

# Mass Soils - Composite Weeks Alteck 2016

PAZ

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## Purpose

This file merges weekly composite concentrations and isotope data.

Imports:

- SoilCompConc\_W1toW15.csv
- SoilCompIsotopes\_W1toW15.csv (old, not used)
- SoilCompIsotopes\_W1toW15ng.csv

Generates:

- WeeklySoils\_Rng.csv

## Required R-packages:

```
library("plyr")
library("dplyr")
```

## Working directory

```
# setwd("D:/Documents/these_pablo/Alteckendorf2016/R")
# setwd("/Users/DayTightChunks/Documents/PhD/Routput/Alteck/R")
# setwd("D:/Documents/these_pablo/Alteckendorf2016/00_TransparencyFolder")
getwd()
```

```
## [1] "/Users/DayTightChunks/Documents/PhD/HydrologicalMonitoring"
```

## Lab Parameters

```
# Pure and cuve isotope average
d13Co = -32.253
```

```
# Lab enrichment: Alteck
#epsilon_max = -1.5 # +/- 0.3 (@ 20C, 20% vwc)
#epsilon_min = -2.0 # +/- 0.2 (@ 20C, 40% vwc)
```

```
# Essahn values:
epsilon_max = -1.8
epsilon_min = -2.6
epsilon_mean = -2.2 # ± 0.4
epsilon_mean
```

```
## [1] -2.2
```

## Field Assumptions

```
# S-metolachlor Mass [g]
# Conc. [ug/g dry soil] * [g/106 ug] * density [g/m3] * depth [m] * A [m2]
# Soil bulk density: 2200 or 0.99? -> Leaching experiments: 0.99 [g/cm3]
rho = 0.99*106 # soil density [g/m3]
depth = 0.01 # [m]

# Transect Areas pre-corn applications
Area_Na = 13.92663*104 # [m2]

# Assumptions on Non-measured plots - Transect assignment:
#Area_Ta = 6.55813*104 # [m2] # South Burger's as Talweg
#Area_Sa = 11.05376*104 # [m2] # South Burger's as Talweg
Area_Ta = 4.37134*104 # [m2]
Area_Sa = 13.3175*104 # [m2] # South Burger's as South

# Transect Areas post Corn applications (not on transect)
Area_Nb = 14.9949*104 # [m2]

# Assumptions on Non-measured plots - Transect assignment:
#Area_Tb = 6.55813*104 # [m2] # South Burger's as Talweg
#Area_Sb = 11.65202*104 # [m2] # South Burger's as Talweg
Area_Tb = 4.37134*104 # [m2]
Area_Sb = 13.91767*104 # [m2] # South Burger's as South

Area_tot <- Area_Nb + Area_Tb + Area_Sb
Area_tot

## [1] 332839.1
```

