

Weekly Flux Characterisitics

PAZ

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Purpose

This document creates summary variables for discharge characteristics by sub-weeks.

Input files:

- **hydroAlteck2016_R.csv** (Book 2.0)
- **WeeklyHydro_R.csv** (for reference only)

Output files:

- **groupAlteck2016_R** (line 256, use in Shiny App, and for BEACH data)
- **fluxAlteck2016_R.csv**
-

Required R-packages:

```
# Date-time functions
```

```
library("ggplot2")
library("chron")
library("stringr")
library("plyr")
library("dplyr")
```

Working directory

```
getwd()
```

```
## [1] "D:/Documents/these_pablo/Alteckendorf2016/HydrologicalMonitoring"
```

Import data

```
grpAlteck = read.csv2("Data/hydroAlteck2016_R.csv")
head(grpAlteck)
```

```
##           Date      DateCheck.S      DateCheck Q.m3Hrs  Qna
## 1 2016-03-25 00:04:00 25/03/2016 00:04 25/03/2016 00:04   1.192 1.192
## 2 2016-03-25 00:06:00 25/03/2016 00:06 25/03/2016 00:06   1.212 1.212
## 3 2016-03-25 00:08:00 25/03/2016 00:08 25/03/2016 00:08   1.195 1.195
## 4 2016-03-25 00:10:00 25/03/2016 00:10 25/03/2016 00:10   1.219 1.219
## 5 2016-03-25 00:12:00 25/03/2016 00:12 25/03/2016 00:12   1.217 1.217
## 6 2016-03-25 00:14:00 25/03/2016 00:14 25/03/2016 00:14   1.230 1.230
##   Qapprox Qinterp   Q.HW1      Q.HW2   DayMoYr Vol2min sampleQ
```

```
## 1 1.192 1.192 1.248600 1.182 2016-03-25 0.04162000 NA
## 2 1.212 1.212 1.237280 1.15424605576659 2016-03-25 0.04124267 NA
## 3 1.195 1.195 1.232224 1.17064567467883 2016-03-25 0.04107413 NA
## 4 1.219 1.219 1.224779 1.15616381968654 2016-03-25 0.04082597 NA
## 5 1.217 1.217 1.223623 1.17726250242028 2016-03-25 0.04078745 NA
## 6 1.230 1.230 1.222299 1.17700401428494 2016-03-25 0.04074329 NA
##      Type Rain.mm Rain12min.mm
## 1 Discharge      0           0
## 2 Discharge      0           0
## 3 Discharge      0           0
## 4 Discharge      0           0
## 5 Discharge      0           0
## 6 Discharge      0           0

grpAlteck$Date = as.POSIXct(strptime(grpAlteck$Date, "%Y-%m-%d %H:%M", tz="EST"))
class(grpAlteck$Date)

## [1] "POSIXct" "POSIXt"

sum(is.na(grpAlteck$Date))

## [1] 0

sum(is.na(grpAlteck$Q.HW1))

## [1] 0
```

