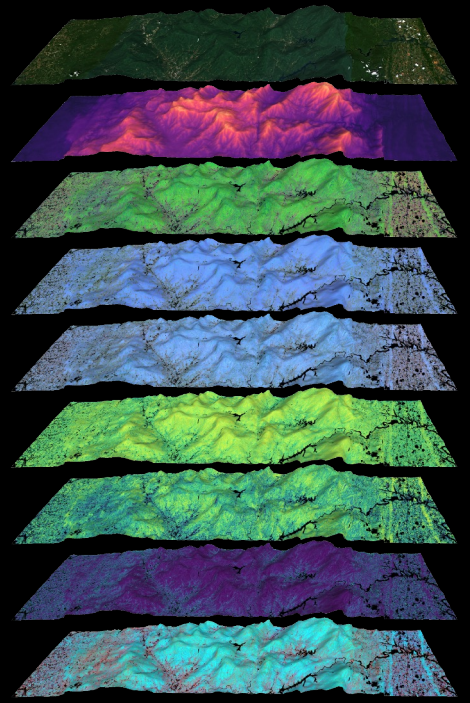
Mapping changes in forest diversity and disease in North American temperate forests



J. Antonio Guzmán Q., Jeannine Cavender-Bares (PI), Philip A. Townsend, Jesús N. Pinto-Ledezma, Gerard Sapés, Jennifer Juzwik, Jonathan Knott.

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Annual NASA Biodiversity & Ecological Conservation Meeting
May 7th – 9th Silver Spring, MD

Project goals (summary):

1. Model species distributions using remote sensing data as input variables.

2. Scale forest diversity detection to map communities using satellite imagery.

3. Identify and differentiate threats to oaks species.

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   Pinto-Ledezma and Cavender-Bares (2021) *Scientific Reports*

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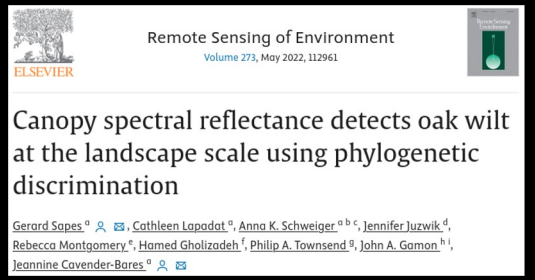
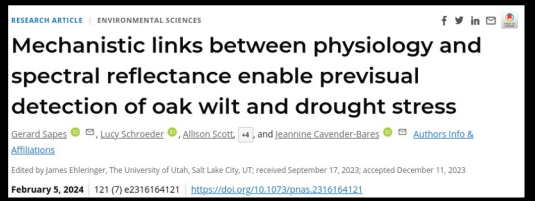
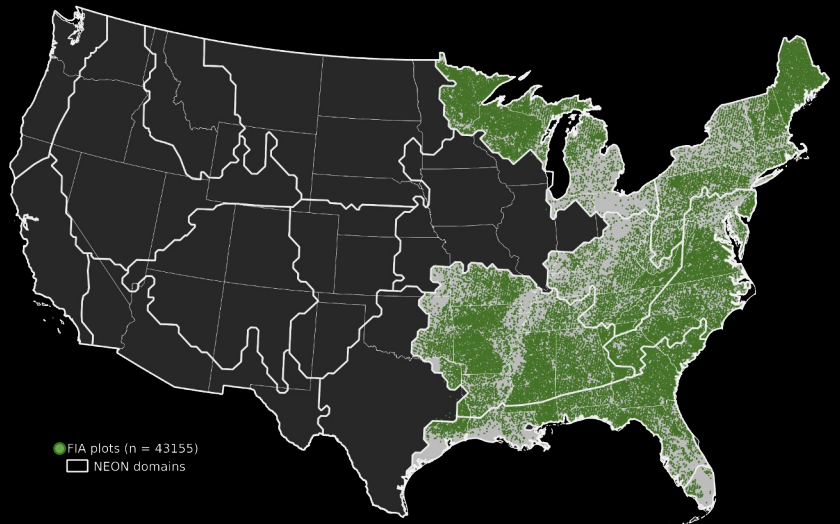
   Sapés et al. (2022) *Remote Sensing of Environment*
   Guzmán et al. (2023) *Remote Sensing of Environment*
   Sapés et al. (2024) *Proceedings of the National Academy of Sciences*



