Import CSV from ConfoMap ISO25178 - tool function experiment

Lisa Schunk

2021-02-04 14:45:52

# Goal of the script

This script formats the output of the resulting CSV-file from applying a template computing ISO 25178 parameters in ConfoMap. The script will:

1. Read in the original CSV-file
2. Format the data
3. Write an XLSX-file and save an R object ready for further analysis in R

dir\_in <- "analysis/raw\_data"  
dir\_out <- "analysis/derived\_data/"

Raw data must be located in ~/analysis/raw\_data.  
Formatted data will be saved in ~/analysis/derived\_data/.

The knit directory for this script is the project directory.

# Load packages

library(openxlsx)

Warning: package 'openxlsx' was built under R version 4.0.3

library(tools)  
library(R.utils)  
library(chron)

# Get names, path and information of the file

data\_file <- list.files(dir\_in, pattern = "\\.csv$", full.names = TRUE)  
md5\_in <- md5sum(data\_file)  
info\_in <- data.frame(file = basename(names(md5\_in)), checksum = md5\_in, row.names = NULL)

The checksum (MD5 hashes) of the imported file are:

file checksum  
1 TFE\_pro.csv aca5a03e94d1efdc6197b198b5c68147

# Read in original CSV-file

imp\_data <- read.csv(data\_file, header = FALSE, stringsAsFactors = FALSE,   
 na.strings = "\*\*\*\*\*")  
  
str(imp\_data)