Define the Weekly discharge tags

```
grpAlteck$SubWeeks = NA
grpAlteck$SubWeeks[grpAlteck$Date < as.POSIXct("2016-03-25 12:04:00", tz = "EST")] = as.character("W0-0")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-03-25 12:04:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-03-28 22:37:00", tz = "EST")] = as.character("W0-1")

#
grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-03-28 22:37:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-03-30 12:17:00", tz = "EST")] = as.character("W0-2x") # Not samp

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-03-30 12:17:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-03-31 15:35:00", tz = "EST")] = as.character("W1-1")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-03-31 15:35:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-04-01 14:55:00", tz = "EST")] = as.character("W1-2")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-04-01 14:45:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-04-05 15:07:00", tz = "EST")] = as.character("W1-3x") # Not samp

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-04-05 15:07:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-04-06 14:51:00", tz = "EST")] = as.character("W2-1")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-04-06 14:51:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-04-09 00:38:50")] = as.character("W2-2")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-04-08 00:38:00", tz = "EST") &
```

```

    grpAlteck$Date < as.POSIXct("2016-04-14 13:51:00", tz = "EST")] = as.character("W2-3x") # Not samp

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-04-14 13:51:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-04-16 18:32:00", tz = "EST")] = as.character("W3-1")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-04-16 18:32:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-04-17 09:02:00", tz = "EST")] = as.character("W3-2")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-04-17 09:02:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-04-18 20:30:00", tz = "EST")] = as.character("W3-2.1x") # Not sm

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-04-18 20:30:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-04-21 09:11:00", tz = "EST")] = as.character("W3-3")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-04-21 09:11:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-04-23 06:37:00", tz = "EST")] = as.character("W4-1")

#
grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-04-23 06:37:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-04-26 11:50:00", tz = "EST")] = as.character("W4-2x") # Not samp

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-04-26 11:50:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-05-01 10:46:00", tz = "EST")] = as.character("W5-1")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-05-01 10:46:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-05-03 12:02:00", tz = "EST")] = as.character("W5-2")

#
grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-05-03 12:02:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-05-03 13:09:00", tz = "EST")] = as.character("W5-3x")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-05-03 13:09:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-05-10 00:05:00", tz = "EST")] = as.character("W6-1")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-05-10 00:05:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-05-12 06:33:00", tz = "EST")] = as.character("W6-2")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-05-12 06:33:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-05-12 09:12:00", tz = "EST")] = as.character("W6-3")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-05-12 09:12:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-05-12 12:52:00", tz = "EST")] = as.character("W6-4")

#
grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-05-12 12:52:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-05-13 12:05:00", tz = "EST")] = as.character("W6-5x") # Not samp

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-05-13 12:05:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-05-16 15:11:00", tz = "EST")] = as.character("W7-1")

#
grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-05-16 15:11:00", tz = "EST") &

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    grpAlteck$Date < as.POSIXct("2016-05-17 09:16:00", tz = "EST")] = as.character("W7-2x") # Not samp

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-05-17 09:16:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-05-23 18:02:00", tz = "EST")] = as.character("W8-1")

#
grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-05-23 18:02:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-05-24 12:00:00", tz = "EST")] = as.character("W8-2x") # Not samp

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-05-24 12:00:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-05-29 12:09:00", tz = "EST")] = as.character("W9-1")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-05-29 12:09:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-05-30 05:48:00", tz = "EST")] = as.character("W9-2")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-05-30 05:48:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-05-30 12:11:00", tz = "EST")] = as.character("W9-3")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-05-30 12:11:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-05-30 17:28:00", tz = "EST")] = as.character("W9-4")
##
grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-05-30 17:28:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-05-31 12:00:00", tz = "EST")] = as.character("W9-5x") # Not samp

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-05-31 12:00:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-06-02 12:57:00", tz = "EST")] = as.character("W10-1")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-06-02 12:57:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-06-03 12:05:00", tz = "EST")] = as.character("W10-2")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-06-03 12:05:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-06-04 08:35:00", tz = "EST")] = as.character("W10-3")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-06-04 08:35:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-06-04 11:00:00", tz = "EST")] = as.character("W10-4")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-06-04 11:00:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-06-04 15:31:00", tz = "EST")] = as.character("W10-5")

#
grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-06-04 15:31:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-06-07 12:00:00", tz = "EST")] = as.character("W10-6x") # Not samp

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-06-07 12:00:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-06-10 05:25:00", tz = "EST")] = as.character("W11-1")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-06-10 05:25:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-06-14 12:34:00", tz = "EST")] = as.character("W11-2")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-06-14 12:34:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-06-14 13:06:00", tz = "EST")] = as.character("W11-3")

