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The *Dicorynia guianensis* population genomic structure mirrors the distribution of environmental variables in French Guiana

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Background

Effective forest management can protect forests and enhance adaptation to climate change. In French Guiana, timber exploitation and climate change are threatening *Dicorynia guianensis*, a drought-sensitive tree that plays a crucial role in timber harvests[1]. Understanding its genetic adaptation to environmental variations through landscape genomic studies[2] is essential to designing better management programs.

Objective: identify significant outlier loci associated with environmental variation in *Dicorynia guianensis* in French Guiana

Material: whole genome resequencing of 87 individuals distributed over 11 sites with varying environmental conditions

Methods: outlier analysis methods, based on genetic structure and genotype-environment association methods[3]
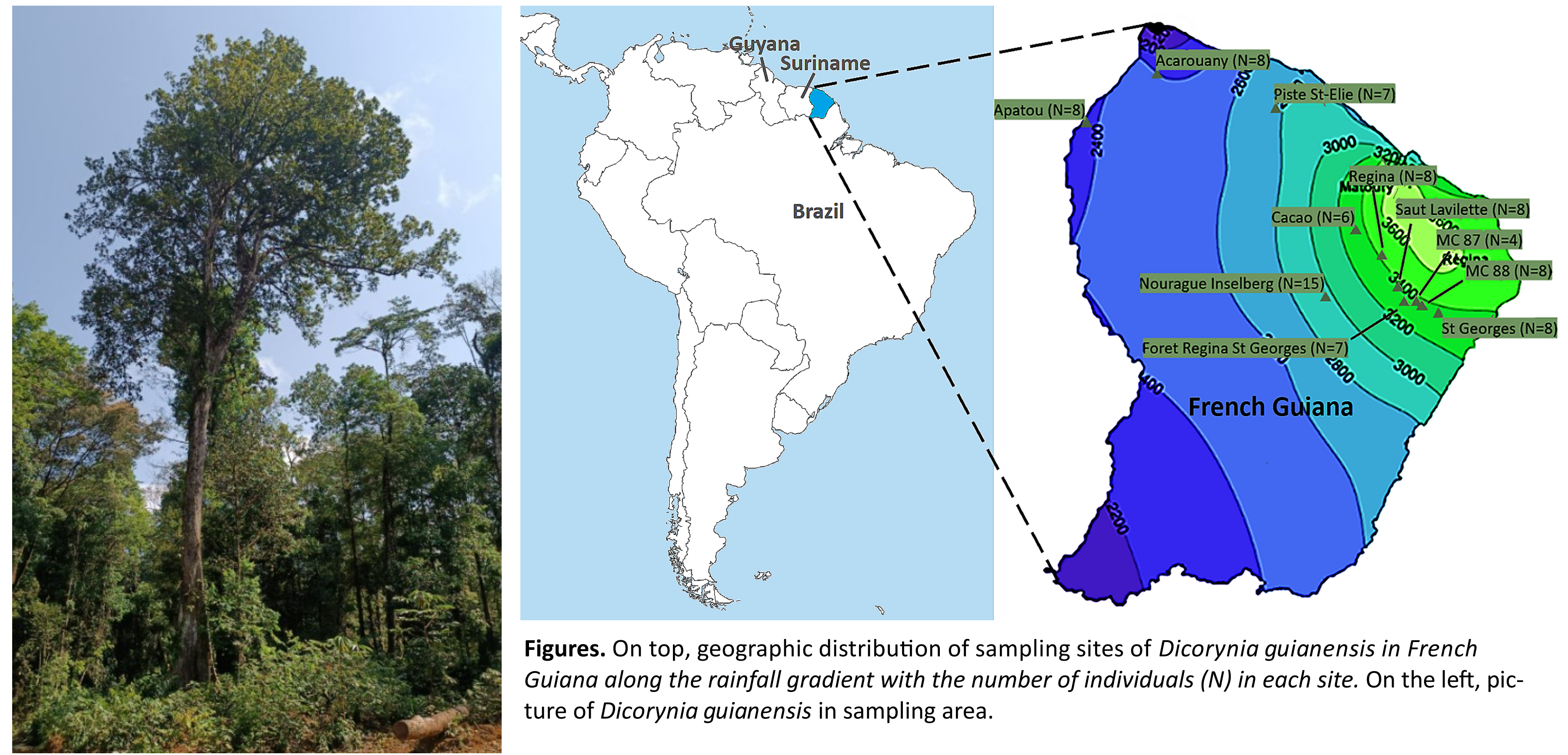
Figures. On top, geographic distribution of sampling sites of *Dicorynia guianensis* in French Guiana along the rainfall gradient with the number of individuals (N) in each site. On the left, picture of *Dicorynia guianensis* in sampling area.
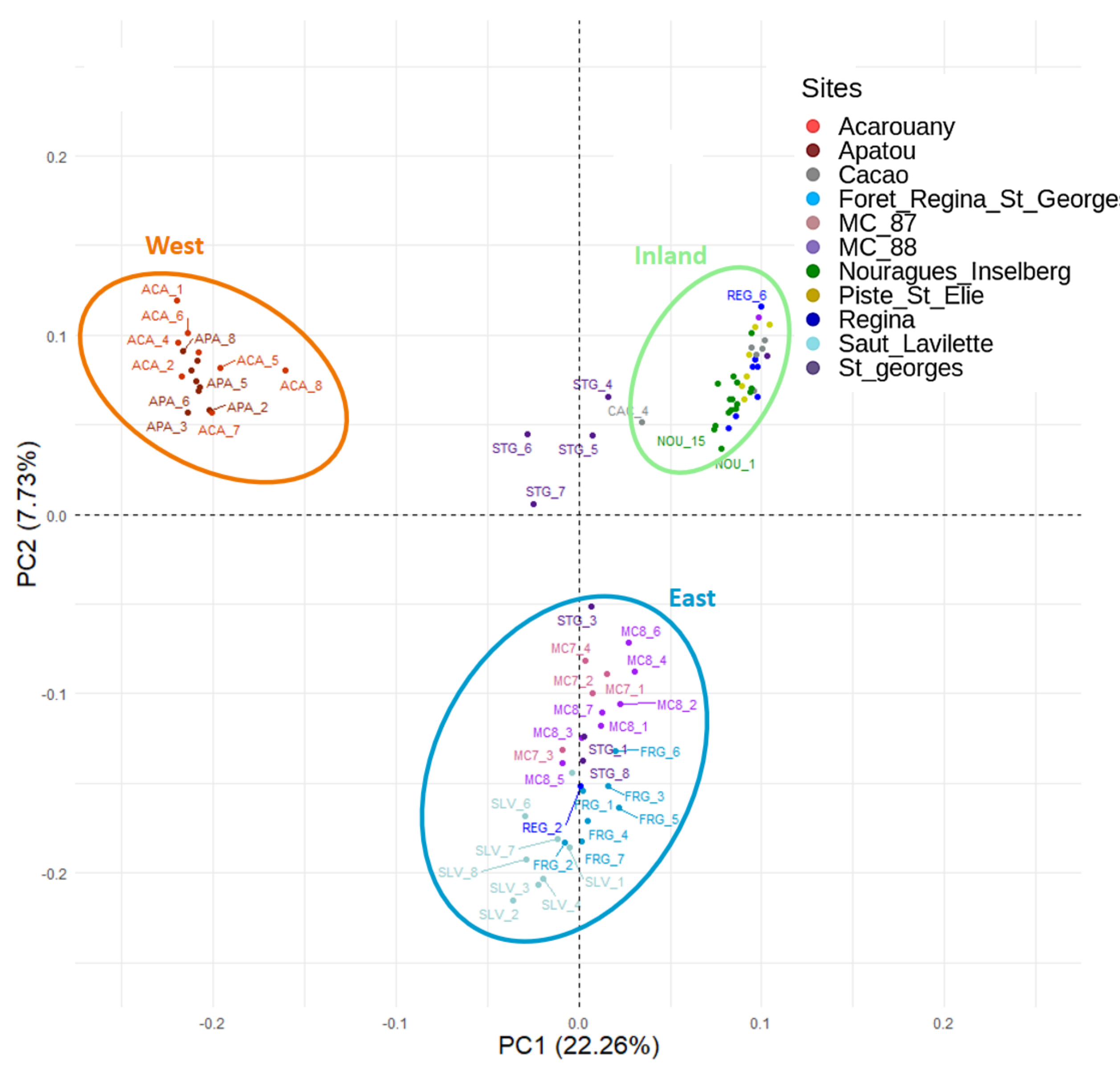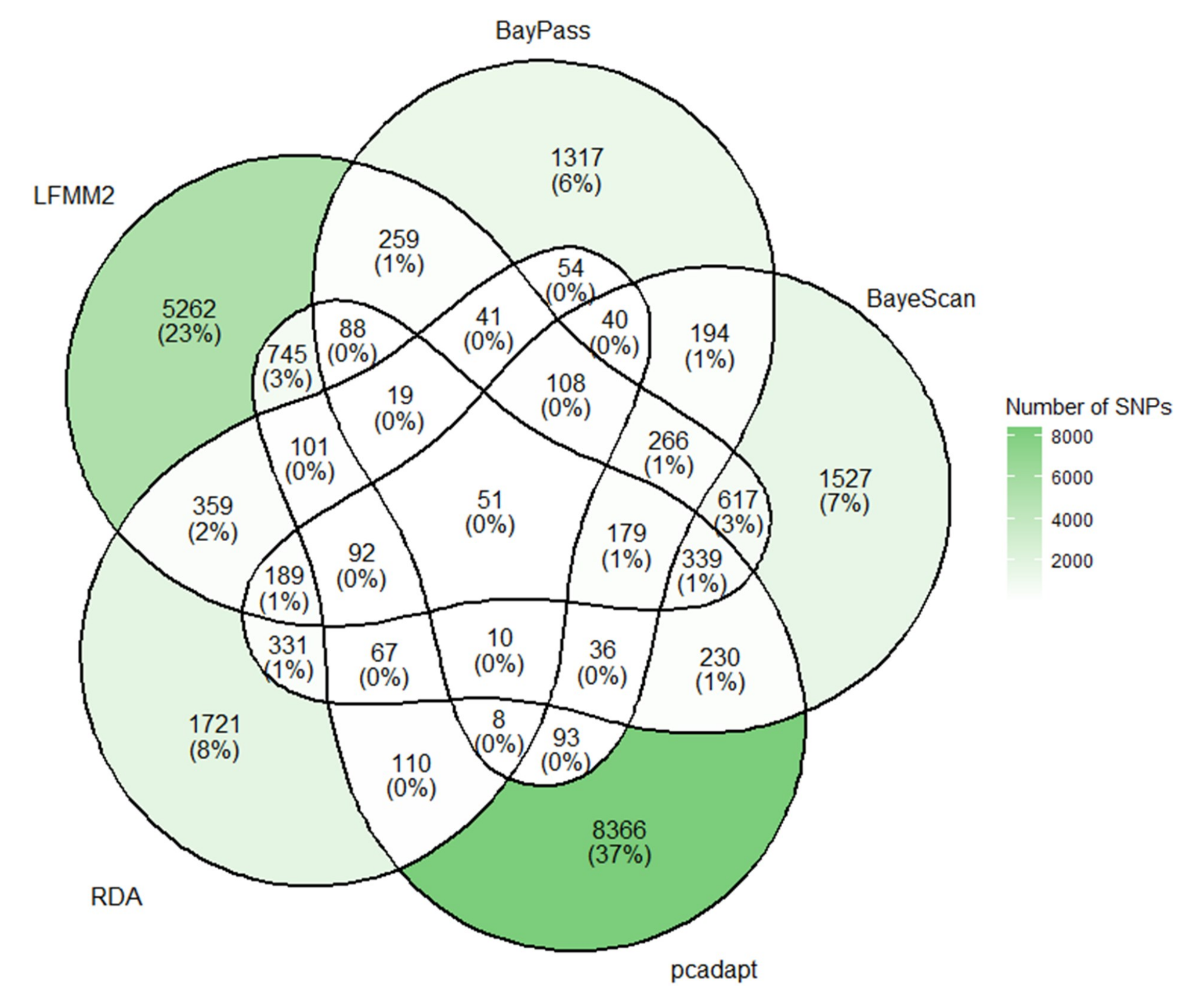