'data.frame': 27 obs. of 100 variables:  
 $ V1 : chr "#" "#" "#" "27.08.2020" ...  
 $ V2 : chr "#" "#" "#" "15:01:32" ...  
 $ V3 : chr "#" "#" "#" "C:\\Users\\schunk\\Documents\\USE-WEAR\\experiment\\tool\_function-experiment\\ConfoMap\\TFE\_pro --- TFE\_50x\_res"| \_\_truncated\_\_ ...  
 $ V4 : chr "OPERATOR:1" "X-axis rotation angle" "°" "-0.473512322" ...  
 $ V5 : chr "OPERATOR:1" "Y-axis rotation angle" "°" "1.731683477" ...  
 $ V6 : chr "OPERATOR:2" "a0" "nm" "-370.3850221" ...  
 $ V7 : chr "OPERATOR:2" "ax" "nm" "12.47840143" ...  
 $ V8 : chr "OPERATOR:2" "ax2" "nm" "-0.01786267" ...  
 $ V9 : chr "OPERATOR:2" "ax3" "nm" "-3.63E-06" ...  
 $ V10 : chr "OPERATOR:2" "ay" "nm" "0.843379272" ...  
 $ V11 : chr "OPERATOR:2" "axy" "nm" "0.010205056" ...  
 $ V12 : chr "OPERATOR:2" "ax2y" "nm" "2.72E-05" ...  
 $ V13 : chr "OPERATOR:2" "ay2" "nm" "-0.013967608" ...  
 $ V14 : chr "OPERATOR:2" "axy2" "nm" "-2.51E-05" ...  
 $ V15 : chr "OPERATOR:2" "ay3" "nm" "1.15E-05" ...  
 $ V16 : chr "6" "Name" "<no unit>" "TFE\_50x\_res --- FLT8-10 - FLT8-10\_2000\_C1-01-a\_50x095\_LSM\_Topo" ...  
 $ V17 : chr "6" "Created on" "<no unit>" "8/27/2020 11:10:06 AM" ...  
 $ V18 : chr "6" "Studiable type" "<no unit>" "Surface" ...  
 $ V19 : chr "6" "Axis name - X" "<no unit>" "X" ...  
 $ V20 : chr "6" "Axis length - X" "µm" "255.4748056" ...  
 $ V21 : chr "6" "Axis size - X" "points" "1198" ...  
 $ V22 : chr "6" "Axis spacing - X" "µm" "0.213429245" ...  
 $ V23 : chr "6" "Axis name - Y" "<no unit>" "Y" ...  
 $ V24 : chr "6" "Axis length - Y" "µm" "255.4748056" ...  
 $ V25 : chr "6" "Axis size - Y" "points" "1198" ...  
 $ V26 : chr "6" "Axis spacing - Y" "µm" "0.213429245" ...  
 $ V27 : chr "6" "Axis name - Z" "<no unit>" "Z" ...  
 $ V28 : chr "6" "Layer type - Z" "<no unit>" "Topography" ...  
 $ V29 : chr "6" "Axis length - Z" "nm" "34010.19716" ...  
 $ V30 : chr "6" "Axis size - Z" "digits" "73180" ...  
 $ V31 : chr "6" "Axis spacing - Z" "nm" "0.46474716" ...  
 $ V32 : chr "6" "NM-points ratio - Z" "%" "0" ...  
 $ V33 : chr "8" "Name" "<no unit>" "TFE\_50x\_res --- FLT8-10 - FLT8-10-2000s-C1-01-a\_50x095\_LSM\_Topo > Leveled (LS-plane)" ...  
 $ V34 : chr "8" "Created on" "<no unit>" "8/27/2020 11:10:06 AM" ...  
 $ V35 : chr "8" "Studiable type" "<no unit>" "Surface" ...  
 $ V36 : chr "8" "Axis name - X" "<no unit>" "X" ...  
 $ V37 : chr "8" "Axis length - X" "µm" "255.4748056" ...  
 $ V38 : chr "8" "Axis size - X" "points" "1198" ...  
 $ V39 : chr "8" "Axis spacing - X" "µm" "0.213429245" ...  
 $ V40 : chr "8" "Axis name - Y" "<no unit>" "Y" ...  
 $ V41 : chr "8" "Axis length - Y" "µm" "255.4748056" ...  
 $ V42 : chr "8" "Axis size - Y" "points" "1198" ...  
 $ V43 : chr "8" "Axis spacing - Y" "µm" "0.213429245" ...  
 $ V44 : chr "8" "Axis name - Z" "<no unit>" "Z" ...  
 $ V45 : chr "8" "Layer type - Z" "<no unit>" "Topography" ...  
 $ V46 : chr "8" "Axis length - Z" "nm" "34296.48141" ...  
 $ V47 : chr "8" "Axis size - Z" "digits" "73796" ...  
 $ V48 : chr "8" "Axis spacing - Z" "nm" "0.46474716" ...  
 $ V49 : chr "8" "NM-points ratio - Z" "%" "0" ...  
 $ V50 : chr "15" "Name" "<no unit>" "TFE\_50x\_res --- FLT8-10 - FLT8-10-2000s-C1-01-a\_50x095\_LSM\_Topo > Leveled (LS-plane) > Form removed (LS-poly 3)"| \_\_truncated\_\_ ...  
