Import CSV from ConfoMap ISO25178 - use-wear archaeology

Ivan Calandra & Lisa Schunk

2021-02-04 17:01:11

# Goal of the script

This script formats the output of the resulting CSV-files from applying a template computing ISO25178 parameters in ConfoMap. The script will:

1. Read in the original CSV-files
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)  
library(tidyverse)

Warning: package 'ggplot2' was built under R version 4.0.3

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

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

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

# Get names, path and information of all files

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

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

files checksum  
1 BA\_pro.csv 448e57518fea7cb79b3d07755ae27504  
2 BU\_pro.csv 1a24067387cfc3860e4531754721964e  
3 R\_pro.csv 115819f48ed77a49ee02cbb30cb485a2

# Read in original CSV-files

imp\_data <- vector(mode = "list", length = length(data\_files))  
names(imp\_data) <- basename(data\_files)  
# loop for import data due to the three different CSV files   
for (i in seq\_along(data\_files)) {  
 imp\_data[[i]] <- read.csv(data\_files[i], header = FALSE,   
 stringsAsFactors = FALSE, na.strings = "\*\*\*\*\*")  
}  
str(imp\_data)

List of 3  
 $ BA\_pro.csv:'data.frame': 102 obs. of 100 variables:  
 ..$ V1 : chr [1:102] "#" "#" "#" "07.09.2020" ...  
 ..$ V2 : chr [1:102] "#" "#" "#" "15:08:03" ...  
 ..$ V3 : chr [1:102] "#" "#" "#" "E:\\USE-WEAR\\archaeology\\BALVE\\ConfoMap\\BA\_pro --- BA\_50x\_res --- BA\_20x\_ext --- MU-232-B2-01-a\_20x07\_LSM\_Topo.mnt" ...  
 ..$ V4 : chr [1:102] "OPERATOR:1" "X-axis rotation angle" "°" "-3.126075388" ...  
 ..$ V5 : chr [1:102] "OPERATOR:1" "Y-axis rotation angle" "°" "15.76269757" ...  
 ..$ V6 : chr [1:102] "OPERATOR:2" "a0" "nm" "27860.91498" ...  
 ..$ V7 : chr [1:102] "OPERATOR:2" "ax" "nm" "-140.1050645" ...  
 ..$ V8 : chr [1:102] "OPERATOR:2" "ax2" "nm" "0.152743077" ...  
 ..$ V9 : chr [1:102] "OPERATOR:2" "ax3" "nm" "-4.27E-05" ...  
 ..$ V10 : chr [1:102] "OPERATOR:2" "ay" "nm" "-14.50031072" ...  
 ..$ V11 : chr [1:102] "OPERATOR:2" "axy" "nm" "0.070278252" ...  
 ..$ V12 : chr [1:102] "OPERATOR:2" "ax2y" "nm" "-6.42E-05" ...  
 ..$ V13 : chr [1:102] "OPERATOR:2" "ay2" "nm" "0.006875652" ...  
 ..$ V14 : chr [1:102] "OPERATOR:2" "axy2" "nm" "3.42E-05" ...  
 ..$ V15 : chr [1:102] "OPERATOR:2" "ay3" "nm" "-2.29E-05" ...  
 ..$ V16 : chr [1:102] "6" "Name" "<no unit>" "BA\_50x\_res --- BA\_20x\_ext --- MU-232\_B2-01-a\_20x07\_LSM\_Topo" ...  
 ..$ V17 : chr [1:102] "6" "Created on" "<no unit>" "07.07.2020 16:58" ...  
 ..$ V18 : chr [1:102] "6" "Studiable type" "<no unit>" "Surface" ...  
 ..$ V19 : chr [1:102] "6" "Axis name - X" "<no unit>" "X" ...  
 ..$ V20 : chr [1:102] "6" "Axis length - X" "µm" "254.9211018" ...  
 ..$ V21 : chr [1:102] "6" "Axis size - X" "points" "1198" ...  
 ..$ V22 : chr [1:102] "6" "Axis spacing - X" "µm" "0.212966668" ...  
 ..$ V23 : chr [1:102] "6" "Axis name - Y" "<no unit>" "Y" ...  
 ..$ V24 : chr [1:102] "6" "Axis length - Y" "µm" "254.9211018" ...  
 ..$ V25 : chr [1:102] "6" "Axis size - Y" "points" "1198" ...  
 ..$ V26 : chr [1:102] "6" "Axis spacing - Y" "µm" "0.212966668" ...  
 ..$ V27 : chr [1:102] "6" "Axis name - Z" "<no unit>" "Z" ...  
 ..$ V28 : chr [1:102] "6" "Layer type - Z" "<no unit>" "Topography" ...  
 ..$ V29 : chr [1:102] "6" "Axis length - Z" "nm" "249563.8891" ...  
 ..$ V30 : chr [1:102] "6" "Axis size - Z" "digits" "65505" ...  
 ..$ V31 : chr [1:102] "6" "Axis spacing - Z" "nm" "3.809844884" ...  
 ..$ V32 : chr [1:102] "6" "NM-points ratio - Z" "%" "0" ...  
 ..$ V33 : chr [1:102] "8" "Name" "<no unit>" "BA\_50x\_res --- BA\_20x\_ext --- MU-232-B2-01-a\_20x07\_LSM\_Topo > Leveled (LS-plane)" ...  
 ..$ V34 : chr [1:102] "8" "Created on" "<no unit>" "07.07.2020 16:58" ...  
 ..$ V35 : chr [1:102] "8" "Studiable type" "<no unit>" "Surface" ...  
 ..$ V36 : chr [1:102] "8" "Axis name - X" "<no unit>" "X" ...  
 ..$ V37 : chr [1:102] "8" "Axis length - X" "µm" "254.9211018" ...  
 ..$ V38 : chr [1:102] "8" "Axis size - X" "points" "1198" ...  
 ..$ V39 : chr [1:102] "8" "Axis spacing - X" "µm" "0.212966668" ...  
 ..$ V40 : chr [1:102] "8" "Axis name - Y" "<no unit>" "Y" ...  
 ..$ V41 : chr [1:102] "8" "Axis length - Y" "µm" "254.9211018" ...  
 ..$ V42 : chr [1:102] "8" "Axis size - Y" "points" "1198" ...  
 ..$ V43 : chr [1:102] "8" "Axis spacing - Y" "µm" "0.212966668" ...  
 ..$ V44 : chr [1:102] "8" "Axis name - Z" "<no unit>" "Z" ...  
 ..$ V45 : chr [1:102] "8" "Layer type - Z" "<no unit>" "Topography" ...  
 ..$ V46 : chr [1:102] "8" "Axis length - Z" "nm" "270491.3671" ...  
 ..$ V47 : chr [1:102] "8" "Axis size - Z" "digits" "70998" ...  
 ..$ V48 : chr [1:102] "8" "Axis spacing - Z" "nm" "3.809844884" ...  
 ..$ V49 : chr [1:102] "8" "NM-points ratio - Z" "%" "0" ...  
 ..$ V50 : chr [1:102] "15" "Name" "<no unit>" "BA\_50x\_res --- BA\_20x\_ext --- MU-232-B2-01-a\_20x07\_LSM\_Topo > Leveled (LS-plane) > Form removed (LS-poly 3) > O"| \_\_truncated\_\_ ...  
 ..$ V51 : chr [1:102] "15" "Created on" "<no unit>" "07.07.2020 16:58" ...  
 ..$ V52 : chr [1:102] "15" "Studiable type" "<no unit>" "Surface" ...  
 ..$ V53 : chr [1:102] "15" "Axis name - X" "<no unit>" "X" ...  
 ..$ V54 : chr [1:102] "15" "Axis length - X" "µm" "254.9211018" ...  
 ..$ V55 : chr [1:102] "15" "Axis size - X" "points" "1198" ...  
 ..$ V56 : chr [1:102] "15" "Axis spacing - X" "µm" "0.212966668" ...  
 ..$ V57 : chr [1:102] "15" "Axis name - Y" "<no unit>" "Y" ...  
 ..$ V58 : chr [1:102] "15" "Axis length - Y" "µm" "254.9211018" ...  
 ..$ V59 : chr [1:102] "15" "Axis size - Y" "points" "1198" ...  
 ..$ V60 : chr [1:102] "15" "Axis spacing - Y" "µm" "0.212966668" ...  
 ..$ V61 : chr [1:102] "15" "Axis name - Z" "<no unit>" "Z" ...  