Figure. Principal component analysis (PCA) based on 599,959 SNP markers and conducted on the sampling sites using the first two components (PC1 and PC2).
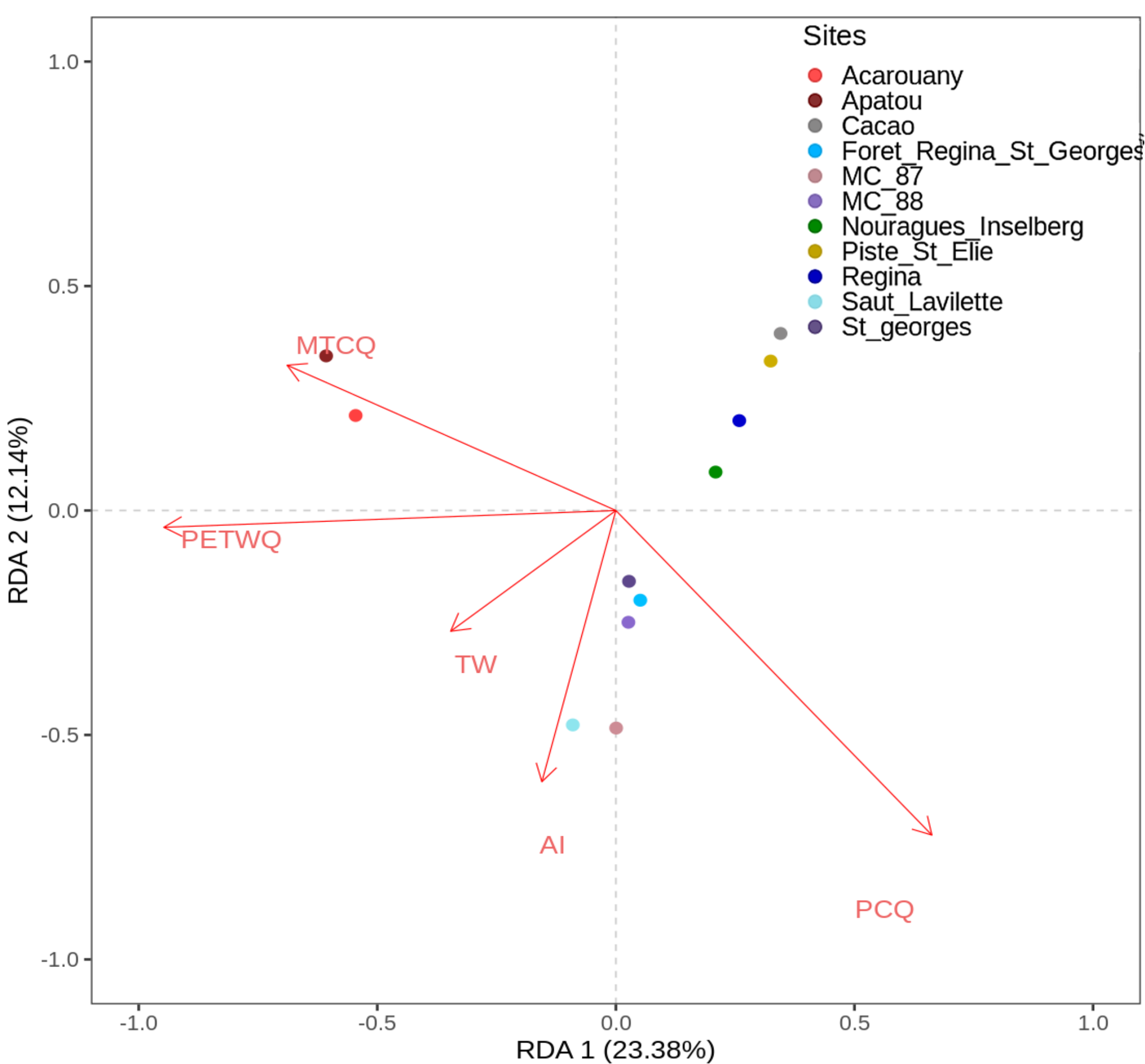
Genetic structure and environmental variation