```

```

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-06-14 13:06:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-06-15 08:14:00", tz = "EST")] = as.character("W12-1")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-06-15 08:14:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-06-16 08:21:00", tz = "EST")] = as.character("W12-2")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-06-16 08:21:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-06-17 00:49:00", tz = "EST")] = as.character("W12-3")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-06-17 00:49:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-06-17 11:05:00", tz = "EST")] = as.character("W12-4")

#
grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-06-17 11:05:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-06-21 12:00:00", tz = "EST")] = as.character("W12-5x") # Not sam

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-06-21 12:00:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-06-24 14:51:00", tz = "EST")] = as.character("W13-1")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-06-24 14:51:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-06-25 07:49:00", tz = "EST")] = as.character("W13-2")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-06-25 07:49:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-06-28 08:55:00", tz = "EST")] = as.character("W13-3")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-06-28 08:55:00", tz = "EST") &
  grpAlteck$Date < as.POSIXct("2016-07-04 14:41:00", tz = "EST")] = as.character("W14-1")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-07-04 14:41:00", tz = "EST") &
  grpAlteck$Date <= as.POSIXct("2016-07-12 10:20:00", tz = "EST")] = as.character("W15-1")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-09-08 00:00:00", tz = "EST") &
  grpAlteck$Date <= as.POSIXct("2016-09-08 23:59:00", tz = "EST")] = as.character("W16-1")

grpAlteck$SubWeeks[grpAlteck$Date >= as.POSIXct("2016-09-30 00:00:00", tz = "EST") &
  grpAlteck$Date <= as.POSIXct("2016-09-30 23:59:00", tz = "EST")] = as.character("W17-1")

head(grpAlteck)

```

```

##          Date      DateCheck.S      DateCheck Q.m3Hrs  Qna
## 1 2016-03-25 00:04:00 25/03/2016 00:04 25/03/2016 00:04   1.192 1.192
## 2 2016-03-25 00:06:00 25/03/2016 00:06 25/03/2016 00:06   1.212 1.212
## 3 2016-03-25 00:08:00 25/03/2016 00:08 25/03/2016 00:08   1.195 1.195
## 4 2016-03-25 00:10:00 25/03/2016 00:10 25/03/2016 00:10   1.219 1.219
## 5 2016-03-25 00:12:00 25/03/2016 00:12 25/03/2016 00:12   1.217 1.217
## 6 2016-03-25 00:14:00 25/03/2016 00:14 25/03/2016 00:14   1.230 1.230
##  Qapprox Qinterp   Q.HW1      Q.HW2   DayMoYr   Vol2min sampleQ
## 1    1.192    1.192 1.248600      1.182 2016-03-25 0.04162000      NA
## 2    1.212    1.212 1.237280 1.15424605576659 2016-03-25 0.04124267      NA
## 3    1.195    1.195 1.232224 1.17064567467883 2016-03-25 0.04107413      NA
## 4    1.219    1.219 1.224779 1.15616381968654 2016-03-25 0.04082597      NA
## 5    1.217    1.217 1.223623 1.17726250242028 2016-03-25 0.04078745      NA
## 6    1.230    1.230 1.222299 1.17700401428494 2016-03-25 0.04074329      NA
##          Type Rain.mm Rain12min.mm SubWeeks

```

```
## 1 Discharge      0      0      W0-0x
## 2 Discharge      0      0      W0-0x
## 3 Discharge      0      0      W0-0x
## 4 Discharge      0      0      W0-0x
## 5 Discharge      0      0      W0-0x
## 6 Discharge      0      0      W0-0x
```

```
sum(is.na(grpAlteck$Q.m3Hrs))
```

```
## [1] 0
```

```
sum(is.na(grpAlteck$SubWeeks))
```

```
## [1] 29111
```

```
sum(is.na(grpAlteck$Q.HW1))
```

```
## [1] 0
```