 ..$ V62 : chr [1:102] "15" "Layer type - Z" "<no unit>" "Topography" ...  
 ..$ V63 : chr [1:102] "15" "Axis length - Z" "nm" "20482.48807" ...  
 ..$ V64 : chr [1:102] "15" "Axis size - Z" "digits" "53762" ...  
 ..$ V65 : chr [1:102] "15" "Axis spacing - Z" "nm" "0.380984488" ...  
 ..$ V66 : chr [1:102] "15" "NM-points ratio - Z" "%" "0" ...  
 ..$ V67 : chr [1:102] "17" "Sq" "nm" "3243.46492" ...  
 ..$ V68 : chr [1:102] "17" "Ssk" "<no unit>" "0.063364928" ...  
 ..$ V69 : chr [1:102] "17" "Sku" "<no unit>" "3.456648954" ...  
 ..$ V70 : chr [1:102] "17" "Sp" "nm" "10477.07343" ...  
 ..$ V71 : chr [1:102] "17" "Sv" "nm" "10005.41463" ...  
 ..$ V72 : chr [1:102] "17" "Sz" "nm" "20482.48807" ...  
 ..$ V73 : chr [1:102] "17" "Sa" "nm" "2505.545764" ...  
 ..$ V74 : chr [1:102] "17" "Smr (c = 1000 nm below highest peak)" "%" "0.551009273" ...  
 ..$ V75 : chr [1:102] "17" "Smc (p = 10.00%)" "nm" "3753.565649" ...  
 ..$ V76 : chr [1:102] "17" "Sxp (p = 50.00% q = 97.50%)" "nm" "6582.264251" ...  
 ..$ V77 : chr [1:102] "17" "Sal (s = 0.2000)" "µm" "25.94647646" ...  
 ..$ V78 : chr [1:102] "17" "Str (s = 0.2000)" "<no unit>" "0.321132254" ...  
 ..$ V79 : chr [1:102] "17" "Std (Reference angle = 0.000°)" "°" "42.49526812" ...  
 ..$ V80 : chr [1:102] "17" "Sdq" "<no unit>" "0.602524437" ...  
 ..$ V81 : chr [1:102] "17" "Sdr" "%" "9.99401306" ...  
 ..$ V82 : chr [1:102] "17" "Vm (p = 10.00%)" "µm³/µm²" "0.209379149" ...  
 ..$ V83 : chr [1:102] "17" "Vv (p = 10.00%)" "µm³/µm²" "3.962846805" ...  
 ..$ V84 : chr [1:102] "17" "Vmp (p = 10.00%)" "µm³/µm²" "0.209379149" ...  
 ..$ V85 : chr [1:102] "17" "Vmc (p = 10.00% q = 80.00%)" "µm³/µm²" "2.775219749" ...  
 ..$ V86 : chr [1:102] "17" "Vvc (p = 10.00% q = 80.00%)" "µm³/µm²" "3.55940934" ...  
 ..$ V87 : chr [1:102] "17" "Vvv (p = 80.00%)" "µm³/µm²" "0.403437465" ...  
 ..$ V88 : chr [1:102] "18" "Maximum depth of furrows" "nm" "12698.49874" ...  
 ..$ V89 : chr [1:102] "18" "Mean depth of furrows" "nm" "2585.970205" ...  
 ..$ V90 : chr [1:102] "18" "Mean density of furrows" "cm/cm2" "2987.422098" ...  
 ..$ V91 : chr [1:102] "19" "First direction" "°" "44.9809005" ...  
 ..$ V92 : chr [1:102] "19" "Second direction" "°" "26.45485129" ...  
 ..$ V93 : chr [1:102] "19" "Third direction" "°" "63.52628654" ...  
 ..$ V94 : chr [1:102] "20" "Isotropy" "%" "13.49804216" ...  
 ..$ V95 : chr [1:102] "21" "Length-scale anisotropy (Sfrax) (epLsar)" "<no unit>" "0.003682853" ...  
 ..$ V96 : chr [1:102] "21" "Length-scale anisotropy (NewEplsar)" "<no unit>" "0.018102172" ...  
 ..$ V97 : chr [1:102] "22" "Fractal complexity (Asfc)" "<no unit>" "12.79944237" ...  
 ..$ V98 : chr [1:102] "22" "Scale of max complexity (Smfc)" "µm²" "2.508392949" ...  
 ..$ V99 : chr [1:102] "22" "HAsfc9 (HAsfc9)" "<no unit>" "0.629247569" ...  
 .. [list output truncated]  
 $ BU\_pro.csv:'data.frame': 21 obs. of 100 variables:  
 ..$ V1 : chr [1:21] "#" "#" "#" "07.09.2020" ...  
 ..$ V2 : chr [1:21] "#" "#" "#" "14:54:55" ...  
 ..$ V3 : chr [1:21] "#" "#" "#" "E:\\USE-WEAR\\archaeology\\BUHLEN\\ConfoMap\\BU\_pro --- BU\_50x\_res --- - - - Users - schunk - Documents - US"| \_\_truncated\_\_ ...  
 ..$ V4 : chr [1:21] "OPERATOR:1" "X-axis rotation angle" "°" "-2.694053682" ...  
 ..$ V5 : chr [1:21] "OPERATOR:1" "Y-axis rotation angle" "°" "-4.169364046" ...  
 ..$ V6 : chr [1:21] "OPERATOR:2" "a0" "nm" "-5316.302467" ...  
 ..$ V7 : chr [1:21] "OPERATOR:2" "ax" "nm" "20.87003088" ...  
 ..$ V8 : chr [1:21] "OPERATOR:2" "ax2" "nm" "-0.023343306" ...  
 ..$ V9 : chr [1:21] "OPERATOR:2" "ax3" "nm" "7.67E-06" ...  
 ..$ V10 : chr [1:21] "OPERATOR:2" "ay" "nm" "6.260864436" ...  
 ..$ V11 : chr [1:21] "OPERATOR:2" "axy" "nm" "0.003825339" ...  
 ..$ V12 : chr [1:21] "OPERATOR:2" "ax2y" "nm" "-9.87E-06" ...  
 ..$ V13 : chr [1:21] "OPERATOR:2" "ay2" "nm" "-0.006613336" ...  
 ..$ V14 : chr [1:21] "OPERATOR:2" "axy2" "nm" "4.10E-06" ...  
 ..$ V15 : chr [1:21] "OPERATOR:2" "ay3" "nm" "8.83E-07" ...  
 ..$ V16 : chr [1:21] "6" "Name" "<no unit>" "BU\_50x\_res --- - - - Users - schunk - Documents - USE-WEAR - BUHLEN - LSM - BU-003 - BU-003\_C1-01-a\_50x09\_LSM\_Topo" ...  
 ..$ V17 : chr [1:21] "6" "Created on" "<no unit>" "07.02.2020 10:45" ...  
 ..$ V18 : chr [1:21] "6" "Studiable type" "<no unit>" "Surface" ...  
 ..$ V19 : chr [1:21] "6" "Axis name - X" "<no unit>" "X" ...  
 ..$ V20 : chr [1:21] "6" "Axis length - X" "µm" "255.4748056" ...  
 ..$ V21 : chr [1:21] "6" "Axis size - X" "points" "1198" ...  
 ..$ V22 : chr [1:21] "6" "Axis spacing - X" "µm" "0.213429245" ...  
 ..$ V23 : chr [1:21] "6" "Axis name - Y" "<no unit>" "Y" ...  
 ..$ V24 : chr [1:21] "6" "Axis length - Y" "µm" "255.4748056" ...  
 ..$ V25 : chr [1:21] "6" "Axis size - Y" "points" "1198" ...  
 ..$ V26 : chr [1:21] "6" "Axis spacing - Y" "µm" "0.213429245" ...  
 ..$ V27 : chr [1:21] "6" "Axis name - Z" "<no unit>" "Z" ...  
 ..$ V28 : chr [1:21] "6" "Layer type - Z" "<no unit>" "Topography" ...  
 ..$ V29 : chr [1:21] "6" "Axis length - Z" "nm" "38041.42788" ...  
 ..$ V30 : chr [1:21] "6" "Axis size - Z" "digits" "64277" ...  
 ..$ V31 : chr [1:21] "6" "Axis spacing - Z" "nm" "0.591835772" ...  
 ..$ V32 : chr [1:21] "6" "NM-points ratio - Z" "%" "0" ...  
 ..$ V33 : chr [1:21] "8" "Name" "<no unit>" "BU\_50x\_res --- - - - Users - schunk - Documents - USE-WEAR - BUHLEN - LSM - BU-003 - BU-003-C1-01-a\_50x09\_LS"| \_\_truncated\_\_ ...  
 ..$ V34 : chr [1:21] "8" "Created on" "<no unit>" "07.02.2020 10:45" ...  
 ..$ V35 : chr [1:21] "8" "Studiable type" "<no unit>" "Surface" ...  
 ..$ V36 : chr [1:21] "8" "Axis name - X" "<no unit>" "X" ...  
 ..$ V37 : chr [1:21] "8" "Axis length - X" "µm" "255.4748056" ...  
 ..$ V38 : chr [1:21] "8" "Axis size - X" "points" "1198" ...  
 ..$ V39 : chr [1:21] "8" "Axis spacing - X" "µm" "0.213429245" ...  
 ..$ V40 : chr [1:21] "8" "Axis name - Y" "<no unit>" "Y" ...  
