Plot positions and speeds

Version 2: smooths the speeds

Reads .xlsx files Outputs .rds files for columns not all NA

```
rm(list=ls())
setwd("~/WORKSHOP/GPS/")
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
```

```
library(lubridate)
```

```
##
## Attaching package: 'lubridate'
```

```
## The following objects are masked from 'package:base':
##
##     date, intersect, setdiff, union
```

Utility GC formula

```
# Calculates the geodesic distance between two points specified by radian latitude/longitude using the
# Haversine formula (hf)
gcd.hf <- function(long1, lat1, long2, lat2) {
  R <- 6371*1000 # Earth mean radius [m]
  delta.long <- (long2 - long1)
  delta.lat <- (lat2 - lat1)
  a <- sin(delta.lat/2)^2 + cos(lat1) * cos(lat2) * sin(delta.long/2)^2
  c <- 2 * asin(min(1,sqrt(a)))
  d = R * c
  return(d) # Distance in m
}
```

Define function to calculate speed

```
getSpeed <- function(time,lon,lat)
{
```

```
  rtod <- pi/180
  speed <- NULL
  speed_smoo <- NULL
  for (it in 1:(length(time)-1))
  {
    # calc great-circle distance between pairs of points
    distance <- gcd.hf(rtod*lon[it+1],rtod*lat[it+1],rtod*lon[it],rtod*lat[it])
    delta_time <- as.numeric(time[it+1]-time[it])/60 # dt in hours now
    #browser()
    # calc speed
    speed <- c(speed,abs(distance/delta_time))
  }
  speed_smoo <- NULL
  for (j in 1:(length(speed)-1))
  {
    speed_smoo <- rbind(speed_smoo,c(j,median(c(speed[j-2],speed[j-1],speed[j],speed[j+1],speed[j+1]),na
  }
  speed_smoo <- rbind(speed_smoo[1,],speed_smoo,speed_smoo[nrow(speed_smoo),])
  #browser()
  return(list("speed"=speed,"speed_smoo"=speed_smoo))
}
```

Plot coloured points

```
plotcolouredpoints <- function(x,y,limitdates,pair,ivar)
{
  idx <- which(df$POSIX >= limitdates[(pair-1)*2+1] & df$POSIX < limitdates[(pair-1)*2+2])
  points(x[idx],y[idx],type="p",cex=0.3,col=1+pair)
  if (ivar == 'speed') {print(paste(pair,' from ',limitdates[(pair-1)*2+1],' to ', limitdates[(pair-1)*

}
```

plot positions and speeds etc

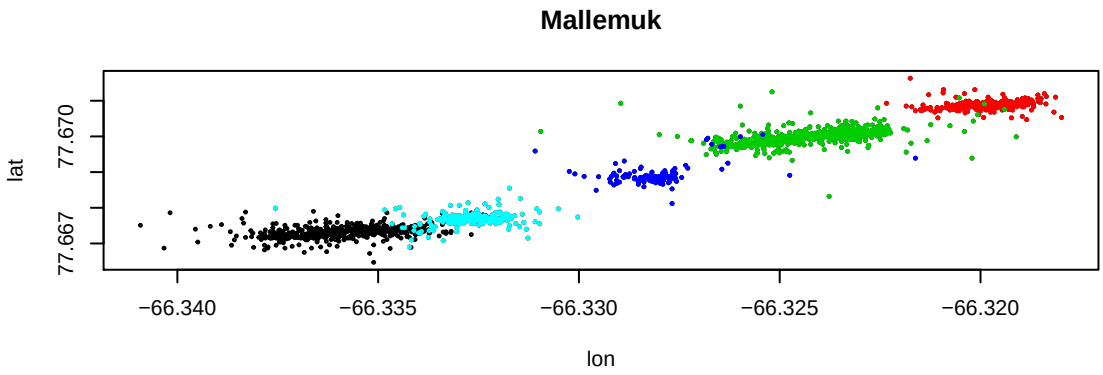
```
plot_stuff <- function(df,name,limitdates)
{
  par(mfrow=c(4,1))
  nlimits <- length(limitdates)
  statname <- strsplit(strsplit(name, "/")[[1]][2],".rds")[[1]][1]
  # First plot positions
  plot(df$Longitude,df$Latitude,type="p",cex=0.3,xlab="lon",ylab="lat",main=statname)
  plotcolouredpoints(df$Longitude,df$Latitude,limitdates,1,'')
  plotcolouredpoints(df$Longitude,df$Latitude,limitdates,2,'')
  plotcolouredpoints(df$Longitude,df$Latitude,limitdates,3,'')
  plotcolouredpoints(df$Longitude,df$Latitude,limitdates,4,'')
  # Plot lon vs time
  plot(df$POSIX,df$Longitude,type="p",cex=0.3,xlab="Date/Time",ylab="lon",main=statname)
  plotcolouredpoints(df$POSIX,df$Longitude,limitdates,1,'')
  plotcolouredpoints(df$POSIX,df$Longitude,limitdates,2,'')
```