 $ V51 : chr "15" "Created on" "<no unit>" "8/27/2020 11:10:06 AM" ...  
 $ V52 : chr "15" "Studiable type" "<no unit>" "Surface" ...  
 $ V53 : chr "15" "Axis name - X" "<no unit>" "X" ...  
 $ V54 : chr "15" "Axis length - X" "µm" "255.4748056" ...  
 $ V55 : chr "15" "Axis size - X" "points" "1198" ...  
 $ V56 : chr "15" "Axis spacing - X" "µm" "0.213429245" ...  
 $ V57 : chr "15" "Axis name - Y" "<no unit>" "Y" ...  
 $ V58 : chr "15" "Axis length - Y" "µm" "255.4748056" ...  
 $ V59 : chr "15" "Axis size - Y" "points" "1198" ...  
 $ V60 : chr "15" "Axis spacing - Y" "µm" "0.213429245" ...  
 $ V61 : chr "15" "Axis name - Z" "<no unit>" "Z" ...  
 $ V62 : chr "15" "Layer type - Z" "<no unit>" "Topography" ...  
 $ V63 : chr "15" "Axis length - Z" "nm" "12956.17485" ...  
 $ V64 : chr "15" "Axis size - Z" "digits" "278779" ...  
 $ V65 : chr "15" "Axis spacing - Z" "nm" "0.046474716" ...  
 $ V66 : chr "15" "NM-points ratio - Z" "%" "0" ...  
 $ V67 : chr "17" "Sq" "nm" "1639.824789" ...  
 $ V68 : chr "17" "Ssk" "<no unit>" "-0.625520875" ...  
 $ V69 : chr "17" "Sku" "<no unit>" "7.122443946" ...  
 $ V70 : chr "17" "Sp" "nm" "5602.619962" ...  
 $ V71 : chr "17" "Sv" "nm" "7353.554886" ...  
 $ V72 : chr "17" "Sz" "nm" "12956.17485" ...  
 $ V73 : chr "17" "Sa" "nm" "1080.425967" ...  
 $ V74 : chr "17" "Smr (c = 1000 nm below highest peak)" "%" "0.88718972" ...  
 $ V75 : chr "17" "Smc (p = 10.00%)" "nm" "1669.034734" ...  
 $ V76 : chr "17" "Sxp (p = 50.00% q = 97.50%)" "nm" "4453.800909" ...  
 $ V77 : chr "17" "Sal (s = 0.2000)" "µm" "19.27134811" ...  
 $ V78 : chr "17" "Str (s = 0.2000)" "<no unit>" "0.259543727" ...  
 $ V79 : chr "17" "Std (Reference angle = 0.000°)" "°" "159.2409342" ...  
 $ V80 : chr "17" "Sdq" "<no unit>" "0.269035059" ...  
 $ V81 : chr "17" "Sdr" "%" "3.006301428" ...  
 $ V82 : chr "17" "Vm (p = 10.00%)" "µm³/µm²" "0.135390838" ...  
 $ V83 : chr "17" "Vv (p = 10.00%)" "µm³/µm²" "1.804402664" ...  
 $ V84 : chr "17" "Vmp (p = 10.00%)" "µm³/µm²" "0.135390838" ...  
 $ V85 : chr "17" "Vmc (p = 10.00% q = 80.00%)" "µm³/µm²" "0.927873972" ...  
 $ V86 : chr "17" "Vvc (p = 10.00% q = 80.00%)" "µm³/µm²" "1.553178741" ...  
 $ V87 : chr "17" "Vvv (p = 80.00%)" "µm³/µm²" "0.251223923" ...  
 $ V88 : chr "18" "Maximum depth of furrows" "nm" "7250.562268" ...  
 $ V89 : chr "18" "Mean depth of furrows" "nm" "1161.089383" ...  
 $ V90 : chr "18" "Mean density of furrows" "cm/cm2" "2724.29728" ...  
 $ V91 : chr "19" "First direction" "°" "89.98041753" ...  
 $ V92 : chr "19" "Second direction" "°" "135.0199217" ...  
 $ V93 : chr "19" "Third direction" "°" "0.001700073" ...  
 $ V94 : chr "20" "Isotropy" "%" "18.27056476" ...  
 $ V95 : chr "21" "Length-scale anisotropy (Sfrax) (epLsar)" "<no unit>" "0.002336563" ...  
 $ V96 : chr "21" "Length-scale anisotropy (NewEplsar)" "<no unit>" "0.018492557" ...  
 $ V97 : chr "22" "Fractal complexity (Asfc)" "<no unit>" "4.309128563" ...  
 $ V98 : chr "22" "Scale of max complexity (Smfc)" "µm²" "4.931042371" ...  
 $ V99 : chr "22" "HAsfc9 (HAsfc9)" "<no unit>" "0.662829456" ...  
 [list output truncated]

