# R Script in Supplement to the manuscript 'Multi-method chronological assessment of the Balta Alba Kurgan loess-paleosol sequence (Romania) - a comparative study on dating methods for a robust and precise age-model' by Stephanie Scheidt et al.

# this R script applied the ADMIn and BChron age-depth models to data

# this script contains 3 parts: application of the BChron model, application of the ADMin model, and interpolation of data

# the exact input dataset is not supplied with the manuscript, this script is meant for reference, not for re-computuing results

# scripted by C. Zeeden, 2019-2020

# load libraries, which must be installed

library(readxl)

library(Bchron)

library(Hmisc)

library(astrochron)

library(plyr)

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# part 1: application of the BChron model

# read ages from excel sheet

# path and data file name need to be set

Bi <- read\_excel("C:/Zeeden.C/Hannover/ms\_in\_prep/Scheidt\_BAK/BAK\_Alter\_ModellierungC2\_2020Aug18.xlsx",

 sheet = "Bchron")

# omit some columns

Bi <- na.omit(Bi[,2:6])

# possibly omit tephra layer (not done here)

#Bi <- Bi[1:27,]

# run the BChron model

B1 <- Bchronology(ages=Bi[[2]]\*1000,

 ageSds=Bi[[3]]\*1000,

# calCurves= rep('normal', 27),

 calCurves= Bi[[5]],

 positions=Bi[[1]],

 positionThicknesses = rep(.01, 28)

 )

# print results

Res <- summary(B1)

# plot results (in this case teh plot is not very helpful)

#plot(B1)

# export results to clipboard

write.table(Res, 'clipboard')

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# part 2: application of the ADMin model

# ADMin approach:

## import dependent functions

# can be downloaded from Supplementary Materials of Zeeden et al. (2018): Discriminating luminescence age uncertainty composition for a robust Bayesian modelling

source('01\_create.pdf\_0.5.1\_SK.R')

source('02\_recalculate.ages\_0.6.3.R')

# sort data and extract ages and uncertainties

Datax <- sort.list(Bi[,1])

Data <- cb(Bi[Datax,2], Bi[Datax,3])

# create probbaility density function for random/systematic parts of uncertainty

PDF <- create.pdf(Data, n.MC=10000, uncertainty.max = 100, plot=T)

PDF[[1]][,2] <- 0

PDF[[1]][100,2] <- 1

# new dataset with doubled uncertainty to use 2-sigma uncertainty for Bayesian model input

Mb <- cb(Data[[1]], Data[[2]])

Mb[,2] <- Mb[,2]\*2

# apply ADMin age-depth model to and the PDF loess

# ! This is done in parts with overlap to speed up computation. This is generally NOT recommended, but pragmatic in this case

recM1 <- recalculate.ages(data=Mb[1:10,], pdf=PDF$pdf, n.MC.max = 10001)#, probability=c(0.1585, 0.8415))

recM2 <- recalculate.ages(data=Mb[10:18,], pdf=PDF$pdf, n.MC.max = 10001)#, probability=c(0.1585, 0.8415))

recM3 <- recalculate.ages(data=na.omit(Mb[19:29,]), pdf=PDF$pdf, n.MC.max = 10001)#, probability=c(0.1585, 0.8415))

# export results

write.table(recM1[[1]], 'clipboard')

write.table(recM2[[1]], 'clipboard')

write.table(recM3[[1]], 'clipboard')

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#part 3: place paleomagnetic data on time scale

# read from file

# read data from age models

# ADMin

SupplementADMin <- read\_excel("C:/Zeeden.C/Hannover/ms\_in\_prep/Scheidt\_BAK/Supplement\_tables\_CZ-final.xlsx",

 sheet = "resultsADMin")

#BChron

SupplementBChron <- read\_excel("C:/Zeeden.C/Hannover/ms\_in\_prep/Scheidt\_BAK/Supplement\_tables\_CZ-final.xlsx",

 sheet = "resultsBChron")

# read depths for interpolation

Dephs\_PMag <- read\_excel("C:/Zeeden.C/Hannover/ms\_in\_prep/Scheidt\_BAK/Teufen\_PMagProben\_Alter\_Altersmodel.xlsx")

# interpolate age models

ages\_ADMin <- tune(dat=cb(Dephs\_PMag[,4], Dephs\_PMag[,4]), controlPts = linterp(SupplementADMin[,1:2]), extrapolate=F)

ages\_BChron <- tune(dat=cb(Dephs\_PMag[,4], Dephs\_PMag[,4]), controlPts = cb(SupplementBChron[,1], SupplementBChron[,3]), extrapolate = T)

# export data to clipboard

write.table(ages\_BChron, 'clipboard')

write.table(ages\_ADMin, 'clipboard')

# end script