

A Multidisciplinary Framework for Biodiversity Prediction in the Brazilian Atlantic Forest Hotspot



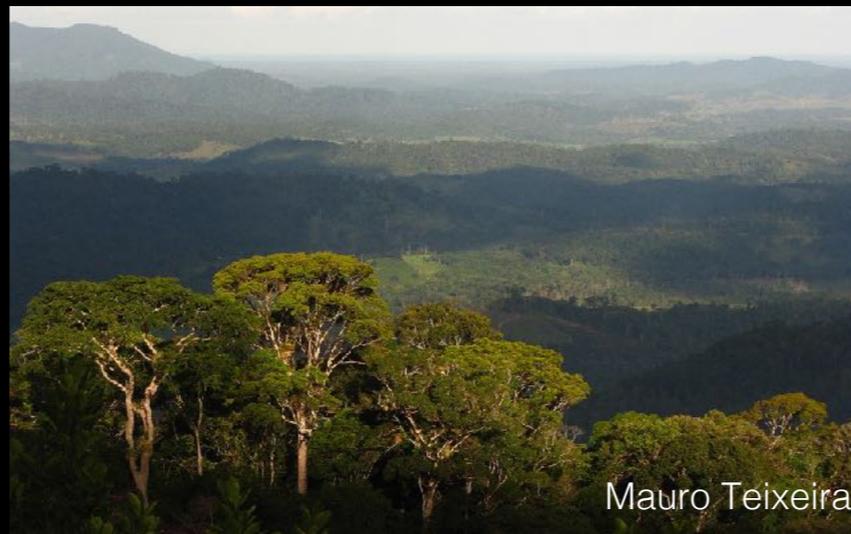
The Atlantic Forest



Danielle Rivera



Maria Strangas

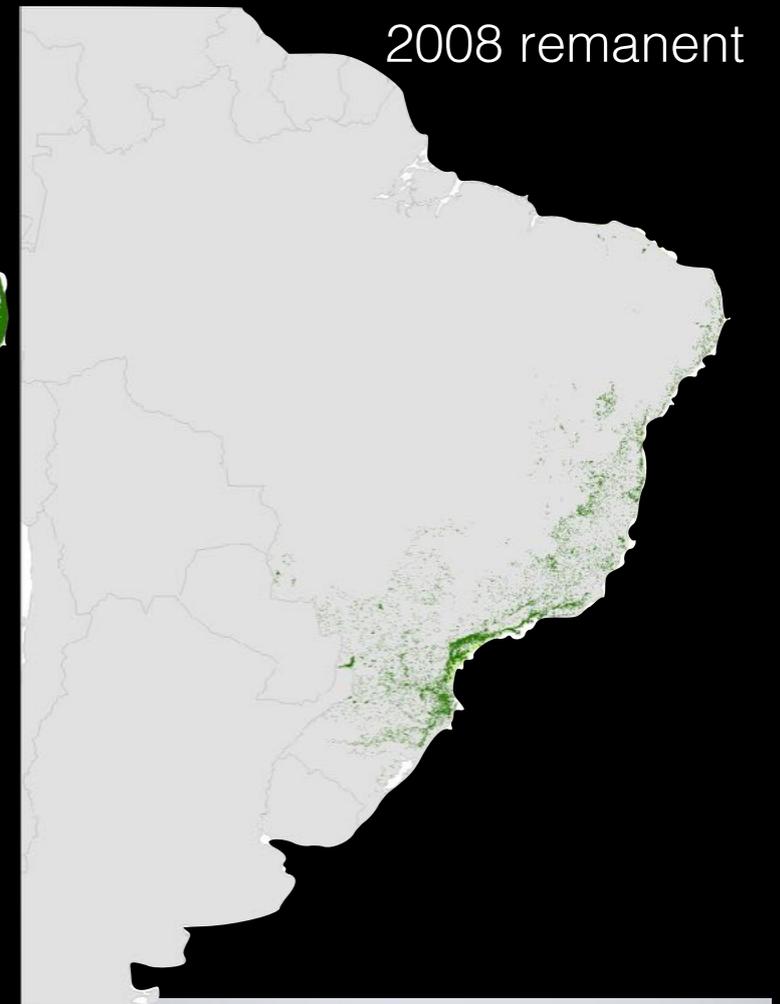
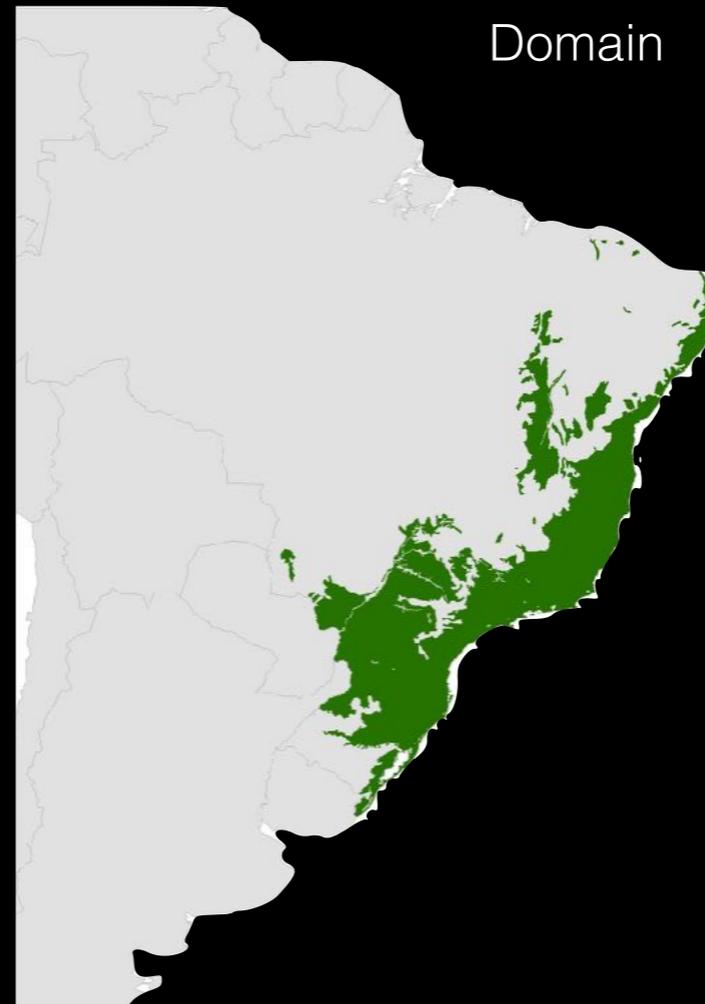