# Format data

## Keep only interesting columns and rows

# keeps only the columns and rows of interest for the analysis   
data\_keep\_col <- c(1:2, 16:17, 20:22, 24:26, 29:32, 67:100)  
data\_keep\_rows <- which(imp\_data[[1]] != "#")  
data\_keep <- imp\_data[data\_keep\_rows, data\_keep\_col]

## Add headers

head\_data\_keep <- unlist(imp\_data[2, data\_keep\_col])   
colnames(data\_keep) <- gsub("\\.+", "\\.", make.names(head\_data\_keep))  
colnames(data\_keep) <- gsub("\\.$", "", colnames(data\_keep))

## Identify results using frame numbers

# combines the results from the different analysis based on the column numbers   
# (ID from MountainsMAp)  
frames <- as.numeric(unlist(imp\_data[1, data\_keep\_col]))

Warning: NAs introduced by coercion

ID <- which(frames == 6)[-(1:2)]  
ISO <- which(frames == 17)  
furrow <- which(frames == 18)  
diriso <- which(frames %in% 19:20)  
SSFA <- which(frames %in% 21:22)

## Shorten the names for parameters

# keeps only the important information of the headers   
colnames(data\_keep)[ISO] <- sapply(strsplit(names(data\_keep)[ISO], ".", fixed = TRUE),   
 `[[`, 1)  
colnames(data\_keep)[SSFA] <- gsub("^([A-Za-z0-9]+\\.)+", "", colnames(data\_keep)[SSFA])

## Save units

# takes the units which were part of the headers and separates them; creates a data frame  
var\_num <- c(ID, ISO, furrow, diriso, SSFA)  
# extracts 'unit' line for considered columns  
units\_var <- unlist(imp\_data[3, data\_keep\_col])[var\_num]   
# gets names associated to the units  
names(units\_var) <- head\_data\_keep[var\_num]   
# puts all of it into a data.frame  
units\_var\_table <- data.frame(variable = names(units\_var), unit = units\_var)

## Convert to numeric

for (i in var\_num) data\_keep[[i]] <- as.numeric(data\_keep[[i]])

## Split the column ‘Name’ into several columns

# these lines extract the artefact ID out of the path name  
stud\_name <- gsub("^([A-Za-z0-9\_]+( --- ))+", "", data\_keep[["Name"]])  
stud\_name <- gsub("([A-Za-z0-9\_-]\*( - ))+", "", stud\_name)  
split\_name <- do.call(rbind, strsplit(stud\_name, "\_"))[, 1:4]  
split\_loc <- do.call(rbind, strsplit(split\_name[, 3], "-"))  
  
# splits the ID in the separat information   
data\_final <- data.frame(split\_name[, -3], split\_loc, data\_keep[-3],   
 stringsAsFactors = FALSE)  
colnames(data\_final)[1:9] <- c("Sample", "Cycle","Objective", "Location", "Area", "Spot",  
 "Analysis.date", "Analysis.time",   
 "Acquisition.date.time")

## Format date and time columns

data\_final[["Analysis.date"]] <- as.Date(data\_final[["Analysis.date"]], format = "%d.%m.%Y")  
data\_final[["Analysis.time"]] <- times(data\_final[["Analysis.time"]])

The column data\_final[["Acquisition.date.time"]] includes several formats and is therefore left as character without convertion to POSIXct.

## Add columns about site, contact material, the task and the edge angle

# extracts the raw material based on the ID  
data\_final[grep("FLT8-", data\_final[["Sample"]]), "Raw.material"] <- "flint"  
data\_final[grep("LYDIT5-", data\_final[["Sample"]]), "Raw.material"] <- "lydite"  
data\_final[["Raw.material"]] <- factor(data\_final[["Raw.material"]])  
  
# adds column about the contact material  
data\_final[grep("LYDIT5-", data\_final[["Sample"]]), "Contact.material"] <- "bone plate"  
data\_final[grep("FLT8-", data\_final[["Sample"]]), "Contact.material"] <- "bone plate"  
data\_final[["Contact.material"]] <- factor(data\_final[["Contact.material"]])  
  