Define new sub-IDs

```
Split <- strsplit(grpAlteck$SubWeeks, "-", fixed = TRUE)
grpAlteck$Weeks <- sapply(Split, "[", 1)
```

```
Split2 <- strsplit(grpAlteck$SubWeeks, "W", fixed = TRUE)
grpAlteck$WeekNo <- sapply(Split2, "[", 2)
```

```
Split3 <- strsplit(grpAlteck$WeekNo, "-", fixed=T)
grpAlteck$WeekNo <- sapply(Split3, "[", 1)
grpAlteck$WeekNo = as.numeric(grpAlteck$WeekNo)
```

```
head(grpAlteck)
```

```
##           Date      DateCheck.S      DateCheck Q.m3Hrs  Qna
## 1 2016-03-25 00:04:00 25/03/2016 00:04 25/03/2016 00:04   1.192 1.192
## 2 2016-03-25 00:06:00 25/03/2016 00:06 25/03/2016 00:06   1.212 1.212
## 3 2016-03-25 00:08:00 25/03/2016 00:08 25/03/2016 00:08   1.195 1.195
## 4 2016-03-25 00:10:00 25/03/2016 00:10 25/03/2016 00:10   1.219 1.219
## 5 2016-03-25 00:12:00 25/03/2016 00:12 25/03/2016 00:12   1.217 1.217
## 6 2016-03-25 00:14:00 25/03/2016 00:14 25/03/2016 00:14   1.230 1.230
##   Qapprox Qinterp   Q.HW1      Q.HW2   DayMoYr   Vol2min sampleQ
## 1   1.192   1.192 1.248600      1.182 2016-03-25 0.04162000      NA
## 2   1.212   1.212 1.237280 1.15424605576659 2016-03-25 0.04124267      NA
## 3   1.195   1.195 1.232224 1.17064567467883 2016-03-25 0.04107413      NA
## 4   1.219   1.219 1.224779 1.15616381968654 2016-03-25 0.04082597      NA
## 5   1.217   1.217 1.223623 1.17726250242028 2016-03-25 0.04078745      NA
## 6   1.230   1.230 1.222299 1.17700401428494 2016-03-25 0.04074329      NA
##           Type Rain.mm Rain12min.mm SubWeeks Weeks WeekNo
## 1 Discharge      0      0      W0-0x      W0      0
## 2 Discharge      0      0      W0-0x      W0      0
## 3 Discharge      0      0      W0-0x      W0      0
## 4 Discharge      0      0      W0-0x      W0      0
```

```
## 5 Discharge      0          0    WO-0x    WO      0
## 6 Discharge      0          0    WO-0x    WO      0
```