Mauro Teixeira

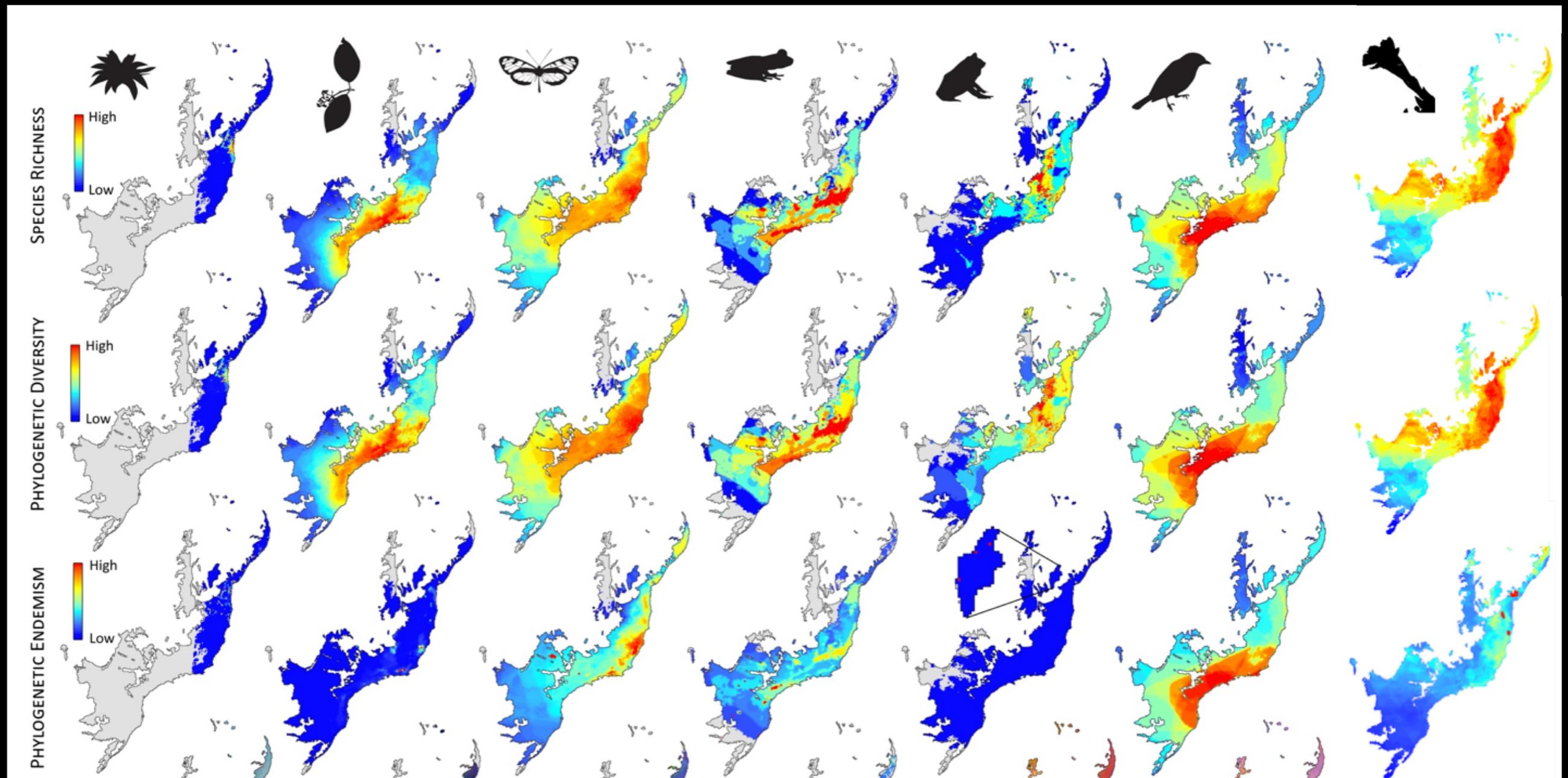


Maria Strangas

What remains of the AF



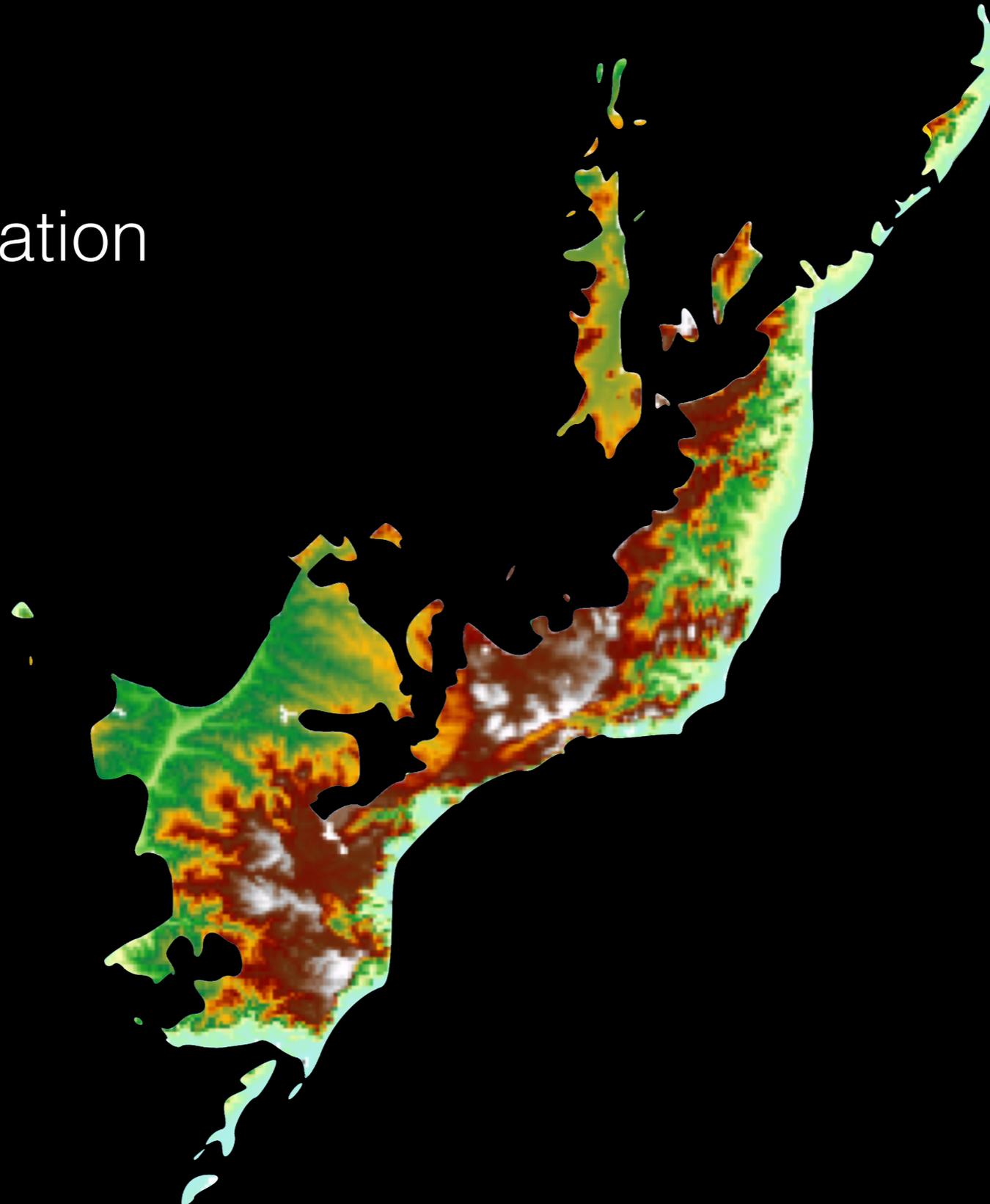
Mapping different dimensions of diversity in the AF



Can we use remote sensing to predict diversity patterns at large geographical scales?



Elevation



Bio 2 (CHELSA)

Bio 8 (CHELSA)

Bio 13 (CHELSA)

Bio 18 (CHELSA)

Bio 19 (CHELSA)

