traslados de
l Year: ",i))
  a2[[i+1]]<-hc

};htmltools::tagList(a1);htmltools::tagList(a2)
```

```
## [1] "Year  2019"
##          UME ALBACETE 1          UME ALBACETE 2    UME ALCÁZAR DE SAN JUAN
##                1657                1811                808
##          UME ALMADEN          UME ALMANSA    UME AZUQUECA DE HENARES
##                458                523                1165
##          UME CIUDAD REAL          UME CUENCA          UME ESCALONA
##                1360                897                663
##          UME GUADALAJARA          UME HELLIN          UME ILLESCAS
##                1799                789                1365
##          UME MANZANARES    UME MOLINA DE ARAGÓN    UME MOTILLA DEL PALANCAR
##                761                184                520
##          UME PUERTOLLANO    UME QUINTANAR DE LA ORDEN    UME TALAVERA DE LA REINA
##                1099                750                1502
##          UME TARANCON          UME TEMBLEQUE          UME TOLEDO 1
##                579                663                1626
##          UME TOLEDO 2          UME TOMELLOSO    UME TORREMOCHA DEL JARAMA
##                992                947                248
##          UME VALDEPEÑAS          UME VILLARROBLEDO
##                814                702
```

```
## Warning in data.frame(Base = data_column2$Base, resultado): row names were found
## from a short variable and have been discarded
```

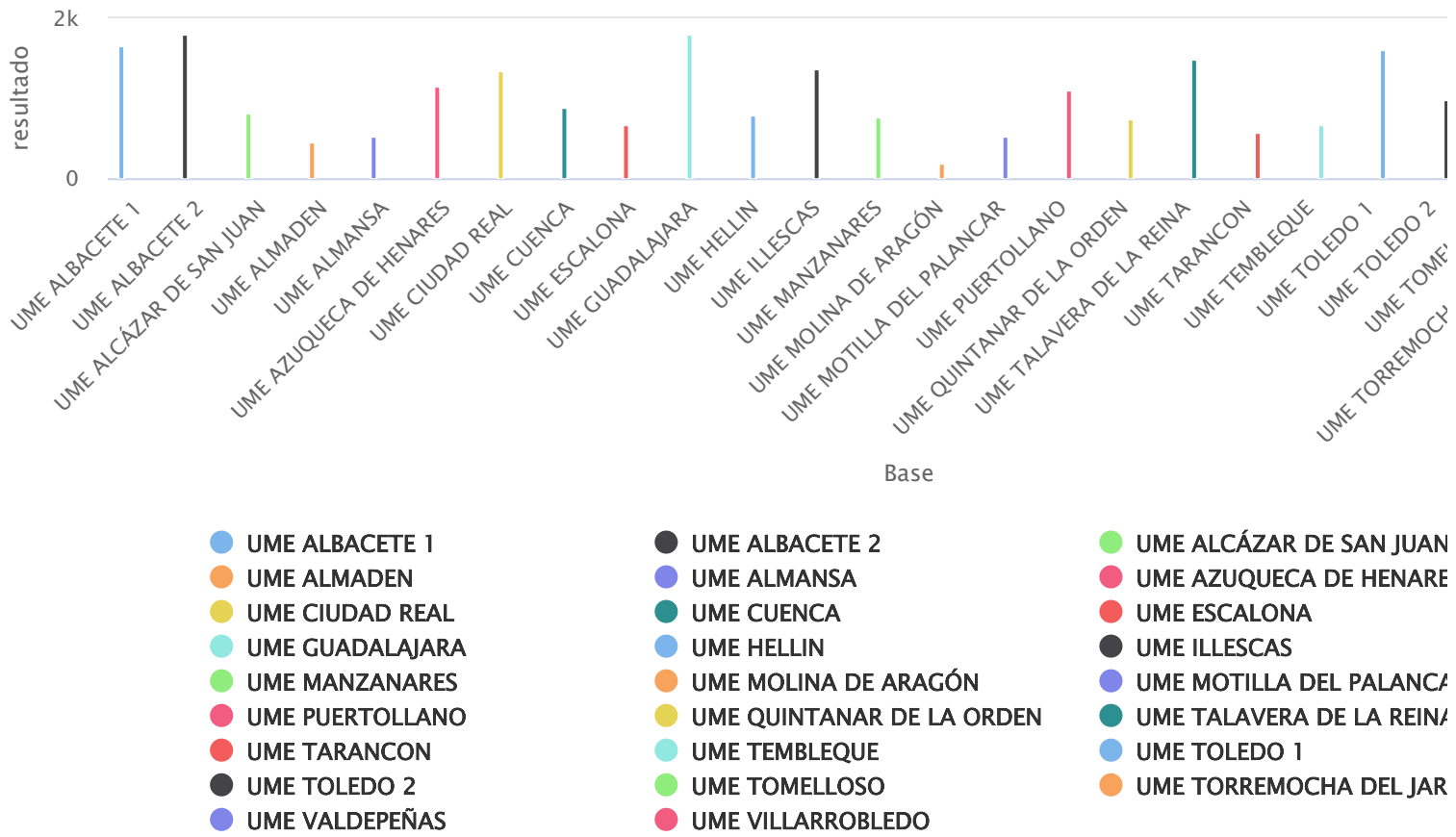
```
## [1] "Year 2020"
##           UME ALBACETE 1           UME ALBACETE 2   UME ALCÁZAR DE SAN JUAN
##           1301           1463           628
##           UME ALMADEN           UME ALMANSA   UME AZUQUECA DE HENARES
##           348           399           894
##           UME CIUDAD REAL           UME CUENCA           UME ESCALONA
##           1172           732           535
##           UME GUADALAJARA           UME HELLIN           UME ILLESCAS
##           1319           664           1109
##           UME