Classifying events

```
library(plyr)
library(dplyr)
library(gridExtra)

##
## Attaching package: 'gridExtra'

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

library("scales")

detach("package:plyr", unload=TRUE)

## Warning: 'plyr' namespace cannot be unloaded:
## namespace 'plyr' is imported by 'scales', 'ggplot2' so cannot be unloaded

Q1change <- mutate(grpAlteck, Row = 1:n()) %>%
  mutate(PercentChange = (Q.HW1-lag(Q.HW1))/lag(Q.HW1) * 100)
Q1change$PercentChange[1] <- 0

dd <- Q1change[, c("Date", "Q.HW1")]
# set the number of rows to reduce by
idx <- ceiling(seq_len(nrow(Q1change)) / 10)
# do colMeans on the last column with lapply
# bind them with rbind to give a matrix, then convert to as.data.frame
res <- as.data.frame(do.call(rbind, lapply(split(dd[ncol(dd)], idx),
  colMeans, na.rm = TRUE)))
# assign first value of "Date" in each n-th group to the new dataframe
res$Date <- dd$Date[seq(1, nrow(dd), by=10)]

# Compute the %change on every row
res1 <- mutate(res, Event = 1:n()) %>%
  mutate(PercentChange = (Q.HW1-lag(Q.HW1))/lag(Q.HW1) * 100)

res1 <- mutate(res1, Event = 1:n()) %>%
  mutate(Change = (Q.HW1-lag(Q.HW1)))

res1$PercentChange[1] <- 0

res1$Markers1 <- ifelse( res1$Change > 5 , res1$Q.HW1, NA)
res1$Markers2 <- ifelse( res1$PercentChange > 90 & res1$Q.HW1 >20 & res1$Q.HW1 < 100, res1$Q.HW1, NA)

res1$Markers <- ifelse(!is.na(res1$Markers1), res1$Markers1,
  ifelse(!is.na(res1$Markers2), res1$Markers2, NA))
res <- res1[complete.cases(res1["Markers"]),]

resTime <- mutate(res, Event = 1:n()) %>%
```



```

mutate(TimeDiff = Date-lag(Date))

resTime$TimeDiff[1]<-1440
resTime <- resTime[resTime$TimeDiff > 20, ]

# For some reason, changed minutes to hrs
resTime <- mutate(resTime, Event = 1:n()) %>%
  mutate(TimeDiff = Date-lag(Date))

# Add first row time, so as to not loose it
resTime$TimeDiff[1]<-24
resTime <- resTime[resTime$TimeDiff > 5, ]
resTime <- mutate(resTime, Event = 1:n()) %>%
  mutate(TimeDiff = Date-lag(Date))

resTime$TimeDiff[1]<-24
resTime <- resTime[resTime$TimeDiff >= 9, ]
resTime <- mutate(resTime, Event = 1:n()) %>%
  mutate(TimeDiff = Date-lag(Date))

resTime$TimeDiff[1]<-24
resTime <- resTime[resTime$TimeDiff > 12, ]
resTime <- mutate(resTime, Event = 1:n()) %>%
  mutate(TimeDiff = Date-lag(Date))

resTime$TimeDiff[1]<-24
resTime$Markers1 <- NULL
resTime$Markers2 <- NULL
resTime$Q.HW1 <- NULL

grpAlteck <- merge(grpAlteck, resTime, by= "Date", all = T)
sum(is.na(grpAlteck$Q.HW1))

## [1] 0

grpAlteck$numNoEvent <- ifelse(grpAlteck$Q.HW1 < 18, 1, 0)
grpAlteck$numNoEvent <- ifelse(is.na(grpAlteck$numNoEvent), 0, grpAlteck$numNoEvent)
sum(is.na(grpAlteck$numNoEvent))

## [1] 0

# No Event counts the number of hours without a major discharge (i.e. 18 m3/h)
noEventVect <- grpAlteck$numNoEvent
aux <- split(noEventVect, cumsum(noEventVect == 0))
v <- unlist(sapply(aux, cumsum))
grpAlteck$noEventHrs <- v/60 # Convert to Hrs

# No rain counts for Hrs without at least 0.2 mm rain (in a 2 minute interval)
grpAlteck$numNoRain <- ifelse(grpAlteck$Rain.mm < 0.2, 1, 0)
grpAlteck$numNoRain <- ifelse(is.na(grpAlteck$numNoRain), 1, grpAlteck$numNoRain)
sum(is.na(grpAlteck$numNoRain))

## [1] 0

noRainVect <- grpAlteck$numNoRain