# adds column about the task/movement   
data\_final[grep("FLT8-2", data\_final[["Sample"]]), "Task"] <- "cutting"  
data\_final[grep("LYDIT5-2", data\_final[["Sample"]]), "Task"] <- "cutting"  
data\_final[grep("FLT8-5", data\_final[["Sample"]]), "Task"] <- "cutting"  
data\_final[grep("LYDIT5-7", data\_final[["Sample"]]), "Task"] <- "cutting"  
  
data\_final[grep("FLT8-10", data\_final[["Sample"]]), "Task"] <- "carving"  
data\_final[grep("LYDIT5-8", data\_final[["Sample"]]), "Task"] <- "carving"  
data\_final[grep("FLT8-9", data\_final[["Sample"]]), "Task"] <- "carving"  
data\_final[grep("LYDIT5-12", data\_final[["Sample"]]), "Task"] <- "carving"  
data\_final[["Task"]] <- factor(data\_final[["Task"]])  
  
# adds column about the edge angle   
data\_final[grep("FLT8-2", data\_final[["Sample"]]), "Edge.angle"] <- "45°"  
data\_final[grep("LYDIT5-2", data\_final[["Sample"]]), "Edge.angle"] <- "45°"  
data\_final[grep("FLT8-5", data\_final[["Sample"]]), "Edge.angle"] <- "35°"  
data\_final[grep("LYDIT5-7", data\_final[["Sample"]]), "Edge.angle"] <- "35°"  
  
data\_final[grep("FLT8-10", data\_final[["Sample"]]), "Edge.angle"] <- "45°"  
data\_final[grep("LYDIT5-8", data\_final[["Sample"]]), "Edge.angle"] <- "45°"  
data\_final[grep("FLT8-9", data\_final[["Sample"]]), "Edge.angle"] <- "35°"  
data\_final[grep("LYDIT5-12", data\_final[["Sample"]]), "Edge.angle"] <- "35°"  
data\_final[["Edge.angle"]] <- factor(data\_final[["Edge.angle"]])

## Ignore some columns and reorder columns

data\_final <- data\_final[c(1:2, 4:6, 3, 54:57, 7:9, 10:53)]

## Add units as comment()

comment(data\_final) <- units\_var

Type comment(data\_final) to check the units of the columns.

## Check the result

str(data\_final)