 ..$ V41 : chr [1:21] "8" "Axis length - Y" "µm" "255.4748056" ...  
 ..$ V42 : chr [1:21] "8" "Axis size - Y" "points" "1198" ...  
 ..$ V43 : chr [1:21] "8" "Axis spacing - Y" "µm" "0.213429245" ...  
 ..$ V44 : chr [1:21] "8" "Axis name - Z" "<no unit>" "Z" ...  
 ..$ V45 : chr [1:21] "8" "Layer type - Z" "<no unit>" "Topography" ...  
 ..$ V46 : chr [1:21] "8" "Axis length - Z" "nm" "18938.74469" ...  
 ..$ V47 : chr [1:21] "8" "Axis size - Z" "digits" "32000" ...  
 ..$ V48 : chr [1:21] "8" "Axis spacing - Z" "nm" "0.591835772" ...  
 ..$ V49 : chr [1:21] "8" "NM-points ratio - Z" "%" "0" ...  
 ..$ V50 : chr [1:21] "15" "Name" "<no unit>" "BU\_50x\_res --- - - - Users - schunk - Documents - USE-WEAR - BUHLEN - LSM - BU-003 - BU-003-C1-01-a\_50x09\_LS"| \_\_truncated\_\_ ...  
 ..$ V51 : chr [1:21] "15" "Created on" "<no unit>" "07.02.2020 10:45" ...  
 ..$ V52 : chr [1:21] "15" "Studiable type" "<no unit>" "Surface" ...  
 ..$ V53 : chr [1:21] "15" "Axis name - X" "<no unit>" "X" ...  
 ..$ V54 : chr [1:21] "15" "Axis length - X" "µm" "255.4748056" ...  
 ..$ V55 : chr [1:21] "15" "Axis size - X" "points" "1198" ...  
 ..$ V56 : chr [1:21] "15" "Axis spacing - X" "µm" "0.213429245" ...  
 ..$ V57 : chr [1:21] "15" "Axis name - Y" "<no unit>" "Y" ...  
 ..$ V58 : chr [1:21] "15" "Axis length - Y" "µm" "255.4748056" ...  
 ..$ V59 : chr [1:21] "15" "Axis size - Y" "points" "1198" ...  
 ..$ V60 : chr [1:21] "15" "Axis spacing - Y" "µm" "0.213429245" ...  
 ..$ V61 : chr [1:21] "15" "Axis name - Z" "<no unit>" "Z" ...  
 ..$ V62 : chr [1:21] "15" "Layer type - Z" "<no unit>" "Topography" ...  
 ..$ V63 : chr [1:21] "15" "Axis length - Z" "nm" "8682.585869" ...  
 ..$ V64 : chr [1:21] "15" "Axis size - Z" "digits" "146706" ...  
 ..$ V65 : chr [1:21] "15" "Axis spacing - Z" "nm" "0.059183577" ...  
 ..$ V66 : chr [1:21] "15" "NM-points ratio - Z" "%" "0" ...  
 ..$ V67 : chr [1:21] "17" "Sq" "nm" "1048.895159" ...  
 ..$ V68 : chr [1:21] "17" "Ssk" "<no unit>" "0.132560228" ...  
 ..$ V69 : chr [1:21] "17" "Sku" "<no unit>" "3.516410324" ...  
 ..$ V70 : chr [1:21] "17" "Sp" "nm" "5140.389593" ...  
 ..$ V71 : chr [1:21] "17" "Sv" "nm" "3542.196276" ...  
 ..$ V72 : chr [1:21] "17" "Sz" "nm" "8682.585869" ...  
 ..$ V73 : chr [1:21] "17" "Sa" "nm" "814.220228" ...  
 ..$ V74 : chr [1:21] "17" "Smr (c = 1000 nm below highest peak)" "%" "0.085139289" ...  
 ..$ V75 : chr [1:21] "17" "Smc (p = 10.00%)" "nm" "1348.441983" ...  
 ..$ V76 : chr [1:21] "17" "Sxp (p = 50.00% q = 97.50%)" "nm" "1988.48162" ...  
 ..$ V77 : chr [1:21] "17" "Sal (s = 0.2000)" "µm" "28.35891284" ...  
 ..$ V78 : chr [1:21] "17" "Str (s = 0.2000)" "<no unit>" "0.360722274" ...  
 ..$ V79 : chr [1:21] "17" "Std (Reference angle = 0.000°)" "°" "140.7494502" ...  
 ..$ V80 : chr [1:21] "17" "Sdq" "<no unit>" "0.222325802" ...  
 ..$ V81 : chr [1:21] "17" "Sdr" "%" "2.287042675" ...  
 ..$ V82 : chr [1:21] "17" "Vm (p = 10.00%)" "µm³/µm²" "0.057522401" ...  
 ..$ V83 : chr [1:21] "17" "Vv (p = 10.00%)" "µm³/µm²" "1.405952937" ...  
 ..$ V84 : chr [1:21] "17" "Vmp (p = 10.00%)" "µm³/µm²" "0.057522401" ...  
 ..$ V85 : chr [1:21] "17" "Vmc (p = 10.00% q = 80.00%)" "µm³/µm²" "0.893352314" ...  
 ..$ V86 : chr [1:21] "17" "Vvc (p = 10.00% q = 80.00%)" "µm³/µm²" "1.286082915" ...  
 ..$ V87 : chr [1:21] "17" "Vvv (p = 80.00%)" "µm³/µm²" "0.119870022" ...  
 ..$ V88 : chr [1:21] "18" "Maximum depth of furrows" "nm" "3486.622897" ...  
 ..$ V89 : chr [1:21] "18" "Mean depth of furrows" "nm" "899.2230935" ...  
 ..$ V90 : chr [1:21] "18" "Mean density of furrows" "cm/cm2" "2578.372416" ...  
 ..$ V91 : chr [1:21] "19" "First direction" "°" "135.0094627" ...  
 ..$ V92 : chr [1:21] "19" "Second direction" "°" "90.00677511" ...  
 ..$ V93 : chr [1:21] "19" "Third direction" "°" "153.5489476" ...  
 ..$ V94 : chr [1:21] "20" "Isotropy" "%" "75.30256987" ...  
 ..$ V95 : chr [1:21] "21" "Length-scale anisotropy (Sfrax) (epLsar)" "<no unit>" "0.00164011" ...  
 ..$ V96 : chr [1:21] "21" "Length-scale anisotropy (NewEplsar)" "<no unit>" "0.018376251" ...  
 ..$ V97 : chr [1:21] "22" "Fractal complexity (Asfc)" "<no unit>" "3.698324762" ...  
 ..$ V98 : chr [1:21] "22" "Scale of max complexity (Smfc)" "µm²" "4.610763815" ...  
 ..$ V99 : chr [1:21] "22" "HAsfc9 (HAsfc9)" "<no unit>" "0.148106526" ...  
 .. [list output truncated]  
 $ R\_pro.csv :'data.frame': 36 obs. of 100 variables:  
 ..$ V1 : chr [1:36] "#" "#" "#" "07.09.2020" ...  
 ..$ V2 : chr [1:36] "#" "#" "#" "14:31:36" ...  
 ..$ V3 : chr [1:36] "#" "#" "#" "E:\\USE-WEAR\\archaeology\\RAMIOUL\\ConfoMap\\R\_pro --- R\_50x\_res --- - - Users - schunk - Documents - USE-WE"| \_\_truncated\_\_ ...  
 ..$ V4 : chr [1:36] "OPERATOR:1" "X-axis rotation angle" "°" "0.694920518" ...  
 ..$ V5 : chr [1:36] "OPERATOR:1" "Y-axis rotation angle" "°" "2.627071571" ...  
 ..$ V6 : chr [1:36] "OPERATOR:2" "a0" "nm" "1672.074411" ...  
 ..$ V7 : chr [1:36] "OPERATOR:2" "ax" "nm" "-3.802595656" ...  
 ..$ V8 : chr [1:36] "OPERATOR:2" "ax2" "nm" "0.010569345" ...  
 ..$ V9 : chr [1:36] "OPERATOR:2" "ax3" "nm" "-9.36E-06" ...  
 ..$ V10 : chr [1:36] "OPERATOR:2" "ay" "nm" "-7.303528796" ...  
 ..$ V11 : chr [1:36] "OPERATOR:2" "axy" "nm" "0.004108866" ...  
 ..$ V12 : chr [1:36] "OPERATOR:2" "ax2y" "nm" "3.14E-06" ...  
 ..$ V13 : chr [1:36] "OPERATOR:2" "ay2" "nm" "0.00761333" ...  
 ..$ V14 : chr [1:36] "OPERATOR:2" "axy2" "nm" "-3.12E-06" ...  
 ..$ V15 : chr [1:36] "OPERATOR:2" "ay3" "nm" "-2.74E-06" ...  
 ..$ V16 : chr [1:36] "6" "Name" "<no unit>" "R\_50x\_res --- - - Users - schunk - Documents - USE-WEAR - RAMIOUL - LSM - R-002 - R-002\_A1-01-a\_50x09\_LSM\_Topo" ...  
 ..$ V17 : chr [1:36] "6" "Created on" "<no unit>" "07.01.2020 09:56" ...  
 ..$ V18 : chr [1:36] "6" "Studiable type" "<no unit>" "Surface" ...  
 ..$ V19 : chr [1:36] "6" "Axis name - X" "<no unit>" "X" ...  
