

## sDiv working group meeting report

### "sTRAITS II"

The second workshop lasted four days and consisted of two short agenda items and one primary topic. On the first day of the workshop, the shorter topics covered the refined global foliar trait map inter-comparison and potential sensitivity analysis. The main topic of improved trait sampling was discussed in detail over the remaining three days.

On the first day, we discussed results and the revised manuscript draft of the global map inter-comparison. This included a new approach to characterize the within-grid cell trait heterogeneity and the results based on it. As well, the comparison to reference data from sPlotOpen was discussed in detail. We agreed on the key elements for improving the manuscript. In the afternoon, we discussed in detail the potential sensitivity analyses and concluded that ideally the sensitivity analyses should be coupled to the representativeness analyses.

On the second day, we started discussing the first aspect of the improved sampling, namely the planned global representativity analysis. Ryan Pavlick provided an introduction that showed preliminary results focusing on North America. The main question was how to quantify gaps in currently available trait data to determine where best to sample in future campaigns. The discussions included various aspects such as which variables to include and at which spatial resolution the analyses should be conducted. Complementary to the global representativeness, we also discussed local-scale representativeness, which was introduced by Phil Townsend sharing insights from intensive field and airborne sampling campaigns. This local-scale representativeness addresses the question of how a landscape should be sampled to obtain trait data that is representative for broad upscaling, which is closely linked to designing optimized sampling protocols. In the late afternoon, we traveled to the canopy crane facility of iDiv in the Leipzig floodplain forest. There, we had the opportunity to be pulled up above the canopy in the gondola of the crane in small groups. Crane researchers and technical staff provided detailed information on the range of different measurements and projects ongoing at the facility.

On the third day and the first half of the fourth, we split into two break-out groups to discuss in more detail global vs. local representativeness of trait data for upscaling. We addressed the key aspects of the scientific questions, planned analyses, and potential manuscripts. In between the group sessions, we came together in plenary meetings to share the content of our discussions with the whole working group. Some of the key aspects are summarized below:

Global representativeness:

We identified two main objectives: first, to quantify the representativeness of existing trait data and second, the representativeness of the potential trait data when considering large-scale measurement networks that could either intensify foliar trait sampling or add it to other measurements. In addition, we discussed the complementarity of intensive spatial

measurement campaigns to generate baseline global trait maps and continuous, long-term measurements of trait variations monitor impacts of global change.

Local representativeness:

We discussed various aspects relevant for characterizing landscape-scale trait variations. This included the purpose of the sampling of which an important aspect is the link to remote sensing. This has implications for decisions on sampling dominant, top-of-canopy species more intensively. Also, knowledge of the drivers of local-scale trait variations could help to optimize the sampling efforts. There might be some overlap with the global representativeness regarding the driving variables. The use of airborne trait mapping was identified as important aspect to bridge the in-situ sampling with the larger satellite remote sensing grid cells.

In the afternoon of the fourth day, we summarized our discussions and identified the next steps. This included the plan for two manuscripts on the global and local representativeness and an additional study on regionally upscaling airborne-based trait maps. Among other things, such maps could be used to demonstrate the potential for ecological applications of large-scale foliar trait maps as further motivation for intensifying efforts towards improved global-scale trait mapping.

Over the course of the workshop, we had several presentations from workshop participants on recent progress of different global trait mapping approaches including the use of citizen science data and optimality theory. The presentations were followed by lively discussions. Phil Townsend also gave a talk on "Foliar Functional Traits from Imaging Spectroscopy: Implications for Ecology and Ecosystem Function" in the weekly iDiv institute seminar that included recent results on both spatial and temporal variations of foliar traits.

The atmosphere during the workshop was productive, all discussions were friendly and respectful of other opinions but did not shy away from disagreeing when justified by logical reasoning. Discussions on the workshop topics tended to continue during our coffee and lunch breaks as well as the dinners in the city center. sDiv had well prepared the meeting rooms with technical equipment including a 360-degree camera that tracks the speaker. The participants enjoyed the good catering that was characterized by vegan options. Also, participants were supported with obtaining covid test certificates partly required to re-enter their home countries. Hotel booking and management of travel costs were handled seamlessly.