Elevation

Slope

TWI

Clouds

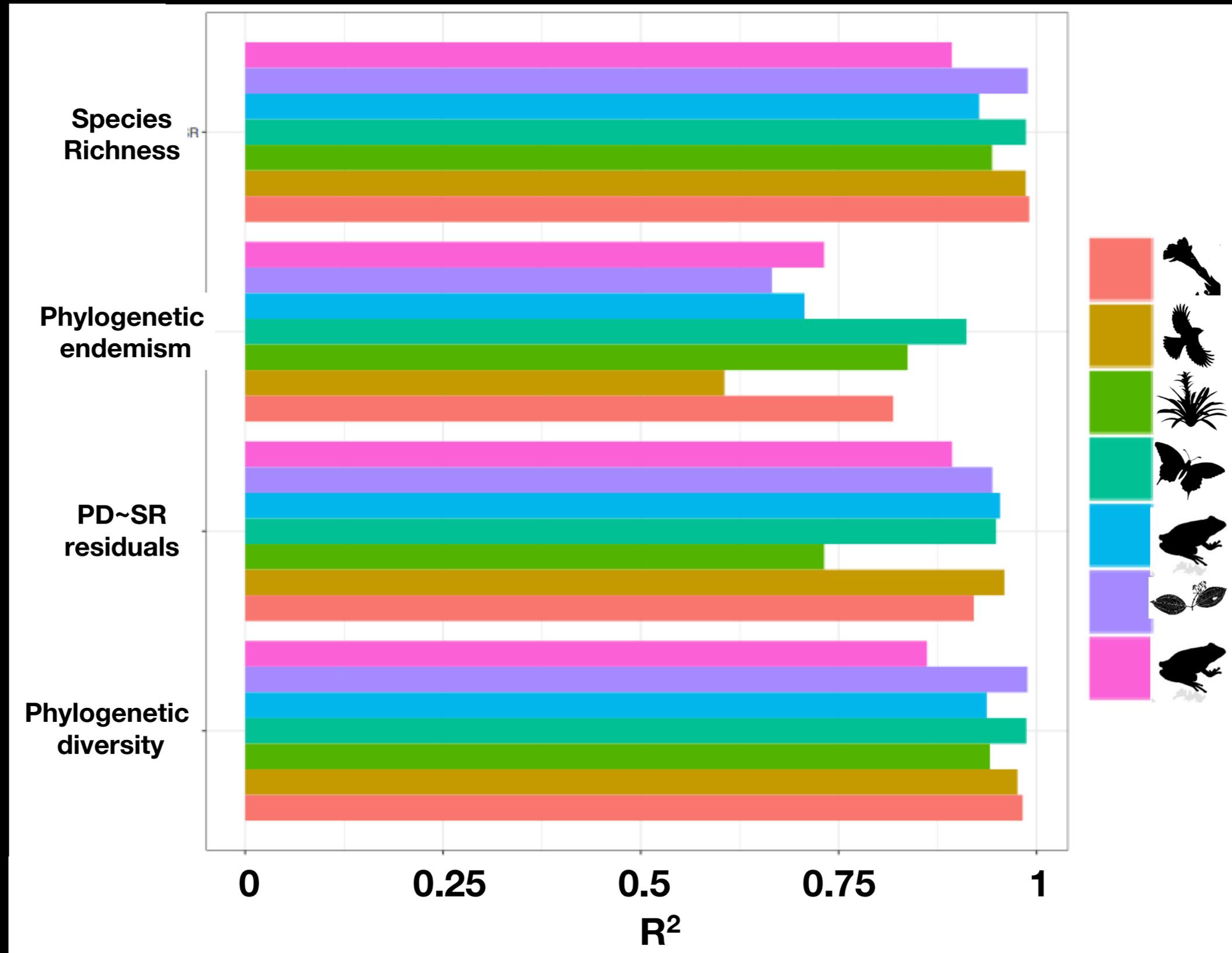
CV bio 1

CV bio 10

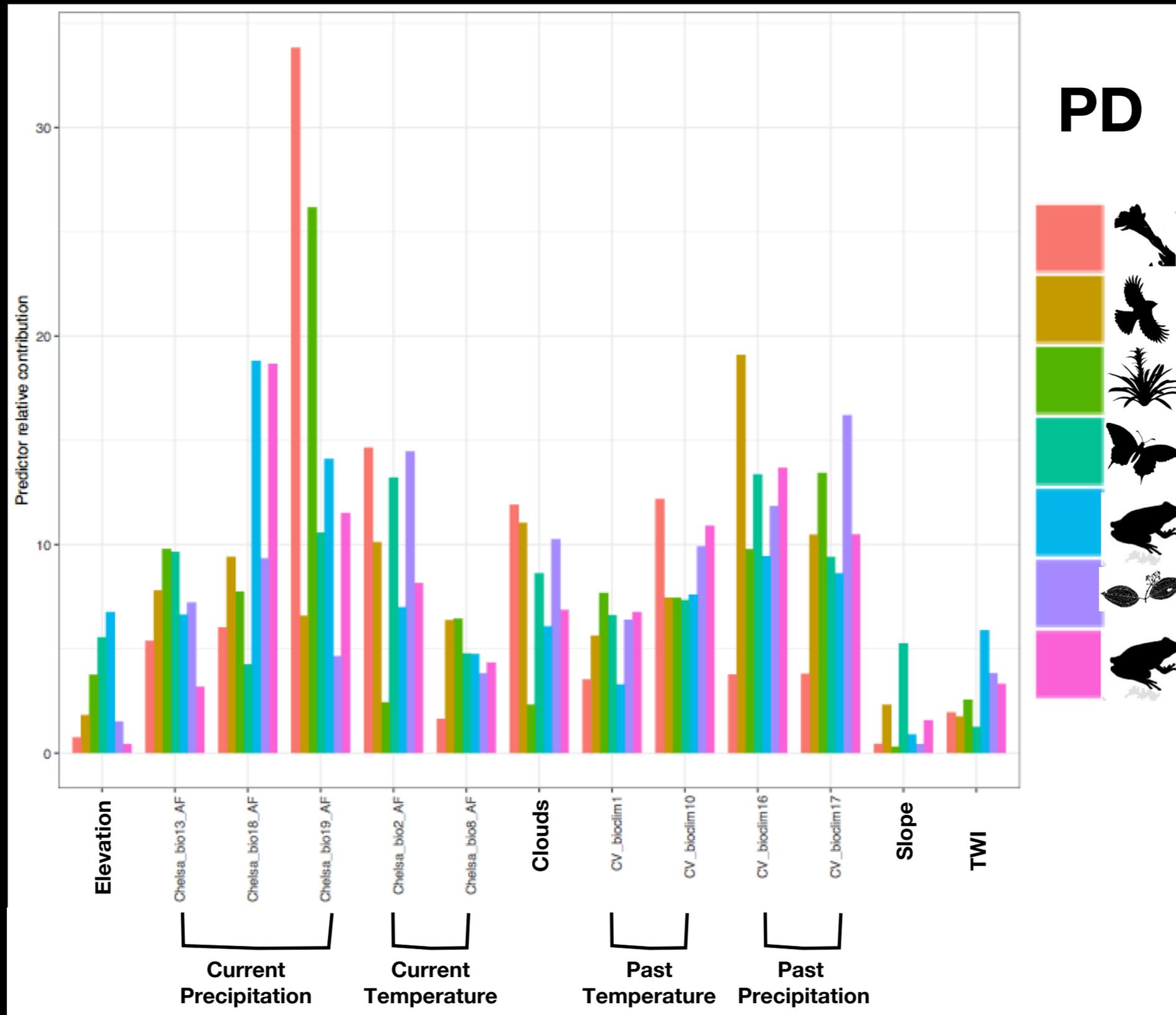
CV bio 16

CV bio 17

Machine learning analyses show we can



Variable contributions to the model vary according to diversity facet and sometimes taxonomic group



So can we quantify changes in diversity in near real time based on RS products?



- We will build new models based on static variables and variables that are measured repeatedly over time (MODIS LST, CHIRPS, MODIS NDVI) so this can be used as a tool for forecasting changes in biodiversity patterns based on changes in temperature, precipitation or vegetation

