Campos Vectoriales

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```
library(tidyr)
library(gcookbook)
library(dplyr)
library(ggplot2)
```

Importacion de datos

```
psych::describe(isabel)
```

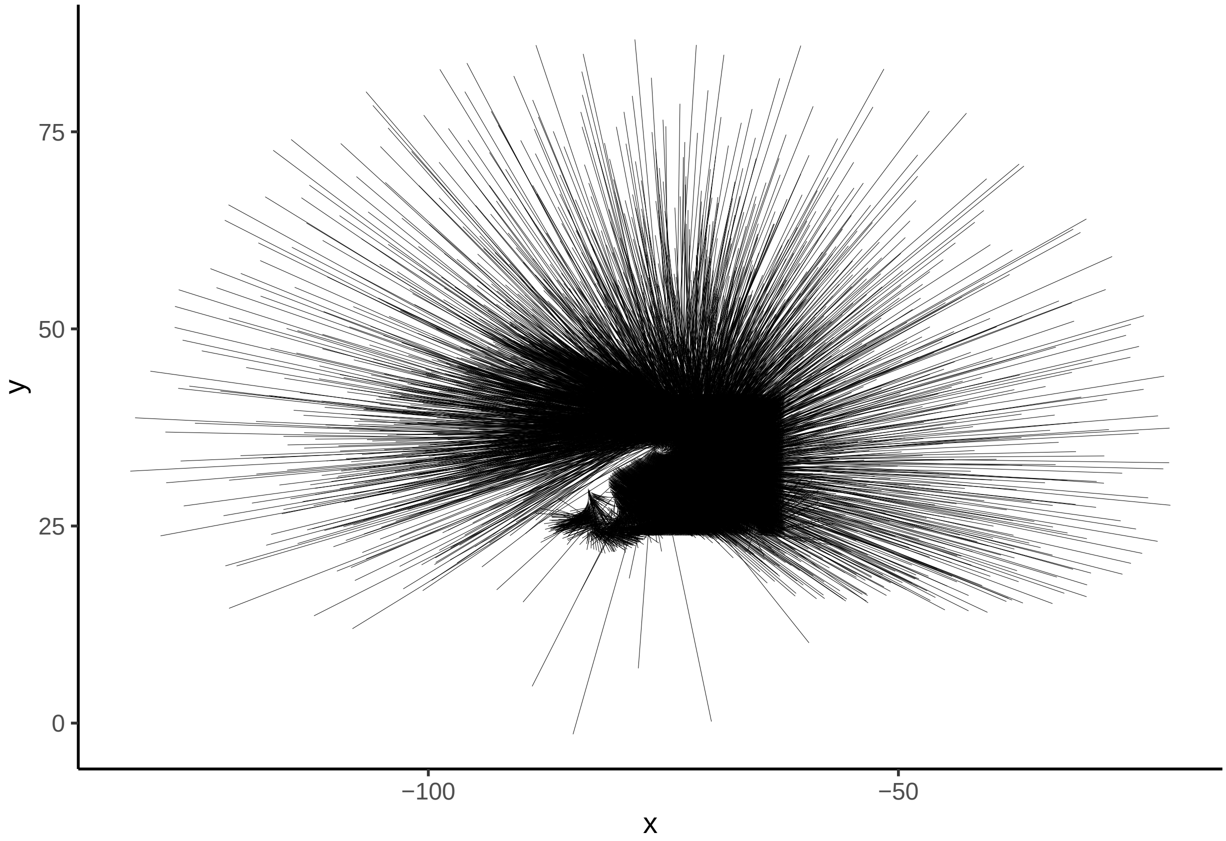
```
##       vars      n   mean    sd median trimmed   mad    min    max  range  skew
## x        1 156250 -72.56  6.07 -72.56  -72.56  7.74 -83.00 -62.13  20.87  0.00
## y        2 156250  32.75  5.21  32.75   32.75  6.63  23.81  41.70  17.89  0.00
## z        3 156250   9.04  5.74   9.04    9.04  7.41   0.04  18.04  18.00  0.00
## vx       4 152505  -1.15  9.81  -0.99   -0.93  7.92 -67.56  54.52 122.08 -0.41
## vy       5 152505   3.99 11.25   3.62    3.66  9.68 -59.45  66.76 126.21  0.31
## vz       6 152505   0.01  0.15   0.00    0.00  0.08  -2.04   9.93  11.97  7.54
## t        7 152505 -27.85 32.57 -31.77  -28.85 46.82 -75.67  29.45 105.12  0.11
## speed    8 152505  12.75  8.79  10.46   11.51  6.69   0.01  70.53  70.52  1.57
##       kurtosis   se
## x        -1.20 0.02
## y        -1.20 0.01
## z        -1.22 0.01
## vx        2.96 0.03
## vy        1.40 0.03
## vz      250.34 0.00
## t        -1.37 0.08
## speed     3.26 0.02
```

Dans un premier temps on se focalise sur les données plus faible en terme d'altitude.