## Composite Concentrations & Isotope Data - Alteckendorf 2016

### 1. Import CSV files

```
#weeklySoilConc = read.csv2("Data/SoilCompConc_W1toW15.csv", header = TRUE)
# Date format stopped working in CSV
# Convert in CSV via "=TEXT(CELL.ID, "dd/mm/yyyy hh:mm")" based on xls-file date

weeklySoilConc = read.csv2("Data/SoilCompConc_W1toW15.csv", header = TRUE, dec = ".")
if (length(weeklySoilConc) == 1){
  weeklySoilConc = read.csv("Data/SoilCompConc_W1toW15.csv", header = TRUE)
}
head(weeklySoilConc)
```

```
##   Filename ID Transect Wnum Sample.Date      Date.Soil
## 1  AW-N-Ox AW         N    -1  30/03/2016 25/03/2016 00:04
## 2  AW-T-Ox AW         T    -1  30/03/2016 25/03/2016 00:04
## 3  AW-S-Ox AW         S    -1  30/03/2016 25/03/2016 00:04
## 4  AW-N-O  AW         N     0  30/03/2016 30/03/2016 12:18
## 5  AW-T-O  AW         T     0  30/03/2016 30/03/2016 12:18
## 6  AW-S-O  AW         S     0  30/03/2016 30/03/2016 12:18
##   Conc.mug.g.dry.soil Conc.ComSoil.SD
## 1                0.0180000          NA
```

```
## 2          0.0200000          NA
## 3          0.0290000          NA
## 4          0.8893358          0.1334004
## 5          0.8007680          0.1201152
## 6          3.2039808          0.4805971

weeklySoilConc$Date.ti <- as.POSIXct(strptime(weeklySoilConc$Date.Soil, "%d/%m/%Y %H:%M", tz="EST"))
sum(is.na(weeklySoilConc$Date.ti))

## [1] 0

# View(weeklySoilConc)
weeklySoilConc <- weeklySoilConc[,c("Filename",
                                     "Transect",
                                     "Wnum",
                                     "Date.Soil",
                                     "Date.ti",
                                     "Conc.mug.g.dry.soil",
                                     "Conc.ComSoil.SD")]

colnames(weeklySoilConc)[colnames(weeklySoilConc) == "Filename"] <- "ID"
print("Soil Composites- Concentrations")

## [1] "Soil Composites- Concentrations"

str(weeklySoilConc)

## 'data.frame':   51 obs. of  7 variables:
##  $ ID          : Factor w/ 51 levels "AW-N-0","AW-N-0x",...: 2 36 19 1 35 18 3 10 11 12 ...
##  $ Transect     : Factor w/ 3 levels "N","S","T": 1 3 2 1 3 2 1 1 1 1 ...
##  $ Wnum         : int  -1 -1 -1 0 0 0 1 2 3 4 ...
##  $ Date.Soil    : Factor w/ 17 levels "03/05/2016 13:10",...: 13 13 13 16 16 16 3 7 10 14 ...
##  $ Date.ti      : POSIXct, format: "2016-03-25 00:04:00" "2016-03-25 00:04:00" ...
##  $ Conc.mug.g.dry.soil: num  0.018 0.02 0.029 0.889 0.801 ...
##  $ Conc.ComSoil.SD   : num  NA NA NA 0.133 0.12 ...

# JESIUM data (before nangoram revision)
# weeklySoilIso = read.csv2("Data/SoilCompIsotopes_W1toW15.csv", header = TRUE)

# After nanogram revision
weeklySoilIso = read.csv2("Data/SoilCompIsotopes_W1toW15ng.csv", header = TRUE, dec = ".")
if (length(weeklySoilIso) == 1){
  weeklySoilIso = read.csv("Data/SoilCompIsotopes_W1toW15ng.csv", header = T)
}
head(weeklySoilIso)

##   Filename ID Week Num Repl d.13C.12C DD13.32.253. Ave...STDEV
## 1  AW-N-1 AW   N   1   1  -32.890      -0.636
## 2  AW-N-1 AW   N   1   2  -32.170       0.087
## 3  AW-N-1 AW   N   1   3  -29.546       1.664
## 4  AW-N-10 AW  N  10   1  -29.360       2.898
## 5  AW-N-10 AW  N  10   3  -28.470       3.782
## 6  AW-N-10 AW  N  10   2      NA          NA
##      Deleted.d13 Deleted.DD      Rt Ampl..44 Std.Ampl.   ng..C.
## 1      2648.2      120      904 3.982301
## 2      2648.0      115      904 3.816372
## 3      2648.0      109      904 3.617257
```

```

## 4                2655.6      155      658 7.066869
## 5                2656.4      183      658 8.343465
## 6 Injection problem      NA      NA      NA      NA
colnames(weeklySoilIso)

## [1] "Filename"      "ID"      "Week"      "Num"
## [5] "Repl"      "d.13C.12C" "DD13.32.253." "Ave...STDEV"
## [9] "Deleted.d13" "Deleted.DD" "Rt"      "Ampl..44"
## [13] "Std.Ampl." "ng..C."

weeklySoilIso <- weeklySoilIso[complete.cases(weeklySoilIso[, "d.13C.12C"]), ]

colnames(weeklySoilIso)[colnames(weeklySoilIso) == "DD13.32.253."] <- "DD13"
colnames(weeklySoilIso)[colnames(weeklySoilIso) == "ng..C."] <- "ngC"
colnames(weeklySoilIso)[colnames(weeklySoilIso) == "Filename"] <- "ID"

weeklySoilIso <- weeklySoilIso[, c("ID",
                                   # "Repl",
                                   "d.13C.12C",
                                   "DD13",
                                   "ngC")]

isoCompSummary = dplyr::ddply(weeklySoilIso, c("ID"), summarise,
                               N_compsoil = length(d.13C.12C),
                               comp.d13C = mean(d.13C.12C),
                               comp.d13C.SD = sd(d.13C.12C),
                               # comp.d13C.SE = comp.d13C.SD / sqrt(N_compsoil),
                               N_ngC = length(ngC),
                               ngC.mean = mean(ngC),
                               ngC.SD = sd(ngC) #,
                               # ngC.SE = ngC.SD/sqrt(N_ngC)
                               )

isoCompSummary$prctError <- (isoCompSummary$comp.d13C.SD/isoCompSummary$comp.d13C)*-100
mean(!is.na(isoCompSummary$prctError))

## [1] 0.9705882
sum(isoCompSummary$N_ngC == 2)/(sum(isoCompSummary$N_ngC == 2) + sum(isoCompSummary$N_ngC > 2))

## [1] 0.3939394
print("Soil Composites - Isotopes All")

## [1] "Soil Composites - Isotopes All"
str(weeklySoilIso)

## 'data.frame': 87 obs. of 4 variables:
## $ ID : Factor w/ 41 levels "AW-N-1","AW-N-10",...: 1 1 1 2 2 3 3 4 6 6 ...
## $ d.13C.12C: num -32.9 -32.2 -29.5 -29.4 -28.5 ...
## $ DD13 : num -0.636 0.087 1.664 2.898 3.782 ...
## $ ngC : num 3.98 3.82 3.62 7.07 8.34 ...
print("Soil Composites - Isotopes Ave and St.Dev.")

## [1] "Soil Composites - Isotopes Ave and St.Dev."

