Untitled

```
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(ggplot2)
library(car)
```

```
Warning: package 'car' was built under R version 4.4.2

Loading required package: carData

Warning: package 'carData' was built under R version 4.4.2

Attaching package: 'car'

The following object is masked from 'package:dplyr':

    recode
```

```
library(stringr)
library(lubridate)
```

```
Attaching package: 'lubridate'

The following objects are masked from 'package:base':

    date, intersect, setdiff, union
```

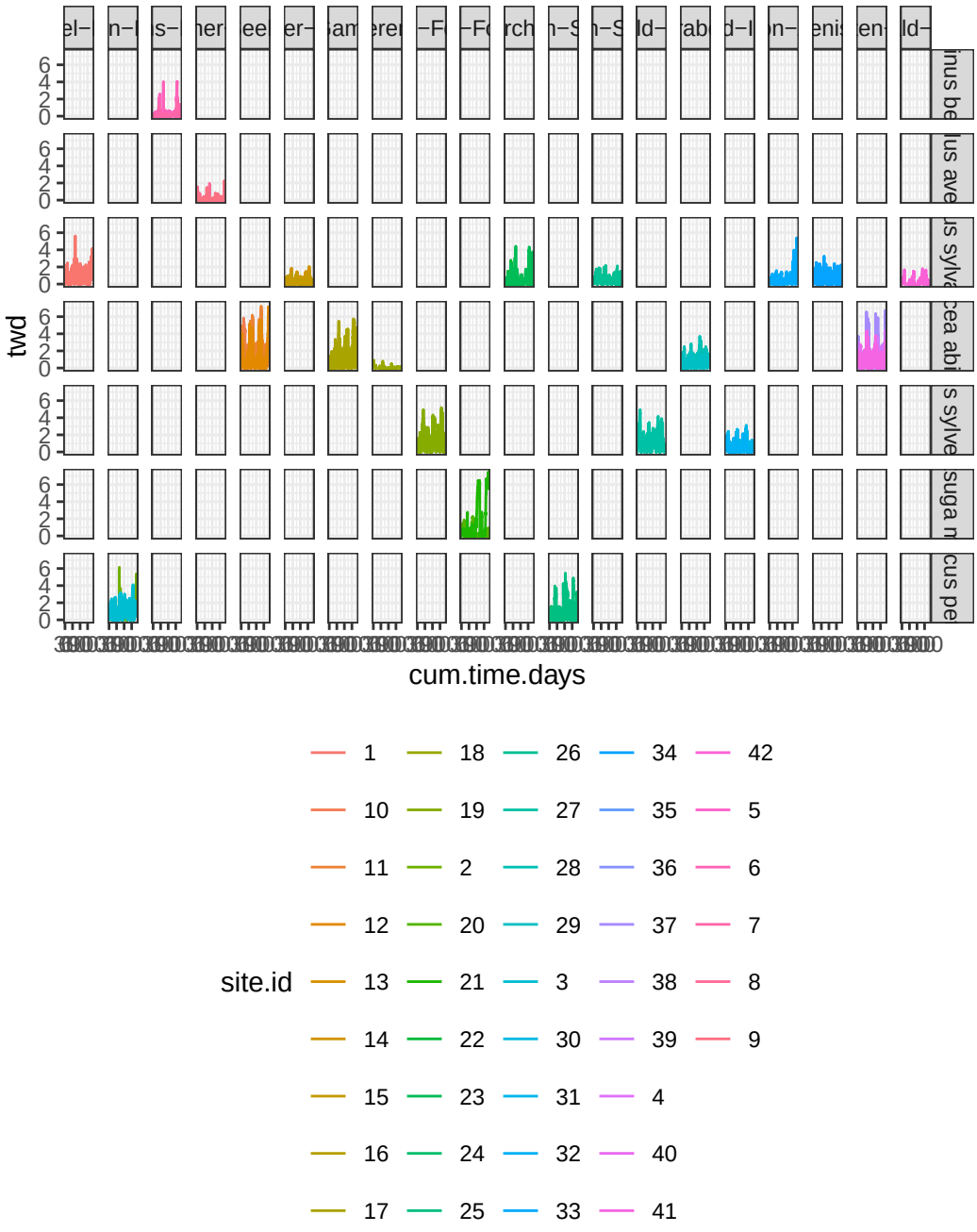
```
knitr::opts_chunk$set(fig.height=7)
```

```
tstoy04_series <- read.csv("tstoy04/tstoy04_series.csv")
tstoy04_series$site.id <- 1:nrow(tstoy04_series)
tstoy04_sites <- read.csv("tstoy04/tstoy04_sites.csv")