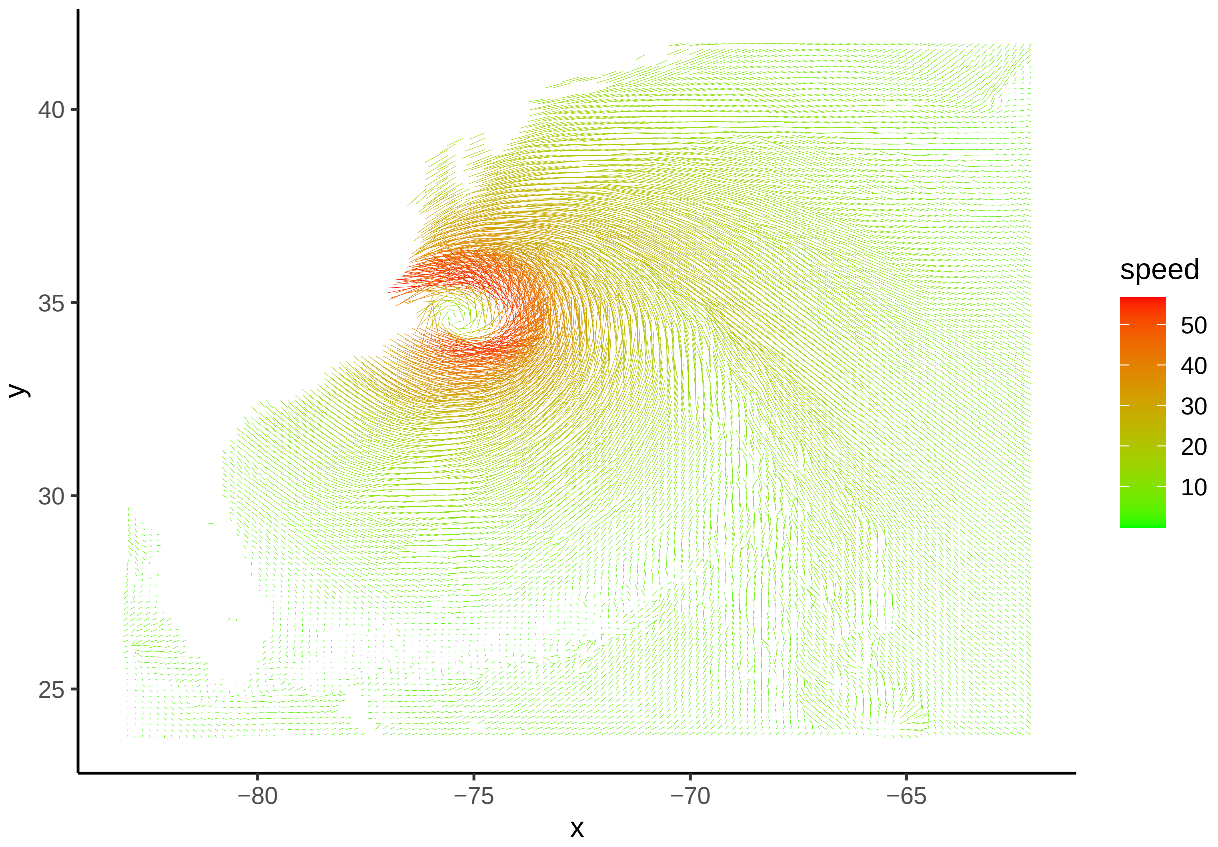
```
isabelmin = isabel %>% filter(z == min(z))
head(isabelmin,10)
```

```
##      x        y     z vx vy vz  t speed
## 1  -83 41.70000 0.035 NA NA NA NA    NA
## 2  -83 41.55571 0.035 NA NA NA NA    NA
## 3  -83 41.41142 0.035 NA NA NA NA    NA
## 4  -83 41.26713 0.035 NA NA NA NA    NA
## 5  -83 41.12285 0.035 NA NA NA NA    NA
## 6  -83 40.97856 0.035 NA NA NA NA    NA
## 7  -83 40.83427 0.035 