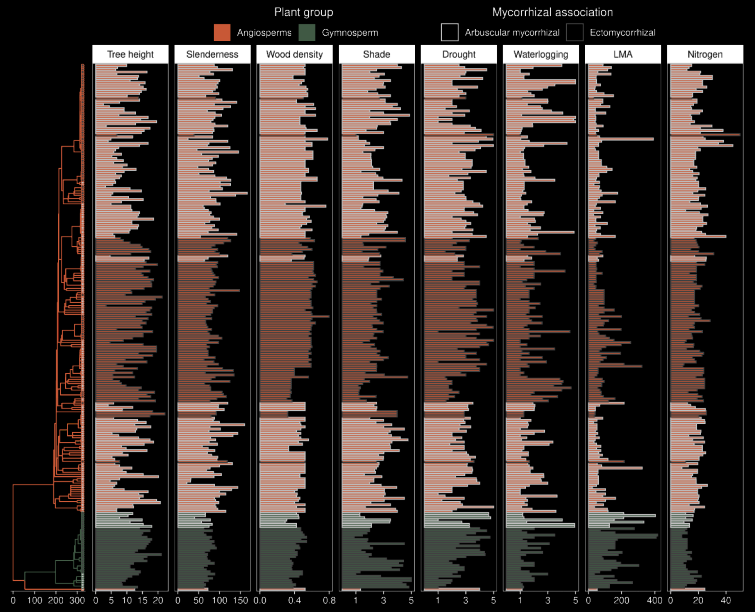


Mapping multiple dimensions of forest diversity

FIA inventories



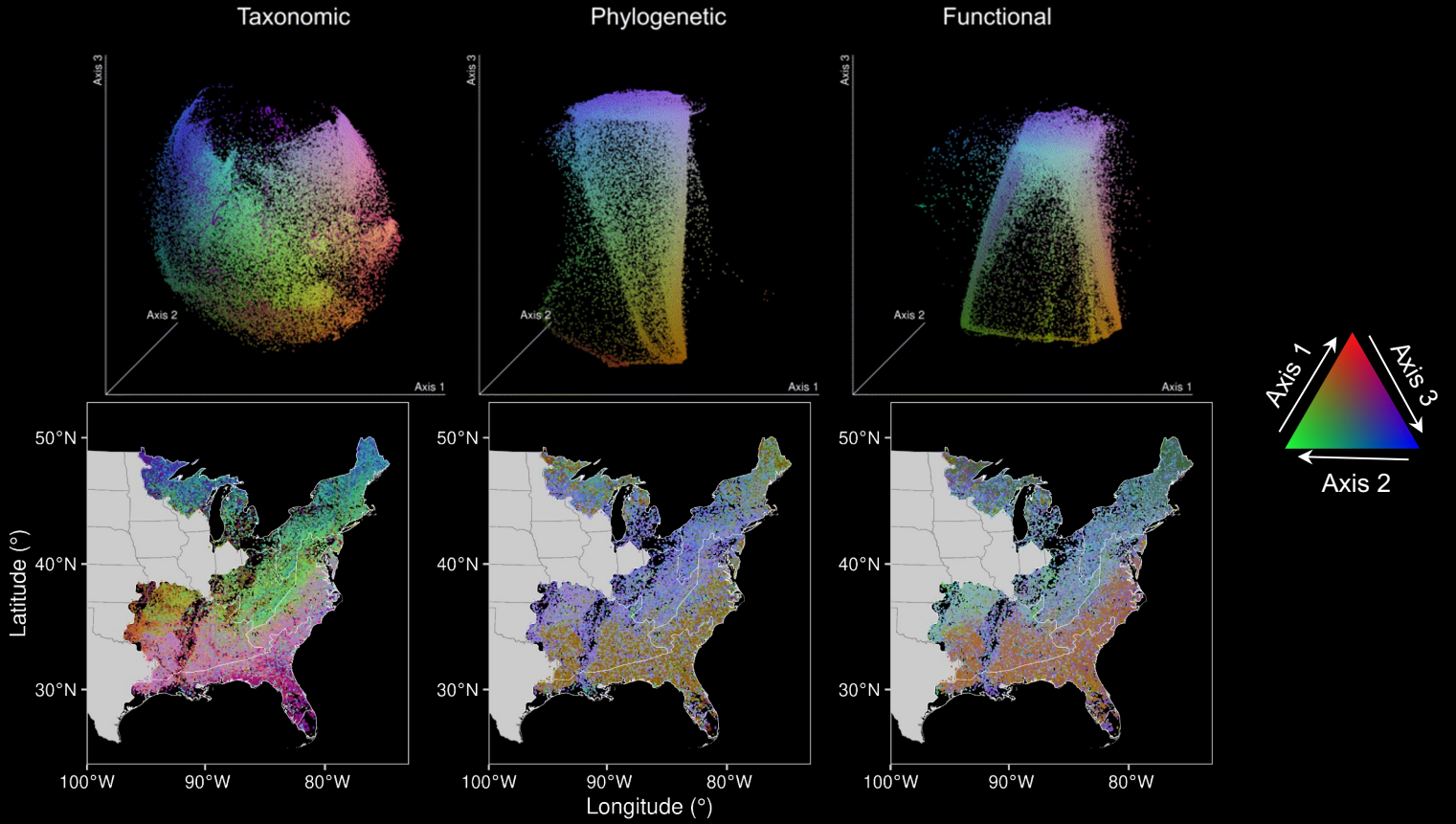
Taxonomic, phylogenetic, and functional information



