Sulfate over time plots

Zhang Zhenglin   Caitlin Webster

Contents

Necessary libraries

```r
library(knitr)
library(ggplot2)
theme_set(theme_bw())
library(emmeans)
library(multcomp)
library(PLS205)
library(lme4)
library(lmerTest)
library(multcompView)
library(car)
library(Rmisc)
library(dplyr) #https://r4ds.had.co.nz/ (Chapter 3, Chapter 5, look at filter and select)
# https://bookdown.org/ansellbr/WEHI_tidyR_course_book/
library(stringr)
library(data.table)
library(GGally)
library(formatR)
library(readxl)
library(FluxCalR)
library(tidyverse)
library(fuzzyjoin)
library(purrr)
library(data.table)
library(broom)
library(lubridate)
```

```r
library(readxl)
library(openxlsx)
library(ggrepel)
library(gridExtra)
```

Load data

```r
sulfate_all <- read_excel("../Data/Sulfate + Drain IC Porewater Sampling Data - Tidy.xlsx", sheet = 1)
str(sulfate_all)
```

```
## tibble [147 x 5] (S3: tbl_df/tbl/data.frame)
##  $ Date_Analyzed          : POSIXct[1:147], format: "2025-07-24" "2025-07-24" ...
##  $ Unique_Sample_ID       : chr [1:147] "ZZL_S1" "ZZL_S2" "ZZL_S3" "ZZL_S4" ...
##  $ Plot                   : num [1:147] 101 102 103 105 106 201 203 204 205 206 ...
##  $ Date_Collected         : POSIXct[1:147], format: "2025-05-13" "2025-05-13" ...
##  $ Sulfate_Concentration_ppm: num [1:147] 84.6 106.2 156.2 44.3 161 ...
```

Allocate plot to treatments

```r
sulfate_all <- sulfate_all %>%
mutate(Treatment = case_when(
  Plot %in% c("105", "201", "301") ~ "CF",
  Plot %in% c("106", "206", "302") ~ "CF-PP",
  Plot %in% c("101", "204", "306") ~ "LD",
  Plot %in% c("103", "205", "304") ~ "LD-PP",
  Plot %in% c("102", "203", "305") ~ "LD-MS",
  TRUE ~ "Other" # This line handles cases where plot is not listed
))

#change to the right variable classes
sulfate_all$Plot <- as.factor(sulfate_all$Plot)
sulfate_all$Treatment <- as.factor(sulfate_all$Treatment)

#check that all variables look good
str(sulfate_all)
```

```
## tibble [147 x 6] (S3: tbl_df/tbl/data.frame)
##  $ Date_Analyzed          : POSIXct[1:147], format: "2025-07-24" "2025-07-24" ...
##  $ Unique_Sample_ID       : chr [1:147] "ZZL_S1" "ZZL_S2" "ZZL_S3" "ZZL_S4" ...
##  $ Plot                   : Factor w/ 15 levels "101","102","103",..: 1 2 3 4 5 6 7 8 9 10 ...
##  $ Date_Collected         : POSIXct[1:147], format: "2025-05-13" "2025-05-13" ...
##  $ Sulfate_Concentration_ppm: num [1:147] 84.6 106.2 156.2 44.3 161 ...
##  $ Treatment              : Factor w/ 5 levels "CF","CF-PP","LD",..: 3 4 5 1 2 1 4 3 5 2 ...
```