```



```

aux2 <- split(noRainVect, cumsum(noRainVect == 0))
v2 <- unlist(sapply(aux2, cumsum))
grpAlteck$dryhrs <- v2/60

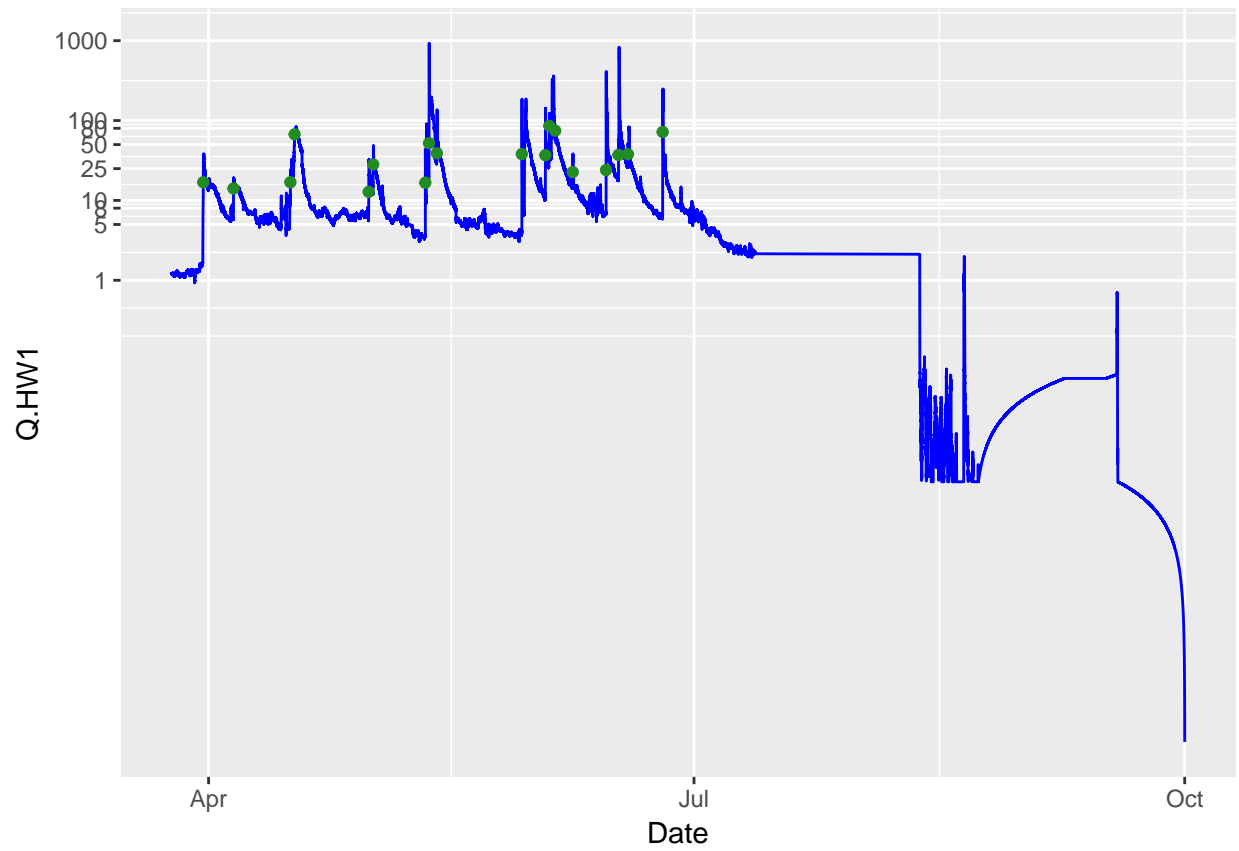
#length(grpAlteck$numNoEvent)
#length(noEventVect)

#grpAlteck$minSinceEvent <- NA
#cumDuration <- 0
# if Q.HW1 < 10m3h: cumDuration += 3 min
# else cumDuration = 0
# for every cell in Date, assign cumDuration to timeSinceEvent
#for (i in 1:length(grpAlteck$Date)) {
#  if (grpAlteck[i,]['Q.HW1'] < 17){
#    grpAlteck[i,]['minSinceEvent'] = cumDuration