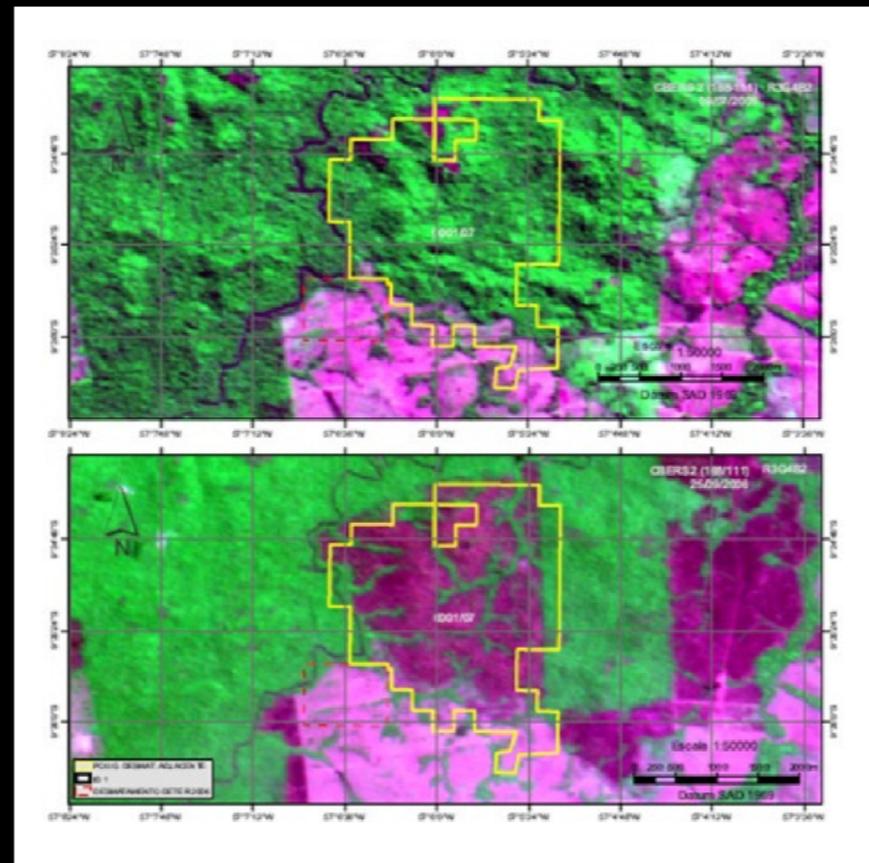
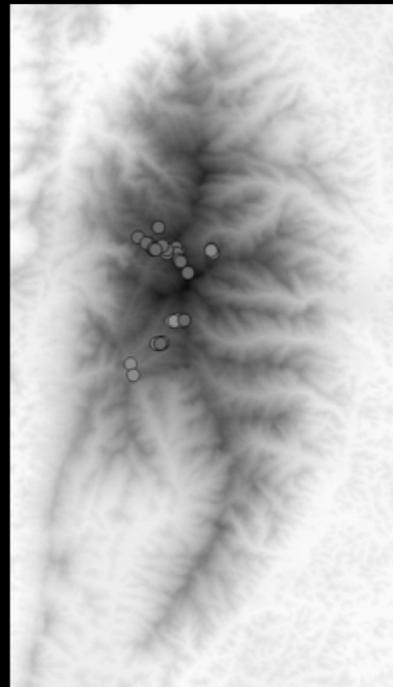
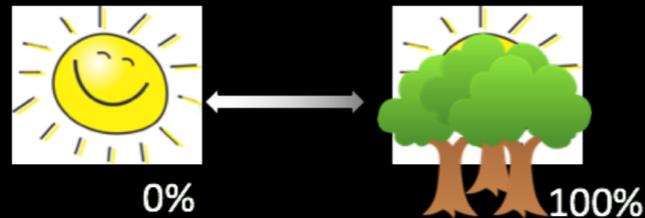


image from DETER
Deforestation Alert

At a smaller ecological scale organisms experiment microclimates. How to scale those in geographic space?



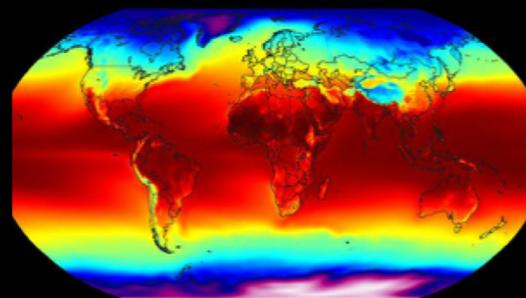
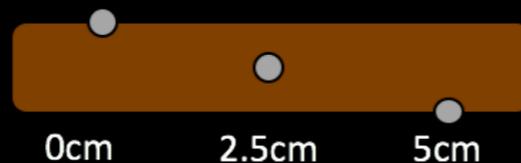
Shade Level (GLCF: VCF)



Substrate Type (soilgrids.org)



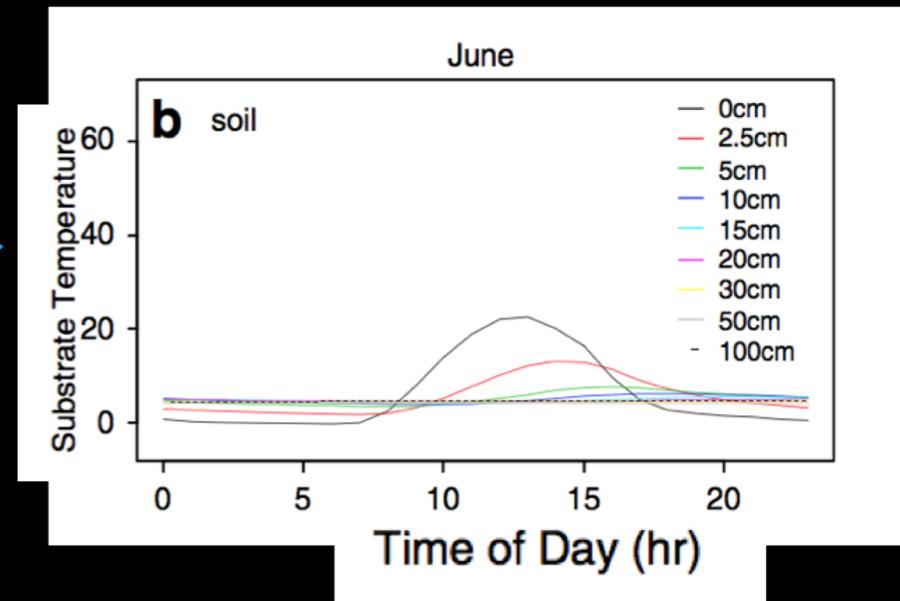
Substrate Depth (nat history)



15km res

30m res

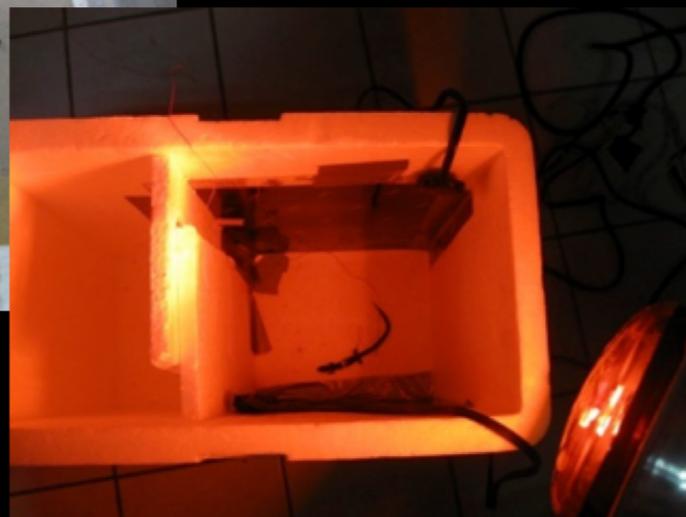
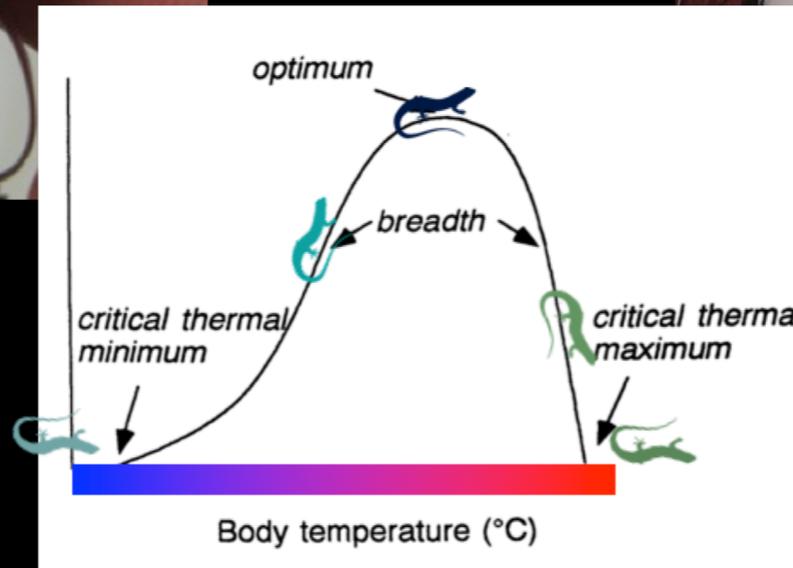
microclimate model