NA NA NA NA    NA
## 8  -83 40.68998 0.035 NA NA NA NA    NA
## 9  -83 40.54569 0.035 NA NA NA NA    NA
## 10 -83 40.40140 0.035 NA NA NA NA    NA
```

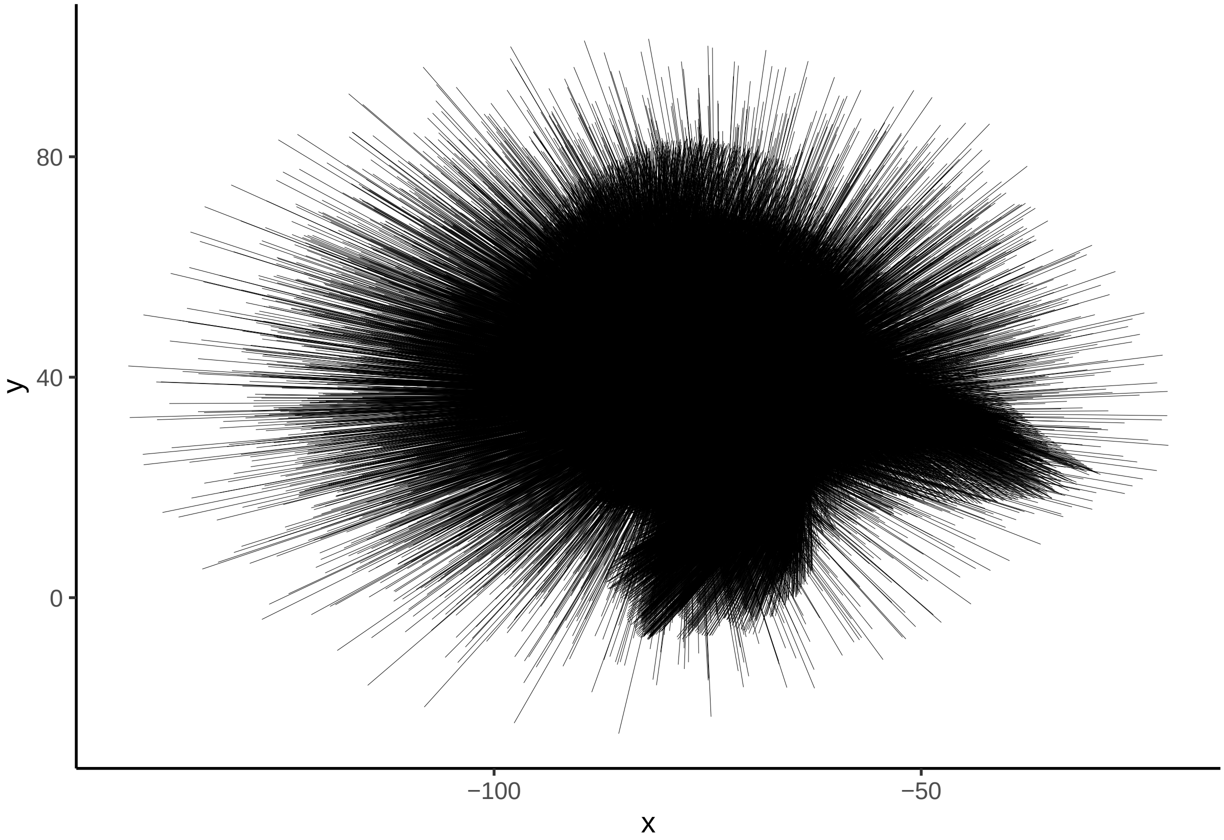
```
ggplot(isabelmin, aes(x=x, y=y))+
  geom_segment( aes(xend=x+vx, yend=y+vy), size = .025)+
  theme_classic()
```



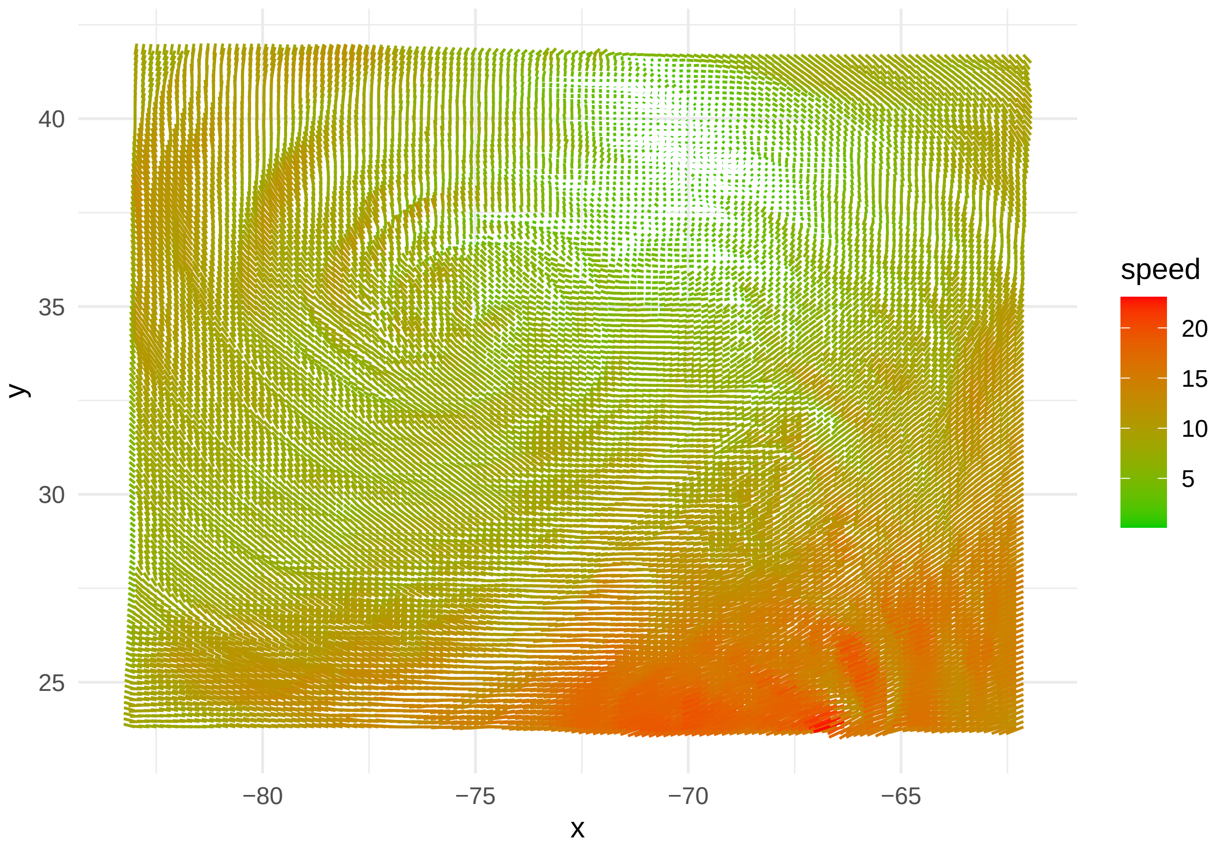
```
ggplot(isabelmin, aes(x=x, y=y, color = speed))+
  geom_segment( aes(xend=x+vx/30, yend=y+vy/30), size = .025)+