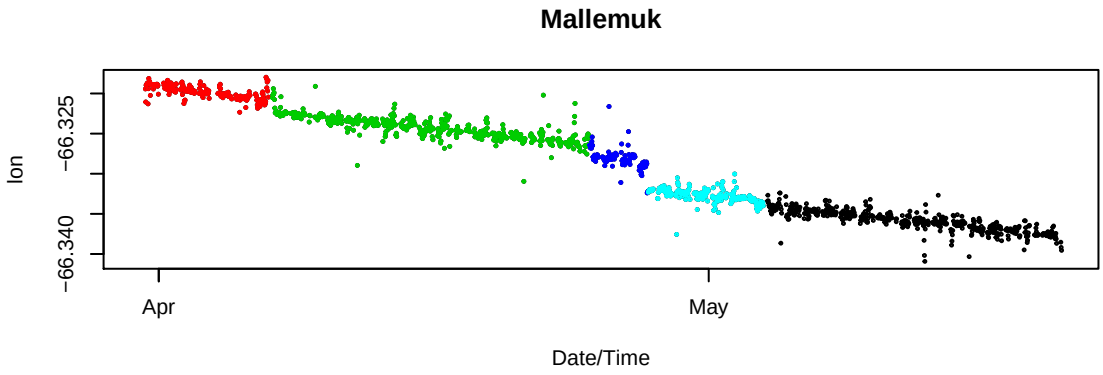
```
  plotcolouredpoints(df$POSIX,df$Longitude,limitdates,3,'')
  plotcolouredpoints(df$POSIX,df$Longitude,limitdates,4,'')
  # Plot lat vs time
  plot(df$POSIX,df$Latitude,type="p",cex=0.3,xlab="Date/Time",ylab="lat",main=statname)
  plotcolouredpoints(df$POSIX,df$Latitude,limitdates,1,'')
  plotcolouredpoints(df$POSIX,df$Latitude,limitdates,2,'')
  plotcolouredpoints(df$POSIX,df$Latitude,limitdates,3,'')
  plotcolouredpoints(df$POSIX,df$Latitude,limitdates,4,'')
  # get speed
  out <- getSpeed(df$POSIX,df$Longitude,df$Latitude)
  speed <- out$speed
  speed_smoo <- out$speed_smoo[,2]
  df$speed <- c(speed[1],speed)
  df$speed_smoo <- speed_smoo
  #browser()
  # plot speed against time
  plot(df$POSIX,df$speed,type="p",cex=0.3,xlab="Date/Time",ylab="speed [m/hr]",main=statname)
  plotcolouredpoints(df$POSIX,df$speed,limitdates,1,'speed')
  plotcolouredpoints(df$POSIX,df$speed,limitdates,2,'speed')
  plotcolouredpoints(df$POSIX,df$speed,limitdates,3,'speed')