 ..$ V20 : chr [1:36] "6" "Axis length - X" "µm" "255.4748056" ...  
 ..$ V21 : chr [1:36] "6" "Axis size - X" "points" "1198" ...  
 ..$ V22 : chr [1:36] "6" "Axis spacing - X" "µm" "0.213429245" ...  
 ..$ V23 : chr [1:36] "6" "Axis name - Y" "<no unit>" "Y" ...  
 ..$ V24 : chr [1:36] "6" "Axis length - Y" "µm" "255.4748056" ...  
 ..$ V25 : chr [1:36] "6" "Axis size - Y" "points" "1198" ...  
 ..$ V26 : chr [1:36] "6" "Axis spacing - Y" "µm" "0.213429245" ...  
 ..$ V27 : chr [1:36] "6" "Axis name - Z" "<no unit>" "Z" ...  
 ..$ V28 : chr [1:36] "6" "Layer type - Z" "<no unit>" "Topography" ...  
 ..$ V29 : chr [1:36] "6" "Axis length - Z" "nm" "20213.11055" ...  
 ..$ V30 : chr [1:36] "6" "Axis size - Z" "digits" "66293" ...  
 ..$ V31 : chr [1:36] "6" "Axis spacing - Z" "nm" "0.304905655" ...  
 ..$ V32 : chr [1:36] "6" "NM-points ratio - Z" "%" "0" ...  
 ..$ V33 : chr [1:36] "8" "Name" "<no unit>" "R\_50x\_res --- - - Users - schunk - Documents - USE-WEAR - RAMIOUL - LSM - R-002 - R-002\_A1-01-a\_50x09\_LSM\_Top"| \_\_truncated\_\_ ...  
 ..$ V34 : chr [1:36] "8" "Created on" "<no unit>" "07.01.2020 09:56" ...  
 ..$ V35 : chr [1:36] "8" "Studiable type" "<no unit>" "Surface" ...  
 ..$ V36 : chr [1:36] "8" "Axis name - X" "<no unit>" "X" ...  
 ..$ V37 : chr [1:36] "8" "Axis length - X" "µm" "255.4748056" ...  
 ..$ V38 : chr [1:36] "8" "Axis size - X" "points" "1198" ...  
 ..$ V39 : chr [1:36] "8" "Axis spacing - X" "µm" "0.213429245" ...  
 ..$ V40 : chr [1:36] "8" "Axis name - Y" "<no unit>" "Y" ...  
 ..$ V41 : chr [1:36] "8" "Axis length - Y" "µm" "255.4748056" ...  
 ..$ V42 : chr [1:36] "8" "Axis size - Y" "points" "1198" ...  
 ..$ V43 : chr [1:36] "8" "Axis spacing - Y" "µm" "0.213429245" ...  
 ..$ V44 : chr [1:36] "8" "Axis name - Z" "<no unit>" "Z" ...  
 ..$ V45 : chr [1:36] "8" "Layer type - Z" "<no unit>" "Topography" ...  
 ..$ V46 : chr [1:36] "8" "Axis length - Z" "nm" "10441.79904" ...  
 ..$ V47 : chr [1:36] "8" "Axis size - Z" "digits" "34246" ...  
 ..$ V48 : chr [1:36] "8" "Axis spacing - Z" "nm" "0.304905655" ...  
 ..$ V49 : chr [1:36] "8" "NM-points ratio - Z" "%" "0" ...  
 ..$ V50 : chr [1:36] "15" "Name" "<no unit>" "R\_50x\_res --- - - Users - schunk - Documents - USE-WEAR - RAMIOUL - LSM - R-002 - R-002\_A1-01-a\_50x09\_LSM\_Top"| \_\_truncated\_\_ ...  
 ..$ V51 : chr [1:36] "15" "Created on" "<no unit>" "07.01.2020 09:56" ...  
 ..$ V52 : chr [1:36] "15" "Studiable type" "<no unit>" "Surface" ...  
 ..$ V53 : chr [1:36] "15" "Axis name - X" "<no unit>" "X" ...  
 ..$ V54 : chr [1:36] "15" "Axis length - X" "µm" "255.4748056" ...  
 ..$ V55 : chr [1:36] "15" "Axis size - X" "points" "1198" ...  
 ..$ V56 : chr [1:36] "15" "Axis spacing - X" "µm" "0.213429245" ...  
 ..$ V57 : chr [1:36] "15" "Axis name - Y" "<no unit>" "Y" ...  
 ..$ V58 : chr [1:36] "15" "Axis length - Y" "µm" "255.4748056" ...  
 ..$ V59 : chr [1:36] "15" "Axis size - Y" "points" "1198" ...  
 ..$ V60 : chr [1:36] "15" "Axis spacing - Y" "µm" "0.213429245" ...  
 ..$ V61 : chr [1:36] "15" "Axis name - Z" "<no unit>" "Z" ...  
 ..$ V62 : chr [1:36] "15" "Layer type - Z" "<no unit>" "Topography" ...  
 ..$ V63 : chr [1:36] "15" "Axis length - Z" "nm" "6777.412398" ...  
 ..$ V64 : chr [1:36] "15" "Axis size - Z" "digits" "222279" ...  
 ..$ V65 : chr [1:36] "15" "Axis spacing - Z" "nm" "0.030490565" ...  
 ..$ V66 : chr [1:36] "15" "NM-points ratio - Z" "%" "0" ...  
 ..$ V67 : chr [1:36] "17" "Sq" "nm" "965.6698832" ...  
 ..$ V68 : chr [1:36] "17" "Ssk" "<no unit>" "0.223698651" ...  
 ..$ V69 : chr [1:36] "17" "Sku" "<no unit>" "3.305367398" ...  
 ..$ V70 : chr [1:36] "17" "Sp" "nm" "2982.770056" ...  
 ..$ V71 : chr [1:36] "17" "Sv" "nm" "3794.642342" ...  
 ..$ V72 : chr [1:36] "17" "Sz" "nm" "6777.412398" ...  
 ..$ V73 : chr [1:36] "17" "Sa" "nm" "753.1662694" ...  
 ..$ V74 : chr [1:36] "17" "Smr (c = 1000 nm below highest peak)" "%" "3.36939136" ...  
 ..$ V75 : chr [1:36] "17" "Smc (p = 10.00%)" "nm" "1286.370713" ...  
 ..$ V76 : chr [1:36] "17" "Sxp (p = 50.00% q = 97.50%)" "nm" "1714.056906" ...  
 ..$ V77 : chr [1:36] "17" "Sal (s = 0.2000)" "µm" "20.8354156" ...  
 ..$ V78 : chr [1:36] "17" "Str (s = 0.2000)" "<no unit>" "0.286866253" ...  
 ..$ V79 : chr [1:36] "17" "Std (Reference angle = 0.000°)" "°" "98.49823473" ...  
 ..$ V80 : chr [1:36] "17" "Sdq" "<no unit>" "0.18024731" ...  
 ..$ V81 : chr [1:36] "17" "Sdr" "%" "1.545220979" ...  
 ..$ V82 : chr [1:36] "17" "Vm (p = 10.00%)" "µm³/µm²" "0.056528148" ...  
 ..$ V83 : chr [1:36] "17" "Vv (p = 10.00%)" "µm³/µm²" "1.342889309" ...  
 ..$ V84 : chr [1:36] "17" "Vmp (p = 10.00%)" "µm³/µm²" "0.056528148" ...  
 ..$ V85 : chr [1:36] "17" "Vmc (p = 10.00% q = 80.00%)" "µm³/µm²" "0.838905952" ...  
 ..$ V86 : chr [1:36] "17" "Vvc (p = 10.00% q = 80.00%)" "µm³/µm²" "1.242258083" ...  
 ..$ V87 : chr [1:36] "17" "Vvv (p = 80.00%)" "µm³/µm²" "0.100631226" ...  
 ..$ V88 : chr [1:36] "18" "Maximum depth of furrows" "nm" "4680.149344" ...  
 ..$ V89 : chr [1:36] "18" "Mean depth of furrows" "nm" "1003.094218" ...  
 ..$ V90 : chr [1:36] "18" "Mean density of furrows" "cm/cm2" "2236.279395" ...  
 ..$ V91 : chr [1:36] "19" "First direction" "°" "135.014308" ...  
 ..$ V92 : chr [1:36] "19" "Second direction" "°" "90.00996958" ...  
 ..$ V93 : chr [1:36] "19" "Third direction" "°" "153.4974777" ...  
 ..$ V94 : chr [1:36] "20" "Isotropy" "%" "53.47867338" ...  
 ..$ V95 : chr [1:36] "21" "Length-scale anisotropy (Sfrax) (epLsar)" "<no unit>" "0.003935162" ...  
 ..$ V96 : chr [1:36] "21" "Length-scale anisotropy (NewEplsar)" "<no unit>" "0.018107507" ...  
 ..$ V97 : chr [1:36] "22" "Fractal complexity (Asfc)" "<no unit>" "2.288328872" ...  
 ..$ V98 : chr [1:36] "22" "Scale of max complexity (Smfc)" "µm²" "9.024672658" ...  
 ..$ V99 : chr [1:36] "22" "HAsfc9 (HAsfc9)" "<no unit>" "0.215684673" ...  
 .. [list output truncated]

