Weekly Flux Characterisitics

PAZ

26 octobre 2016

Purpose

This document characterizes the flux characteristics of the discharge by sub-weeks.

Input files:

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

Output files:

- **groupAlteck2016_R** (line 256)
- **fluxAlteck2016_R.csv**
-

Required R-packages:

```
# Date-time functions

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

Working directory

```
# setwd("D:/Documents/these_pablo/Alteckendorf2016/00_TransparencyFolder")
getwd()
```

```
## [1] "D:/Documents/these_pablo/Alteckendorf2016/00_TransparencyFolder"
```

Import data

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

```
##        DateCheck.S                Date        DateCheck Q.m3Hrs   Qna
## 1 25/03/2016 00:04 2016-03-25 00:04:00 25/03/2016 00:04   1.192 1.192
## 2 25/03/2016 00:06 2016-03-25 00:06:00 25/03/2016 00:06   1.212 1.212
## 3 25/03/2016 00:08 2016-03-25 00:08:00 25/03/2016 00:08   1.195 1.195
## 4 25/03/2016 00:10 2016-03-25 00:10:00 25/03/2016 00:10   1.219 1.219
## 5 25/03/2016 00:12 2016-03-25 00:12:00 25/03/2016 00:12   1.217 1.217
## 6 25/03/2016 00:14 2016-03-25 00:14:00 25/03/2016 00:14   1.230 1.230
##   Qapprox Qinterp    Q.HW1            Q.HW2 sampleQ      Type
## 1   1.192   1.192 1.248600            1.182      NA Discharge
## 2   1.212   1.212 1.237280 1.15424267729696      NA Discharge
## 3   1.195   1.195 1.232224 1.17062590682503      NA Discharge
## 4   1.219   1.219 1.224779 1.15615409458726      NA Discharge
## 5   1.217   1.217 1.223623 1.17724053690379      NA Discharge
## 6   1.230   1.230 1.222299 1.17698892559366      NA Discharge
```

```
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
```

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") &
    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 sam

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")

head(grpAlteck)
```

```
##        DateCheck.S                Date        DateCheck Q.m3Hrs   Qna
## 1 25/03/2016 00:04 2016-03-25 00:04:00 25/03/2016 00:04   1.192 1.192
## 2 25/03/2016 00:06 2016-03-25 00:06:00 25/03/2016 00:06   1.212 1.212
## 3 25/03/2016 00:08 2016-03-25 00:08:00 25/03/2016 00:08   1.195 1.195
## 4 25/03/2016 00:10 2016-03-25 00:10:00 25/03/2016 00:10   1.219 1.219
## 5 25/03/2016 00:12 2016-03-25 00:12:00 25/03/2016 00:12   1.217 1.217
## 6 25/03/2016 00:14 2016-03-25 00:14:00 25/03/2016 00:14   1.230 1.230
##   Qapprox Qinterp    Q.HW1            Q.HW2 sampleQ      Type SubWeeks
## 1   1.192   1.192 1.248600            1.182      NA Discharge    W0-0x
## 2   1.212   1.212 1.237280 1.15424267729696      NA Discharge    W0-0x
## 3   1.195   1.195 1.232224 1.17062590682503      NA Discharge    W0-0x
## 4   1.219   1.219 1.224779 1.15615409458726      NA Discharge    W0-0x
## 5   1.217   1.217 1.223623 1.17724053690379      NA Discharge    W0-0x
## 6   1.230   1.230 1.222299 1.17698892559366      NA Discharge    W0-0x
```

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

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

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

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

Define new sub-IDs

```r
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)
```

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

```r
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 (peak or valley) withing subsample (chExtreme)
- discharge at peak (peak)
- minimum discharge (valley)
- elapsed time in hours (tdiff)

```r
dflux = grpAlteck %>%
  group_by(SubWeeks) %>%
  # filter(Type == 'Sample') %>%
  select(Date, Q.HW1, SubWeeks) %>%
  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]),
            peak = max(Q.HW1),
            valley = min(Q.HW1))

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

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

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

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

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

head(dflux)
```

```
## Source: local data frame [6 x 10]
##
##   WeekSubWeek                  ti                  tf     iflux     fflux
##         (chr)              (time)              (time)     (dbl)     (dbl)
## 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
## Variables not shown: changeflux (dbl), peak (dbl), valley (dbl), tdiff
##   (dbl), chExtreme (dbl)
```

Saving

```
write.csv2(dflux, "Data/fluxAlteck2016_R.csv", row.names = F)
```