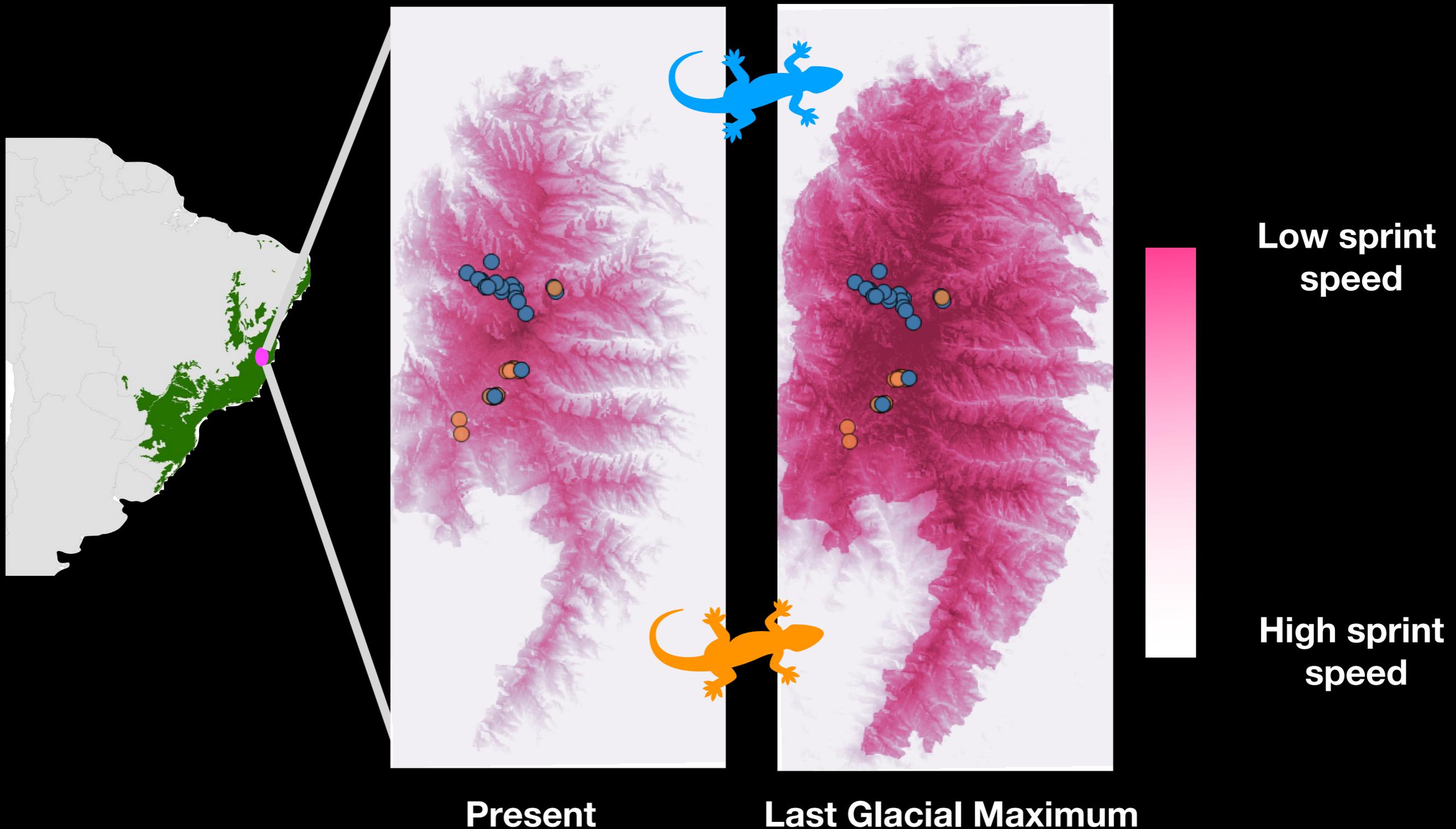
ECOGRAPHY PATTERN AND DIVERSITY IN ECOLOGY
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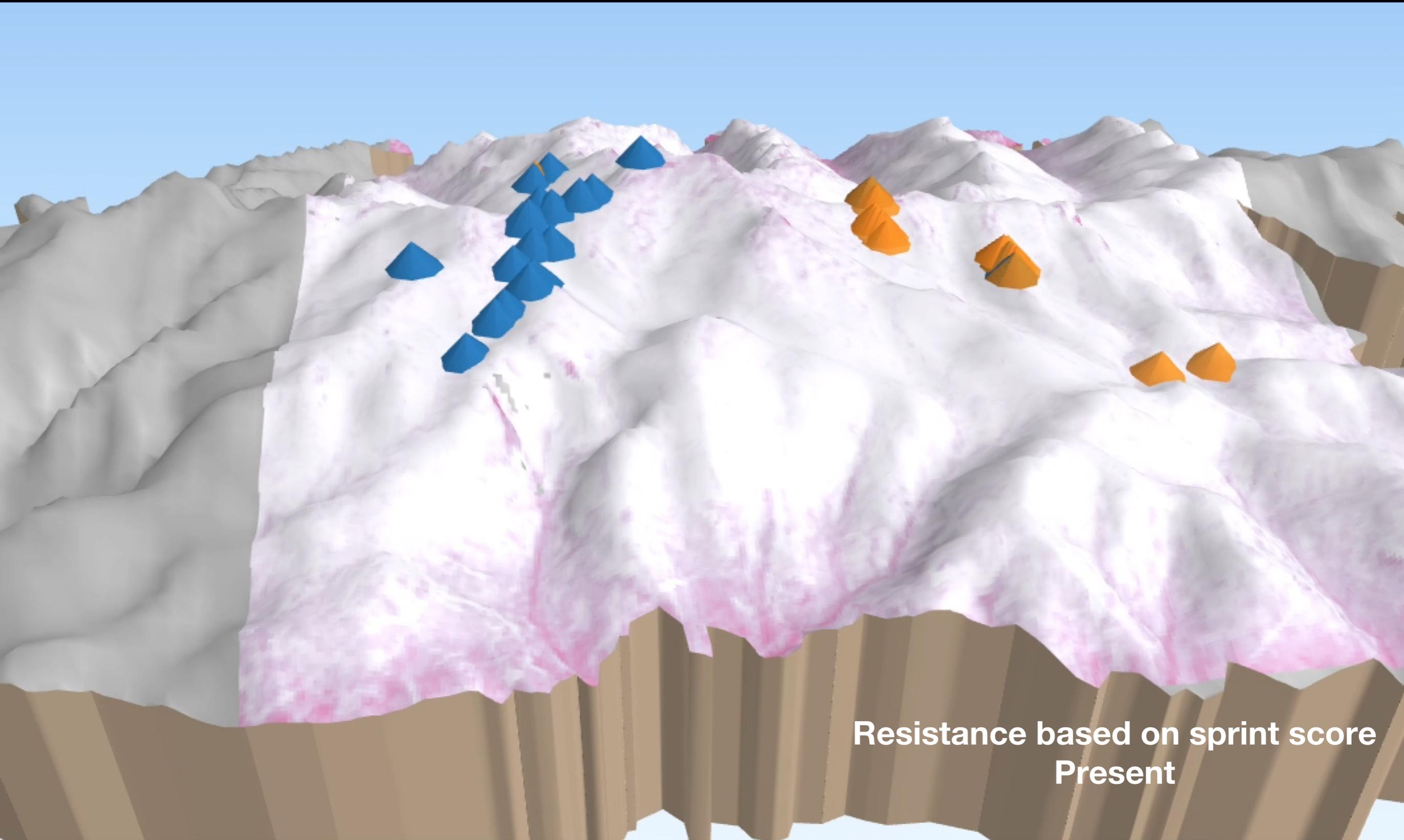
Research
NicheMapR - an R package for biophysical modelling: the microclimate model
Michael R. Kearney , Warren P. Porter
Accepted manuscript online: 25 August 2016 [Full publication history](#)