Raw scatter plot

```
ggplot(sulfate_all, aes(x = Date_Collected, y = Sulfate_Concentration_ppm,  colour =  Treatment))+
  geom_point(position = "jitter")
```
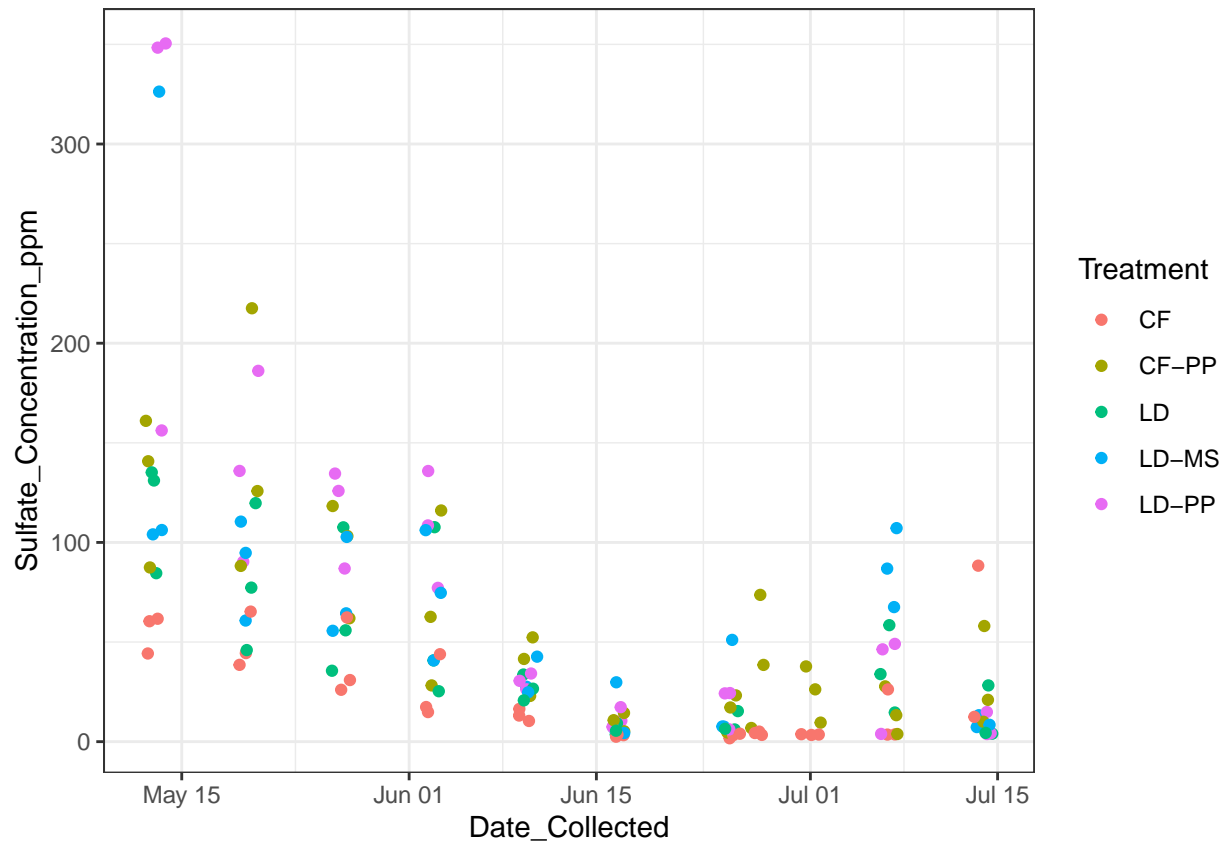


```
# geom_line()
```

