Enviromics enhances a climatic-smart approach for mining adaptive alleles and optimize predictive breeding

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What is enviromics?

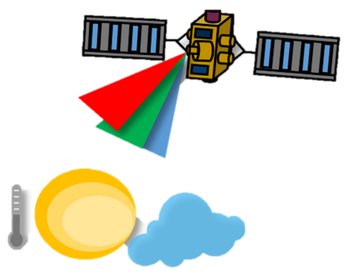
Enviromics is the field of data analytics that use large-scale information to characterize the growing environment of the species

Envirotyping pipeline

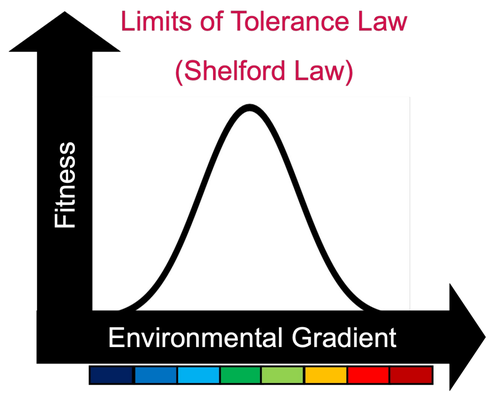
Data Collection → **Data Processing** → **Environmental Features**

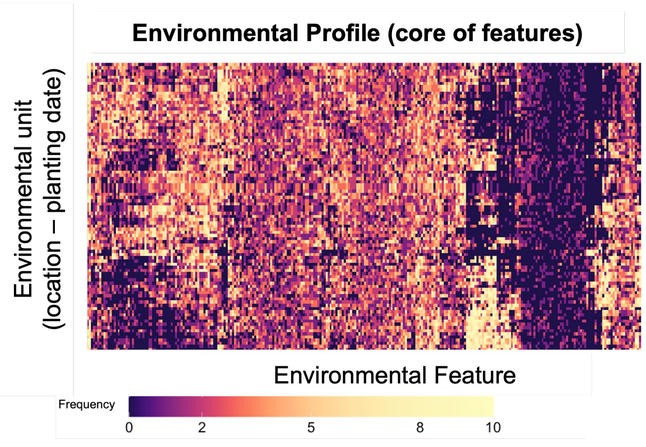
EnvRtype

Open-source R package



Remote sensing is key for developing countries





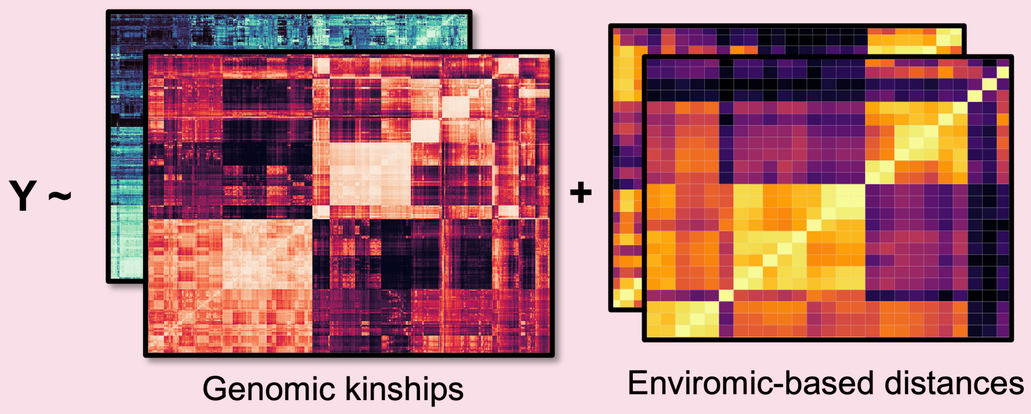
Fingerprint of the shared feature frequencies

Optimizing Predictive Breeding

Enviromics-aided Genomic Prediction (E-GP) could be used to increase GxE prediction accuracy, guide selective phenotyping efforts and perform virtual screening for plant's adaptability

