



HAL
open science

The role of epigenetics in local adaptation in oak trees: a population epigenetic analysis

Shannon Brandt, Ludovic Duvaux, Isabelle Lesur, Odile Rogier, Mamadou Sow, Stéphane Maury, Alexandre Duplan, Harold Duruflé, Christophe Plomion, Jerome Salse, et al.

► To cite this version:

Shannon Brandt, Ludovic Duvaux, Isabelle Lesur, Odile Rogier, Mamadou Sow, et al.. The role of epigenetics in local adaptation in oak trees: a population epigenetic analysis. 5th Epicatch meeting, Jul 2024, Bordeaux, France. <hal-05228453>

HAL Id: hal-05228453

<https://hal.science/hal-05228453v1>

Submitted on 28 Aug 2025

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons CC BY 4.0 - Attribution - International License

The role of epigenetics in local adaptation in oak trees: a population epigenetic analysis

Shannon Brandt¹, Ludovic Duvaux¹, Isabelle Lesur^{1,2}, Odile Rogier³, Mamadou Sow⁴, Stéphane Maury⁵, Alexandre Duplan^{3,5}, Harold Duruflé³, Christophe Plomion¹, Jerome Salse⁴, Jorg Tost⁶, Leopoldo Sanchez³, EPITREE CONSORTIUM

1. INRAE, Univ. Bordeaux, BIOGECO, F-33610 Cestas, France. 2. HelixVenture, F-33700 Mérignac, France. 3. INRAE, ONF, BioForA, F-45075 Orléans, France. 4. INRAE/UCA UMR GDEC 1095, F-63100 Clermont Ferrand, France. 5. P2E, INRAE, Univ. d'Orléans, F-45067 Orléans, France. 6. CNRGH, CEA-Institut de Biologie François Jacob, Univ. Paris-Saclay, F-91000 Evry, France.

Email: shannon.brandt@inrae.fr

Background

Rapid climate change intensely affects trees as they cannot migrate & have long generation times, limiting their adaptational ability to keep pace with climate change.

Epigenetic changes such as DNA methylation allows for rapid change under environmental variability. These changes impact gene expression & are meiotically heritable transgenerationally.

DNA methylation can thus allow rapid local adaptation of populations.

