---
title: “Dendrochronolgy in R”
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date: ’ r format(Sys.time(), "%B %d, %Y)
output:
word_document: default
pdf_document: default
html_document: default

Working with ring-width data

`dplR` version 1.7.2 is available on CRAN

Here we show how to import tree-ring data.

We are using data downloaded from the NOAA XXXX, specifically the Cook - Kelsey Tract TSCA-ITRDB NC005 [url - https://www.ncdc.noaa.gov/paleo-search/study/2987?siteId=15463]

Installation of dplR

```
# install the package if not already installed and call it via library()
if(!require(dplR)){install.packages("dplR")}
```

```
## Loading required package: dplR
```

```
library(dplR)
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --

## v ggplot2 3.3.5     v purrr   0.3.4
## v tibble  3.1.3     v dplyr   1.0.7
## v tidyr   1.1.3     v stringr 1.4.0
## v readr   2.0.0     v forcats 0.5.1

## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

Importing ring-width data

The vignette included with dplR provides a thorough walkthrough (https://cran.r-project.org/web/packages/dplR/vignettes/intro-dplR.pdf) here we show some highlights based on the independet dataset we have downloaded.

```
# the primary function in dplR is read.rwl()
rw <- dplR::read.rwl("../inst/extdata/dendro/nc005.rwl")
```

```
## Attempting to automatically detect format.
## Assuming a Tucson format file.
## There does not appear to be a header in the rwl file
## There are 31 series
## 1        102061       1653    1983   0.01
## 2        102062       1649    1983   0.01
## 3        102081       1707    1983   0.01
## 4        102101       1634    1983   0.01
## 5        102102       1637    1983   0.01
## 6        102121       1675    1976   0.01
## 7        102141       1638    1983   0.01
## 8        102142       1665    1983   0.01
## 9        102171       1623    1983   0.01
## 10       102172       1654    1983   0.01
## 11       102181       1695    1983   0.01
## 12       102182       1684    1983   0.01
## 13       102241       1654    1983   0.01
## 14       102261       1694    1983   0.01
## 15       102271       1737    1983   0.01
## 16       102272       1678    1983   0.01
## 17       102291       1594    1983   0.01
## 18       102292       1594    1983   0.01
## 19       102301       1673    1932   0.01
## 20       102302       1628    1977   0.01
## 21       102311       1623    1983   0.01
## 22       102312       1645    1983   0.01
## 23       102321       1689    1983   0.01
## 24       102322       1738    1983   0.01
## 25       102341       1560    1983   0.01
## 26       102342       1573    1983   0.01
## 27       102431       1692    1983   0.01
## 28       102432       1663    1983   0.01
## 29       102451       1617    1983   0.01
## 30       102452       1581    1983   0.01
## 31       102491       1612    1983   0.01
```

```
# lets look at the dimension of our dataset
dim(rw)   # 424 years and 31 series
```

```
## [1] 424  31
```

```
# and you can see that the data are both class "rw" and "data.frame"
class(rw)
```