# Format data

## Merge three datasets

# check pairwise if the three lines of headers are identical among the datasets  
# merges the data based on the three lines of headers while they get only   
# used in the first CSV file   
comp <- all(sapply(list(imp\_data[[1]][1:3, ], imp\_data[[2]][1:3, ]),   
 FUN = identical, imp\_data[[3]][1:3, ]))  
if (comp == TRUE) {  
 merged\_data <- rbind(imp\_data[[1]], imp\_data[[2]][-(1:3), ],   
 imp\_data[[3]][-(1:3), ])  
} else {  
 stop("The headers are not identical among the datasets")  
}  
  
str(merged\_data)

'data.frame': 153 obs. of 100 variables:  
 $ V1 : chr "#" "#" "#" "07.09.2020" ...  
 $ V2 : chr "#" "#" "#" "15:08:03" ...  
 $ V3 : chr "#" "#" "#" "E:\\USE-WEAR\\archaeology\\BALVE\\ConfoMap\\BA\_pro --- BA\_50x\_res --- BA\_20x\_ext --- MU-232-B2-01-a\_20x07\_LSM\_Topo.mnt" ...  
 $ V4 : chr "OPERATOR:1" "X-axis rotation angle" "°" "-3.126075388" ...  
 $ V5 : chr "OPERATOR:1" "Y-axis rotation angle" "°" "15.76269757" ...  
 $ V6 : chr "OPERATOR:2" "a0" "nm" "27860.91498" ...  
 $ V7 : chr "OPERATOR:2" "ax" "nm" "-140.1050645" ...  
 $ V8 : chr "OPERATOR:2" "ax2" "nm" "0.152743077" ...  
 $ V9 : chr "OPERATOR:2" "ax3" "nm" "-4.27E-05" ...  
 $ V10 : chr "OPERATOR:2" "ay" "nm" "-14.50031072" ...  
 $ V11 : chr "OPERATOR:2" "axy" "nm" "0.070278252" ...  
 $ V12 : chr "OPERATOR:2" "ax2y" "nm" "-6.42E-05" ...  
 $ V13 : chr "OPERATOR:2" "ay2" "nm" "0.006875652" ...  
 $ V14 : chr "OPERATOR:2" "axy2" "nm" "3.42E-05" ...  
 $ V15 : chr "OPERATOR:2" "ay3" "nm" "-2.29E-05" ...  
 $ V16 : chr "6" "Name" "<no unit>" "BA\_50x\_res --- BA\_20x\_ext --- MU-232\_B2-01-a\_20x07\_LSM\_Topo" ...  
 $ V17 : chr "6" "Created on" "<no unit>" "07.07.2020 16:58" ...  
 $ V18 : chr "6" "Studiable type" "<no unit>" "Surface" ...  
 $ V19 : chr "6" "Axis name - X" "<no unit>" "X" ...  
 $ V20 : chr "6" "Axis length - X" "µm" "254.9211018" ...  
 $ V21 : chr "6" "Axis size - X" "points" "1198" ...  
 $ V22 : chr "6" "Axis spacing - X" "µm" "0.212966668" ...  
 $ V23 : chr "6" "Axis name - Y" "<no unit>" "Y" ...  
 $ V24 : chr "6" "Axis length - Y" "µm" "254.9211018" ...  
 $ V25 : chr "6" "Axis size - Y" "points" "1198" ...  
 $ V26 : chr "6" "Axis spacing - Y" "µm" "0.212966668" ...  
 $ 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" "249563.8891" ...  
 $ V30 : chr "6" "Axis size - Z" "digits" "65505" ...  
 $ V31 : chr "6" "Axis spacing - Z" "nm" "3.809844884" ...  
 $ V32 : chr "6" "NM-points ratio - Z" "%" "0" ...  
 $ V33 : chr "8" "Name" "<no unit>" "BA\_50x\_res --- BA\_20x\_ext --- MU-232-B2-01-a\_20x07\_LSM\_Topo > Leveled (LS-plane)" ...  
 $ V34 : chr "8" "Created on" "<no unit>" "07.07.2020 16:58" ...  
 $ V35 : chr "8" "Studiable type" "<no unit>" "Surface" ...  
 $ V36 : chr "8" "Axis name - X" "<no unit>" "X" ...  
 $ V37 : chr "8" "Axis length - X" "µm" "254.9211018" ...  
 $ V38 : chr "8" "Axis size - X" "points" "1198" ...  
 $ V39 : chr "8" "Axis spacing - X" "µm" "0.212966668" ...  
 $ V40 : chr "8" "Axis name - Y" "<no unit>" "Y" ...  
 $ V41 : chr "8" "Axis length - Y" "µm" "254.9211018" ...  
 $ V42 : chr "8" "Axis size - Y" "points" "1198" ...  
 $ V43 : chr "8" "Axis spacing - Y" "µm" "0.212966668" ...  
 $ 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" "270491.3671" ...  
 $ V47 : chr "8" "Axis size - Z" "digits" "70998" ...  
 $ V48 : chr "8" "Axis spacing - Z" "nm" "3.809844884" ...  
 $ V49 : chr "8" "NM-points ratio - Z" "%" "0" ...  
 $ V50 : chr "15" "Name" "<no unit>" "BA\_50x\_res --- BA\_20x\_ext --- MU-232-B2-01-a\_20x07\_LSM\_Topo > Leveled (LS-plane) > Form removed (LS-poly 3) > O"| \_\_truncated\_\_ ...  
 $ V51 : chr "15" "Created on" "<no unit>" "07.07.2020 16:58" ...  
 $ V52 : chr "15" "Studiable type" "<no unit>" "Surface" ...  
 $ V53 : chr "15" "Axis name - X" "<no unit>" "X" ...  
 $ V54 : chr "15" "Axis length - X" "µm" "254.9211018" ...  
 $ V55 : chr "15" "Axis size - X" "points" "1198" ...  
 $ V56 : chr "15" "Axis spacing - X" "µm" "0.212966668" ...  
 $ V57 : chr "15" "Axis name - Y" "<no unit>" "Y" ...  
 $ V58 : chr "15" "Axis length - Y" "µm" "254.9211018" ...  
 $ V59 : chr "15" "Axis size - Y" "points" "1198" ...  
 $ V60 : chr "15" "Axis spacing - Y" "µm" "0.212966668" ...  
 $ 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" "20482.48807" ...  
 $ V64 : chr "15" "Axis size - Z" "digits" "53762" ...  
 $ V65 : chr "15" "Axis spacing - Z" "nm" "0.380984488" ...  
 $ V66 : chr "15" "NM-points ratio - Z" "%" "0" ...  
 $ V67 : chr "17" "Sq" "nm" "3243.46492" ...  
 $ V68 : chr "17" "Ssk" "<no unit>" "0.063364928" ...  
 $ V69 : chr "17" "Sku" "<no unit>" "3.456648954" ...  
 $ V70 : chr "17" "Sp" "nm" "10477.07343" ...  
 $ V71 : chr "17" "Sv" "nm" "10005.41463" ...  
 $ V72 : chr "17" "Sz" "nm" "20482.48807" ...  
 $ V73 : chr "17" "Sa" "nm" "2505.545764" ...  
 $ V74 : chr "17" "Smr (c = 1000 nm below highest peak)" "%" "0.551009273" ...  
 $ V75 : chr "17" "Smc (p = 10.00%)" "nm" "3753.565649" ...  
 $ V76 : chr "17" "Sxp (p = 50.00% q = 97.50%)" "nm" "6582.264251" ...  
 $ V77 : chr "17" "Sal (s = 0.2000)" "µm" "25.94647646" ...  
 $ V78 : chr "17" "Str (s = 0.2000)" "<no unit>" "0.321132254" ...  
 $ V79 : chr "17" "Std (Reference angle = 0.000°)" "°" "42.49526812" ...  
 $ V80 : chr "17" "Sdq" "<no unit>" "0.602524437" ...  
 $ V81 : chr "17" "Sdr" "%" "9.99401306" ...  
 $ V82 : chr "17" "Vm (p = 10.00%)" "µm³/µm²" "0.209379149" ...  
 $ V83 : chr "17" "Vv (p = 10.00%)" "µm³/µm²" "3.962846805" ...  
 $ V84 : chr "17" "Vmp (p = 10.00%)" "µm³/µm²" "0.209379149" ...  
 $ V85 : chr "17" "Vmc (p = 10.00% q = 80.00%)" "µm³/µm²" "2.775219749" ...  
 $ V86 : chr "17" "Vvc (p = 10.00% q = 80.00%)" "µm³/µm²" "3.55940934" ...  
 $ V87 : chr "17" "Vvv (p = 80.00%)" "µm³/µm²" "0.403437465" ...  
 $ V88 : chr "18" "Maximum depth of furrows" "nm" "12698.49874" ...  
 $ V89 : chr "18" "Mean depth of furrows" "nm" "2585.970205" ...  
 $ V90 : chr "18" "Mean density of furrows" "cm/cm2" "2987.422098" ...  
 $ V91 : chr "19" "First direction" "°" "44.9809005" ...  
 $ V92 : chr "19" "Second direction" "°" "26.45485129" ...  
 $ V93 : chr "19" "Third direction" "°" "63.52628654" ...  
 $ V94 : chr "20" "Isotropy" "%" "13.49804216" ...  
 $ V95 : chr "21" "Length-scale anisotropy (Sfrax) (epLsar)" "<no unit>" "0.003682853" ...  
 $ V96 : chr "21" "Length-scale anisotropy (NewEplsar)" "<no unit>" "0.018102172" ...  
 $ V97 : chr "22" "Fractal complexity (Asfc)" "<no unit>" "12.79944237" ...  
 $ V98 : chr "22" "Scale of max complexity (Smfc)" "µm²" "2.508392949" ...  
 $ V99 : chr "22" "HAsfc9 (HAsfc9)" "<no unit>" "0.629247569" ...  
 [list output truncated]