Plot some graphs huehue

```
sulfate_all_graphing <- sulfate_all %>%
  group_by(Treatment, Date_Collected) %>%
  mutate(Sulfate_Concentration_ppm_se = sd(Sulfate_Concentration_ppm)/sqrt(3)) %>%
  summarise(Sulfate_Concentration_ppm = mean(Sulfate_Concentration_ppm),
  Sulfate_Concentration_ppm_se = mean(Sulfate_Concentration_ppm_se))
```

```
## 'summarise()' has grouped output by 'Treatment'. You can override using the
## '.groups' argument.
```

```
sulfate_over_time <- ggplot(sulfate_all_graphing, aes(x = Date_Collected, y = Sulfate_Concentration_ppm
  geom_point()+
```

```
geom_line()+
geom_errorbar(aes(ymin=Sulfate_Concentration_ppm-Sulfate_Concentration_ppm_se, ymax=Sulfate_Concentra
ggtitle("Sulfate over time")
```

```
## Warning: Using 'size' aesthetic for lines was deprecated in ggplot2 3.4.0.
## i Please use 'linewidth' instead.
## This warning is displayed once every 8 hours.
## Call 'lifecycle::last_lifecycle_warnings()' to see where this warning was
## generated.
```

```
sulfate_over_time
```
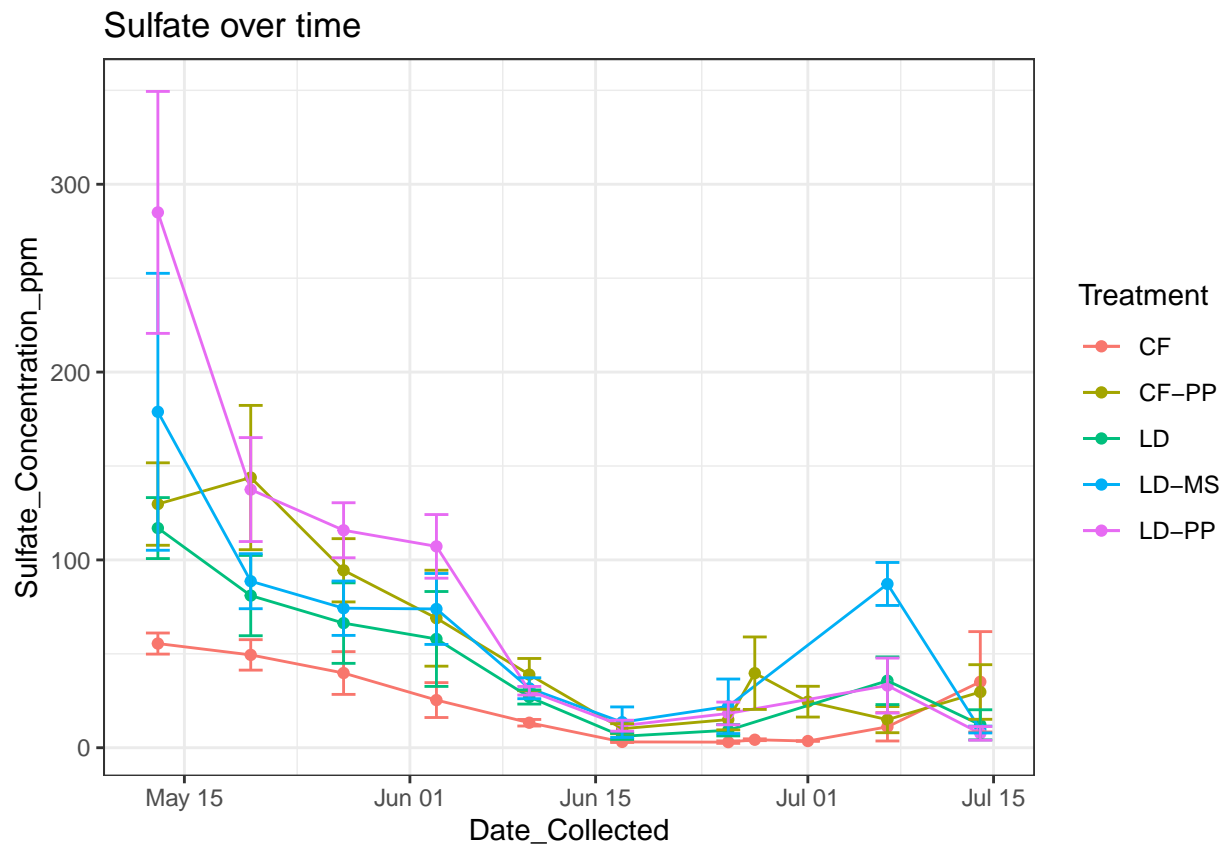


```
ggsave(sulfate_over_time, filename = "../Figures/sulfate_over_time.jpg", height = 25, width = 30, units
```