'data.frame': 24 obs. of 57 variables:  
 $ Sample : chr "FLT8-10" "FLT8-10" "FLT8-10" "FLT8-2" ...  
 $ Cycle : chr "2000" "2000" "2000" "2000" ...  
 $ Location : chr "C1" "C1" "C1" "D1" ...  
 $ Area : chr "01" "01" "01" "01" ...  
 $ Spot : chr "a" "b" "c" "a" ...  
 $ Objective : chr "50x095" "50x095" "50x095" "50x095" ...  
 $ Raw.material : Factor w/ 2 levels "flint","lydite": 1 1 1 1 1 1 1 1 1 1 ...  
 $ Contact.material : Factor w/ 1 level "bone plate": 1 1 1 1 1 1 1 1 1 1 ...  
 $ Task : Factor w/ 2 levels "carving","cutting": 1 1 1 2 2 2 2 2 2 1 ...  
 $ Edge.angle : Factor w/ 2 levels "35°","45°": 2 2 2 2 2 2 1 1 1 1 ...  
 $ Analysis.date : Date, format: "2020-08-27" "2020-08-27" ...  
 $ Analysis.time : 'times' num 15:01:32 15:02:11 15:02:48 15:03:28 15:04:06 ...  
 ..- attr(\*, "format")= chr "h:m:s"  
 $ Acquisition.date.time : chr "8/27/2020 11:10:06 AM" "8/27/2020 11:41:47 AM" "8/27/2020 11:54:14 AM" "8/26/2020 4:10:04 PM" ...  
 $ Axis.length.X : num 255 255 255 255 255 ...  
 $ Axis.size.X : num 1198 1198 1198 1198 1198 ...  
 $ Axis.spacing.X : num 0.213 0.213 0.213 0.213 0.213 ...  
 $ Axis.length.Y : num 255 255 255 255 255 ...  
 $ Axis.size.Y : num 1198 1198 1198 1198 1198 ...  
 $ Axis.spacing.Y : num 0.213 0.213 0.213 0.213 0.213 ...  
 $ Axis.length.Z : num 34010 95224 7771 60579 60641 ...  
 $ Axis.size.Z : num 73180 61441 61664 52314 57436 ...  
 $ Axis.spacing.Z : num 0.465 1.55 0.126 1.158 1.056 ...  
 $ NM.points.ratio.Z : num 0 0 0 0 0 0 0 0 0 0 ...  
 $ Sq : num 1640 7217 315 2525 1718 ...  
 $ Ssk : num -0.626 0.517 -1.202 -0.51 -1.432 ...  
 $ Sku : num 7.12 4.34 6.34 6.94 12.01 ...  
 $ Sp : num 5603 24832 716 8900 5842 ...  
 $ Sv : num 7354 24749 1929 12958 11581 ...  
 $ Sz : num 12956 49581 2645 21858 17423 ...  
 $ Sa : num 1080 5359 239 1814 1117 ...  
 $ Smr : num 0.887 0.151 84.156 0.519 0.768 ...  
 $ Smc : num 1669 8453 350 2620 1633 ...  
 $ Sxp : num 4454 13827 770 5202 3974 ...  
 $ Sal : num 19.3 18.3 11.3 20.1 17.7 ...  
 $ Str : num 0.26 NA 0.286 NA 0.154 ...  
 $ Std : num 159 169 156 148 148 ...  
 $ Sdq : num 0.269 1.165 0.166 0.336 0.294 ...  
 $ Sdr : num 3.01 19.2 1.35 4.62 3.61 ...  
 $ Vm : num 0.1354 0.6714 0.0093 0.1819 0.1149 ...  
 $ Vv : num 1.804 9.125 0.359 2.802 1.748 ...  
 $ Vmp : num 0.1354 0.6714 0.0093 0.1819 0.1149 ...  
 $ Vmc : num 0.928 5.19 0.266 1.856 1.034 ...  
 $ Vvc : num 1.553 8.34 0.309 2.488 1.485 ...  
 $ Vvv : num 0.2512 0.7845 0.0502 0.314 0.2637 ...  
 $ Maximum.depth.of.furrows: num 7251 27509 2061 7182 6417 ...  
 $ Mean.depth.of.furrows : num 1161 8568 433 2115 1408 ...  
 $ Mean.density.of.furrows : num 2724 2613 3036 2486 2519 ...  
 $ First.direction : num 90 169 90 135 135 ...  
 $ Second.direction : num 135 174 154 154 154 ...  
 $ Third.direction : num 0.0017 179.9953 135.0327 0.0028 161.4949 ...  
 $ Isotropy : num 18.3 NA 38.2 NA 35.8 ...  
 $ epLsar : num 0.00234 0.00814 0.00109 0.00501 0.00521 ...  
 $ NewEplsar : num 0.0185 0.021 0.0178 0.0199 0.02 ...  
 $ Asfc : num 4.31 37.84 2.9 5.11 4.67 ...  
 $ Smfc : num 4.93 759.24 3.3 32.33 6.9 ...  
 $ HAsfc9 : num 0.6628 6.9889 0.0727 0.5633 0.4985 ...  
 $ HAsfc81 : num 0.708 6.728 0.198 1.53 1.352 ...  
 - attr(\*, "comment")= Named chr [1:44] "µm" "points" "µm" "µm" ...  
 ..- attr(\*, "names")= chr [1:44] "Axis length - X" "Axis size - X" "Axis spacing - X" "Axis length - Y" ...