Beta diversity

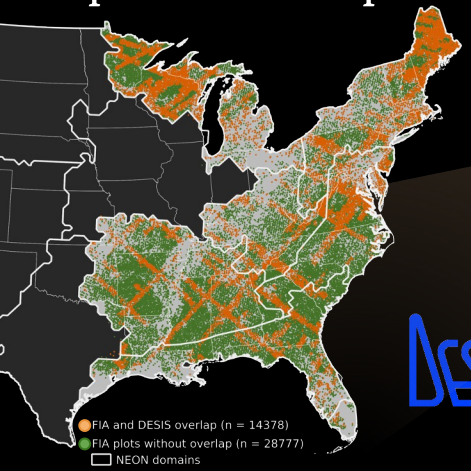
Ordination of communities using
Non-metric Multidimensional Scaling (NMDS)

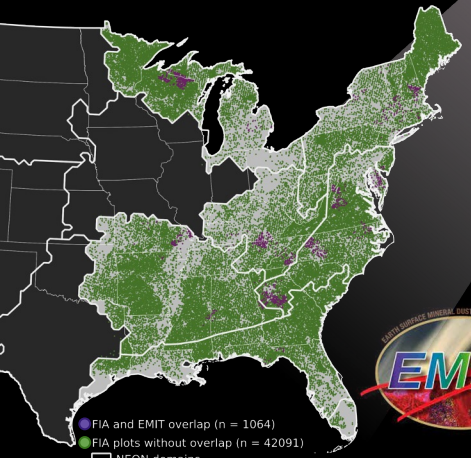
Ordination of plant communities

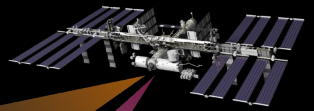


NMDS of multiple dimensions of beta diversity and its spatial pattern

Spaceborne spectroscopy data



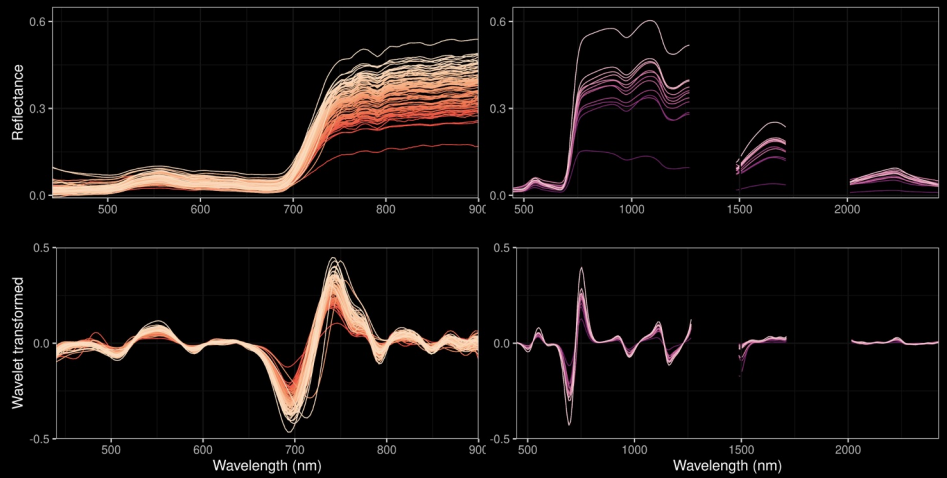




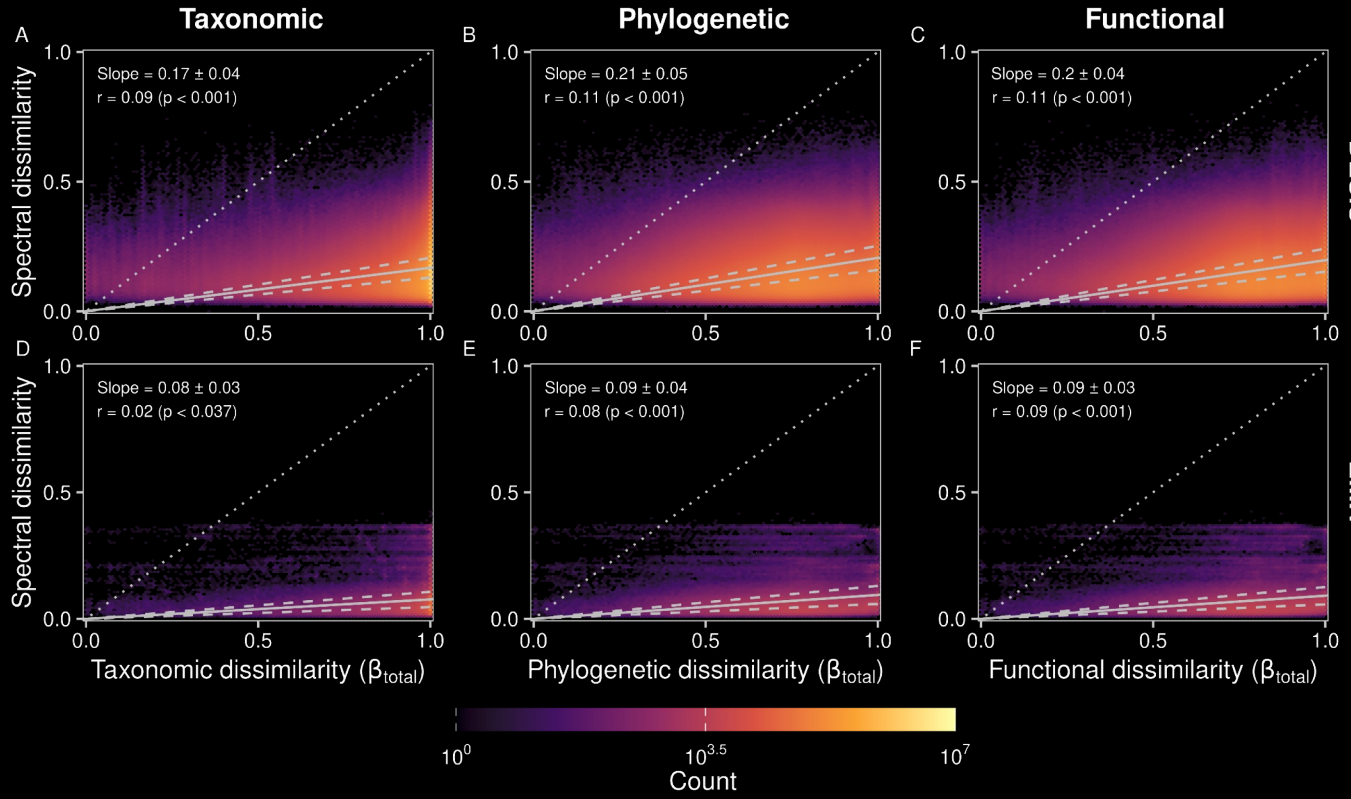
Our application

- To test the correspondence between spectral and community dissimilarity
- To develop models (PLSR) to predict community ordinations (beta diversity)