MANZANARES           UME MOLINA DE ARAGÓN   UME MOTILLA DEL PALANCAR
##           560           132           422
##           UME PUERTOLLANO UME QUINTANAR DE LA ORDEN   UME TALAVERA DE LA REINA
##           858           553           1183
##           UME TARANCON           UME TEMBLEQUE           UME TOLEDO 1
##           396           463           1259
##           UME TOLEDO 2           UME TOMELLOSO UME TORREMOCHA DEL JARAMA
##           865           740           198
##           UME VALDEPEÑAS           UME VILLARROBLEDO
##           709           584
```

```
## Warning in data.frame(Base = data_column2$Base, resultado): row names were found
## from a short variable and have been discarded
```

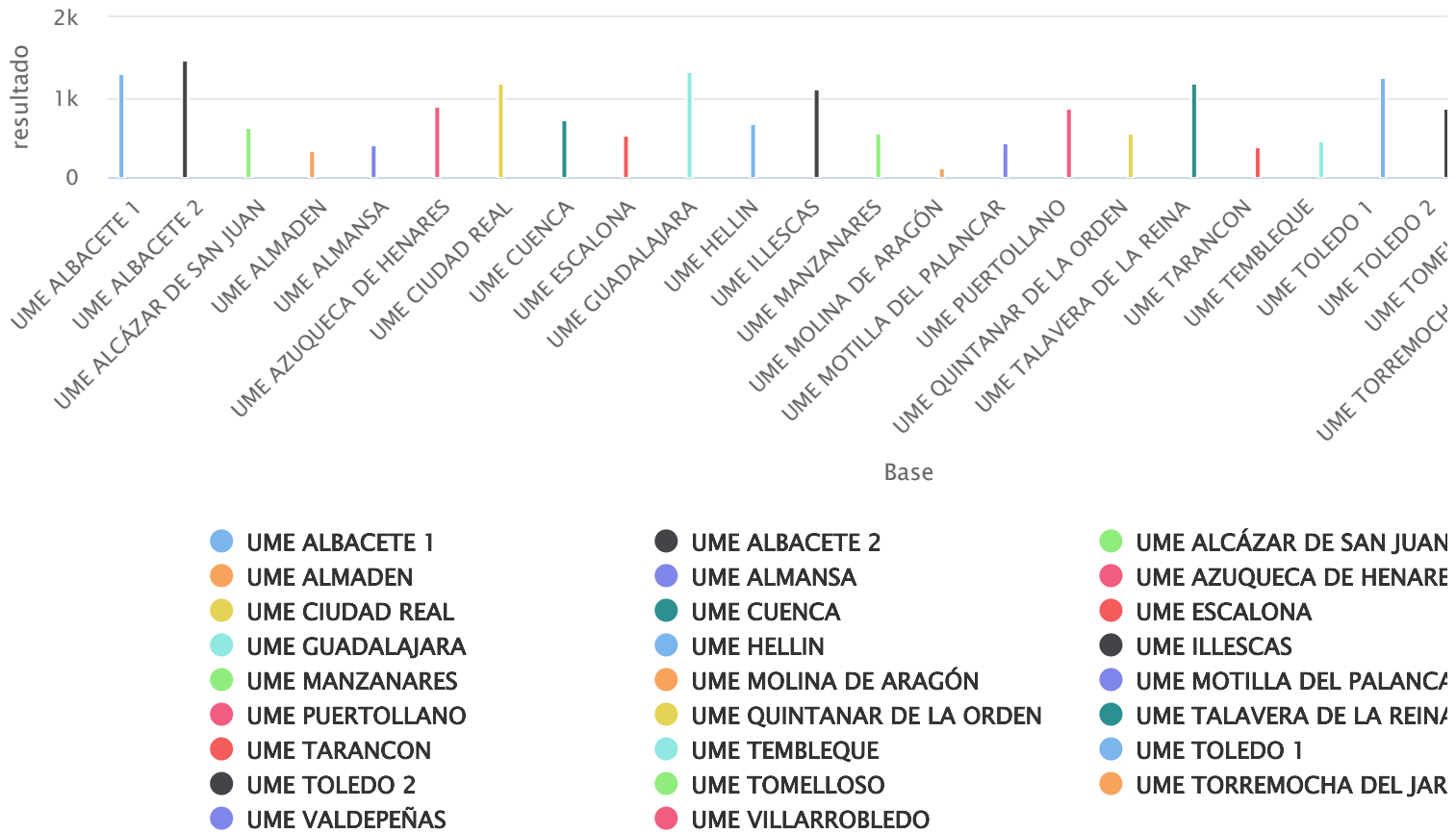
```
## [1] "Year 2021"
##           UME ALBACETE 1           UME ALBACETE 2   UME ALCÁZAR DE SAN JUAN
##           1190           1294           545
##           UME ALMADEN           UME ALMANSA   UME AZUQUECA DE HENARES
##           300           416           861
##           UME CIUDAD REAL           UME CUENCA           UME ESCALONA
##           1065           709           496
##           UME GUADALAJARA           UME HELLIN           UME ILLESCAS
##           1352           627           1133
##           UME MANZANARES           UME MOLINA DE ARAGÓN   UME MOTILLA DEL PALANCAR
##           