  scale_color_gradient(low = "green", high = "red")+
  theme_classic()
```



```
ggplot(isabel, aes(x=x, y=y))+
  geom_segment( aes(xend=x+vx, yend=y+vy), size = .025)+
  theme_classic()
```



```
isabelmax = isabel %>% filter(z == max(z))

ggplot(isabelmax, aes(x=x, y=y, color = speed))+
  geom_segment( aes(xend=x+vx/30, yend=y+vy/30), size = .025, linewidth = .5)+
  scale_color_gradient(low = "green3", high = "red")+
  theme_minimal()
```

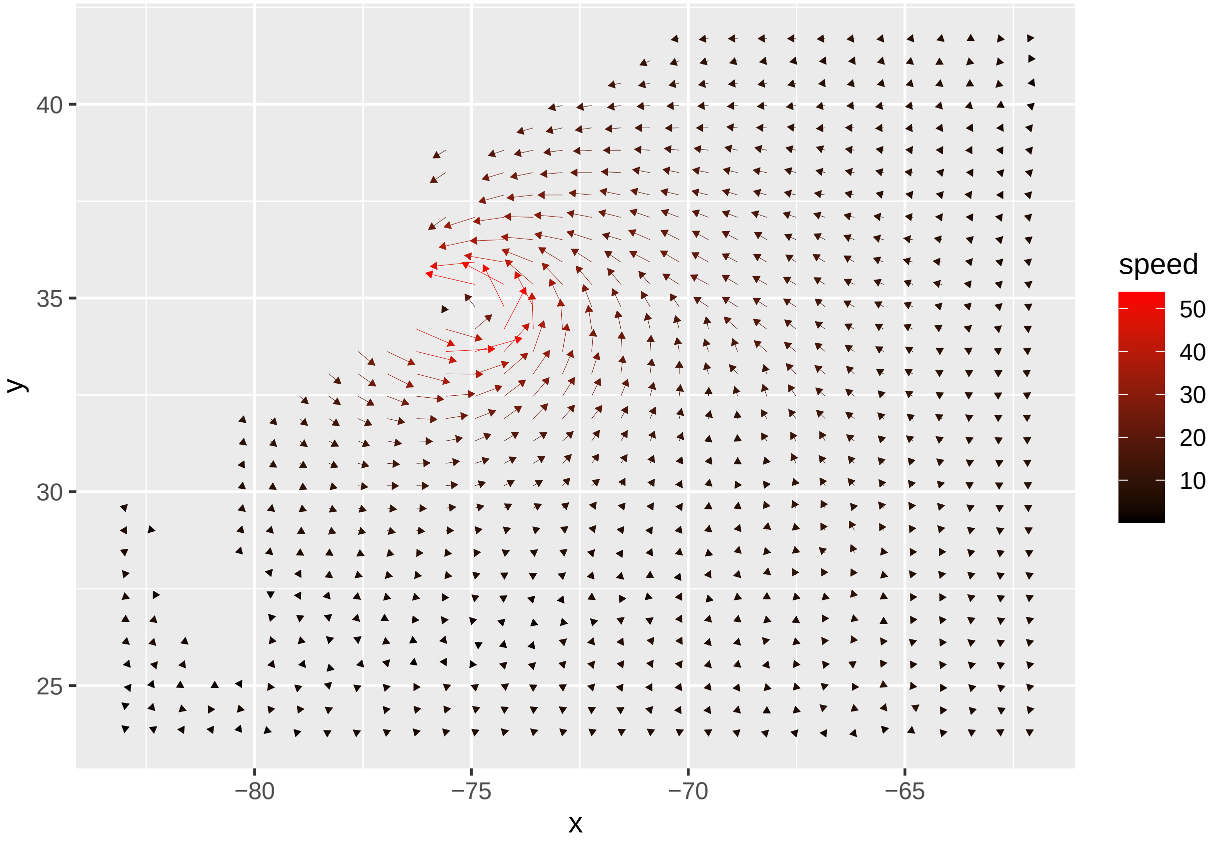


```r
uno_cada_M = function(x, M) {
  x = sort(x)
  x[seq(1, length(x), by = M)]
}
```

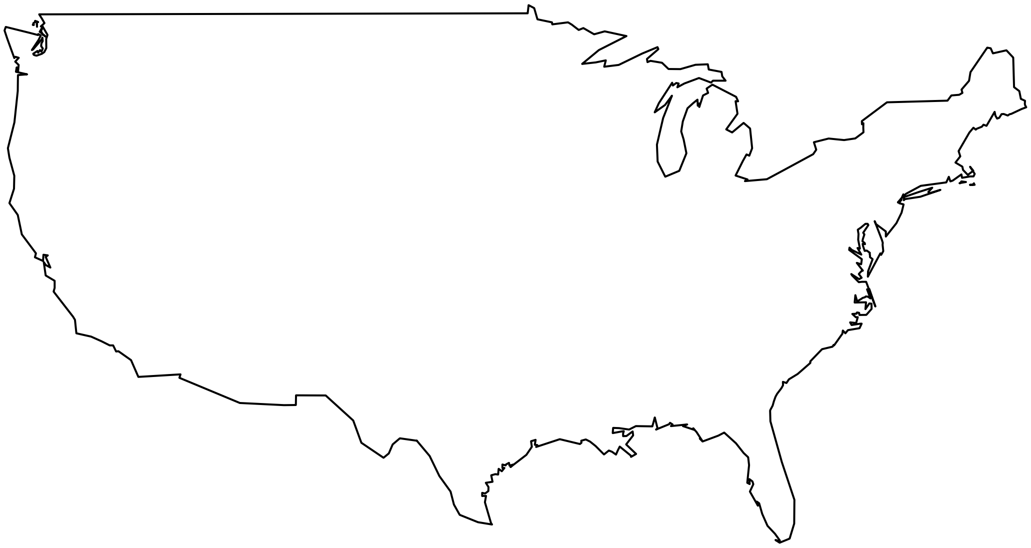
```r
sub_x = uno_cada_M(unique(isabelmin$x), M = 4)
sub_y = uno_cada_M(unique(isabelmin$y), M = 4)
```

```r
isabelmin_sub = filter(isabelmin, x %in% sub_x & y %in% sub_y)
```

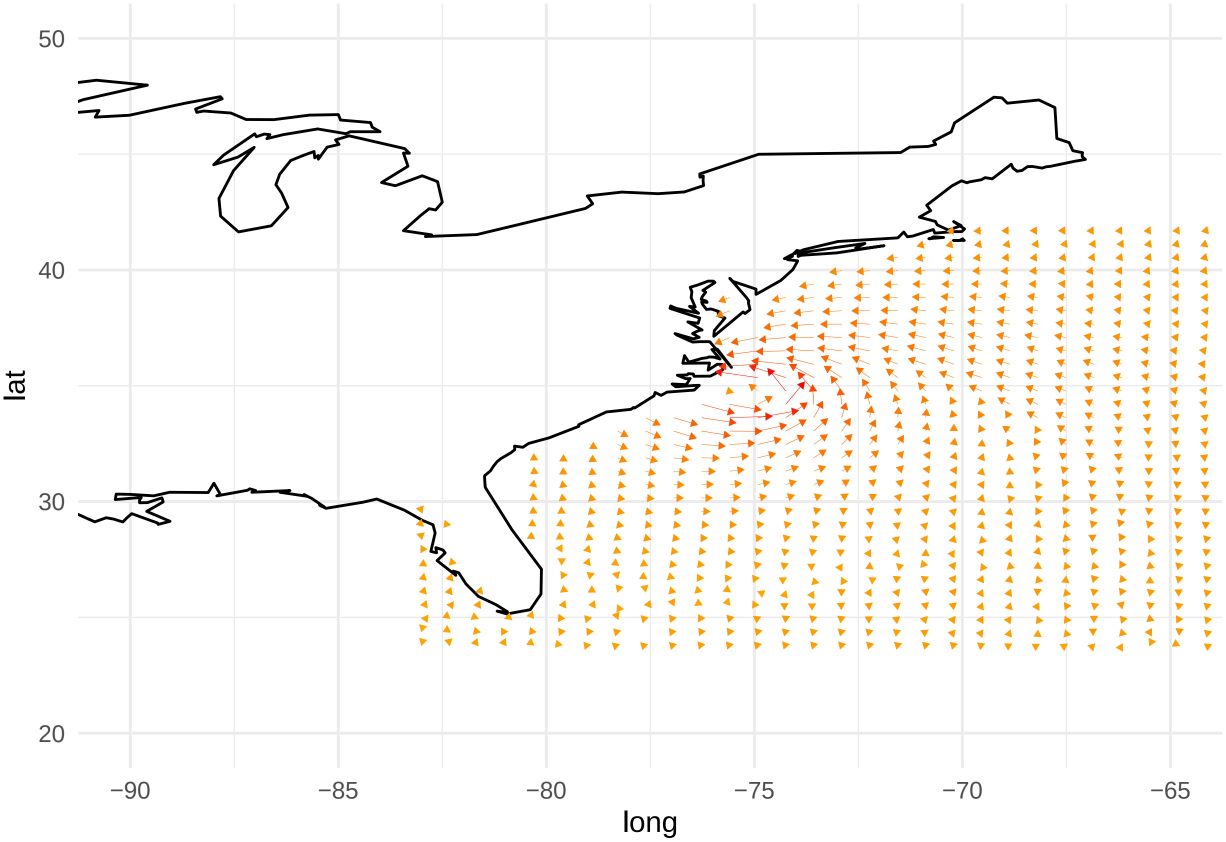
```r
library(grid) # para dibujar flechas

ggplot(isabelmin_sub, aes(x=x, y=y, color = speed))+
  geom_segment(aes(xend=x+vx/45, yend=y+vy/45), size = .025,
               arrow = arrow(length = unit(0.1, "cm"), type = "closed"))+
  scale_color_gradient(low = "black", high = "red")
```



```r
library(maps)
map = map("usa")
```



```r
ggplot(map)+
  geom_polygon(aes(x=long, y=lat, group = group), fill = NA, color = "black")+
  geom_segment(data=isabelmin_sub,
               aes(x=x, y=y, xend=x+vx/50, yend=y+vy/50, color = speed),
               size = .025,
               arrow = arrow(length = unit(0.1, "cm"), type = "closed"))+
  scale_color_gradient(low = "orange", high = "red")+
  scale_fill_manual(values = rep("black", 10))+
  theme_minimal()+
  theme(legend.position = "none") +
  coord_cartesian(xlim = c(-90, -65), ylim = c(20,50))
```


50
40
30
20
lat
−90
−85
−80
−75
−70
−65
long