#    cumDuration <- cumDuration + 3.0
#  } else {
#    cumDuration <- 0
#    grpAlteck[i,]['minSinceEvent'] = cumDuration
#  }
#}

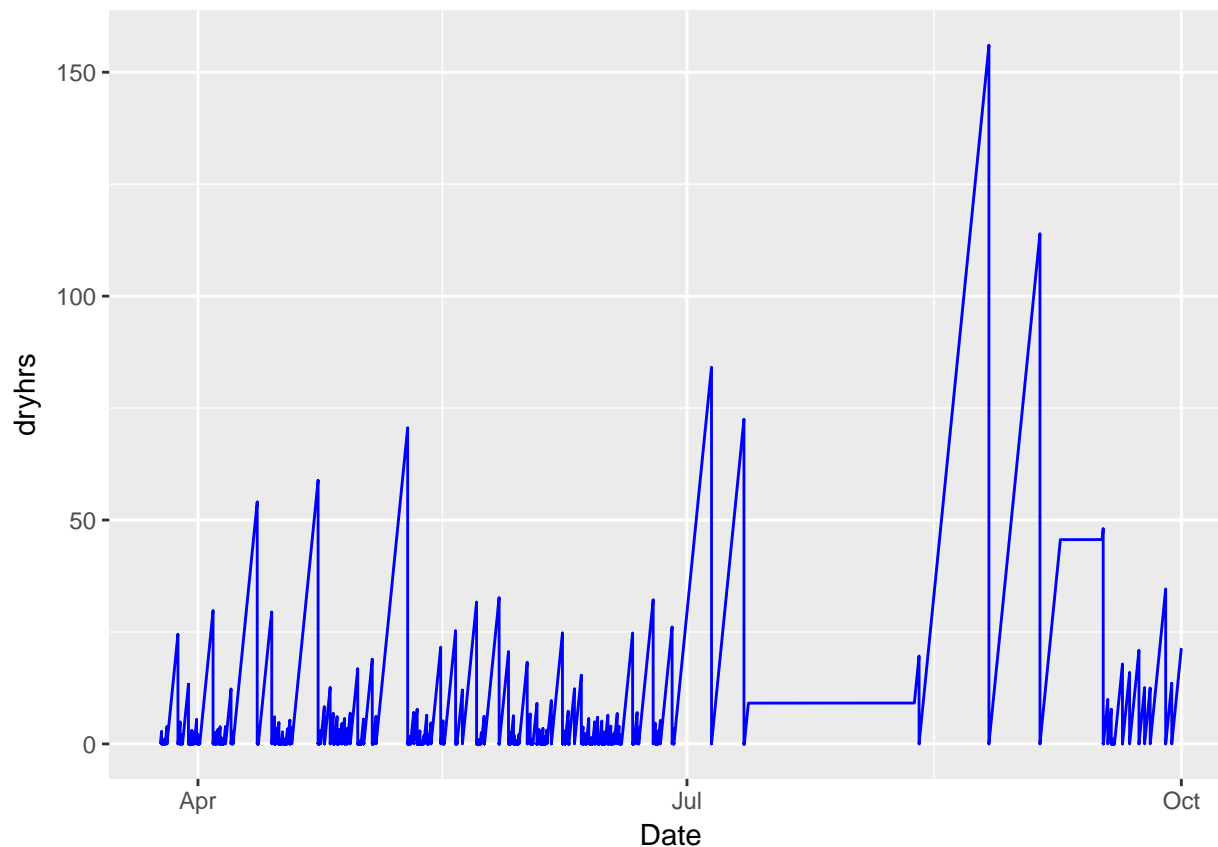
# (Sub)Event markers
ggplot() +
  geom_line(data = grpAlteck, aes(x= Date, y = Q.HW1), color = "blue") +
  geom_point(data = grpAlteck, aes(x= Date, y = Markers), color = "forestgreen") +
  scale_y_continuous(trans=log_trans(), breaks=c(1,5,8, 10,25, 50, 80, 100,1000))

## Warning: Removed 108926 rows containing missing values (geom_point).