550           143           418
##           UME PUERTOLLANO UME QUINTANAR DE LA ORDEN   UME TALAVERA DE LA REINA
##           864           544           1138
##           UME TARANCON           UME TEMBLEQUE           UME TOLEDO 1
##           420           463           1384
##           UME TOLEDO 2           UME TOMELLOSO UME TORREMOCHA DEL JARAMA
##           982           619           208
##           UME VALDEPEÑAS           UME VILLARROBLEDO
##           634           565
```

```
## Warning in data.frame(Base = data_column2$Base, resultado): row names were found
## from a short variable and have been discarded
```

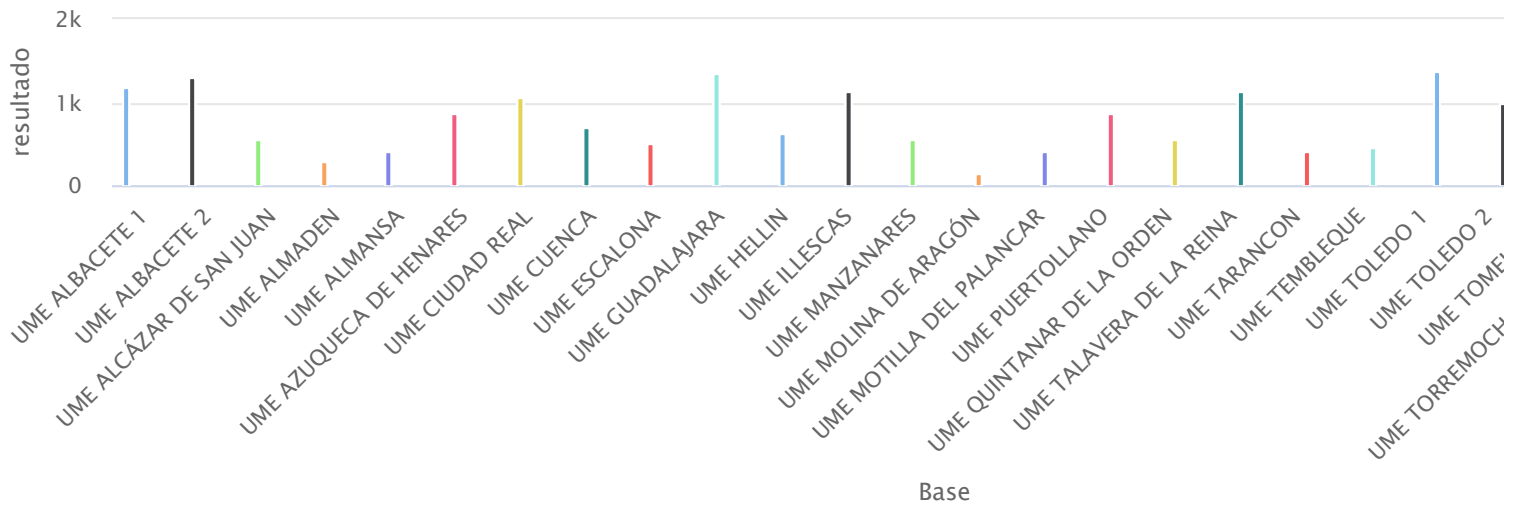