```

```
str(isoCompSummary)
```

```
## 'data.frame': 34 obs. of 8 variables:
## $ ID : Factor w/ 41 levels "AW-N-1","AW-N-10",...: 1 2 3 4 5 6 7 8 9 10 ...
## $ N_compsoil : int 3 2 2 1 2 3 3 2 2 3 ...
## $ comp.d13C : num -31.5 -28.9 -29.5 -29.5 -29 ...
## $ comp.d13C.SD: num 1.76 0.6293 0.0636 NA 0.4031 ...
## $ N_ngC : int 3 2 2 1 2 3 3 2 2 3 ...
## $ ngC.mean : num 3.81 7.71 8.64 1.57 5.12 ...
## $ ngC.SD : num 0.183 0.903 0.806 NA 0.503 ...
## $ prctError : num 5.581 2.176 0.216 NA 1.392 ...
```

## 2. Merge lab concentrations and isotopes

```
comp.CoIs = merge(weeklySoilConc, isoCompSummary, by = "ID", all = T)
comp.CoIs$Wnum = as.numeric(comp.CoIs$Wnum)
comp.CoIs <- comp.CoIs[order(comp.CoIs$Wnum),]

comp.CoIs$comp.IMP.d13C <- comp.CoIs$comp.d13C
comp.CoIs$comp.IMP.d13C[is.na(comp.CoIs$comp.d13C)] <- ave(comp.CoIs$comp.d13C,
                                                             comp.CoIs$Wnum,
                                                             FUN= function(x) mean(x, na.rm = T))[is.na(c

comp.CoIs$comp.d13C <- ifelse(is.na(comp.CoIs$comp.d13C), comp.CoIs$comp.IMP.d13C, comp.CoIs$comp.d13C)

print("Merged Soil Concentrations and Isotopes")
```

```
## [1] "Merged Soil Concentrations and Isotopes"
```

```
str(comp.CoIs)
```

```
## 'data.frame': 51 obs. of 15 variables:
## $ ID : Factor w/ 51 levels "AW-N-0","AW-N-0x",...: 2 19 36 1 18 35 3 20 37 10 ...
## $ Transect : Factor w/ 3 levels "N","S","T": 1 2 3 1 2 3 1 2 3 1 ...
## $ Wnum : num -1 -1 -1 0 0 0 1 1 1 2 ...
## $ Date.Soil : Factor w/ 17 levels "03/05/2016 13:10",...: 13 13 13 16 16 16 3 3 3 7 ...
## $ Date.ti : POSIXct, format: "2016-03-25 00:04:00" "2016-03-25 00:04:00" ...
## $ Conc.mug.g.dry.soil: num 0.018 0.029 0.02 0.889 3.204 ...
## $ Conc.ComSoil.SD : num NA NA NA 0.133 0.481 ...
## $ N_compsoil : int NA NA NA NA NA NA 3 3 3 3 ...
## $ comp.d13C : num NaN NaN NaN NaN NaN ...
## $ comp.d13C.SD : num NA NA NA NA NA ...
## $ N_ngC : int NA NA NA NA NA NA 3 3 3 3 ...
## $ ngC.mean : num NA NA NA NA NA ...
## $ ngC.SD : num NA NA NA NA NA ...
## $ prctError : num NA NA NA NA NA ...
## $ comp.IMP.d13C : num NaN NaN NaN NaN NaN ...
```