```
## [1] "rwl"        "data.frame"
```

Data descriptions

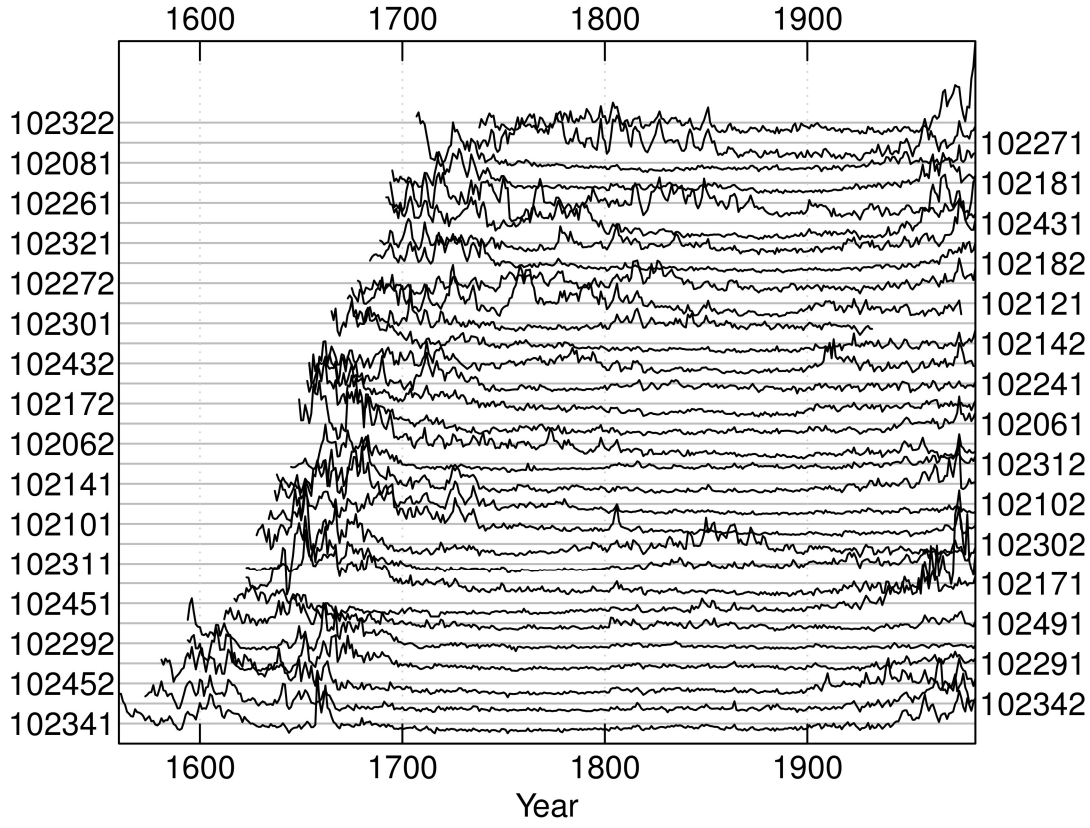
`dplR` has a function, `rw.report()` that provides a fairly detailed description of the data set(s) you are working with.

```
## Number of dated series: 31
```

```
## Number of measurements: 10281
## Avg series length: 331.6452
## Range:  424
## Span:  1560 - 1983
## Mean (Std dev) series intercorrelation: 0.5316996 (0.05975429)
## Mean (Std dev) AR1: 0.8697419 (0.04867715)
## -------------
## Years with absent rings listed by series
##     Series 102182 -- 1877 1888
##     Series 102291 -- 1644
##     Series 102292 -- 1756
##     Series 102311 -- 1752 1753
##     Series 102312 -- 1752 1753
##     Series 102321 -- 1876
##     Series 102341 -- 1716 1752
##     Series 102451 -- 1714 1715 1716 1717 1718
##     Series 102452 -- 1752
## 17 absent rings (0.165%)
## -------------
## Years with internal NA values listed by series
##     None
```

Plotting data (Spaghetti Plots)

We can now plot these data.



Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.

Detrending

```
## Detrending example, albeit brief.
rw.detrend <- detrend(rwl = rw, method = "ModNegExp", verbose = TRUE)
```

```
# we can look at the col names of the new object
names(rw.detrend)
```

```
##  [1] "102061" "102062" "102081" "102101" "102102" "102121" "102141" "102142"
##  [9] "102171" "102172" "102181" "102182" "102241" "102261" "102271" "102272"
## [17] "102291" "102292" "102301" "102302" "102311" "102312" "102321" "102322"
## [25] "102341" "102342" "102431" "102432" "102451" "102452" "102491"
```

