DERIVING VITALITY PARAMETERS OF AESCULUS HIPPOCASTANUM USING RADIATIVE TRANSFER MODELS

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Tree canopies in urban environments play an important role in urban ecology. Chestnut trees (Aesculus hippocastanum) are one of the major tree species in Germany's capital Berlin. Their proportion sums up to 5 % of the tree population. Urban trees often suffer from deficient environmental conditions. The impact of the horse chestnut leaf miner (Cameraria ohridella), a parasitic insect, amplifies the stress levels especially on chestnut trees. Thus, monitoring plant health and detection of plant damages at early stages are major tasks to adequately manage urban tree canopies.

Many studies point out the expedient use of methods based on radiative transfer modeling in heterogeneous environments. This research aims to derive quantitative parameters of chestnut trees and to characterize their vitality in an urban environment. Therefore, a combination of the radiative transfer models PROSPECT-SAIL-GEOSAIL will be used. An extensive field campaign, required to calibrate and validate the models, was performed. To cover a wide range of environmental conditions and to realize a high temporal resolution of parameter change, 11 individual trees at 4 test sites were sampled every 2 weeks. In cooperation with plant physiologists, relevant plant specific parameters (content of pigments, water, dry mater, starch, sugar; LAI; spectral response) were measured. Analysis of the acquired data yielded a good agreement between laboratory and spectrometric measurements at leaf level. Furthermore, PROSPECT was adapted to chestnut leaves. The results and the quality of PROSPECT output are described and discussed in detail.

An outlook is given on the planned upscaling to canopy level based on airborne spatial VHR and hyperspectral data. The analysis will be carried out with HyMap data and data from the HRSC AX.