## 3. Compute Degradation Extent and Delta-delta

```
# Pure and cuve isotope average
d13Co
```

```
## [1] -32.253
```

```
# Lab enrichment: Alteck
epsilon_max # +/- 0.3 (@ 20C, 20% vwc)
```

```
## [1] -1.8
epsilon_min # +/- 0.2 (@ 20C, 40% vwc)

## [1] -2.6
epsilon_mean

## [1] -2.2
sd(c(epsilon_max, epsilon_min))

## [1] 0.5656854

# Vine
# (@ 20C, 20% vwc) -0.8 +/- 0.1
# (@ 30C, 20% vwc) -1.4 +/- 0.2
# (@ 20C, 40% vwc) -1.7 +/- 0.2
# Average

# Remaining fraction
comp.CoIs$DD13C.comp <- (comp.CoIs$comp.d13C - (d13Co))

# Max epsilon (20C, 20%)
comp.CoIs$f.max.comp <-
  ((10-3*comp.CoIs$comp.d13C + 1)/(10-3*d13Co + 1))(1000/(epsilon_max))

comp.CoIs$B.max.comp <-
  (1 - comp.CoIs$f.max.comp)*100

# Min epsilon (20C, 40%)
comp.CoIs$f.min.comp <-
  ((10-3*comp.CoIs$comp.d13C + 1)/(10-3*d13Co + 1))(1000/(epsilon_min))

comp.CoIs$B.min.comp <-
  (1 - comp.CoIs$f.min.comp)*100

# Mean epsilon (# Alteck)
comp.CoIs$f.mean.comp <-
  ((10-3*comp.CoIs$comp.d13C + 1)/(10-3*d13Co + 1))(1000/(epsilon_mean))

comp.CoIs$B.mean.comp <-
  (1 - comp.CoIs$f.mean.comp)*100
```

### 3. Compute Soil S-metolachlor Mass at time $t$ across space

For non-measured plots, the soil concentration and isotope measured at the nearest transect is assumed. The total area for each transect at the end of the season is shown below. Corn fields in the catchment were known to have received S-metolachlor applications only during the last week of May, 2017. Given that two of these plots were not included within the transects, their area was not accounted for but until after the known application dates for corn plots.

```
# Check values:
Area_Nb/10000
```

```
## [1] 14.9949
```