## 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(merged\_data[[1]] != "#")   
data\_keep <- merged\_data[data\_keep\_rows, data\_keep\_col]

## Add headers

head\_data\_keep <- unlist(merged\_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(merged\_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)  
#extract 'unit' line for considered columns  
units\_var <- unlist(merged\_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]] <- gsub(",", "\\.", data\_keep[[i]])  
 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, "\_"))[, 1:3]  
split\_loc <- do.call(rbind, strsplit(split\_name[, 2], "-"))  
  
# splits location (A1-3,B1-3,C1-3,D1-3) in location (A,B,C,D) and sublocation (1,2,3,4)  
split\_subloc1 <- substr(split\_loc[,1], 1, 1)  
split\_subloc2 <- substr(split\_loc[,1], 2, 2)  
  
# splits the ID in the separat information   
data\_final <- data.frame(split\_name[, -2], split\_subloc1, split\_subloc2,   
 split\_loc[, 2-3], data\_keep[-3], stringsAsFactors = FALSE)  
colnames(data\_final)[1:9] <- c("Sample", "Objective", "Location", "Sublocation",   
 "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 with further information and corrects 50x objectives’ NAs

# extracte the site name based on the ID  
data\_final[grep("R-0", data\_final[["Sample"]]), "Site"] <- "Ramioul"  
data\_final[grep("MU-", data\_final[["Sample"]]), "Site"] <- "Balve"  
data\_final[grep("BU-", data\_final[["Sample"]]), "Site"] <- "Buhlen"  
data\_final[["Site"]] <- factor(data\_final[["Site"]])  
  
# adds the raw material by defining the flint samples, everything else is lydite   
data\_final[["Raw.material"]] <- factor(ifelse(data\_final[["Sample"]] %in%   
 c("MU-224", "MU-197", "R-002", "R-006",  
 "R-007", "R-008" ,"R-010" ,"R-013"),  
 "flint", "lydite"))  
  
# add the tool type - Keilmesser  
data\_final[grep("MU-003", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("MU-008", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("MU-020", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("MU-021", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("MU-041", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("MU-107", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("MU-111", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("MU-112", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("MU-199", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("MU-202", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("MU-224", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("MU-232", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("MU-197", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("MU-240", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("MU-246", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("MU-273", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
  
data\_final[grep("R-002", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("R-006", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("R-007", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("R-008", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("R-020", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
  
data\_final[grep("BU-003", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("BU-032", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("BU-077", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
data\_final[grep("BU-173", data\_final[["Sample"]]), "Tool.type"] <- "Keilmesser"  
  
# add the tool type - Prądnik spall  
data\_final[grep("MU-104", data\_final[["Sample"]]), "Tool.type"] <- "Prądnik spall"  
data\_final[grep("MU-119", data\_final[["Sample"]]), "Tool.type"] <- "Prądnik spall"  
data\_final[grep("MU-217", data\_final[["Sample"]]), "Tool.type"] <- "Prądnik spall"  
  
data\_final[grep("BU-128", data\_final[["Sample"]]), "Tool.type"] <- "Prądnik spall"  
  
# add the tool type - Scraper   
data\_final[grep("MU-019", data\_final[["Sample"]]), "Tool.type"] <- "Scraper"  
data\_final[grep("MU-025", data\_final[["Sample"]]), "Tool.type"] <- "Scraper"  
data\_final[grep("MU-279", data\_final[["Sample"]]), "Tool.type"] <- "Scraper"  
  
data\_final[grep("R-013", data\_final[["Sample"]]), "Tool.type"] <- "Scraper"  
  
  
# add the tool type - Prądnik scraper   
data\_final[grep("R-010", data\_final[["Sample"]]), "Tool.type"] <- "Prądnik scraper"  
data\_final[grep("BU-115", data\_final[["Sample"]]), "Tool.type"] <- "Prądnik scraper"  
data\_final[["Tool.type"]] <- factor(data\_final[["Tool.type"]])  
  
# add the use-wear type - Balve   
data\_final[data\_final[["Sample"]] == "MU-003" & data\_final[["Location"]] == "D" &  
 data\_final[["Sublocation"]] == "1", "Usewear.type"] <- "B"  
data\_final[data\_final[["Sample"]] == "MU-008" & data\_final[["Location"]] == "B" &  
 data\_final[["Sublocation"]] == "2", "Usewear.type"] <- "C"  
data\_final[data\_final[["Sample"]] == "MU-020" & data\_final[["Location"]] == "A" &  
 data\_final[["Sublocation"]] == "1", "Usewear.type"] <- "D"  
data\_final[data\_final[["Sample"]] == "MU-020" & data\_final[["Location"]] == "A" &  
 data\_final[["Sublocation"]] == "2", "Usewear.type"] <- "D2"  
data\_final[data\_final[["Sample"]] == "MU-021" & data\_final[["Location"]] == "C" &  
 data\_final[["Sublocation"]] == "3", "Usewear.type"] <- "B"  
data\_final[data\_final[["Sample"]] == "MU-021" & data\_final[["Location"]] == "D" &  
 data\_final[["Sublocation"]] == "1", "Usewear.type"] <- "D2"  
data\_final[data\_final[["Sample"]] == "MU-041" & data\_final[["Location"]] == "D" &  
 data\_final[["Sublocation"]] == "1", "Usewear.type"] <- "E"  
data\_final[data\_final[["Sample"]] == "MU-041" & data\_final[["Location"]] == "D" &  
 data\_final[["Sublocation"]] == "2", "Usewear.type"] <- "E"  
data\_final[data\_final[["Sample"]] == "MU-107" & data\_final[["Location"]] == "B" &  
 data\_final[["Sublocation"]] == "1", "Usewear.type"] <- "C"  
data\_final[data\_final[["Sample"]] == "MU-107" & data\_final[["Location"]] == "D" &  
 data\_final[["Sublocation"]] == "2", "Usewear.type"] <- "C"  
data\_final[data\_final[["Sample"]] == "MU-111" & data\_final[["Location"]] == "B" &  
 data\_final[["Sublocation"]] == "1", "Usewear.type"] <- "E"  
data\_final[data\_final[["Sample"]] == "MU-112" & data\_final[["Location"]] == "C" &  
 data\_final[["Sublocation"]] == "1", "Usewear.type"] <- "E"  
data\_final[data\_final[["Sample"]] == "MU-199" & data\_final[["Location"]] == "A" &  
 data\_final[["Sublocation"]] == "2", "Usewear.type"] <- "E"  
data\_final[data\_final[["Sample"]] == "MU-199" & data\_final[["Location"]] == "C" &  
 data\_final[["Sublocation"]] == "3", "Usewear.type"] <- "C"  
data\_final[data\_final[["Sample"]] == "MU-202" & data\_final[["Location"]] == "C" &  
 data\_final[["Sublocation"]] == "2", "Usewear.type"] <- "A"  
data\_final[data\_final[["Sample"]] == "MU-202" & data\_final[["Location"]] == "D" &  
 data\_final[["Sublocation"]] == "2", "Usewear.type"] <- "C"  
data\_final[data\_final[["Sample"]] == "MU-224" & data\_final[["Location"]] == "D" &  
 data\_final[["Sublocation"]] == "1", "Usewear.type"] <- "B2"  
data\_final[data\_final[["Sample"]] == "MU-224" & data\_final[["Location"]] == "B" &  
 data\_final[["Sublocation"]] == "1", "Usewear.type"] <- "C"  
data\_final[data\_final[["Sample"]] == "MU-232" & data\_final[["Location"]] == "B" &  
 data\_final[["Sublocation"]] == "2" & data\_final[["Area"]]   
 == "01", "Usewear.type"] <- "E"  
data\_final[data\_final[["Sample"]] == "MU-232" & data\_final[["Location"]] == "B" &  
 data\_final[["Sublocation"]] == "2" & data\_final[["Area"]]   
 == "02", "Usewear.type"] <- "A"  
data\_final[data\_final[["Sample"]] == "MU-197" & data\_final[["Location"]] == "B" &  
 data\_final[["Sublocation"]] == "2", "Usewear.type"] <- "F"  
data\_final[data\_final[["Sample"]] == "MU-197" & data\_final[["Location"]] == "D" &  
 data\_final[["Sublocation"]] == "3", "Usewear.type"] <- "F"  
data\_final[data\_final[["Sample"]] == "MU-240" & data\_final[["Location"]] == "C" &  
 data\_final[["Sublocation"]] == "2", "Usewear.type"] <- "C+A"  
data\_final[data\_final[["Sample"]] == "MU-240" & data\_final[["Location"]] == "D" &  
 data\_final[["Sublocation"]] == "1", "Usewear.type"] <- "F"  
data\_final[data\_final[["Sample"]] == "MU-246" & data\_final[["Location"]] == "D" &  
 data\_final[["Sublocation"]] == "1", "Usewear.type"] <- "C/E"  
data\_final[data\_final[["Sample"]] == "MU-273" & data\_final[["Location"]] == "B" &  
 data\_final[["Sublocation"]] == "3", "Usewear.type"] <- "C/E"  
data\_final[data\_final[["Sample"]] == "MU-019" & data\_final[["Location"]] == "A" &  
 data\_final[["Sublocation"]] == "3", "Usewear.type"] <- "B2"  
data\_final[data\_final[["Sample"]] == "MU-025" & data\_final[["Location"]] == "B" &  
 data\_final[["Sublocation"]] == "2", "Usewear.type"] <- "B"  
data\_final[data\_final[["Sample"]] == "MU-279" & data\_final[["Location"]] == "C" &  
 data\_final[["Sublocation"]] == "2", "Usewear.type"] <- "C"  
data\_final[data\_final[["Sample"]] == "MU-104" & data\_final[["Location"]] == "D" &  
 data\_final[["Sublocation"]] == "1", "Usewear.type"] <- "C/E"  
data\_final[data\_final[["Sample"]] == "MU-119" & data\_final[["Location"]] == "C" &  
 data\_final[["Sublocation"]] == "1", "Usewear.type"] <- "C"  
data\_final[data\_final[["Sample"]] == "MU-217" & data\_final[["Location"]] == "A" &  
 data\_final[["Sublocation"]] == "2", "Usewear.type"] <- "A"  
  