head(data\_final)

Sample Cycle Location Area Spot Objective Raw.material Contact.material  
4 FLT8-10 2000 C1 01 a 50x095 flint bone plate  
5 FLT8-10 2000 C1 01 b 50x095 flint bone plate  
6 FLT8-10 2000 C1 01 c 50x095 flint bone plate  
7 FLT8-2 2000 D1 01 a 50x095 flint bone plate  
8 FLT8-2 2000 D1 01 b 50x095 flint bone plate  
9 FLT8-2 2000 D1 01 c 50x095 flint bone plate  
 Task Edge.angle Analysis.date Analysis.time Acquisition.date.time  
4 carving 45° 2020-08-27 15:01:32 8/27/2020 11:10:06 AM  
5 carving 45° 2020-08-27 15:02:11 8/27/2020 11:41:47 AM  
6 carving 45° 2020-08-27 15:02:48 8/27/2020 11:54:14 AM  
7 cutting 45° 2020-08-27 15:03:28 8/26/2020 4:10:04 PM  
8 cutting 45° 2020-08-27 15:04:06 8/26/2020 3:41:55 PM  
9 cutting 45° 2020-08-27 15:04:42 8/26/2020 3:12:27 PM  
 Axis.length.X Axis.size.X Axis.spacing.X Axis.length.Y Axis.size.Y  
4 255.4748 1198 0.2134292 255.4748 1198  
5 255.4748 1198 0.2134292 255.4748 1198  
6 255.4748 1198 0.2134292 255.4748 1198  
7 255.4748 1198 0.2134292 255.4748 1198  
8 255.4748 1198 0.2134292 255.4748 1198  
9 255.4748 1198 0.2134292 255.4748 1198  
 Axis.spacing.Y Axis.length.Z Axis.size.Z Axis.spacing.Z NM.points.ratio.Z  
4 0.2134292 34010.197 73180 0.4647472 0  
5 0.2134292 95223.581 61441 1.5498377 0  
6 0.2134292 7771.318 61664 0.1260268 0  
7 0.2134292 60578.579 52314 1.1579803 0  
8 0.2134292 60640.746 57436 1.0557968 0  
9 0.2134292 47752.177 64939 0.7353390 0  
 Sq Ssk Sku Sp Sv Sz Sa  
4 1639.8248 -0.6255209 7.122444 5602.6200 7353.555 12956.175 1080.4260  
5 7217.0443 0.5167268 4.344765 24832.4303 24748.739 49581.169 5359.1126  
6 315.3104 -1.2015183 6.336598 715.8449 1928.929 2644.774 238.6203  
7 2524.8750 -0.5100466 6.937178 8900.2362 12958.262 21858.498 1813.9692  
8 1718.2963 -1.4319687 12.005263 5841.7238 11581.352 17423.076 1117.1372  
9 2545.8971 -0.7719253 8.618212 8665.1609 14245.575 22910.736 1769.3464  
 Smr Smc Sxp Sal Str Std Sdq  
4 0.8871897 1669.0347 4453.8009 19.27135 0.2595437 159.2409 0.2690351  
5 0.1508375 8453.3226 13827.0922 18.33296 NA 169.0020 1.1647737  
6 84.1558025 349.5086 770.2046 11.34748 0.2859776 156.2535 0.1656981  
7 0.5191462 2619.7487 5201.6690 20.11496 NA 148.4946 0.3357202  
8 0.7680698 1633.4928 3973.5568 17.69425 0.1541349 148.4927 0.2936511  
9 0.4101862 2736.5890 4848.5961 23.58091 0.5143067 140.5092 0.3499047  
 Sdr Vm Vv Vmp Vmc Vvc Vvv  
4 3.006301 0.135390838 1.8044027 0.135390838 0.9278740 1.553179 0.25122392  
5 19.198216 0.671390167 9.1247611 0.671390167 5.1904172 8.340286 0.78447482  
6 1.348053 0.009299266 0.3588037 0.009299266 0.2655201 0.308595 0.05020862  
7 4.622614 0.181895348 2.8016366 0.181895348 1.8557557 2.487597 0.31403995  
8 3.607732 0.114859889 1.7483200 0.114859889 1.0337459 1.484646 0.26367368  
9 4.759987 0.184034352 2.9206306 0.184034352 1.6632884 2.589177 0.33145377  
 Maximum.depth.of.furrows Mean.depth.of.furrows Mean.density.of.furrows  
4 7250.562 1161.0894 2724.297  
5 27509.465 8568.3982 2612.809  
6 2061.349 433.1047 3035.797  
7 7181.678 2114.8766 2486.011  
8 6416.840 1408.2987 2519.403  
9 7852.023 1610.6934 2486.264  
 First.direction Second.direction Third.direction Isotropy epLsar  
4 89.98042 135.0199 1.700073e-03 18.27056 0.002336563  
5 168.71931 173.7408 1.799953e+02 NA 0.008143085  
6 89.99392 153.5202 1.350327e+02 38.23035 0.001092762  
7 134.98947 153.5122 2.795585e-03 NA 0.005005935  
8 134.99394 153.5137 1.614949e+02 35.83259 0.005207355  
9 179.99879 134.9911 1.535509e+02 22.87662 0.001825272  
 NewEplsar Asfc Smfc HAsfc9 HAsfc81  
4 0.01849256 4.309129 4.931042 0.66282946 0.7077260  
5 0.02100014 37.843449 759.238285 6.98892403 6.7282198  
6 0.01777594 2.897573 3.295669 0.07267422 0.1976211  
7 0.01986757 5.112870 32.328292 0.56331153 1.5301426  
8 0.01996242 4.673498 6.898712 0.49849387 1.3522344  
9 0.01807974 6.785818 11.805786 0.72980153 0.9899596