list.ts.files <- list.files("tstoy04/SeparateSeries", full.names = TRUE)
list.ts <- lapply(list.ts.files, read.csv)
df.ts <- bind_rows(list.ts, .id = "site.id")

df.ts.series <- merge(df.ts, tstoy04_series)
```

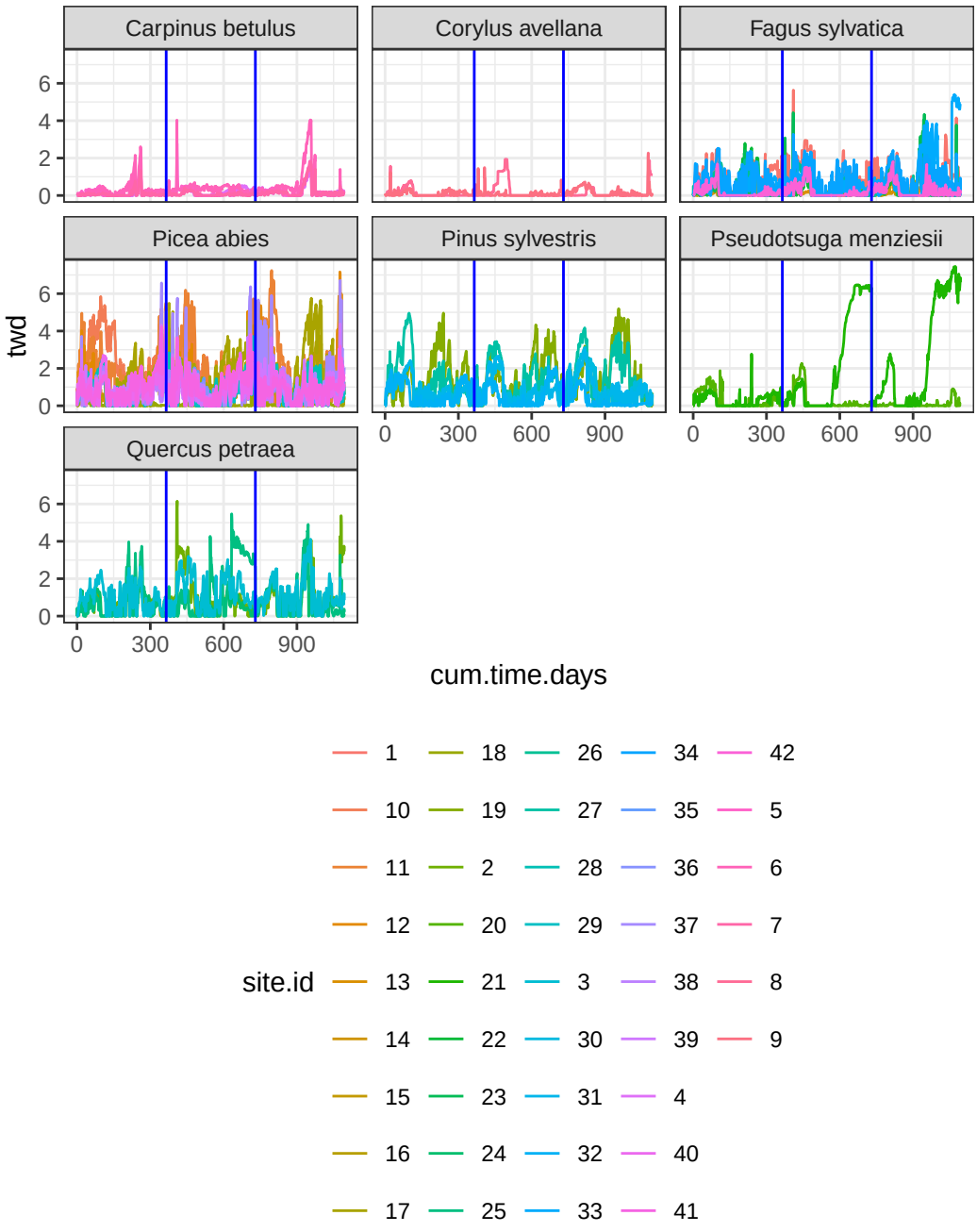
```
df.ts.series <- df.ts.series %>%
  group_by(site.id) %>%
  mutate(
    year =  substr(ts, 1, 4),
    ts = as.Date(ts),
    diff.ts = ts - lag(ts),
    diff.days = as.numeric(diff.ts, units = 'days'),
    diff.days = ifelse(is.na(diff.days), 0, diff.days),
    cum.time.days = cumsum(diff.days),
    day.of.year =  yday(ts),
    month = month(ts)
)

first.time.point <- df.ts.series %>%
  group_by(site.id) %>%
  slice(1) %>%
  pull(ts)
all(first.time.point == "2020-01-01")
```

```
[1] TRUE