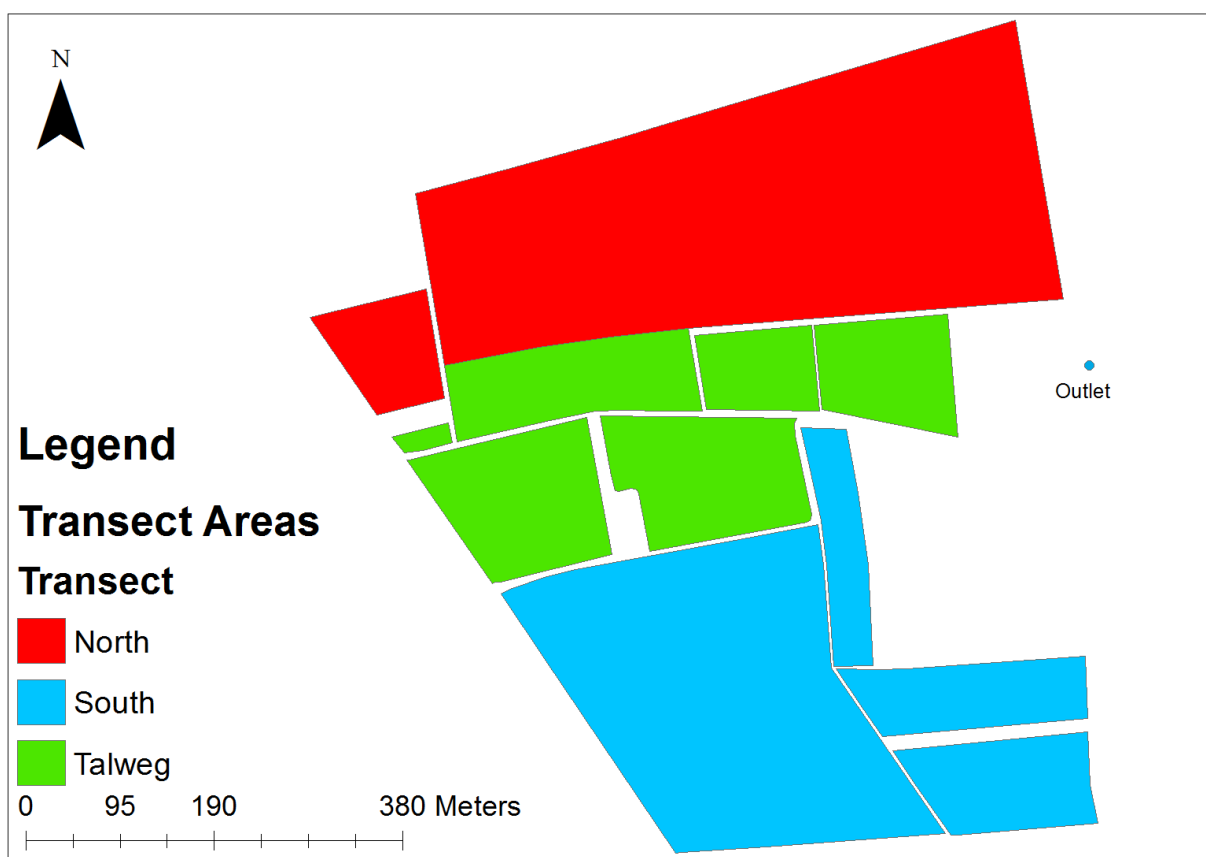


Figure 1: Transect Areas [ $Ha$ ] (North: 14.995; Talweg: 4.371; South: 13.918)

```
Area_Tb/10000
```

```
## [1] 4.37134
```

```
Area_Sb/10000
```

```
## [1] 13.91767
```

The total pesticide mass for each transect at time  $t$  is then given by:

$$M(t)_{Ta} = C(t)_T \cdot \rho \cdot A_T \cdot D$$

```
# S-metolachlor Mass [g]
```

```
# Conc. [ug/g dry soil] * [g/106 ug] * density [g/m3] * depth [m] * A [m2]
```

```
# Soil bulk density: 2200 or 0.99? -> Leaching experiments: 0.99 [g/cm3]
```

```
rho # soil density [g/m3]
```

```
## [1] 990000
```

```
depth # [m]
```

```
## [1] 0.01
```

```
# Transect Areas pre-corn applications
```

```
Area_Na # [m2]
```

```
## [1] 139266.3
```

```
Area-Ta # [m2]
```

```
## [1] 43713.4
```

```
Area-Sa # [m2]
```

```
## [1] 133175
```

```
# Transect Areas post Corn applications (not on transect)
```

```
Area_Nb # [m2]
```

```
## [1] 149949
```

```
Area-Tb # [m2]
```

```
## [1] 43713.4
```

```
Area-Sb # [m2]
```

```
## [1] 139176.7
```

```
# Assign new column for S-metolachlor mass in grams
```

```
comp.CoIs$MassSoil.g <- NA
```

```
comp.CoIs$MassSoil.g.SD <- NA
```

```
# Areas with S-metolachlor before week 9
```

```
comp.CoIs$MassSoil.g <-
```

```
  ifelse((comp.CoIs$Transect == "N" & comp.CoIs$Wnum < 9),  
        comp.CoIs$Conc.mug.g.dry.soil*10-6*rho*depth*Area_Na,
```

```
  ifelse((comp.CoIs$Transect == "T" & comp.CoIs$Wnum < 9),  
        comp.CoIs$Conc.mug.g.dry.soil*10-6*rho*depth*Area-Ta,
```

```
  ifelse((comp.CoIs$Transect == "S" & comp.CoIs$Wnum < 9),  
        comp.CoIs$Conc.mug.g.dry.soil*10-6*rho*depth*Area-Sa, comp.CoIs$MassSoil.g)))
```



```

comp.CoIs$MassSoil.g.SD <-
  ifelse((comp.CoIs$Transect == "N" & comp.CoIs$Wnum < 9),
    comp.CoIs$Conc.ComSoil.SD*10-6*rho*depth*Area_Na,
  ifelse((comp.CoIs$Transect == "T" & comp.CoIs$Wnum < 9),
    comp.CoIs$Conc.ComSoil.SD*10-6*rho*depth*Area-Ta,
  ifelse((comp.CoIs$Transect == "S" & comp.CoIs$Wnum < 9),
    comp.CoIs$Conc.ComSoil.SD*10-6*rho*depth*Area-Sa, comp.CoIs$MassSoil.g.SD)))

# Areas with S-metolachlor after week 9
comp.CoIs$MassSoil.g <-
  ifelse((comp.CoIs$Transect == "N" & comp.CoIs$Wnum >= 9),
    comp.CoIs$Conc.mug.g.dry.soil*10-6*rho*depth*Area-Nb,
  ifelse((comp.CoIs$Transect == "T" & comp.CoIs$Wnum >= 9),
    comp.CoIs$Conc.mug.g.dry.soil*10-6*rho*depth*Area-Tb,
  ifelse((comp.CoIs$Transect == "S" & comp.CoIs$Wnum >= 9),
    comp.CoIs$Conc.mug.g.dry.soil*10-6*rho*depth*Area-Sb, comp.CoIs$MassSoil.g)))

comp.CoIs$MassSoil.g.SD <-
  ifelse((comp.CoIs$Transect == "N" & comp.CoIs$Wnum >= 9),
    comp.CoIs$Conc.ComSoil.SD*10-6*rho*depth*Area-Nb,
  ifelse((comp.CoIs$Transect == "T" & comp.CoIs$Wnum >= 9),
    comp.CoIs$Conc.ComSoil.SD*10-6*rho*depth*Area-Tb,
  ifelse((comp.CoIs$Transect == "S" & comp.CoIs$Wnum >= 9),
    comp.CoIs$Conc.ComSoil.SD*10-6*rho*depth*Area-Sb, comp.CoIs$MassSoil.g.SD)))

# Areas as variables (for later computation of bulk catchment mass)
comp.CoIs$Area.N <-
  ifelse((comp.CoIs$Wnum < 9), Area_Na, Area-Nb)

comp.CoIs$Area.T <-
  ifelse((comp.CoIs$Wnum < 9), Area-Ta, Area-Tb)

comp.CoIs$Area.S <-
  ifelse((comp.CoIs$Wnum < 9), Area-Sa, Area-Sb)

print("S-meto mass per transect at time-t")

## [1] "S-meto mass per transect at time-t"
str(comp.CoIs)

## 'data.frame': 51 obs. of 27 variables:
## $ ID : Factor w/ 51 levels "AW-N-0","AW-N-0x",...: 2 19 36 1 18 35 3 20 37 10 ...
## $ Transect : Factor w/ 3 levels "N","S","T": 1 2 3 1 2 3 1 2 3 1 ...
## $ Wnum : num -1 -1 -1 0 0 0 1 1 1 2 ...
## $ Date.Soil : Factor w/ 17 levels "03/05/2016 13:10",...: 13 13 13 16 16 16 3 3 3 7 ...
## $ Date.ti : POSIXct, format: "2016-03-25 00:04:00" "2016-03-25 00:04:00" ...
## $ Conc.mug.g.dry.soil: num 0.018 0.029 0.02 0.889 3.204 ...
## $ Conc.ComSoil.SD : num NA NA NA 0.133 0.481 ...
## $ N_compsoil : int NA NA NA NA NA NA 3 3 3 3 ...
## $ comp.d13C : num NaN NaN NaN NaN NaN ...
## $ comp.d13C.SD : num NA NA NA NA NA ...
## $ N_ngC : int NA NA NA NA NA NA 3 3 3 3 ...