  plotcolouredpoints(df$POSIX,df$speed,limitdates,4,'speed')
  #lines(df$POSIX,df$speed_smoo)
  }
```

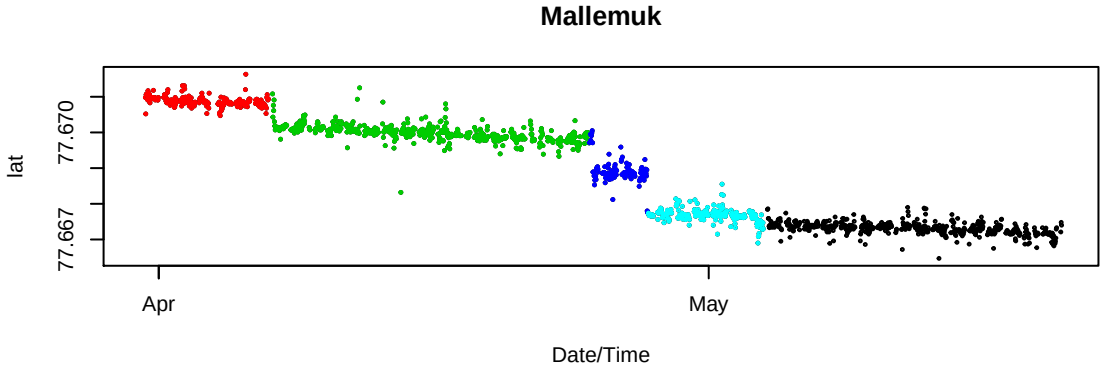
read and plot each file

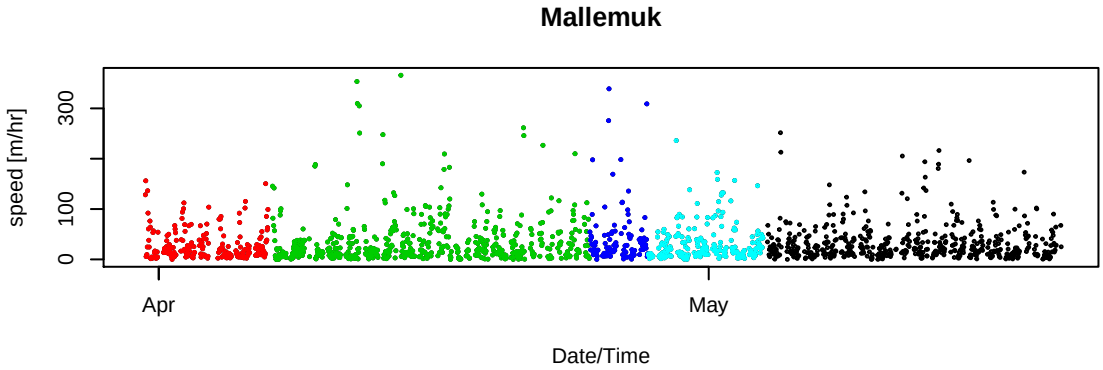
```
files <- c('OUTPUT/Mallemuk.rds','OUTPUT/Soekonge.rds','OUTPUT/Ismaage.rds','OUTPUT/Havterne.rds','OUTPU
#files <- files[1]
limitdates <- c(as.POSIXct("2022-03-31 00:00:00",tz="UTC"),as.POSIXct("2022-04-7 00:00:00",tz="UTC"),
                as.POSIXct("2022-04-7 00:00:00",tz="UTC"),as.POSIXct("2022-04-24 12:00:00",tz="UTC"),
                as.POSIXct("2022-04-24 12:00:00",tz="UTC"),as.POSIXct("2022-04-27 17:00:00",tz="UTC"),
                as.POSIXct("2022-04-27 17:00:00",tz="UTC"),as.POSIXct("2022-05-04 00:00:00",tz="UTC"))

for (ifil in 1:length(files))
{
  print(paste(" Processing file ",files[ifil]))
  df <- readRDS(files[ifil])
  plot_stuff(df,files[ifil],limitdates)
}
```

```
## [1] " Processing file  OUTPUT/Mallemuk.rds"
```