```

```
plot_basic <- ggplot(df.ts.series, aes(x = cum.time.days, y = twd, group = site.id)) +
  geom_line(aes(color = site.id)) +
  theme_bw() +
  theme(legend.position='bottom')

plot_basic +
  facet_grid(vars(species), vars(site))
```




```
plot_basic +
  geom_vline(xintercept = 365, color = "blue") +
  geom_vline(xintercept = 730, color = "blue") +
  facet_wrap(~species)
```




```
ggplot(
  df.ts.series,
  aes(x = day.of.year, y = twd,
  group = interaction(year, site.id))) +
```

```
  geom_line(aes(color = year)) +
  facet_wrap(~species) +
  theme(legend.position='bottom')
```

```r
cor(df.ts.series$twd, df.ts.series$at)
```

```
[1] -0.1194709
```

```r
cor(df.ts.series$twd, df.ts.series$day.of.year)
```

```
[1] 0.05389005
```

```r
#cor(df.ts.series$twd, df.ts.series$year)

lapply(df.ts.series, class)
```

```
$site.id
[1] "character"

$ts
[1] "Date"

$twd
[1] "numeric"

$pr
[1] "numeric"

$at
[1] "numeric"

$ws
[1] "numeric"

$dp
[1] "numeric"

$sr
[1] "numeric"

$lr
[1] "numeric"

$series
```

```
[1] "integer"

$species
[1] "character"

$site
[1] "character"

$year
[1] "character"

$diff.ts
[1] "difftime"

$diff.days
[1] "numeric"

$cum.time.days
[1] "numeric"

$day.of.year
[1] "numeric"

$month
[1] "numeric"
```

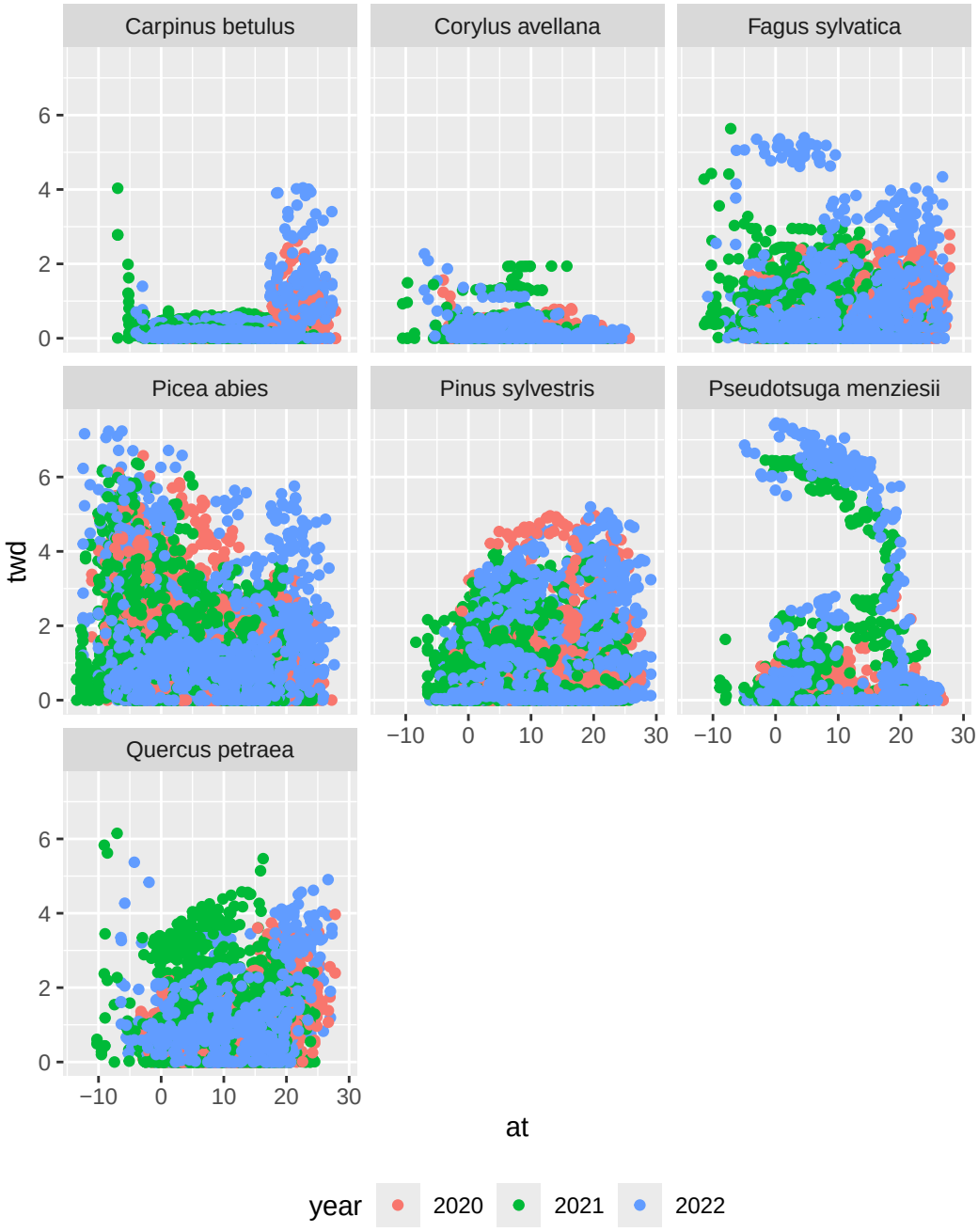
```
num.cols <- c("twd", "pr", "at", "ws", "dp", "sr", "lr", "day.of.year")
num.vars.df <- df.ts.series[,num.cols]
cor_matrix <- cor(num.vars.df, use = "complete.obs")
cor_matrix
```

```
                  twd           pr           at          ws          dp