But individuals and not biodiversity respond to environments



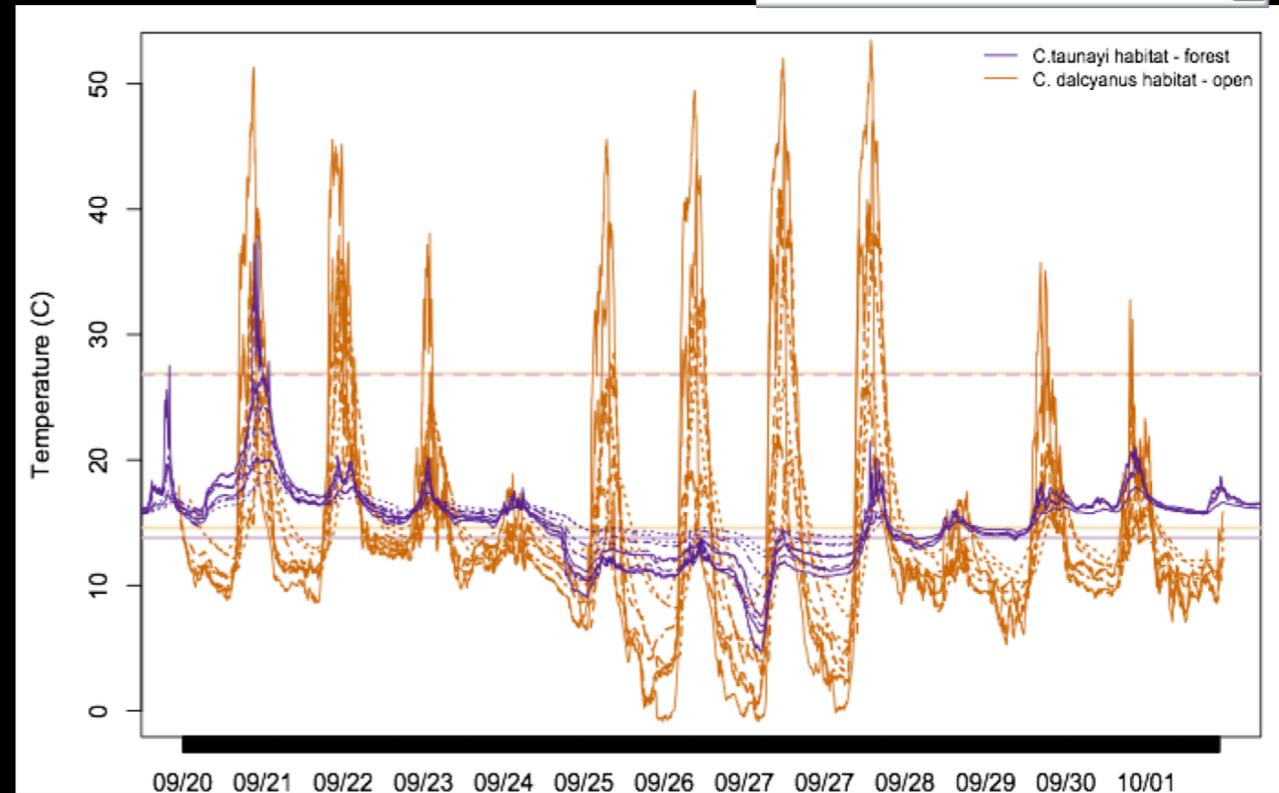
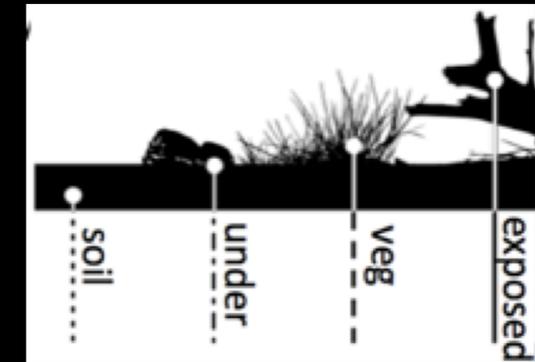
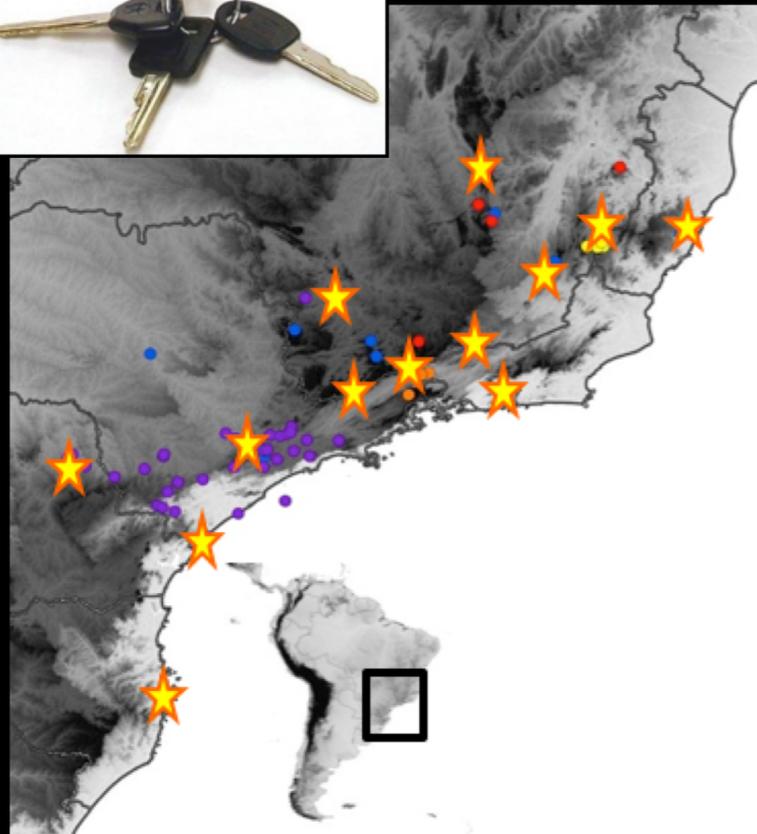
and organisms seem to be limited by microclimates through their physiology