```

```
## $ ngC.mean      : num NA NA NA NA NA ...
## $ ngC.SD        : num NA NA NA NA NA ...
## $ prctError     : num NA NA NA NA NA ...
## $ comp.IMP.d13C : num NaN NaN NaN NaN NaN ...
## $ DD13C.comp    : num NaN NaN NaN NaN NaN ...
## $ f.max.comp    : num NaN NaN NaN NaN NaN ...
## $ B.max.comp    : num NaN NaN NaN NaN NaN ...
## $ f.min.comp    : num NaN NaN NaN NaN NaN ...
## $ B.min.comp    : num NaN NaN NaN NaN NaN ...
## $ f.mean.comp   : num NaN NaN NaN NaN NaN ...
## $ B.mean.comp   : num NaN NaN NaN NaN NaN ...
## $ MassSoil.g    : num 24.82 38.23 8.66 1226.16 4224.23 ...
## $ MassSoil.g.SD : num NA NA NA 184 634 ...
## $ Area.N        : num 139266 139266 139266 139266 139266 ...
## $ Area.T        : num 43713 43713 43713 43713 43713 ...
## $ Area.S        : num 133175 133175 133175 133175 133175 ...
```

```
tail(comp.CoIs)
```

```
##      ID Transect Wnum      Date.Soil      Date.ti
## 8  AW-N-14      N   14 04/07/2016 14:42 2016-07-04 14:42:00
## 25 AW-S-14      S   14 04/07/2016 14:42 2016-07-04 14:42:00
## 42 AW-T-14      T   14 04/07/2016 14:42 2016-07-04 14:42:00
## 9  AW-N-15      N   15 12/07/2016 01:00 2016-07-12 01:00:00
## 26 AW-S-15      S   15 12/07/2016 01:00 2016-07-12 01:00:00
## 43 AW-T-15      T   15 12/07/2016 01:00 2016-07-12 01:00:00
##      Conc.mug.g.dry.soil Conc.ComSoil.SD N_compsoil comp.d13C comp.d13C.SD
## 8      1.3336411      0.2000462      2 -28.9650 0.4030509
## 25      1.0220275      0.1533041      NA -28.4325 NA
## 42      1.5868495      0.2380274      2 -27.9000 0.1414214
## 9      0.9564201      0.1434630      NA      NaN      NA
## 26      1.1610022      0.1741503      NA      NaN      NA
## 43      1.3119054      0.1967858      NA      NaN      NA
##      N_ngC ngC.mean      ngC.SD prctError comp.IMP.d13C DD13C.comp f.max.comp
## 8      2 5.118483 0.5026825 1.3915100 -28.9650 3.2880 0.1519283
## 25      NA      NA      NA      NA -28.4325 3.8205 0.1120376
## 42      2 5.699301 0.9395125 0.5068866 -27.9000 4.3530 0.0826345
## 9      NA      NA      NA      NA      NaN      NaN      NaN
## 26      NA      NA      NA      NA      NaN      NaN      NaN
## 43      NA      NA      NA      NA      NaN      NaN      NaN
##      B.max.comp f.min.comp B.min.comp f.mean.comp B.mean.comp MassSoil.g
## 8      84.80717 0.2712953 72.87047 0.2140088 78.59912 1979.7837
## 25      88.79624 0.2197188 78.02812 0.1668041 83.31959 1408.1998
## 42      91.73655 0.1779682 82.20318 0.1300293 86.99707 686.7292
## 9      NaN      NaN      NaN      NaN      NaN 1419.8009
## 26      NaN      NaN      NaN      NaN      NaN 1599.6860
## 43      NaN      NaN      NaN      NaN      NaN 567.7437
##      MassSoil.g.SD Area.N Area.T Area.S
## 8      296.96756 149949 43713.4 139176.7
## 25      211.22998 149949 43713.4 139176.7
## 42      103.00938 149949 43713.4 139176.7
## 9      212.97013 149949 43713.4 139176.7
## 26      239.95291 149949 43713.4 139176.7
## 43      85.16155 149949 43713.4 139176.7
```

```
write.csv2(comp.CoIs, 'Data/WeeklySoils_Rng.csv', row.names = F)
```