

Functional diversity mapping in agroforestry - linking in-situ data and satellite observations

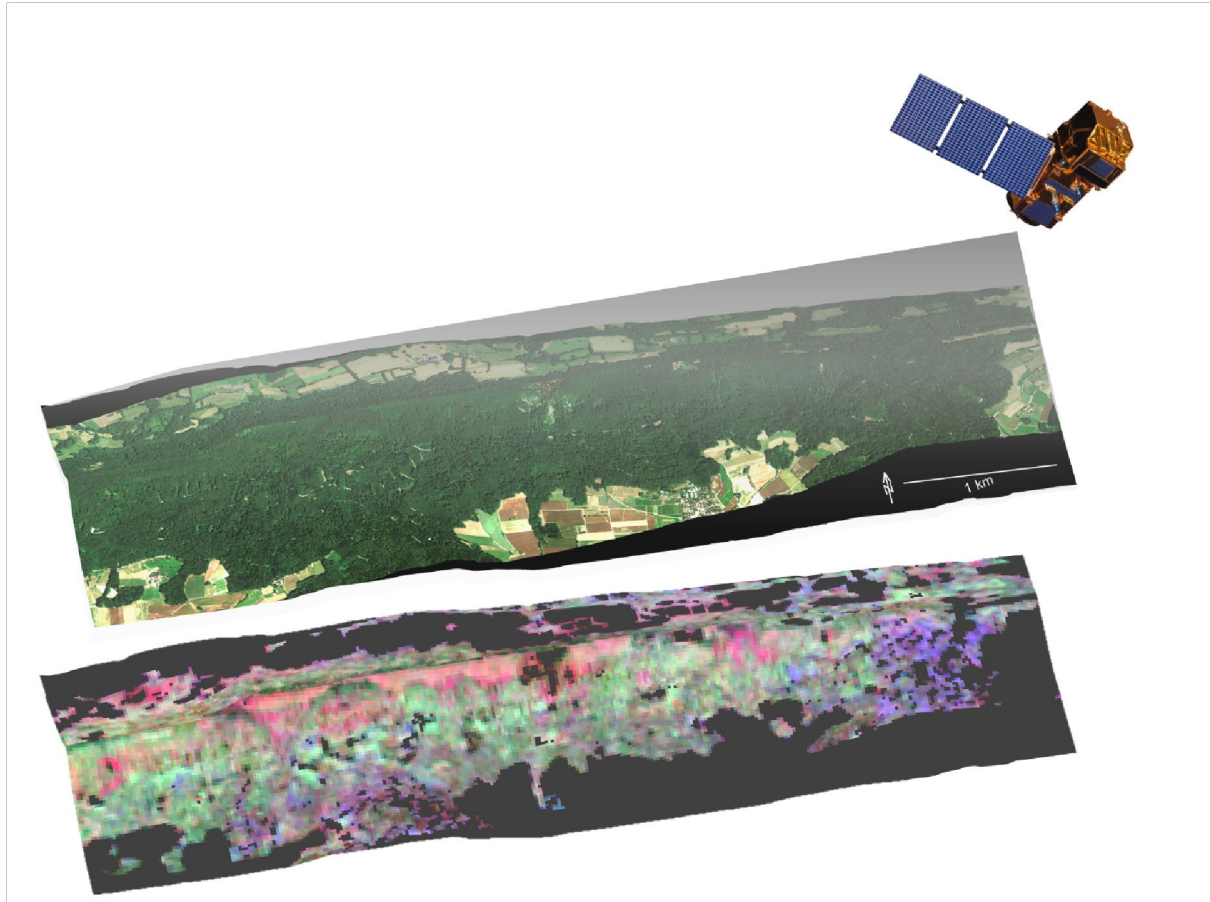


Figure: I. Helfenstein

Background & Relevance:

Biodiversity is globally at threat by many global change related drivers and the in-situ monitoring of changes in biodiversity through observational networks is costly and very difficult to implement for larger regions. Remote sensing (RS) data could fill the spatiotemporal gaps in such observational networks and provide wall-to-wall information on trends in biodiversity change, potentially informing decisions on mitigation strategies. However, such approaches need to be validated and tested across biomes before they can serve such tasks. In this thesis, a recently developed approach for the mapping of forest functional diversity based on Sentinel 2 multi-spectral data shall be transferred to central Africa (Ghana and Cote-d'Ivoire), where it can be validated with in-situ data (biomass and



species diversity) and close-range remote sensing data (UAV based orthoimages and surface models).

Study area:

- Space: Ghana and Cote-d-Ivoire
- Time: 2019-present

Data Input:

- Sentinel 2 multi-spectral satellite images
- In-Situ data (biomass, species diversity)
- UAV data (orthomosaics and surface models)

Analysis tasks:

- Processing S2 data into functional traits and diversity (Google Earth Engine and/or FORCE)
- Linking functional trait and diversity maps with in-situ data using empirical models and/or ML (e.g., Random Forest), considering the implicit scale of observations.

Objectives:

- Test if S2 based functional diversity explains in-situ diversity
- Evaluate the impact of co-founding factors on S2 diversity (e.g., forest structure complexity, topography, etc).

Links & References:

- Helfenstein, I. S., Schneider, F. D., Schaepman, M. E., & Morsdorf, F. (2022). Assessing biodiversity from space: Impact of spatial and spectral resolution on trait- based functional diversity. *Remote Sensing of Environment* , 275 , 113024. Retrieved from <https://www.sciencedirect.com/science/article/pii/S0034425722001389>
- <https://arxiv.org/abs/2206.06119v3>
- <https://nk.users.earthengine.app/view/cocoa-map>

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