twd          1.000000000 -0.131262923 -0.119470916 -0.12483220 -0.22037315
pr          -0.131262923  1.000000000  0.002590598  0.08997804  0.16716389
at          -0.119470916  0.002590598  1.000000000  0.08083005  0.90584762
ws          -0.124832202  0.089978045  0.080830051  1.00000000  0.02792756
dp          -0.220373147  0.167163893  0.905847623  0.02792756  1.00000000
sr           0.008947053 -0.276992037  0.614793728  0.04611393  0.38822556
lr          -0.198775942  0.344976601  0.764139599  0.08014614  0.88312535
day.of.year  0.053890048  0.032564700  0.189554518 -0.13950669  0.28942973
                    sr          lr day.of.year
twd          0.008947053 -0.19877594  0.05389005
```

```
pr          -0.276992037  0.34497660  0.03256470
at           0.614793728  0.76413960  0.18955452
ws           0.046113925  0.08014614 -0.13950669
dp           0.388225562  0.88312535  0.28942973
sr           1.000000000  0.16082884 -0.17224888
lr           0.160828837  1.00000000  0.26590182
day.of.year -0.172248882  0.26590182  1.00000000
```

```
#pairs(num.vars.df)
```

```
ggplot(
  df.ts.series,
  aes(x = at, y = twd,
  group = interaction(year, site.id))) +
  geom_point(aes(color = year)) +
  facet_wrap(~species) +
  theme(legend.position='bottom')
```



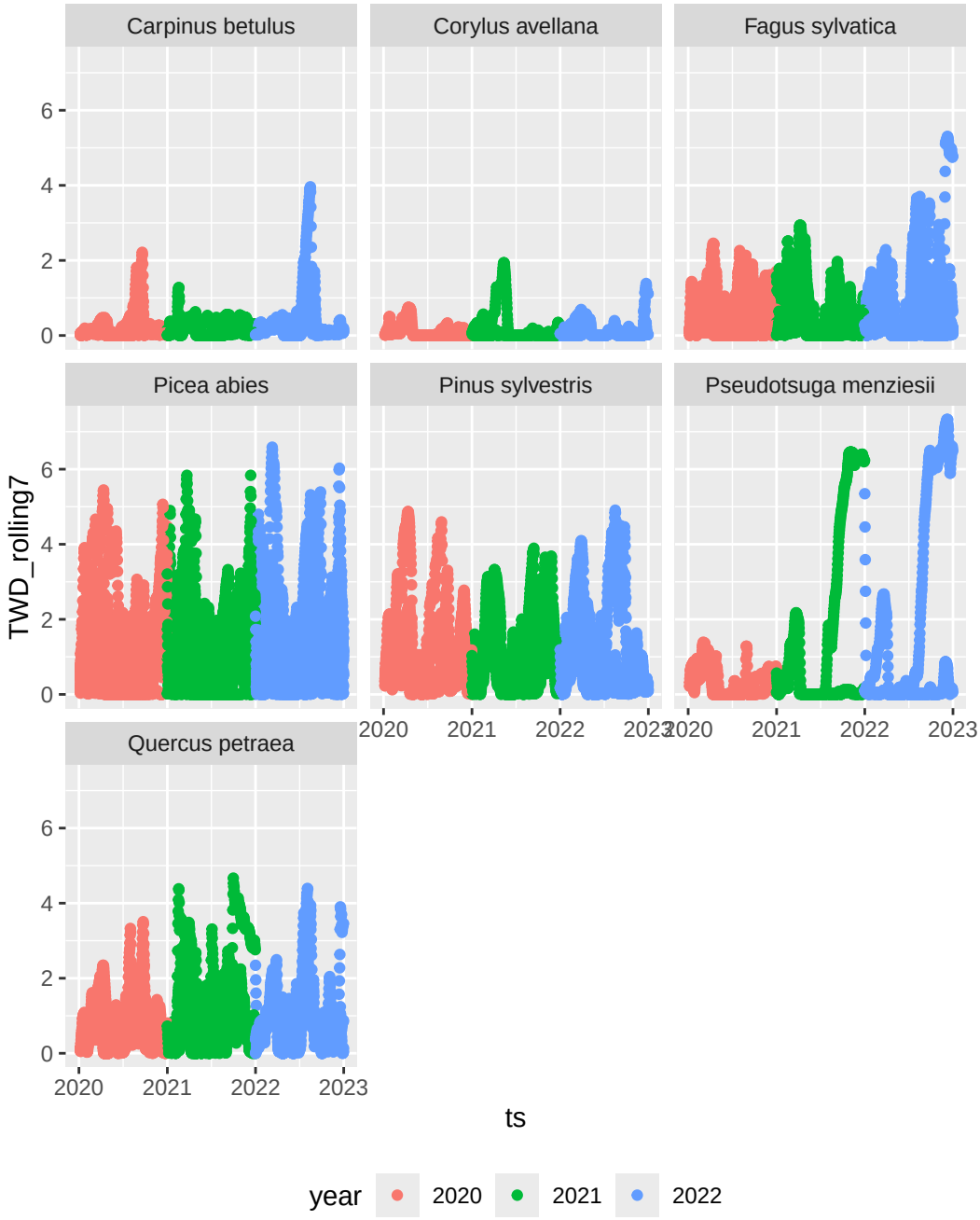

```
library(zoo)
```

```
Warning: package 'zoo' was built under R version 4.4.1
```

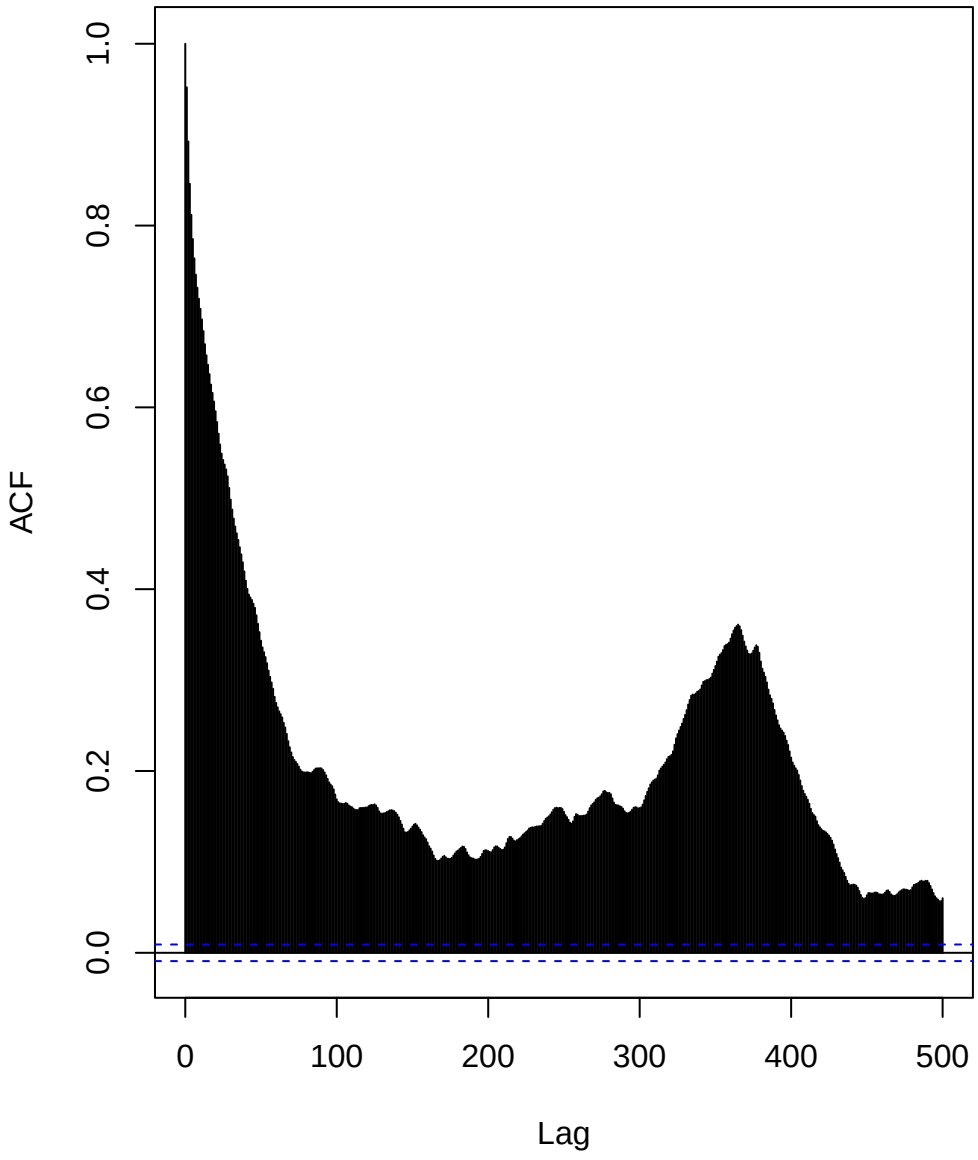
```
Attaching package: 'zoo'