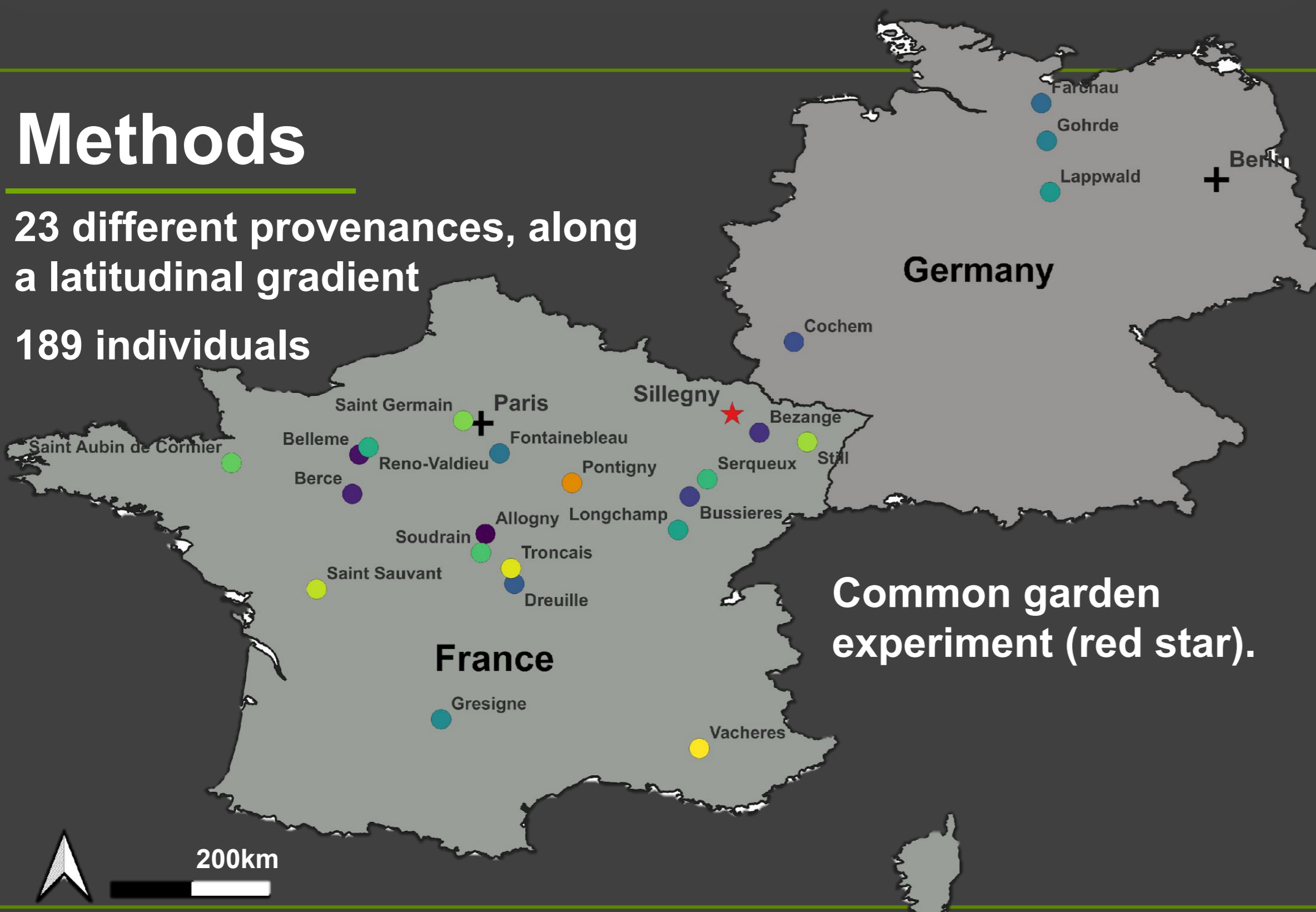
Questions

Aim: understand the relative importance of DNA methylation in early stages of population climatic local adaptation.

1. Are there significant epigenetic differences between populations of Sessile oak?
2. Are these differences linked to environmental differences in the provenance of origin?