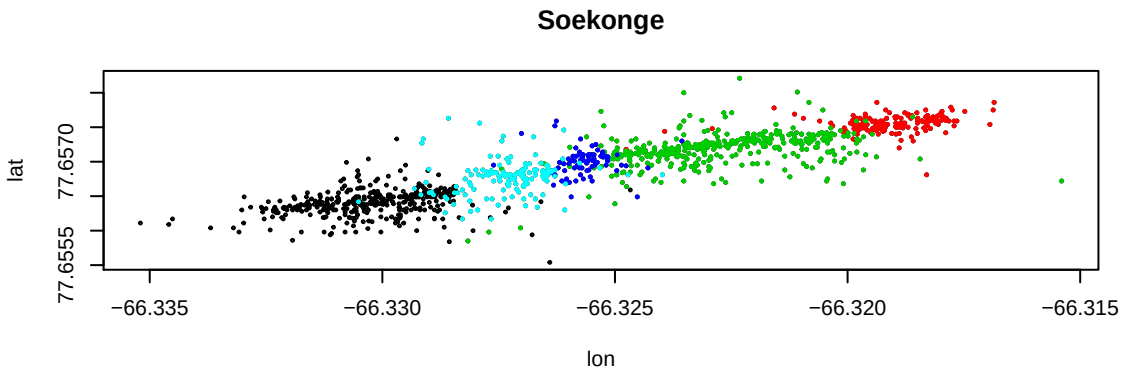


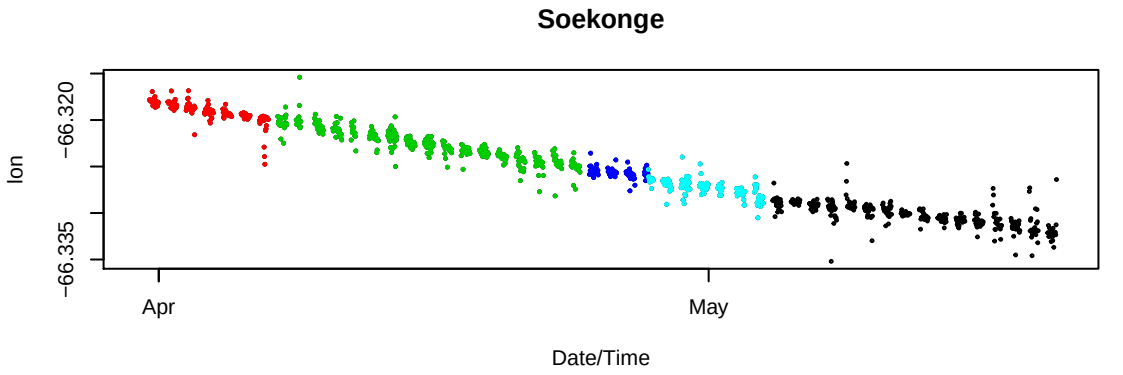


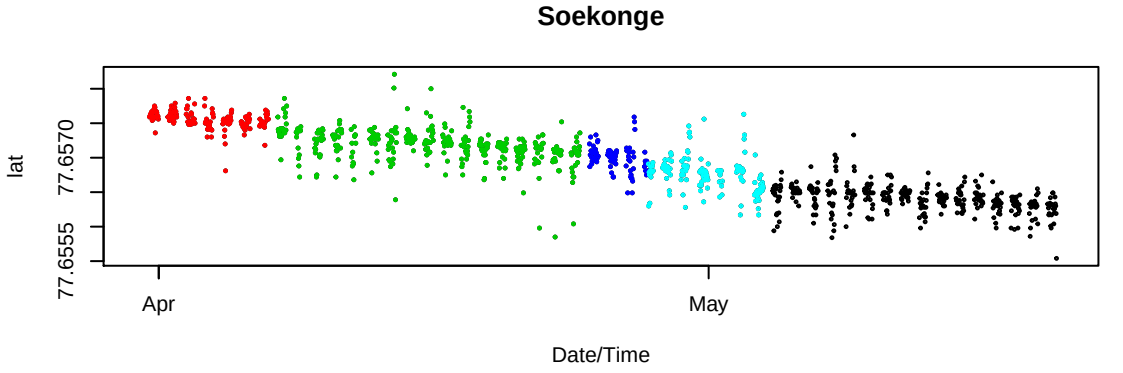


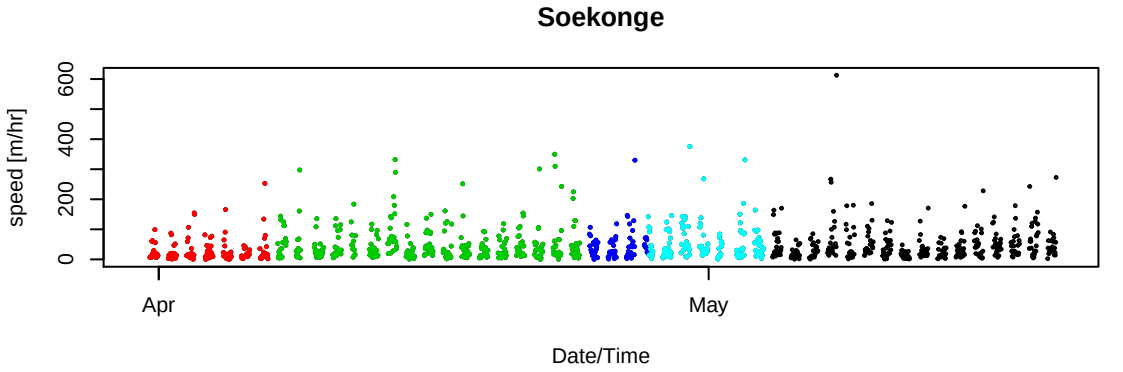

```
## [1] "1  from  2022-03-31  to  2022-04-07  speed:  16  +/-  1.8 m/hr"
```

```
## [1] "2  from  2022-04-07  to  2022-04-24 12:00:00  speed:  19.2  +/-  1.8 m/hr"
## [1] "3  from  2022-04-24 12:00:00  to  2022-04-27 17:00:00  speed:  27  +/-  4.9 m/hr"
## [1] "4  from  2022-04-27 17:00:00  to  2022-05-04  speed:  17.8  +/-  2.2 m/hr"
## [1] " Processing file  OUTPUT/Soekonge.rds"
```