```



```
ggplot() +  
  geom_line(data = grpAlteck, aes(x= Date, y = dryhrs), color = "blue")
```



Save the file in current state, as it is needed in the App.

```
write.csv2(grpAlteck, "Data/groupAlteck2016_R.csv", row.names = F)
```

Characterize discharge sub-weeks (i.e. sampled discharge)

The data frame produced will include, for each sub-week, the:

- initial time (ti)
- final time (tf)
- initial discharge (iflux)
- final discharge (fflux)
- change in discharge between ti and tf (changeflux)
- change in discharge to extreme (maxQ or minQ) withing subsample (chExtreme)
- discharge at maxQ (maxQ)
- minimum discharge (minQ)
- elapsed time in hours (tdiff)

```
colnames(grpAlteck)
```

```
## [1] "Date"          "DateCheck.S"   "DateCheck"     "Q.m3Hrs"
## [5] "Qna"           "Qapprox"       "Qinterp"       "Q.HW1"
## [9] "Q.HW2"         "DayMoYr"       "Vol2min"       "sampleQ"
## [13] "Type"          "Rain.mm"       "Rain12min.mm"  "SubWeeks"
## [17] "Weeks"         "WeekNo"        "Event"         "PercentChange"
## [21] "Change"        "Markers"       "TimeDiff"      "numNoEvent"
## [25] "noEventHrs"    "numNoRain"     "dryhrs"
```

```

dflux = grpAlteck %>%
  group_by(SubWeeks) %>%
  # filter(Type == 'Sample') %>%
  select(Date, Q.HW1, SubWeeks, noEventHrs, dryhrs) %>%
  summarise(ti= Date[1],
            tf = Date[length(Date)],
            iflux = Q.HW1[1],
            fflux = Q.HW1[length(Q.HW1)],
            changeflux = (Q.HW1[length(Q.HW1)] - Q.HW1[1]),
            maxQ = max(Q.HW1),
            minQ = min(Q.HW1) ,
            dryHrsIni = dryhrs[1],
            dryHrsMax = max(dryhrs),
            dryHrsAve = mean(dryhrs),
            noEventHrsIni = noEventHrs[1],
            noEventHrsMax = max(noEventHrs),
            noEventHrsAve = mean(noEventHrs)
            )

# Time elapsed within sub-week in hrs (sampled and non-sampled)
dflux$Duration.Hrs =
  as.numeric(difftime(dflux$tf, dflux$ti, units = "hours"), units = "hours")

# "chngeExtreme" is computed as:
# If change in flux within subsample is:
# negative, maxQminQ = (min. discharge) - (initial discharge)
# positive, maxQminQ = (max. discharge) - (initial discharge)
dflux$chExtreme <- NA

dflux$chExtreme[dflux$changeflux <= 0] =
  dflux$minQ[dflux$changeflux <= 0] - dflux$iflux[dflux$changeflux <= 0]

dflux$chExtreme[dflux$changeflux > 0] =
  dflux$maxQ[dflux$changeflux > 0] - dflux$iflux[dflux$changeflux > 0]

EventMarker <- grpAlteck[, c("SubWeeks", "Event", "Markers", "TimeDiff")]
EventMarker <- EventMarker[!is.na(EventMarker$Event),]

dflux <- merge(dflux, EventMarker, by = "SubWeeks", all = T)

colnames(dflux)[1] <- "WeekSubWeek"
head(dflux)

```

```

##   WeekSubWeek      ti      tf      iflux      fflux
## 1      W0-0x 2016-03-25 00:04:00 2016-03-25 12:02:00 1.248600 1.129227
## 2      W0-1 2016-03-25 12:04:00 2016-03-28 22:36:00 1.124382 1.313125
## 3      W0-2x 2016-03-28 22:38:00 2016-03-30 12:16:00 1.308100 1.456349
## 4      W1-1 2016-03-30 12:18:00 2016-03-31 15:34:00 1.456080 16.445436
## 5      W1-2 2016-03-31 15:36:00 2016-04-01 14:44:00 16.334349 15.184536
## 6      W1-3x 2016-04-01 14:46:00 2016-04-05 15:06:00 15.203629 5.856380
##   changeflux      maxQ      minQ dryHrsIni dryHrsMax dryHrsAve
## 1 -0.1193728 1.248600 1.118296 0.01666667 2.750000 0.7449537

```

```
## 2  0.1887431  1.380388  1.082199  0.03333333  24.516667  7.8272574
## 3  0.1482496  1.637782  0.929055  0.26666667  13.316667  4.8591888
## 4  14.9893566  38.399790  1.448977  0.11666667  4.200000  1.2885633
## 5  -1.1498131  18.668972  13.201113  4.21666667  5.433333  1.3142446
## 6  -9.3472489  15.895640  5.471042  3.41666667  29.716667  9.4699181
##   noEventHrsIni noEventHrsMax noEventHrsAve Duration.Hrs  chExtreme Event
## 1    0.01666667    6.000000    3.008333    11.96667 -0.1303036   NA
## 2    6.01666667   47.283333   26.650000    82.53333  0.2560062   NA
## 3   47.30000000   66.116667   56.708333    37.63333  0.3296817   NA
## 4   66.13333333   72.100000   30.395503    27.26667  36.9437102    1
## 5    1.65000000    6.366667    3.329089    23.13333 -3.1332355   NA
## 6    6.26666667   54.433333   30.350000    96.33333 -9.7325862   NA
##   Markers TimeDiff
## 1      NA NA hours
## 2      NA NA hours
## 3      NA NA hours
## 4  16.88972 24 hours
## 5      NA NA hours
## 6      NA NA hours
```

Saving

```
write.csv2(dflux, "Data/fluxAlteck2016_R.csv", row.names = F)
sum(is.na(dflux$maxQ))
```

```
## [1] 0
```