Example of inventories with a single species



Spectral vs community dissimilarity

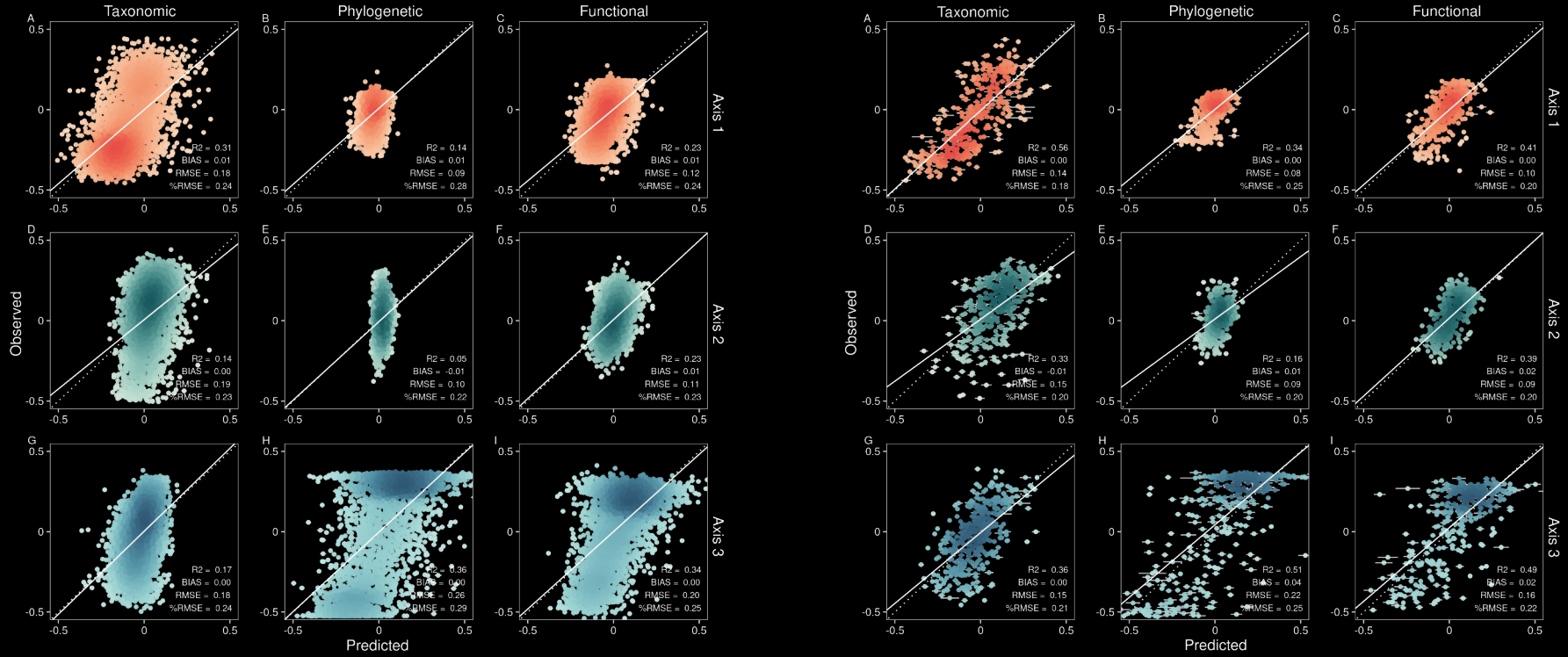


Comparisons between community and spectral dissimilarity