- **3 clusters** : **west**, **inland**, and **east**, improving the previously described population structure[4,5]
- Regions characterized by **varying environmental conditions**, mainly influenced by rainfall during the rainy season

First signs of local adaptation

- **5 different methods** to detect evidence of selection.
- 459 SNPs were retained by at least four methods, highlighting **robust signals of selection**.

Precipitation and evapotranspiration **during rainy season** are the most significant variables modulating local adaptation and in shaping the genetic

Forest management perspective

- Our results showcase the critical role of specific environmental factors, specially **heavy rainfall** during the rainy season, as strong drivers of local adaptation.
- Using genomic offset calculations, we **observed spatial patterns of maladaptation** risk in *D. guianensis* in French Guiana.

Our results advocate for the integration of patterns of genetic structure and local adaptation into management plans by (1) protecting **genetically diverse populations;** (2) developing **region-specific strategies** to cope with environmental change
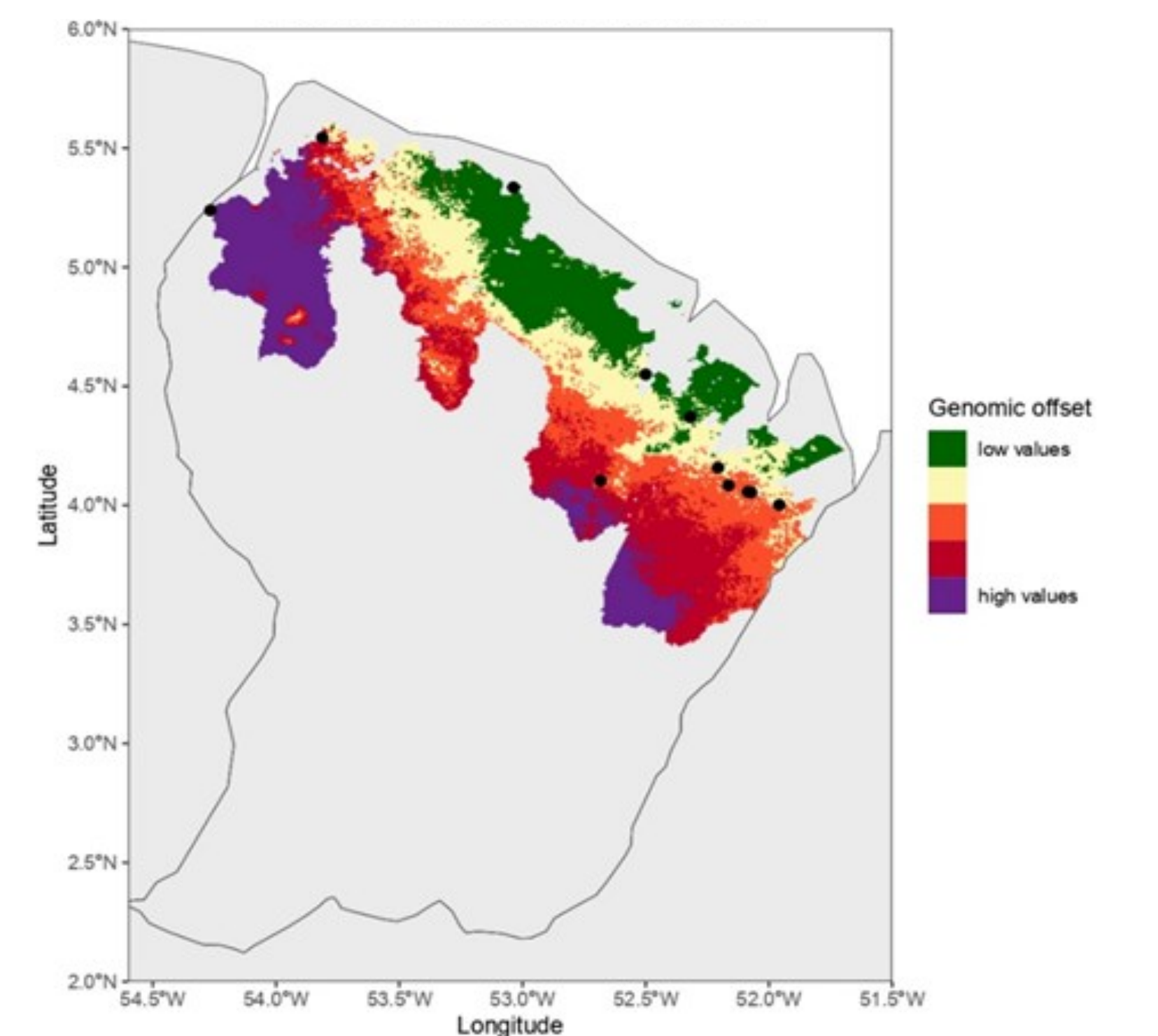

Figure. Spatial projection of adaptive genetic turnover in the permanent forest domain (DFP) in French Guiana.

Figure : Biplot of redundancy analysis (RDA) illustrating the impact of environmental variables on genetic variation at 11 study sites for *Dicorynia guianensis* in French Guiana.

- Mean temperature of the coldest quarter **(MTWQ)**
- Potential evapotranspiration of the wettest quarter **(PETWQ)**
- Topographic wettest index **(TW)**
- Aridity index **(AI)**
- Precipitation of the coldest quarter **(PCQ)**

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