

Sources (proxies)

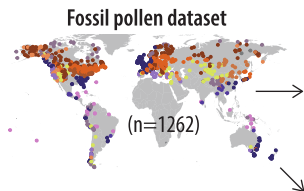
Variables

Inference

Spatial units

HVARPART analysis

Predictor importance (ratio)



Pollen assemblage
properties

Human impact
events



Database of
Archeological
¹⁴C

CHELSA-
TraCE21k
palaeoclimate

MAT °C
Cold °C
Summer prec
Winter prec

Past vegetation
properties



Human impact



Climate



Samples
in records

Samples
across
continent

Samples across
climate zone
and continent

General trends
climate zone
and continent

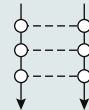
Model changes in properties

Response
Matrix of pollen-
assemblage
properties

Predictor
Human
impact

Predictor
Model changes
in properties

Redundancy analysis (RDA) with scaling of variables



Model regional changes in interrelationships

PCA per time
slice/climate zone
Matrix of pollen-
assemblage
properties

Pairwise
Procrustes
sum of squares
distance
matrix

General
predictor
trends
Human
impact

General
predictor
trends
Matrix of
climate variables

Distance-based RDA with sum-of-squares (m²)



Total predictor
importance

$$\text{Human impact} = \frac{\text{Human impact}}{(\text{Human impact} + \text{Climate})}$$

$$\text{Climate} = \frac{\text{Climate}}{(\text{Climate} + \text{Human impact})}$$