PLSR model performance

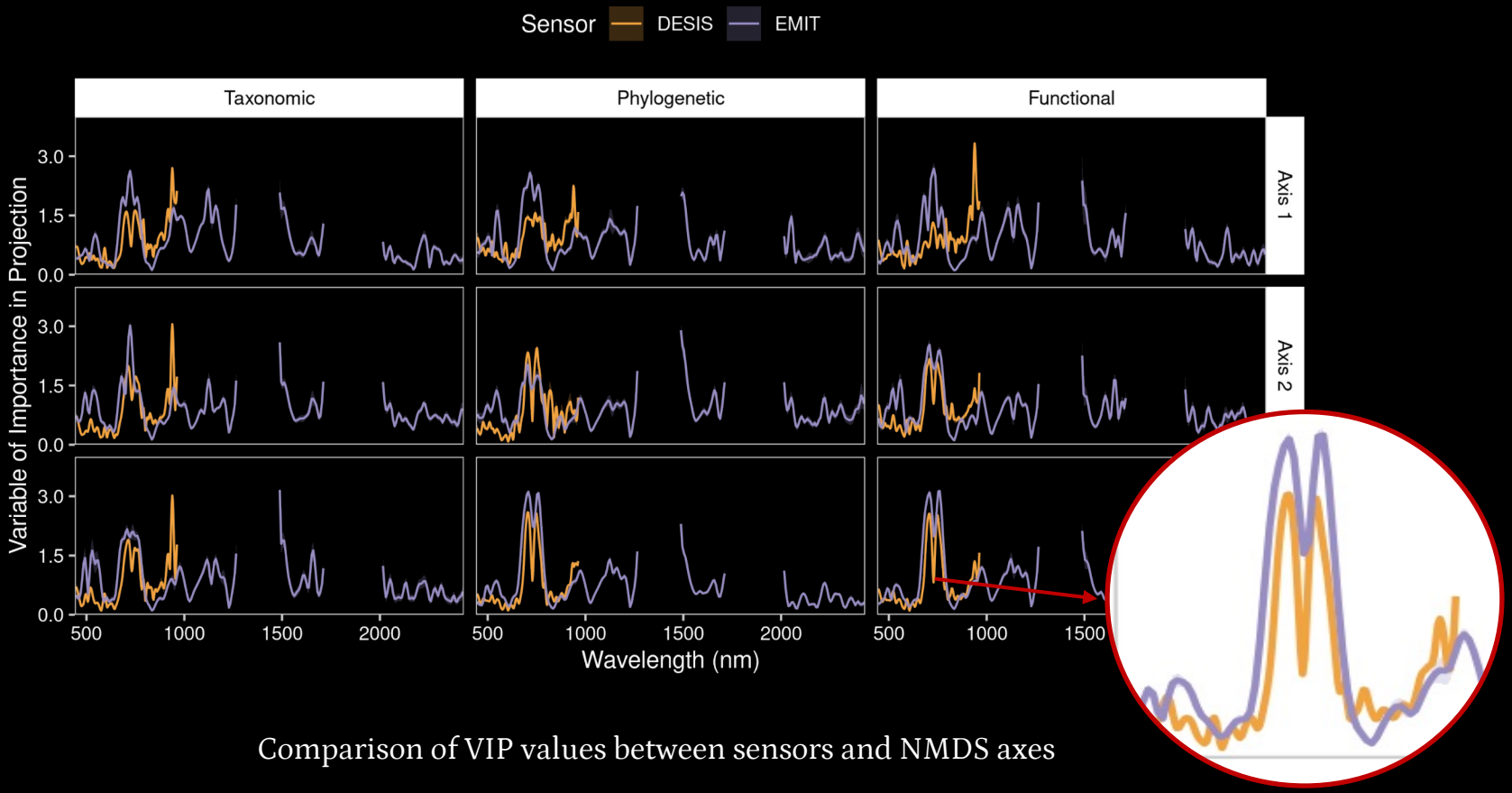
DESIS

EMIT



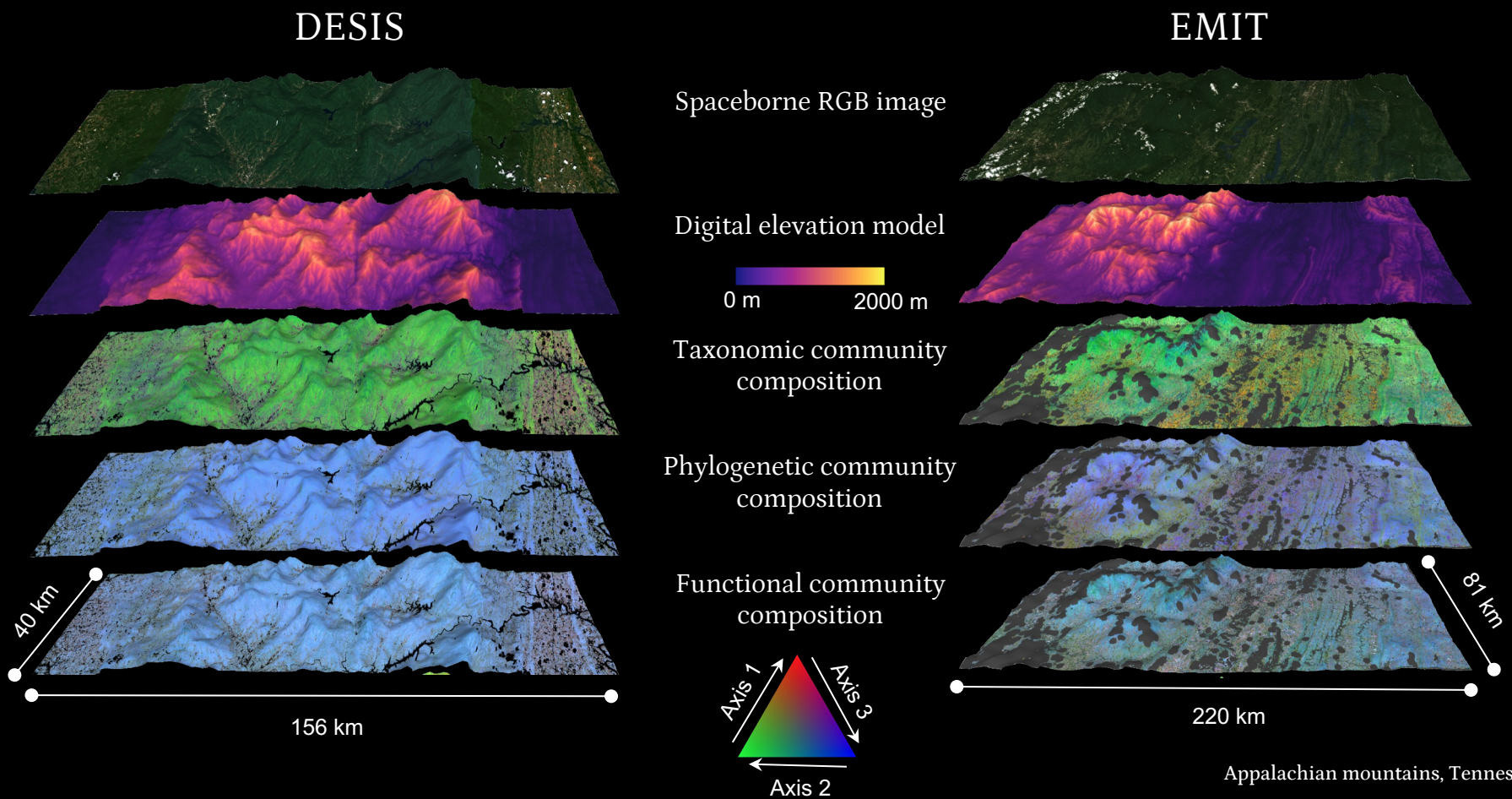
Observed and predicted relationships of models to predict