# Save data

## Format name of output file

file\_out <- "TFE\_use-wear"

The files will be saved as “~/TFE\_use-wear.[ext]”.

## Write to XLSX

write.xlsx(list(data = data\_final, units = units\_var\_table),   
 file = paste0(dir\_out, file\_out, ".xlsx"))

## Save R object

saveObject(data\_final, file = paste0(dir\_out, file\_out, ".Rbin"))

# sessionInfo() and RStudio version

sessionInfo()

R version 4.0.2 (2020-06-22)  
Platform: x86\_64-w64-mingw32/x64 (64-bit)  
Running under: Windows 10 x64 (build 19041)  
  
Matrix products: default  
  
locale:  
[1] LC\_COLLATE=German\_Germany.1252 LC\_CTYPE=German\_Germany.1252   
[3] LC\_MONETARY=German\_Germany.1252 LC\_NUMERIC=C   
[5] LC\_TIME=German\_Germany.1252   
  
attached base packages:  
[1] tools stats graphics grDevices utils datasets methods   
[8] base   
  
other attached packages:  
[1] chron\_2.3-56 R.utils\_2.10.1 R.oo\_1.24.0 R.methodsS3\_1.8.1  
[5] openxlsx\_4.2.3   
  
loaded via a namespace (and not attached):  
 [1] Rcpp\_1.0.6 digest\_0.6.27 magrittr\_2.0.1 evaluate\_0.14   
 [5] zip\_2.1.1 rlang\_0.4.10 stringi\_1.5.3 rmarkdown\_2.6   
 [9] stringr\_1.4.0 xfun\_0.20 yaml\_2.2.1 compiler\_4.0.2   
[13] htmltools\_0.5.1.1 knitr\_1.31

RStudio version 1.3.1073.

END OF SCRIPT