The following objects are masked from 'package:base':

    as.Date, as.Date.numeric
```

```
df.ts.series <- df.ts.series %>%
  mutate(
    TWD_rolling7 = rollmean(twd, k = 7, fill = NA, align = "right")
  )

ggplot(
  df.ts.series,
  aes(x = ts, y = TWD_rolling7,
  group = interaction(year, site.id))) +
  geom_point(aes(color = year)) +
  facet_wrap(~species) +
  theme(legend.position='bottom')
```

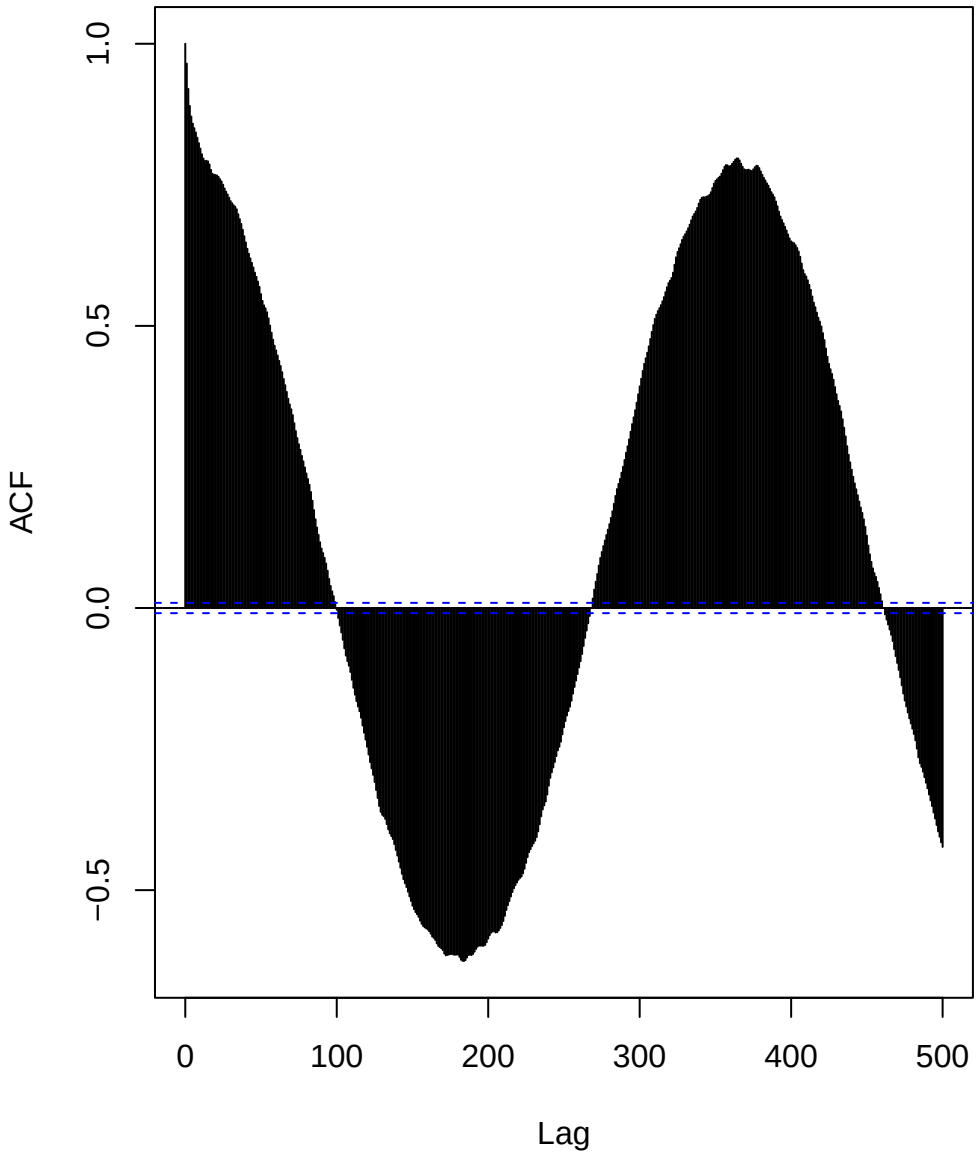
```
Warning: Removed 252 rows containing missing values or values outside the scale range
(`geom_point()`).
```




```r
acf(df.ts.series$twd, lag.max = 500)
```




```
# clear cycl because high correlation again at 365 days

acf(df.ts.series$at, lag.max = 500)
```


Series df.ts.series$at
ACF
1.0
0.5
0.0
−0.5
0
100
200
300
400
500
Lag