Master thesis proposal

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Running title: "**Evaluation of turbulence characteristics and viability of eddy covariance measurements inside agroforestry as function of canopy height**"

The main idea is to analyse wind and turbulent flux measurements (either only CO_2, or CO_2 + sensible and latent heat fluxes) inside heterogeneous agroforestry systems and to study how the wind characteristics and fluxes change according to a varying canopy height at one of the experimental sites of the SIGNAL project, Dornburg (Saale).

The eddy covariance (EC) tower inside the agroforestry system is 10 m tall. It is considered to be tall enough to properly measure turbulent fluxes at the site, but as the tower is located inside a tree row and the trees belong to fast-growing species, trees are too tall relative to the tower height. From few meters below (approx. above 6 or 7 m) they compromise the turbulence measurements. Hence, possible ideas to work on and to develop are:

- (More theoretical) Study 3 dimensional wind field across the period (2016-2023) according to a varying canopy height by using different parameters, like roughness length, friction velocity (u*), stability parameter and turbulence theory, etc. The wind data can be classified according to turbulence intensity and a varying flux footprint on site. The FFP function in Python or R can be applied to single measurements, for example 1h averages, as a function of wind direction and canopy height.
- (More practical) Study turbulent fluxes and classify them according to wind directions – we still measure at least some valuable data between tree rows, when wind is (quasi-)perpendicular to the tree row where the tower is located. The fluxes could be classified using either footprint model functions or just wind directions. Both fluxes and wind directions can be binned according to the canopy height. The hypothesis is that the prevalent wind originates from more perpendicular directions to the tree row with increasing tree height and leads to a reduced footprint area.

For this thesis a good knowledge of one programming language (e.g. R or python) is mandatory.