Resistance based on sprint score
Present

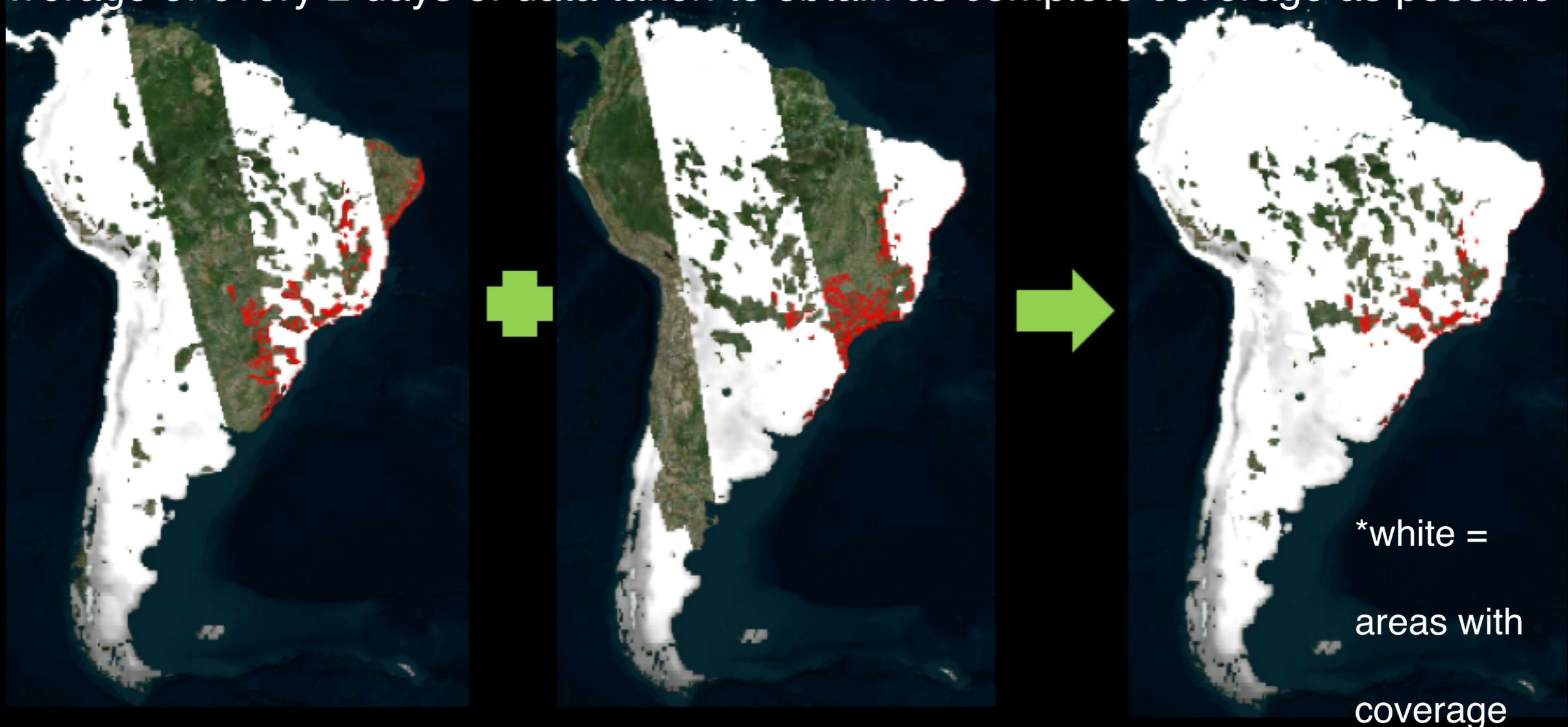
Characterizing microclimates in the ground is ideal but coverage is limited



AMSR-E downscaling using MODIS for better describing microclimates based on RS products and ground data



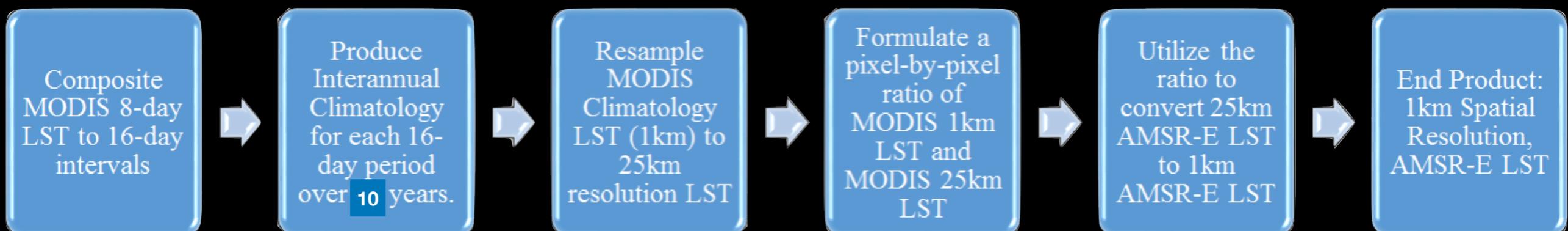
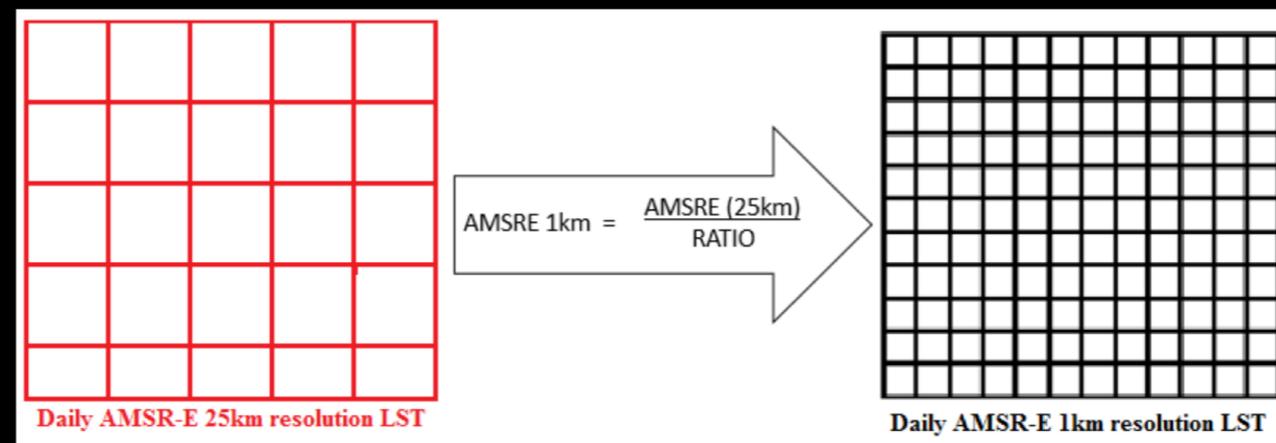
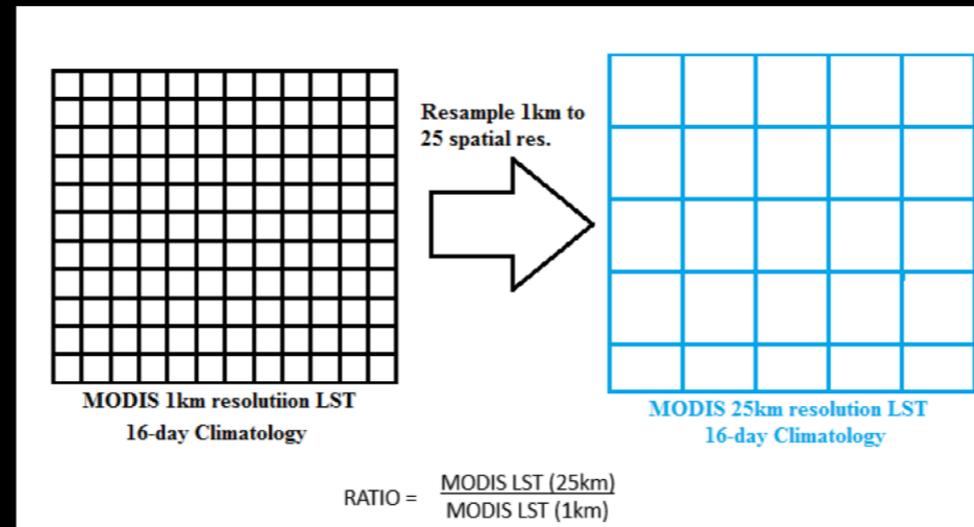
- AMSR-E (2002-2011)
- Data collected twice a day (1:30 AM/PM)
- Average of every 2 days of data taken to obtain as complete coverage as possible