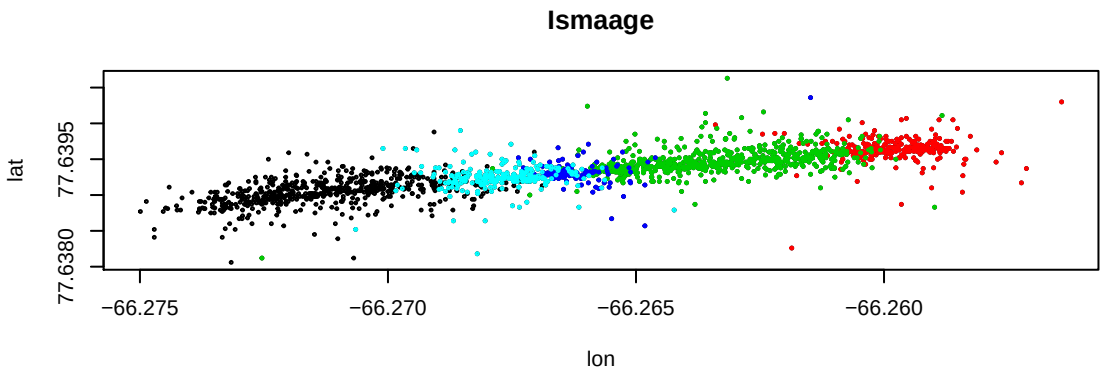


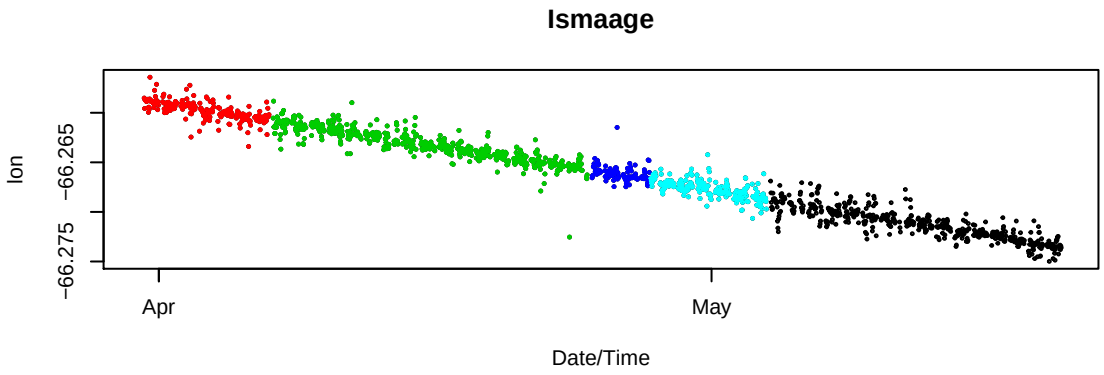


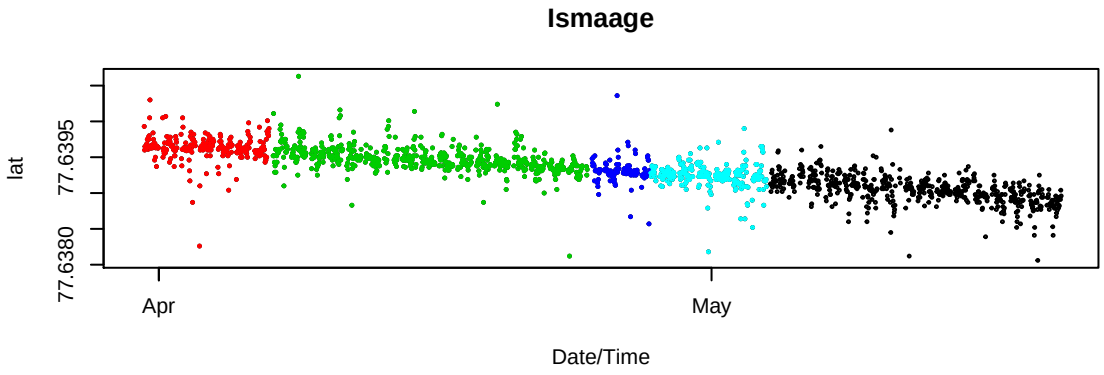


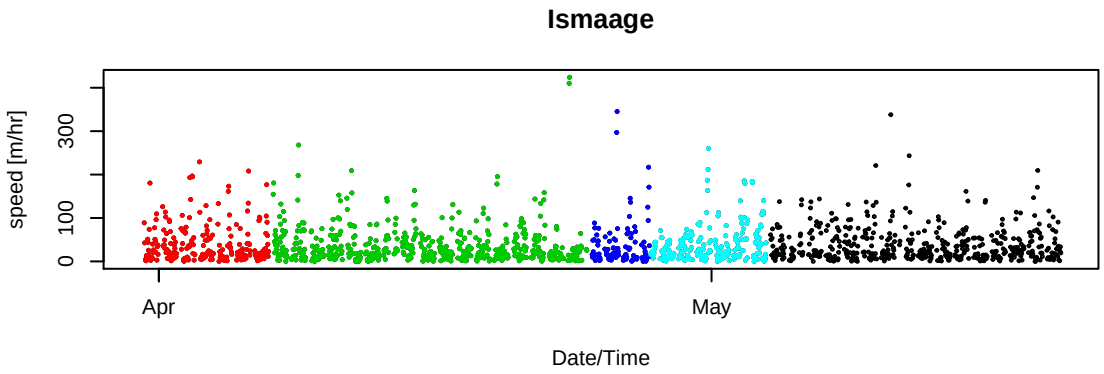

```
## [1] "1  from  2022-03-31  to  2022-04-07  speed:  14  +/-  2.6 m/hr"
```

```
## [1] "2  from  2022-04-07  to  2022-04-24 12:00:00  speed:  30.6  +/-  2.7 m/hr"
## [1] "3  from  2022-04-24 12:00:00  to  2022-04-27 17:00:00  speed:  36.3  +/-  5 m/hr"
## [1] "4  from  2022-04-27 17:00:00  to  2022-05-04  speed:  35.7  +/-  4.6 m/hr"
## [1] " Processing file  OUTPUT/Ismaage.rds"
```