NMDS axes on validation datasets

Variable of Importance in Projection (VIP)



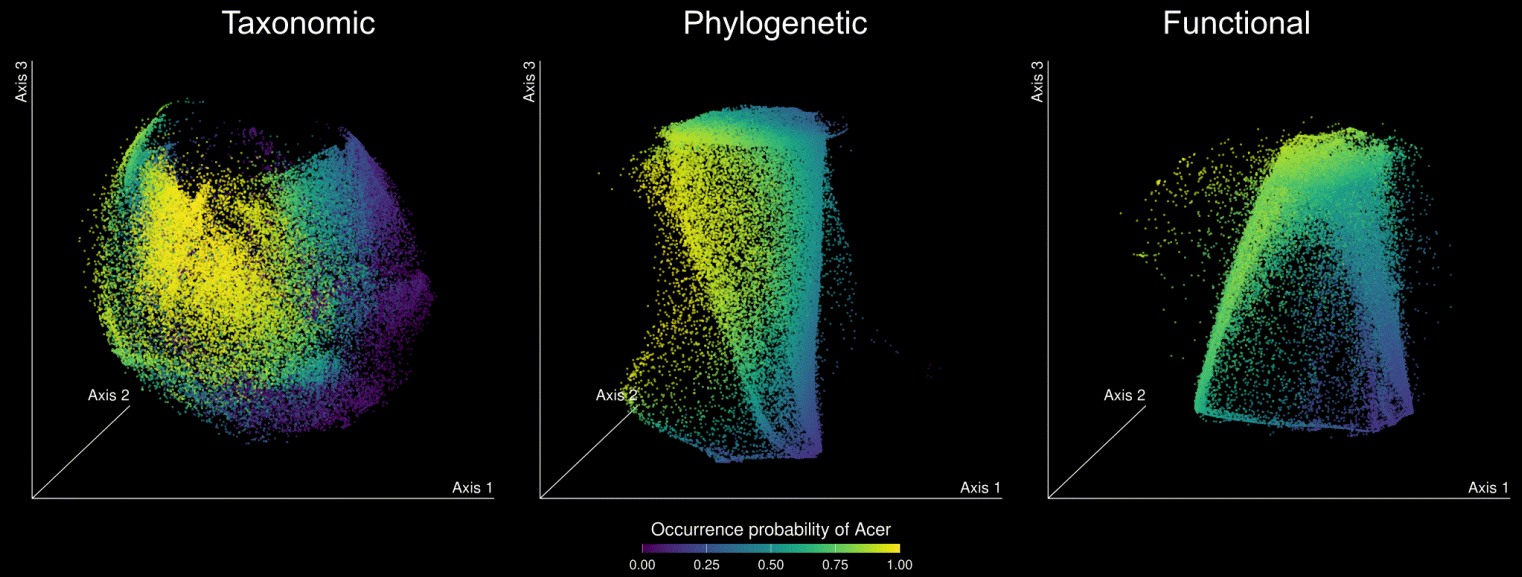
Comparison of VIP values between sensors and NMDS axes