# add the use-wear type - Ramioul   
data\_final[data\_final[["Sample"]] == "R-002" & data\_final[["Location"]] == "A" &  
 data\_final[["Sublocation"]] == "1", "Usewear.type"] <- "D"  
data\_final[data\_final[["Sample"]] == "R-006" & data\_final[["Location"]] == "C" &  
 data\_final[["Sublocation"]] == "3", "Usewear.type"] <- "E"  
data\_final[data\_final[["Sample"]] == "R-007" & data\_final[["Location"]] == "C" &  
 data\_final[["Sublocation"]] == "2", "Usewear.type"] <- "G"  
data\_final[data\_final[["Sample"]] == "R-008" & data\_final[["Location"]] == "C" &  
 data\_final[["Sublocation"]] == "1", "Usewear.type"] <- "D"  
data\_final[data\_final[["Sample"]] == "R-020" & data\_final[["Location"]] == "C" &  
 data\_final[["Sublocation"]] == "2", "Usewear.type"] <- "A"  
data\_final[data\_final[["Sample"]] == "R-020" & data\_final[["Location"]] == "C" &  
 data\_final[["Sublocation"]] == "3", "Usewear.type"] <- "G"  
data\_final[data\_final[["Sample"]] == "R-010" & data\_final[["Location"]] == "B" &  
 data\_final[["Sublocation"]] == "2", "Usewear.type"] <- "C"  
data\_final[data\_final[["Sample"]] == "R-010" & data\_final[["Location"]] == "C" &  
 data\_final[["Sublocation"]] == "1", "Usewear.type"] <- "C/E"  
data\_final[data\_final[["Sample"]] == "R-013" & data\_final[["Location"]] == "C" &  
 data\_final[["Sublocation"]] == "1", "Usewear.type"] <- "G"  
data\_final[data\_final[["Sample"]] == "R-013" & data\_final[["Location"]] == "C" &  
 data\_final[["Sublocation"]] == "3", "Usewear.type"] <- "D2"  
  
# add the use-wear type - Buhlen  
data\_final[data\_final[["Sample"]] == "BU-003" & data\_final[["Location"]] == "C" &  
 data\_final[["Sublocation"]] == "1", "Usewear.type"] <- "C"  
data\_final[data\_final[["Sample"]] == "BU-032" & data\_final[["Location"]] == "B" &  
 data\_final[["Sublocation"]] == "3", "Usewear.type"] <- "D2"  
data\_final[data\_final[["Sample"]] == "BU-077" & data\_final[["Location"]] == "B" &  
 data\_final[["Sublocation"]] == "3", "Usewear.type"] <- "C/E"  
data\_final[data\_final[["Sample"]] == "BU-173" & data\_final[["Location"]] == "C" &  
 data\_final[["Sublocation"]] == "2", "Usewear.type"] <- "C"  
data\_final[data\_final[["Sample"]] == "BU-128" & data\_final[["Location"]] == "D" &  
 data\_final[["Sublocation"]] == "2", "Usewear.type"] <- "C"  
data\_final[data\_final[["Sample"]] == "BU-115" & data\_final[["Location"]] == "A" &  
 data\_final[["Sublocation"]] == "2", "Usewear.type"] <- "C"  
data\_final[["Usewear.type"]] <- factor(data\_final[["Usewear.type"]])  
  
# correct information about the used objectives   
data\_final[data\_final[["Objective"]] == "50x09", "Objective"] <- "50x095"  
data\_final[data\_final[["Objective"]] == "50x07", "Objective"] <- "50x075"  
data\_final[["Objective"]] <- factor(data\_final[["Objective"]])

## Ignore some columns and reorder columns

data\_final <- data\_final[c(1,54, 56, 55, 3:6, 57, 2, 7:53 )]