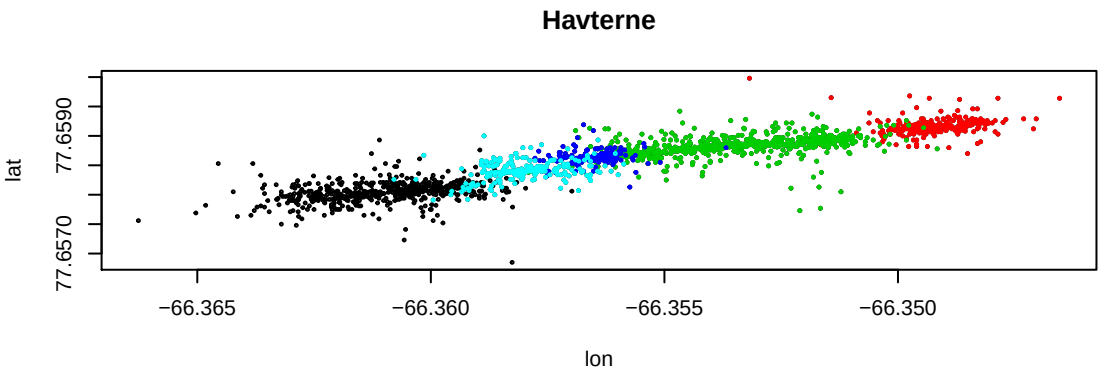


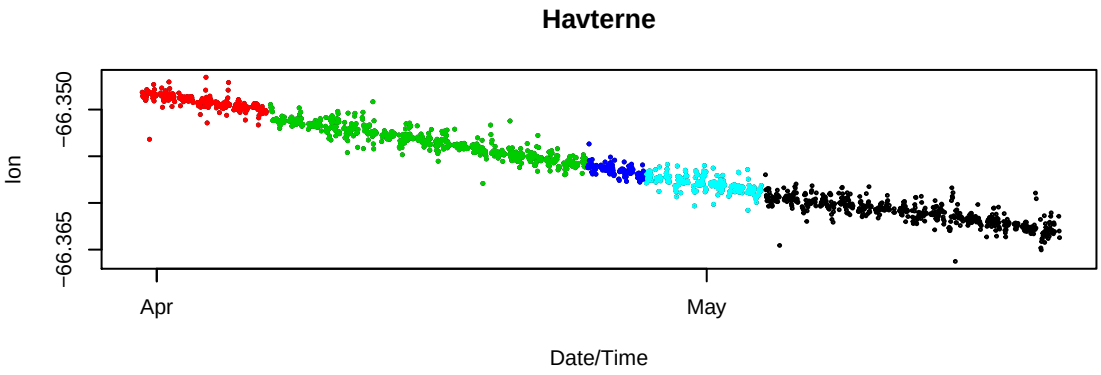


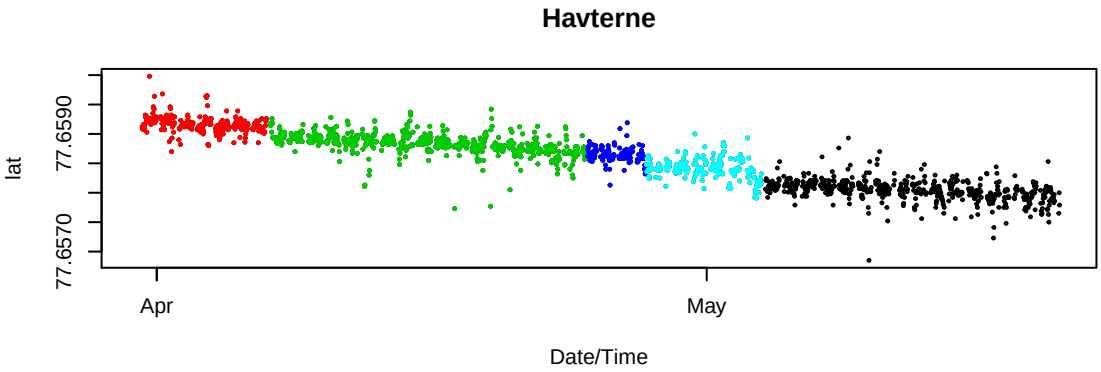


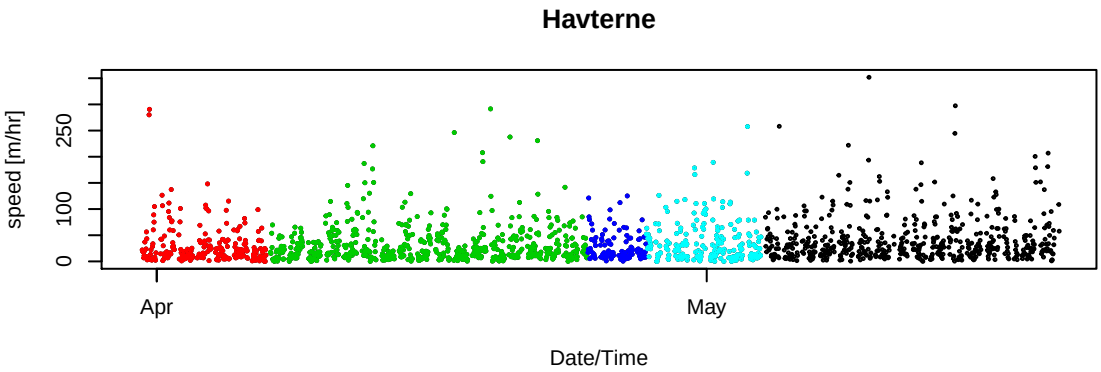

```
## [1] "1  from  2022-03-31  to  2022-04-07  speed:  20.7  +/-  2.6 m/hr"
```

```
## [1] "2  from  2022-04-07  to  2022-04-24 12:00:00  speed:  22.8  +/-  1.6 m/hr"
## [1] "3  from  2022-04-24 12:00:00  to  2022-04-27 17:00:00  speed:  16.1  +/-  4.6 m/hr"
## [1] "4  from  2022-04-27 17:00:00  to  2022-05-04  speed:  25.3  +/-  2.6 m/hr"
## [1] " Processing file  OUTPUT/Havterne.rds"
```