Mapping multiple dimensions of beta diversity



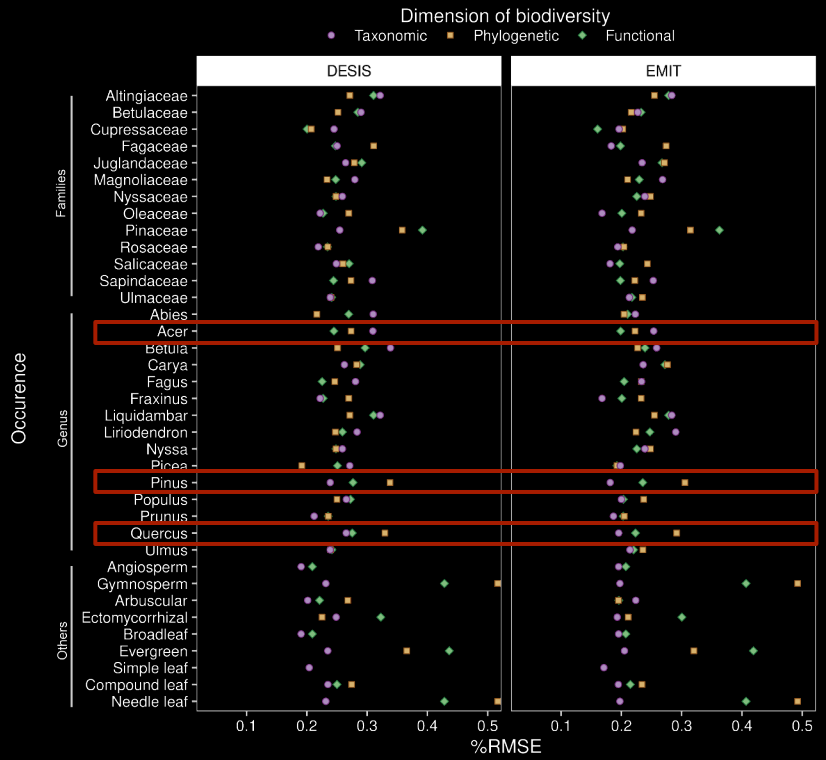
Appalachian mountains, Tennessee

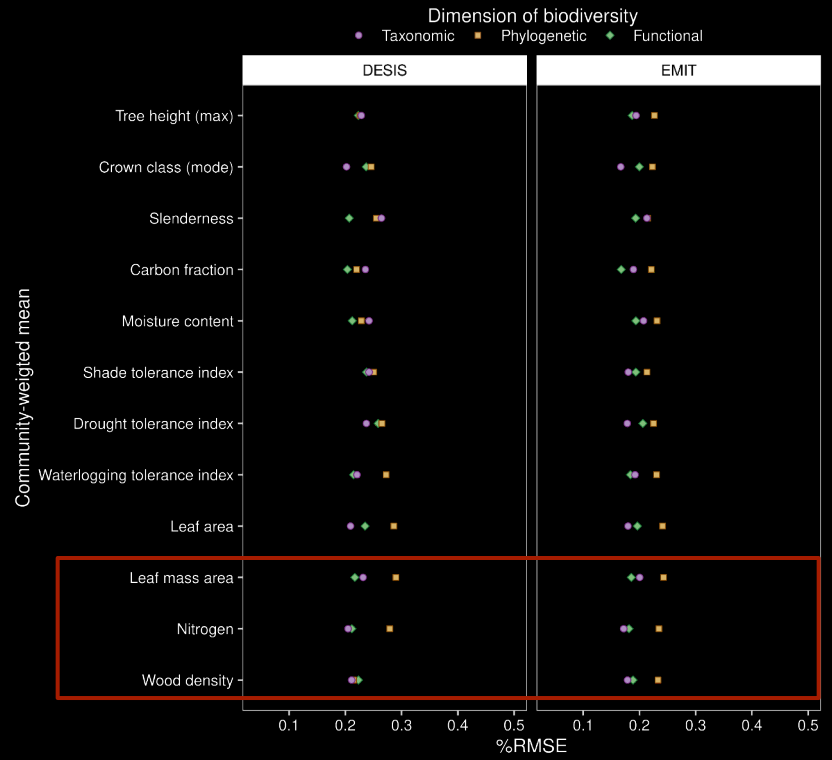
Beyond beta diversity: predicting plant occurrence and traits