## 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': 150 obs. of 57 variables:  
 $ Sample : chr "MU-232" "MU-232" "MU-232" "MU-003" ...  
 $ Site : Factor w/ 3 levels "Balve","Buhlen",..: 1 1 1 1 1 1 1 1 1 1 ...  
 $ Tool.type : Factor w/ 4 levels "Keilmesser","Pradnik scraper",..: 1 1 1 1 1 1 1 1 1 4 ...  
 $ Raw.material : Factor w/ 2 levels "flint","lydite": 2 2 2 2 2 2 2 2 2 2 ...  
 $ Location : chr "B" "B" "B" "D" ...  
 $ Sublocation : chr "2" "2" "2" "1" ...  
 $ Area : chr "01" "01" "01" "01" ...  
 $ Spot : chr "a" "b" "c" "a" ...  
 $ Usewear.type : Factor w/ 11 levels "A","B","B2","C",..: 9 9 9 2 2 2 4 4 4 3 ...  
 $ Objective : Factor w/ 3 levels "20x07","50x075",..: 1 1 1 3 3 3 2 2 2 3 ...  
 $ Analysis.date : Date, format: "2020-09-07" "2020-09-07" ...  
 $ Analysis.time : 'times' num 15:08:03 15:08:27 15:08:51 15:09:16 15:09:41 ...  
 ..- attr(\*, "format")= chr "h:m:s"  
 $ Acquisition.date.time : chr "07.07.2020 16:58" "07.08.2020 10:35" "07.08.2020 12:10" "07.03.2020 10:44" ...  
 $ 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 249564 99661 162726 38576 39610 ...  
 $ Axis.size.Z : num 65505 35461 32419 65340 66654 ...  
 $ Axis.spacing.Z : num 3.81 2.81 5.019 0.59 0.594 ...  
 $ NM.points.ratio.Z : num 0 0 0 0 0 0 0 0 0 0 ...  
 $ Sq : num 3243 2493 4332 1912 1936 ...  
 $ Ssk : num 0.0634 -0.9445 0.1816 -0.058 -0.2928 ...  
 $ Sku : num 3.46 7.36 3.08 3.75 3.47 ...  
 $ Sp : num 10477 7460 12748 6231 5796 ...  
 $ Sv : num 10005 12962 16115 6843 6575 ...  
 $ Sz : num 20482 20422 28864 13075 12371 ...  
 $ Sa : num 2506 1813 3409 1464 1495 ...  
 $ Smr : num 0.551 0.697 0.388 0.784 0.586 ...  
 $ Smc : num 3754 2956 5778 2454 2429 ...  
 $ Sxp : num 6582 4878 7854 3949 4400 ...  
 $ Sal : num 25.9 20.5 23.4 24.4 24.9 ...  
 $ Str : num 0.321 0.215 0.241 0.784 0.767 ...  
 $ Std : num 42.5 93 51 103.7 106.7 ...  
 $ Sdq : num 0.603 0.376 0.557 0.301 0.298 ...  
 $ Sdr : num 9.99 5.11 10.54 4.13 4.09 ...  
 $ Vm : num 0.2094 0.1157 0.2311 0.0944 0.0828 ...  
 $ Vv : num 3.96 3.07 6.01 2.55 2.51 ...  
 $ Vmp : num 0.2094 0.1157 0.2311 0.0944 0.0828 ...  
 $ Vmc : num 2.78 1.82 3.63 1.59 1.6 ...  
 $ Vvc : num 3.56 2.73 5.53 2.31 2.24 ...  
 $ Vvv : num 0.403 0.342 0.48 0.238 0.275 ...  
 $ Maximum.depth.of.furrows: num 12698 14381 16377 7155 7130 ...  
 $ Mean.depth.of.furrows : num 2586 2471 3670 2350 2229 ...  
 $ Mean.density.of.furrows : num 2987 1790 1901 2032 2098 ...  
 $ First.direction : num 44.9809 90.00638 89.98321 0.01527 0.00574 ...  
 $ Second.direction : num 26.5 135 63.5 116.5 135 ...  
 $ Third.direction : num 63.5 116.4 45 135 90 ...  
 $ Isotropy : num 13.5 64.5 14.9 87 86.3 ...  
 $ epLsar : num 0.00368 0.0024 0.00301 0.00161 0.00236 ...  
 $ NewEplsar : num 0.0181 0.0177 0.0179 0.0171 0.0171 ...  
 $ Asfc : num 12.8 6.85 12.12 5.51 5.36 ...  
 $ Smfc : num 2.51 67.38 48.16 94.68 55.32 ...  
 $ HAsfc9 : num 0.629 0.444 0.496 0.666 0.75 ...  
 $ HAsfc81 : num 0.81 2.106 1.515 0.845 0.704 ...  
 - 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 Site Tool.type Raw.material Location Sublocation Area Spot  
4 MU-232 Balve Keilmesser lydite B 2 01 a  
5 MU-232 Balve Keilmesser lydite B 2 01 b  
6 MU-232 Balve Keilmesser lydite B 2 01 c  
7 MU-003 Balve Keilmesser lydite D 1 01 a  
8 MU-003 Balve Keilmesser lydite D 1 01 b  
9 MU-003 Balve Keilmesser lydite D 1 01 c  
 Usewear.type Objective Analysis.date Analysis.time Acquisition.date.time  
4 E 20x07 2020-09-07 15:08:03 07.07.2020 16:58  
5 E 20x07 2020-09-07 15:08:27 07.08.2020 10:35  
6 E 20x07 2020-09-07 15:08:51 07.08.2020 12:10  
7 B 50x095 2020-09-07 15:09:16 07.03.2020 10:44  
8 B 50x095 2020-09-07 15:09:41 07.03.2020 11:12  
9 B 50x095 2020-09-07 15:10:06 07.03.2020 11:41  
 Axis.length.X Axis.size.X Axis.spacing.X Axis.length.Y Axis.size.Y  
4 254.9211 1198 0.2129667 254.9211 1198  
5 254.9211 1198 0.2129667 254.9211 1198  
6 254.9211 1198 0.2129667 254.9211 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 0.2129667 249563.89 65505 3.8098449 0  
5 0.2129667 99661.32 35461 2.8104487 0  
6 0.2129667 162726.02 32419 5.0194644 0  
7 0.2134292 38576.34 65340 0.5903939 0  
8 0.2134292 39610.00 66654 0.5942629 0  
9 0.2134292 54863.85 65476 0.8379230 0  
 Sq Ssk Sku Sp Sv Sz Sa Smr  
4 3243.465 0.06336493 3.456649 10477.073 10005.415 20482.49 2505.546 0.5510093  
5 2492.686 -0.94453683 7.359355 7460.055 12962.351 20422.41 1813.230 0.6974769  
6 4332.029 0.18155179 3.082953 12748.436 16115.492 28863.93 3408.910 0.3877226  
7 1911.594 -0.05804613 3.752128 6231.490 6843.079 13074.57 1464.401 0.7842546  
8 1935.862 -0.29284833 3.470592 5795.609 6575.044 12370.65 1495.026 0.5859935  
9 1413.907 -0.06958621 3.838747 4844.954 5857.249 10702.20 1072.493 0.5892249  
 Smc Sxp Sal Str Std Sdq Sdr Vm  
4 3753.566 6582.264 25.94648 0.3211323 42.49527 0.6025244 9.994013 0.20937915  
5 2956.412 4877.546 20.48344 0.2150411 93.00821 0.3764870 5.107810 0.11573925  
6 5778.475 7853.570 23.40141 0.2410375 50.99436 0.5568364 10.537913 0.23108609  
7 2453.748 3948.846 24.43419 0.7836240 103.74504 0.3008461 4.134572 0.09440997  
8 2429.328 4399.880 24.92475 0.7667171 106.74682 0.2981428 4.087375 0.08277282  
9 1730.839 2853.606 24.16152 0.6924723 93.49320 0.2037989 1.984276 0.08328707  
 Vv Vmp Vmc Vvc Vvv Maximum.depth.of.furrows  
4 3.962847 0.20937915 2.775220 3.559409 0.4034375 12698.499  
5 3.072057 0.11573925 1.817445 2.730142 0.3419151 14380.925  
6 6.009789 0.23108609 3.631368 5.530158 0.4796309 16377.341  
7 2.548137 0.09440997 1.586519 2.310376 0.2377615 7155.043  
8 2.512080 0.08277282 1.595735 2.237261 0.2748192 7129.788  
9 1.814126 0.08328707 1.177174 1.626516 0.1876105 5360.417  
 Mean.depth.of.furrows Mean.density.of.furrows First.direction  
4 2585.970 2987.422 44.980900500  
5 2471.097 1790.038 90.006383440  
6 3669.761 1900.754 89.983209400  
7 2349.892 2031.595 0.015269467  
8 2228.674 2097.686 0.005735854  
9 1402.133 2425.201 89.998777760  
 Second.direction Third.direction Isotropy epLsar NewEplsar Asfc  
4 26.45485129 63.52629 13.49804 0.003682853 0.01810217 12.799442  
5 135.00460320 116.44208 64.54651 0.002403307 0.01765029 6.845867  
6 63.53048970 44.99152 14.91093 0.003013051 0.01791572 12.117159  
7 116.47085940 134.97172 86.95322 0.001612903 0.01709833 5.512847  
8 135.02555380 89.99612 86.25183 0.002359666 0.01713881 5.359400  
9 0.01726191 45.00826 86.90223 0.000603190 0.01747737 2.502234  
 Smfc HAsfc9 HAsfc81  
4 2.508393 0.6292476 0.8101995  
5 67.378699 0.4439865 2.1056364  
6 48.160760 0.4956623 1.5145332  
7 94.675258 0.6660730 0.8450922  
8 55.323498 0.7499158 0.7038073  
9 7.377919 1.1014543 1.1663644

# Save data

## Format name of output file

file\_out <- "Use-wear"

The files will be saved as “~/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] forcats\_0.5.1 stringr\_1.4.0 dplyr\_1.0.3 purrr\_0.3.4   
 [5] readr\_1.4.0 tidyr\_1.1.2 tibble\_3.0.6 ggplot2\_3.3.3   
 [9] tidyverse\_1.3.0 chron\_2.3-56 R.utils\_2.10.1 R.oo\_1.24.0   
[13] R.methodsS3\_1.8.1 openxlsx\_4.2.3   
  
loaded via a namespace (and not attached):  
 [1] tidyselect\_1.1.0 xfun\_0.20 haven\_2.3.1 colorspace\_2.0-0   
 [5] vctrs\_0.3.6 generics\_0.1.0 htmltools\_0.5.1.1 yaml\_2.2.1   
 [9] rlang\_0.4.10 pillar\_1.4.7 withr\_2.4.1 glue\_1.4.2   
[13] DBI\_1.1.1 dbplyr\_2.0.0 modelr\_0.1.8 readxl\_1.3.1   
[17] lifecycle\_0.2.0 munsell\_0.5.0 gtable\_0.3.0 cellranger\_1.1.0   
[21] rvest\_0.3.6 zip\_2.1.1 evaluate\_0.14 knitr\_1.31   
[25] broom\_0.7.4 Rcpp\_1.0.6 backports\_1.2.1 scales\_1.1.1   
[29] jsonlite\_1.7.2 fs\_1.5.0 hms\_1.0.0 digest\_0.6.27   
[33] stringi\_1.5.3 grid\_4.0.2 cli\_2.3.0 magrittr\_2.0.1   
[37] crayon\_1.4.0 pkgconfig\_2.0.3 ellipsis\_0.3.1 xml2\_1.3.2   
[41] reprex\_1.0.0 lubridate\_1.7.9.2 rstudioapi\_0.13 assertthat\_0.2.1   
[45] rmarkdown\_2.6 httr\_1.4.2 R6\_2.5.0 compiler\_4.0.2

RStudio version 1.3.1073.

END OF SCRIPT