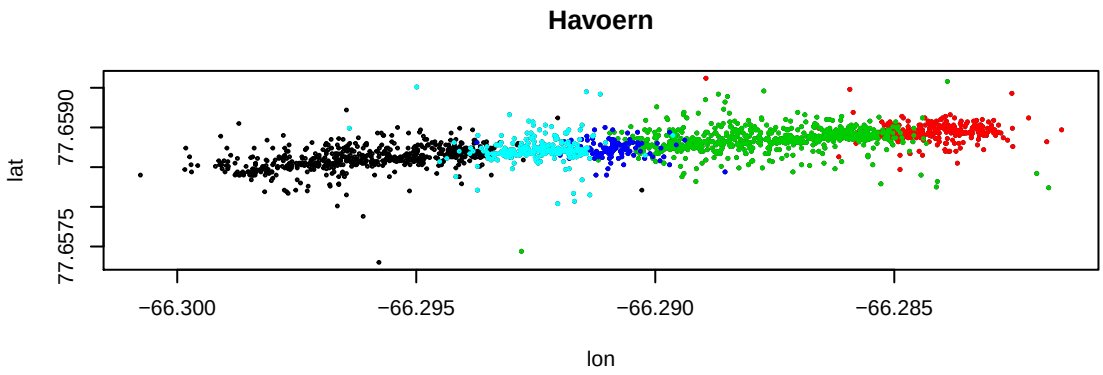


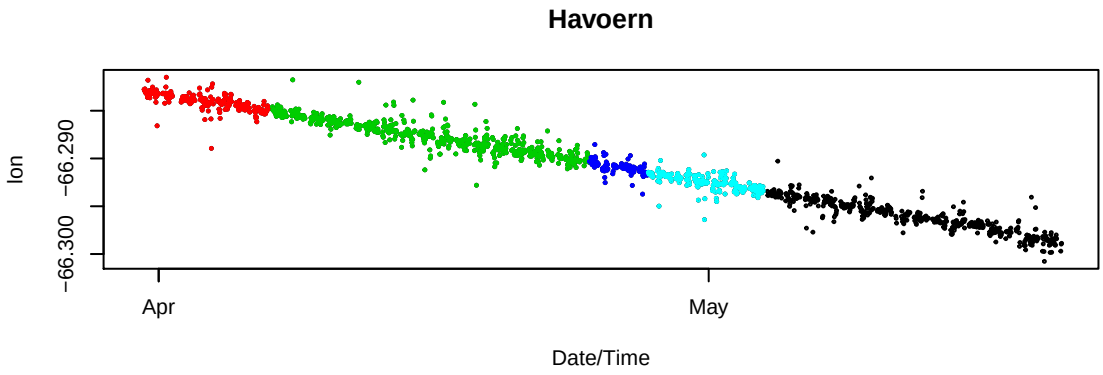


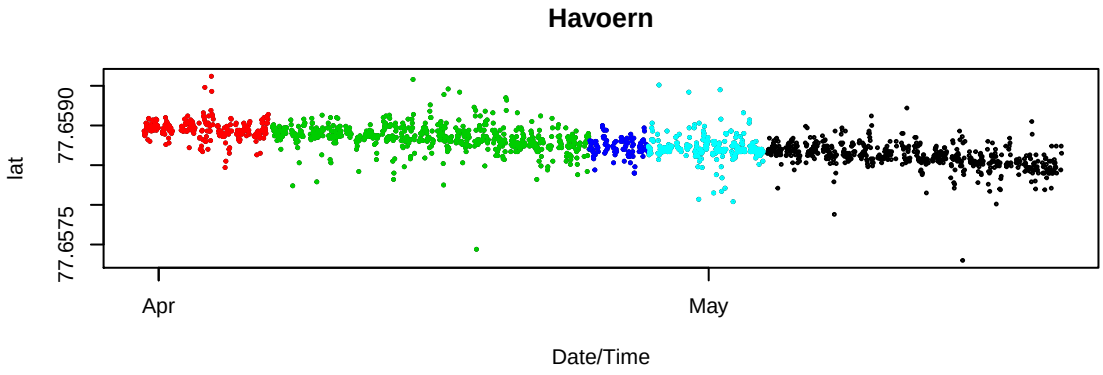


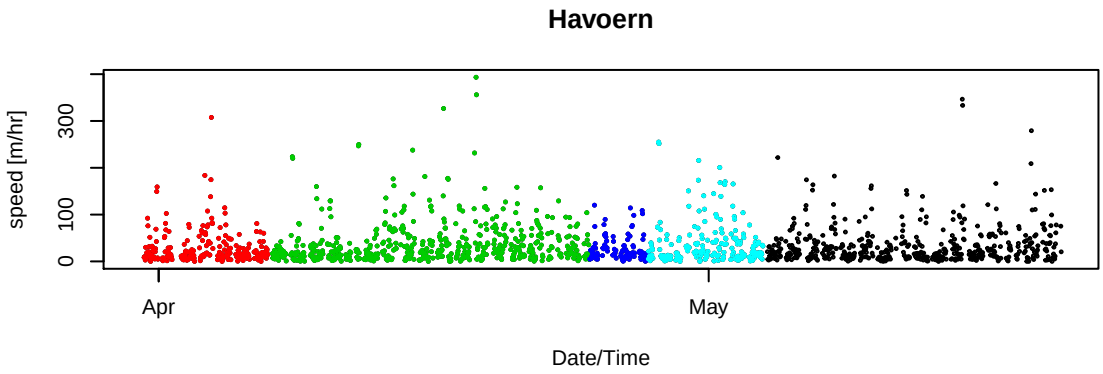

```
## [1] "1  from  2022-03-31  to  2022-04-07  speed:  17.7  +/-  2.2 m/hr"
```

```
## [1] "2  from  2022-04-07  to  2022-04-24 12:00:00  speed:  19.5  +/-  1.4 m/hr"
## [1] "3  from  2022-04-24 12:00:00  to  2022-04-27 17:00:00  speed:  17.2  +/-  2.2 m/hr"
## [1] "4  from  2022-04-27 17:00:00  to  2022-05-04  speed:  24.4  +/-  2.5 m/hr"
## [1] " Processing file  OUTPUT/Havoern.rds"
```