Genomics + Enviromics – from experimental networks to the target population of environments **(TPE)**

Enviromics-aided Genomic Prediction

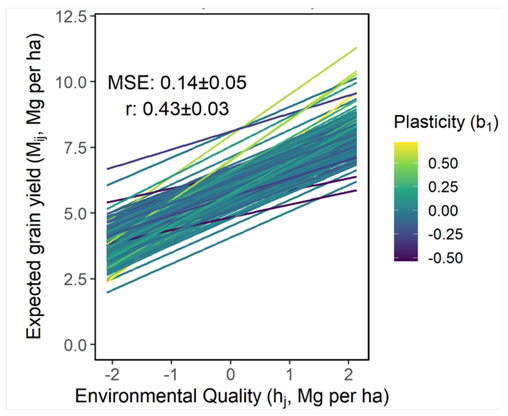


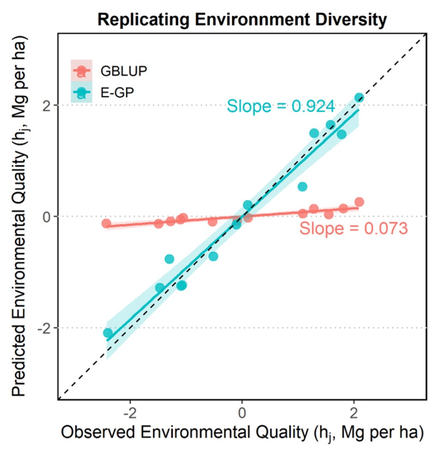
Y[optimized]
Selective Phenotyping

Identification of the best training sets
(representative phenotypes)

Data: Tropical Maize Hybrids, Grain yield, South America

Adaptability screening for untested growing conditions





Mining Alleles for Adaptation

Mining alleles for adaptation can be done by associating genomic and enviromic features, such as a panel of SNPs and temperature features

Climate-smart?

Global plant enviromes could connect multi-omics features to uncover the factors driving the adaptation of a certain specie or germplasm

International environmental panels or diversity panels

EnvRtype

Genomics + enviromics + adaptation features connecting growing regions and natural environments

Environment	TEMP [20,30)	TEMP [30,40)	TEMP [40,50)	TEMP [50,60)	TEMP [60,70)	TEMP [70,80)	TEMP [80,90)	TEMP [90,100)
Env_1	0	0	0	1	2	2	0	0
Env_2	1	3	1	0	0	0	0	0
Env_3	0	0	0	0	0	3	1	1
Env_4	0	2	3	0	0	0	0	0
Env_5	0	0	0	4	1	0	0	0

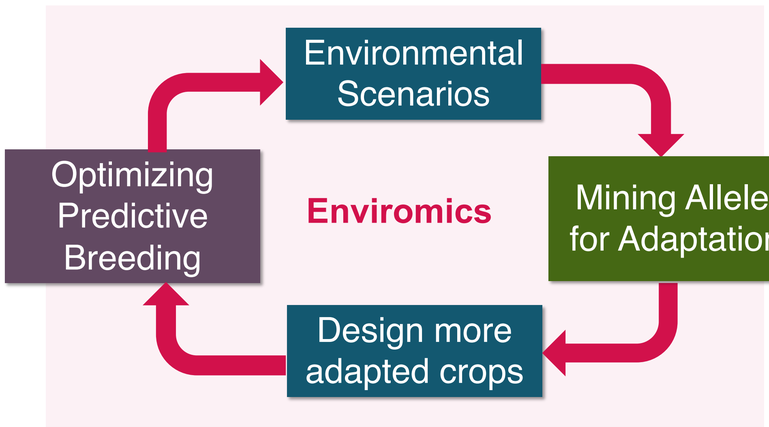
E-G association

Association models

EG-P association

Environment Feature ~ Genomic Features

Adaptation ~ Environment Feature + Genomics



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