Suma de traslados del Year de forma interactiva: 2019



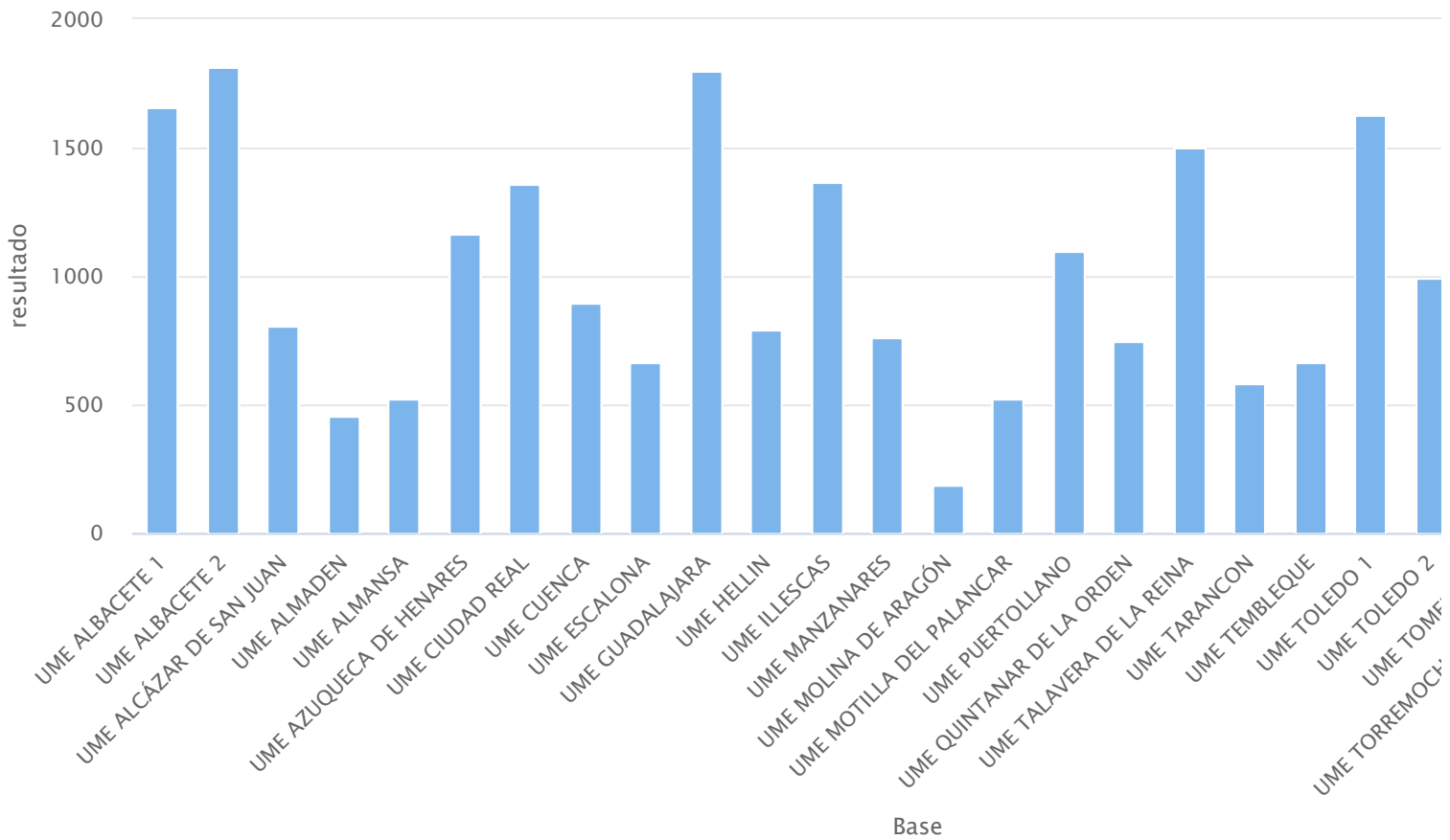
Suma de traslados del Year de forma interactiva: 2020



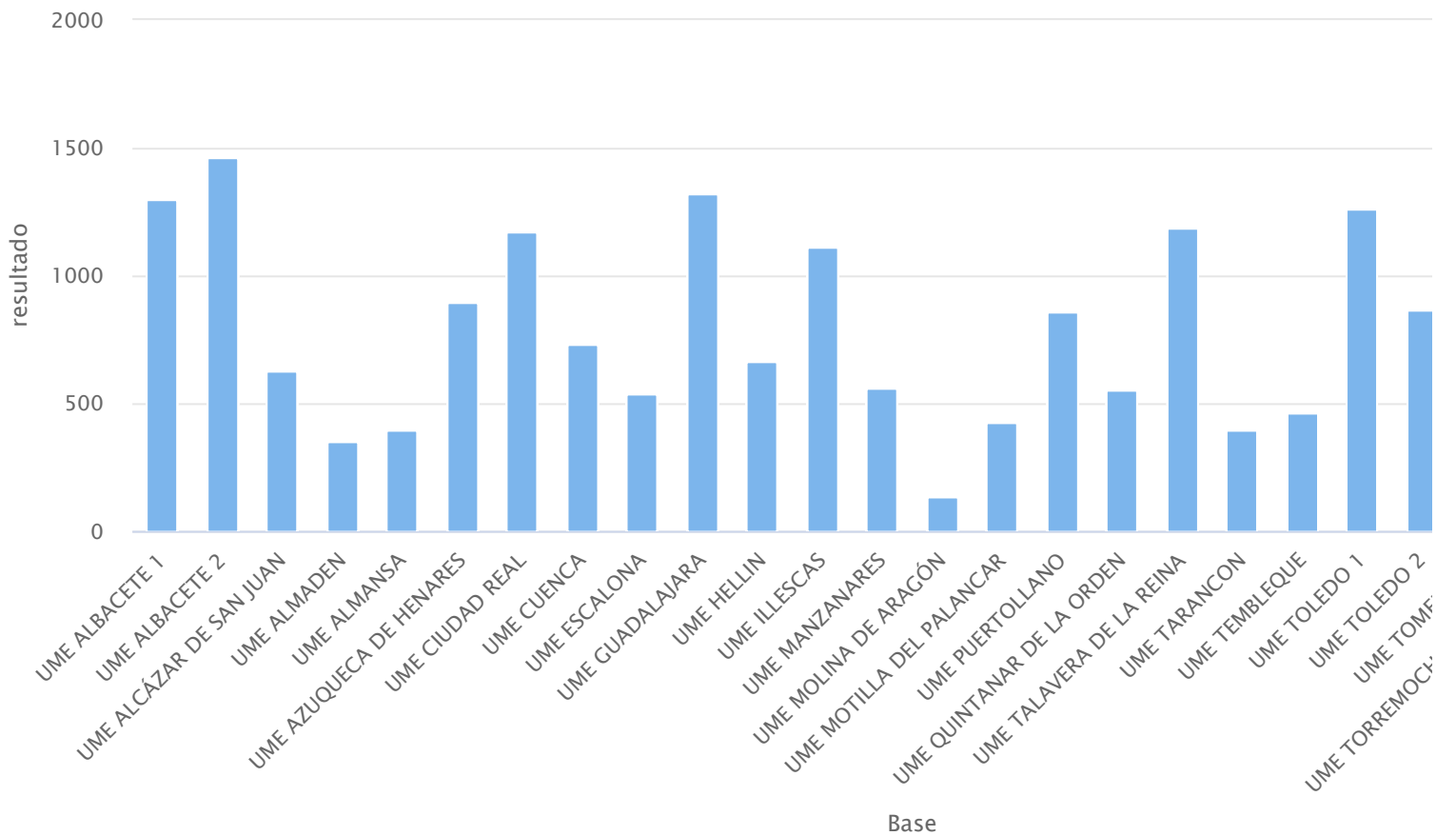
Suma de traslados del Year de forma interactiva: 2021



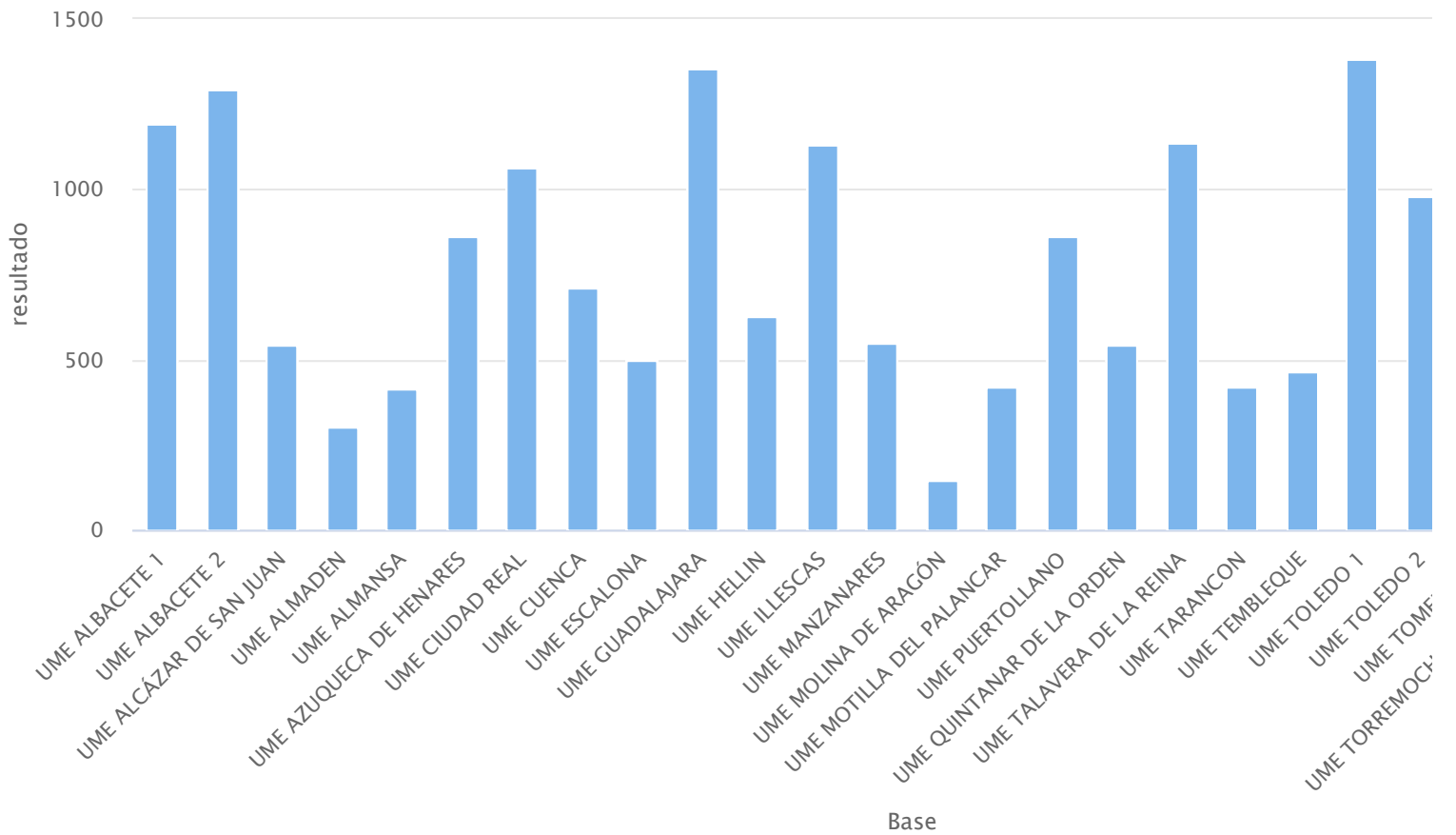
Suma de traslados del Year: 2019



Suma de traslados del Year: 2020

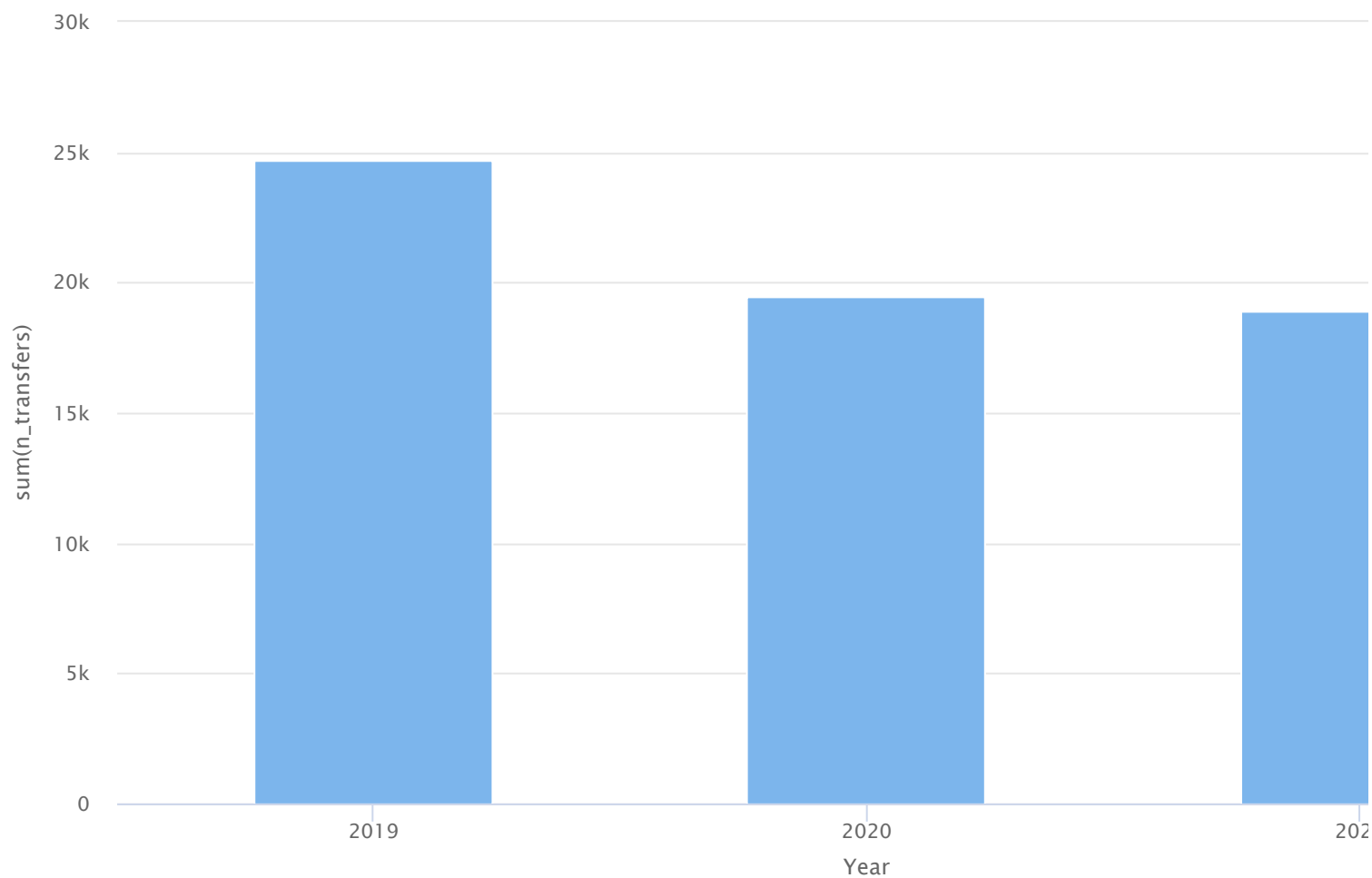


Suma de traslados del Year: 2021



total transfer per year

```
groups <- group_by(data_column,Year)
resultado<-summarise(groups,sum(n_transfers))
hchart(resultado,'column', hcaes(x = Year, y = `sum(n_transfers)`))
```

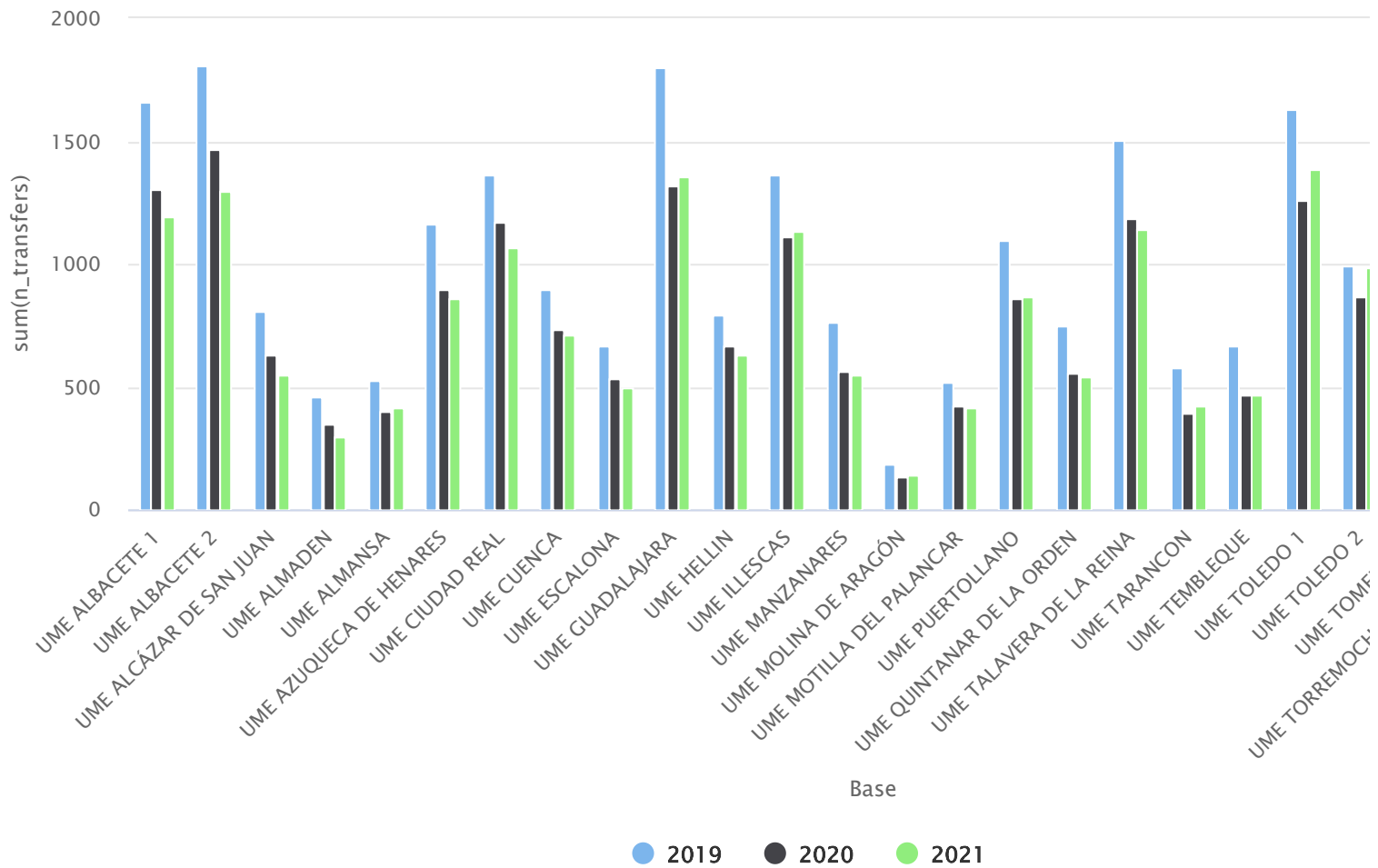


total transfers per base and year

```
groups <- group_by(data_column,Year,Base)
resultado<-summarise(groups,sum(n_transfers))
```

`summarise()` has grouped output by 'Year'. You can override using the `.groups` argument.

```
hchart(resultado,'column', hcaes(x = Base, y = `sum(n_transfers)` ,group=Year))
```

total transfer per mnth and base

```
data_column$mes<-rep(c(1:12),each=26*3)
groups <- group_by(data_column,mes,Base)
resultado<-summarise(groups,sum(n_transfers))
```

```
## `summarise()` has grouped output by 'mes'. You can override using the `.groups` argument.
```

```
hchart(resultado,'column', hcaes(x = Base, y = `sum(n_transfers)`,group=mes))
```