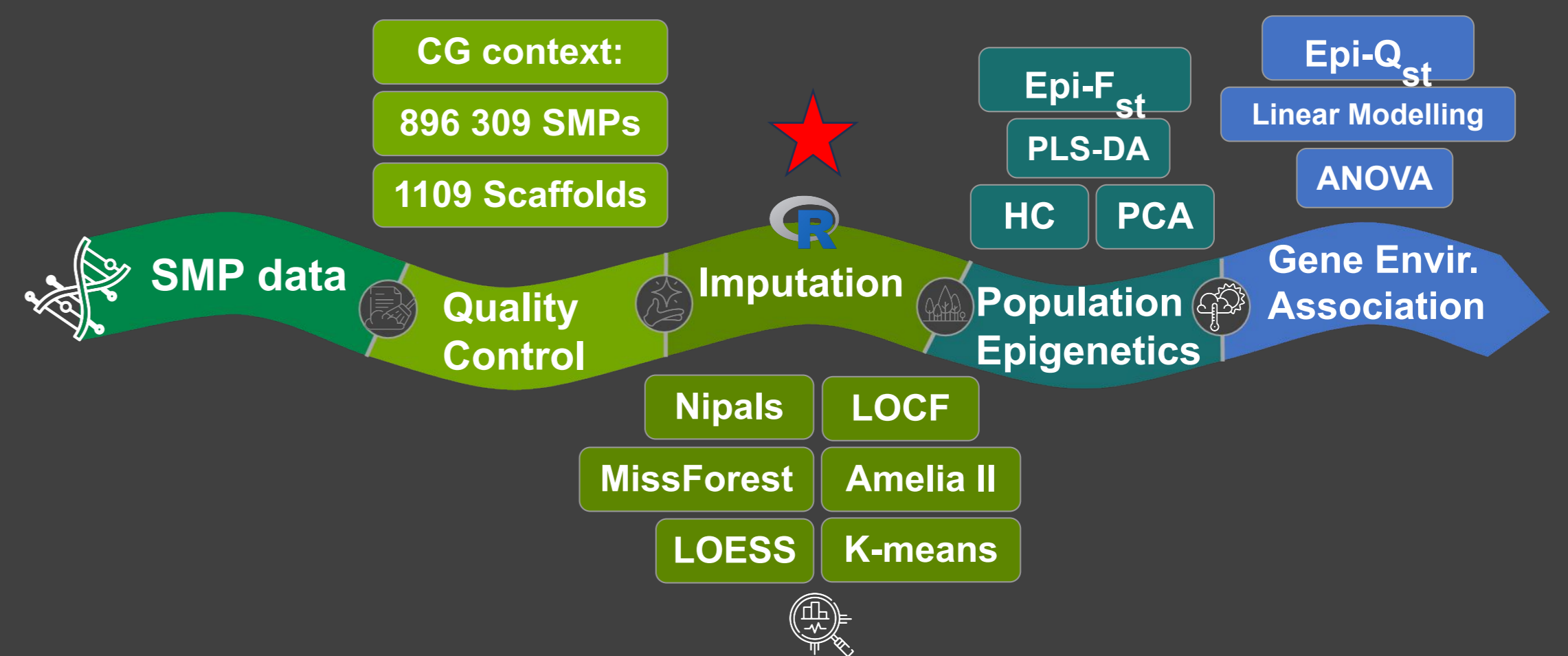
Methods

23 different provenances, along a latitudinal gradient
189 individuals



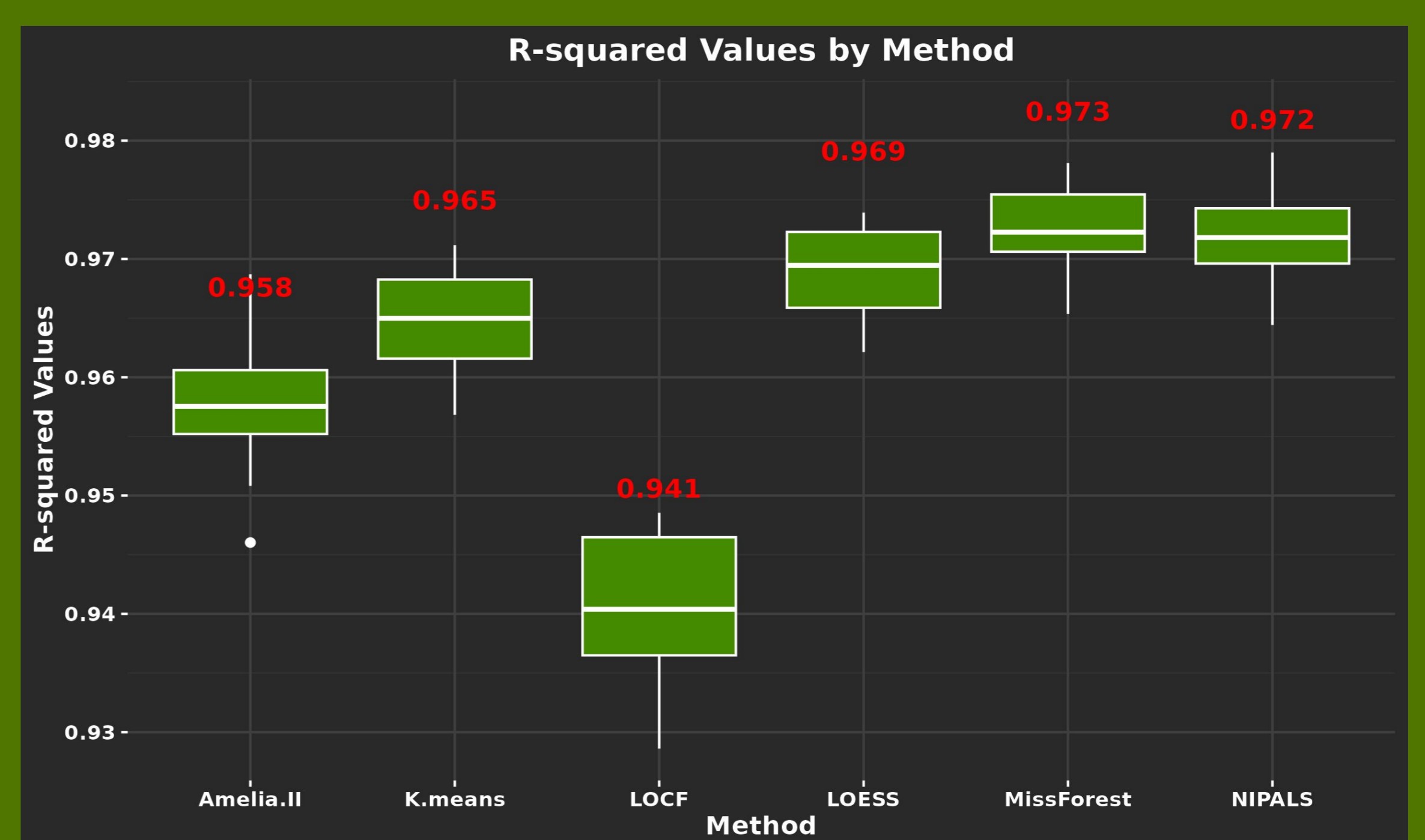
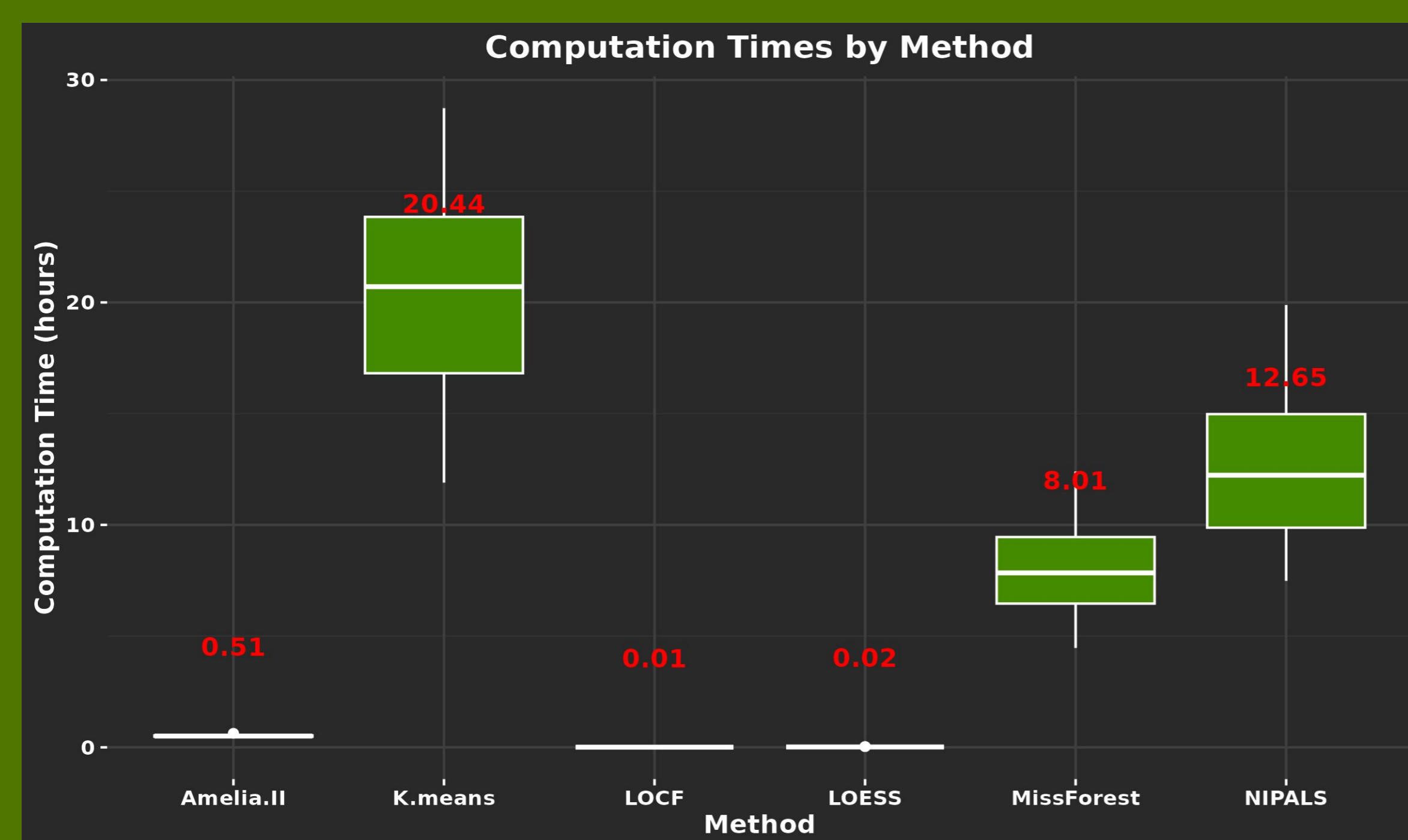
Data analysis work flow

Sequence data produced from Lesur et al. 2024



Imputation Results

Best methods overall: Amelia II & MissForest



* LOCF & K-means: Unreliable on discontinuous data.

Way Forward

Compute entire dataset with MissForest or Amelia II & proceed to rest of workflow.

A symmetrical study is being performed on black poplar, allowing for direct comparison between tree species with different life history traits.

Understanding the ways in which trees can exploit epigenetic changes for rapid local adaptation is vital to allowing us to safeguard our precious forest resources.