Probability of occurrence of plant lineages and community weighted mean of plant traits.

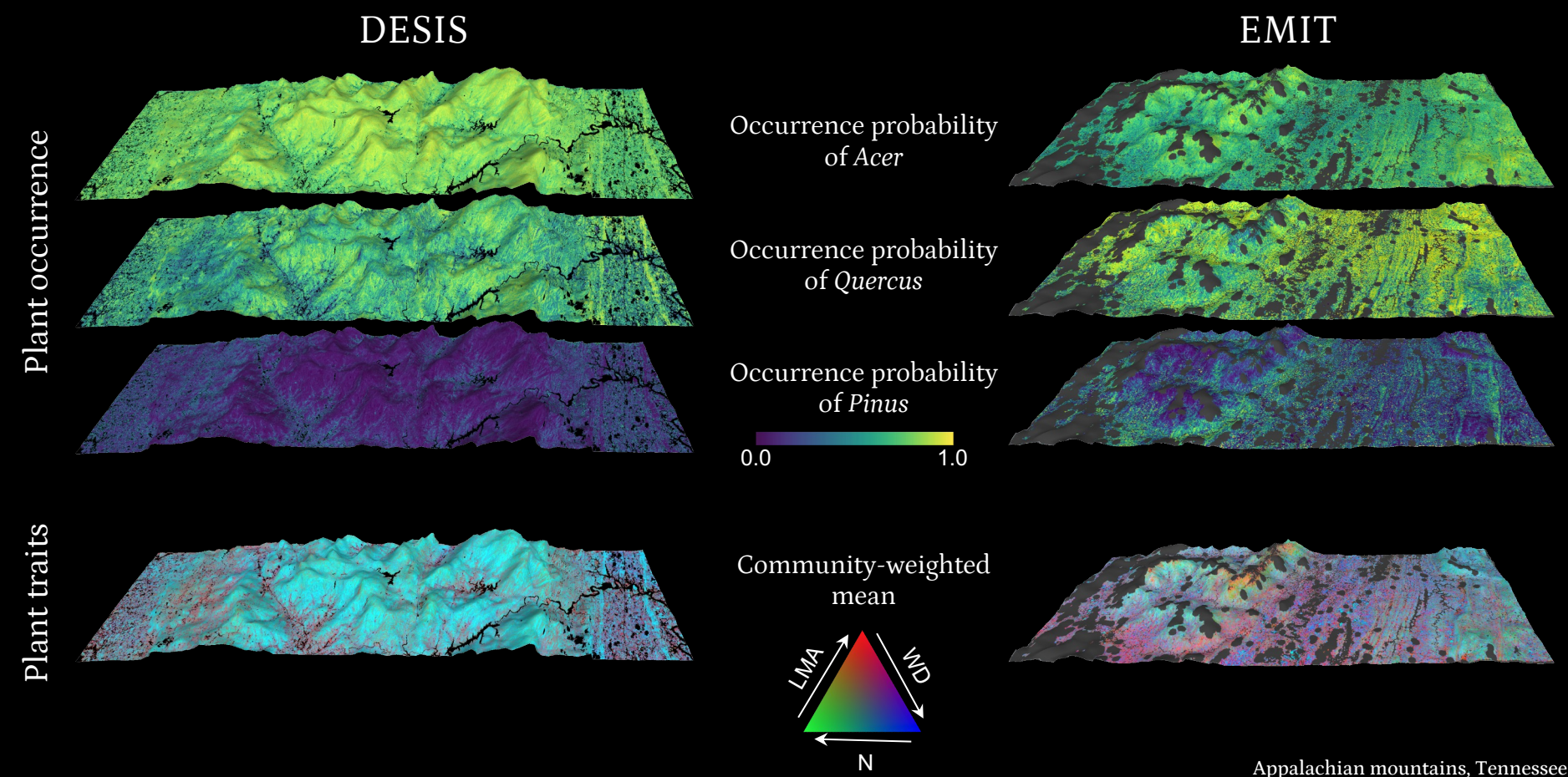
Models to map occurrence or CWM within communities





Performance of models for predicting occurrence and community traits on validation datasets

Mapping occurrence of plant lineages and CWM



Thank you!

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NASA Biodiversity Program (80NSSC21K1349)
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