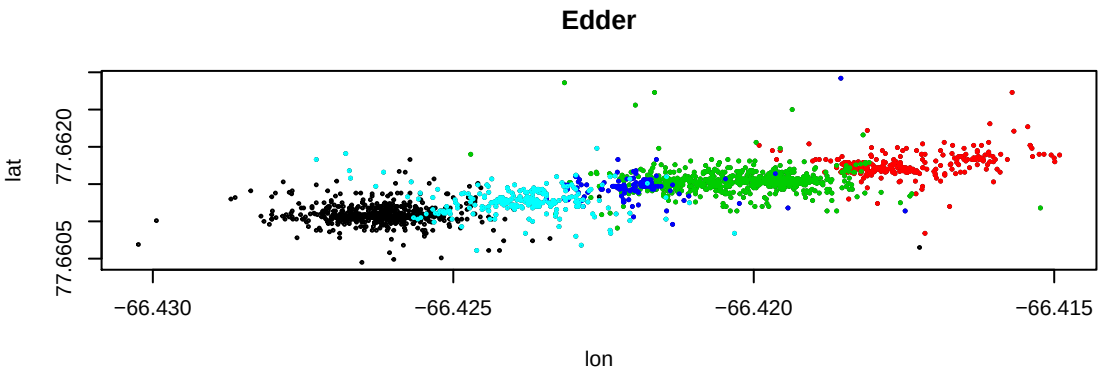


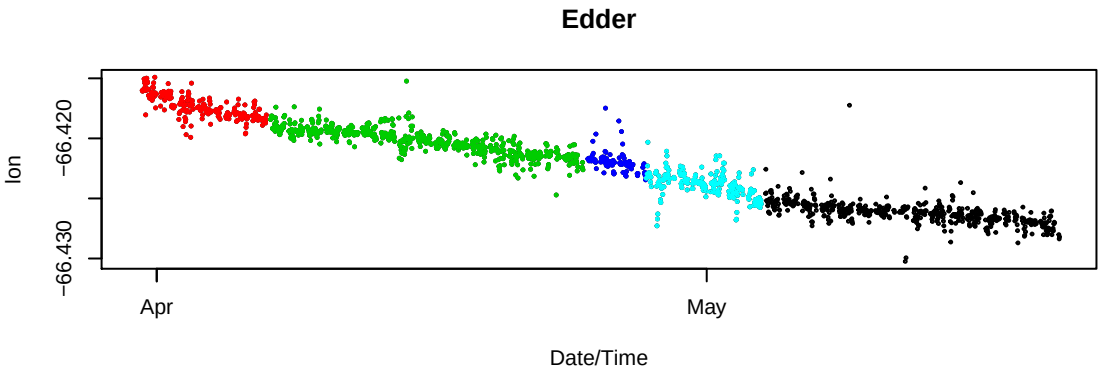


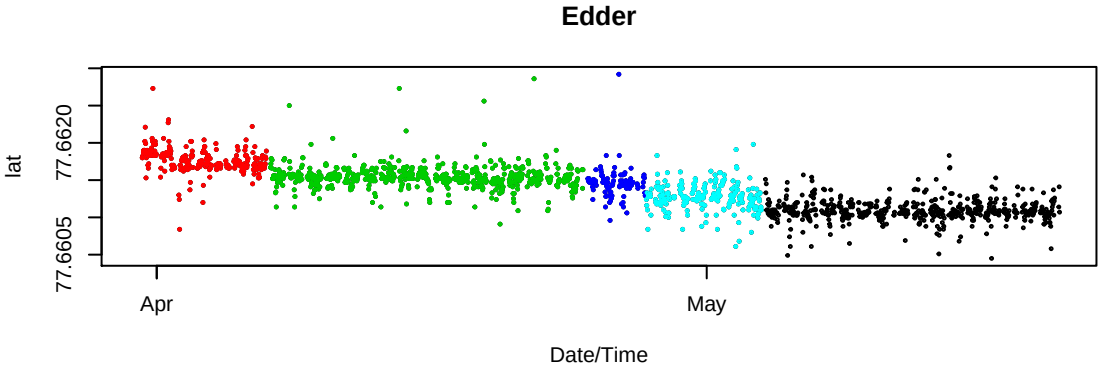


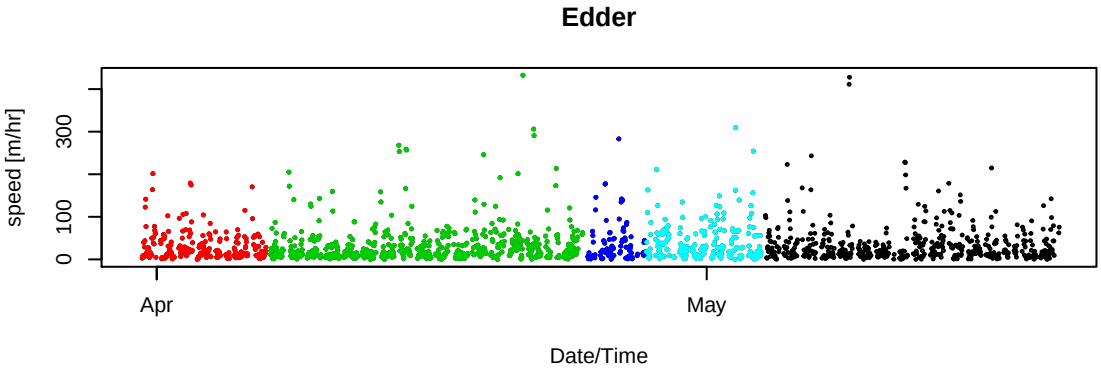

```
## [1] "1  from  2022-03-31  to  2022-04-07  speed:  16.4  +/-  2.2 m/hr"
```

```
## [1] "2  from  2022-04-07  to  2022-04-24 12:00:00  speed:  21.1  +/-  1.8 m/hr"
## [1] "3  from  2022-04-24 12:00:00  to  2022-04-27 17:00:00  speed:  18.4  +/-  2.4 m/hr"
## [1] "4  from  2022-04-27 17:00:00  to  2022-05-04  speed:  19.3  +/-  2.9 m/hr"
## [1] " Processing file  OUTPUT/Edder.rds"
```










```
## [1] "1  from  2022-03-31  to  2022-04-07  speed:  18.8  +/-  2 m/hr"
```

```
## [1] "2  from  2022-04-07  to  2022-04-24 12:00:00  speed:  18.5  +/-  1.7 m/hr"
## [1] "3  from  2022-04-24 12:00:00  to  2022-04-27 17:00:00  speed:  18.3  +/-  4.2 m/hr"
## [1] "4  from  2022-04-27 17:00:00  to  2022-05-04  speed:  26.9  +/-  2.9 m/hr"
```