```
# and we can look at the means of those indviduals
colMeans(rw.detrend, na.rm=TRUE)
```

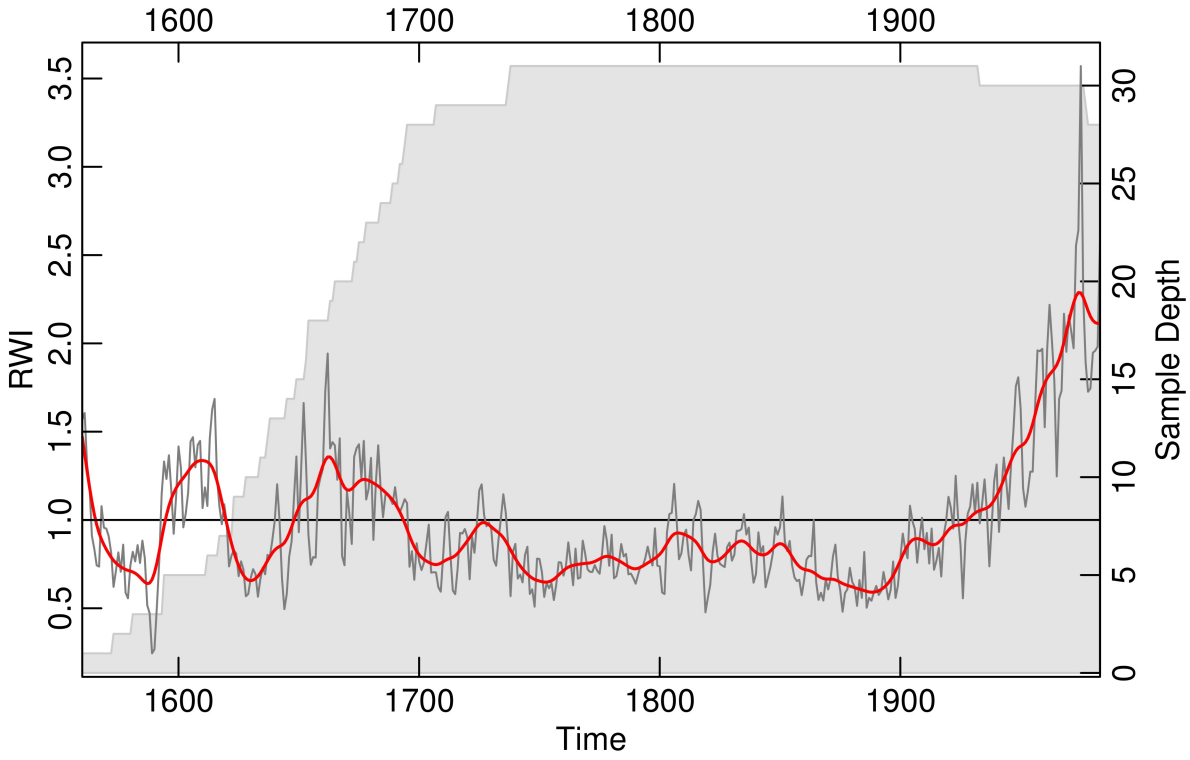
```
##    102061    102062    102081    102101    102102    102121    102141    102142
## 1.0046278 1.0021507 0.9977224 1.0407909 1.0610862 1.0023233 0.9996141 1.0014092
##    102171    102172    102181    102182    102241    102261    102271    102272
## 1.0108265 1.0001056 0.9977949 1.0038460 0.9997856 1.0000540 0.9998278 1.0000000
##    102291    102292    102301    102302    102311    102312    102321    102322
## 0.9979854 0.9990962 0.9996780 1.0112870 1.0000000 1.0007899 0.9996691 1.0000000
##    102341    102342    102431    102432    102451    102452    102491
## 0.9979342 0.9979640 0.9982441 0.9994659 0.9992464 1.0024558 1.0383337
```

Building a Chronology

A chronology can be built from the detrended data.

```
rw.crn <- chron(rw.detrend, prefix = "CAM")

# now we can plot these data
plot(rw.crn, add.spline=TRUE, nyrs=20)
```


1600
1700
1800
1900
RWI
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Sample Depth
0
5
10
15
20
25
30
Time