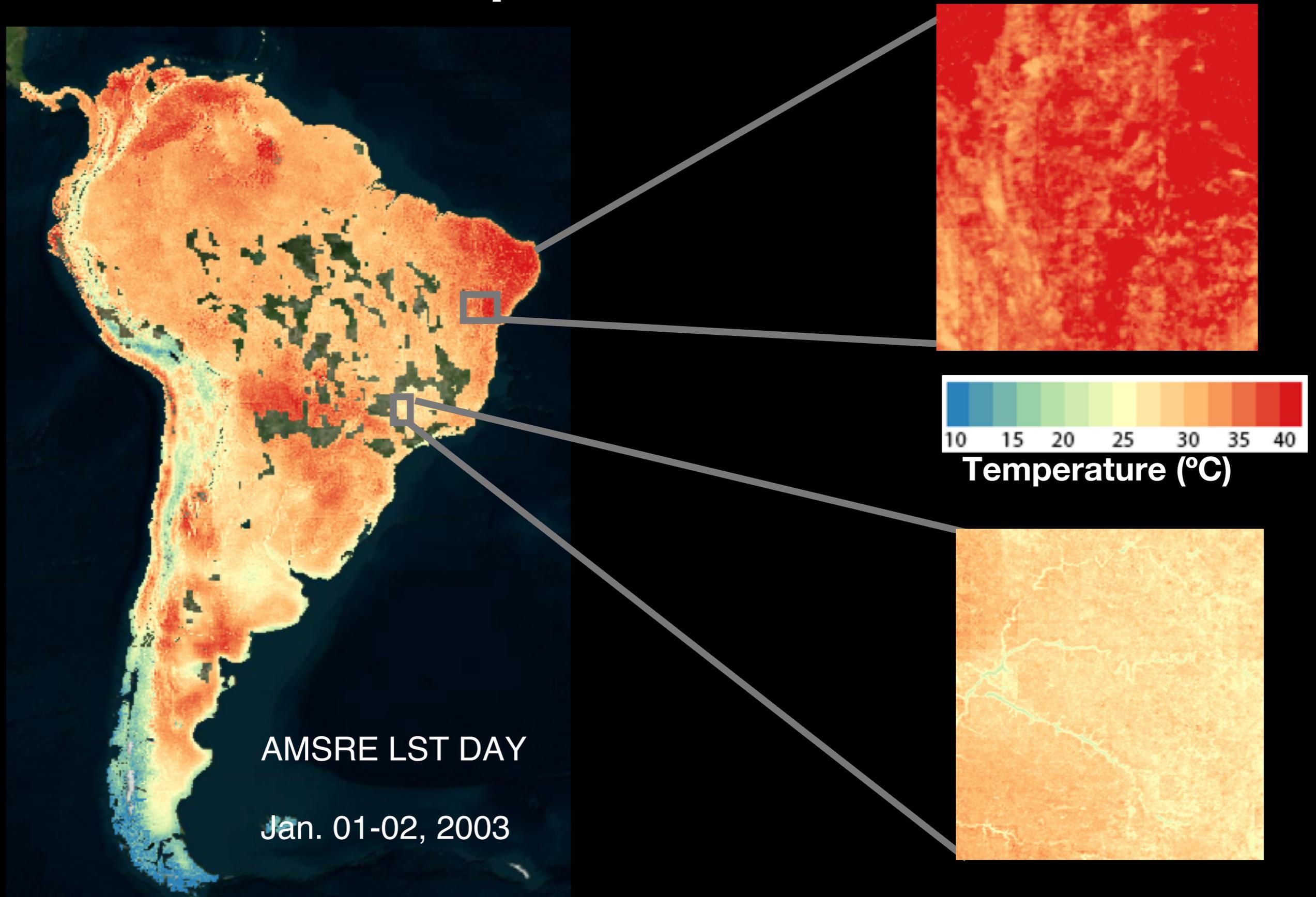
AMSR-E downscaling using MODIS for better describing microclimates based on RS products and ground data



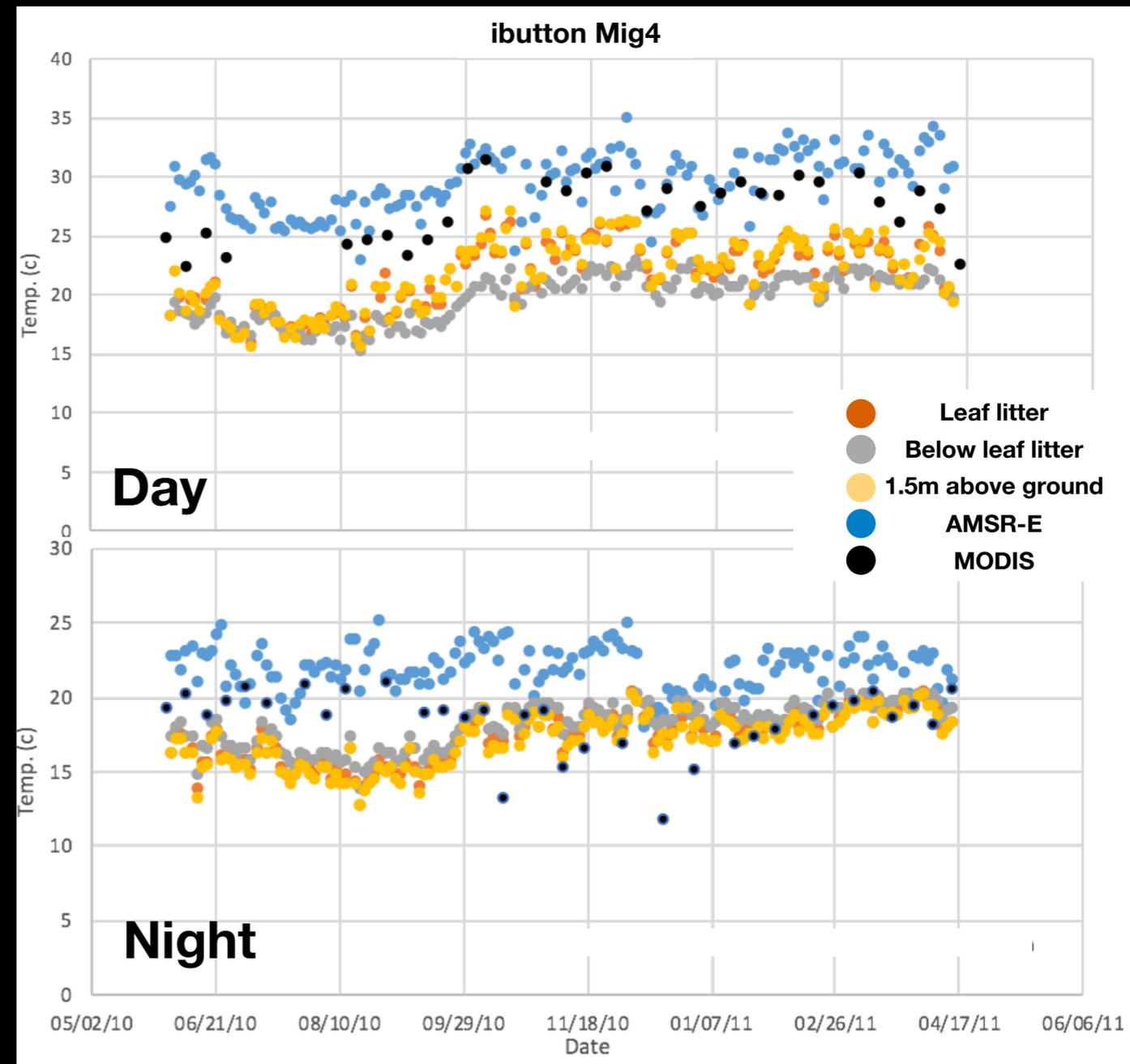
See A. Khan's poster!



Downscaled AMSR-E 1km resolution is still a descriptor of macroclimate



Better describing microclimates based on Downscaled AMSR-E and ground data



To wrap up

- We have been compiling more biodiversity data from the AF
- Remote sensing data can predict biodiversity patterns. Now, can we quantify change?
- The integration of microclimatic estimates based on RS derived macroclimatic estimates with physiology predicts genomic structure at the infraspecific level.
- We are producing a climatology based on AMSR-E data at 1km that mimics microclimatic ground data although still needs to be corrected to finally create microclimatic layers based on these RS products.
- We will explore the role of precipitation in predicting diversity at different geographic and ecological levels

