Remote Sensing for Quantifying Plant Traits at ITC, University Twente

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Understanding and monitoring terrestrial ecosystems requires quantifying ecosystem structure, ecosystem function and plant species traits. Many of these traits are inputs to agricultural, ecological, and meteorological models and several have been recognized as essential biodiversity variables by GEO BON. These include leaf area index (LAI), chlorophyll, specific leaf area (SLA), water content, nitrogen, vegetation height, cover, layering and gaps. Field measurement of these traits is labor-intensive, costly, and only practical for limited samples. Remote sensing has been recognized as a reliable method for mapping and monitoring vegetation and the only practical means of estimating these traits in a large scale. However, utilizing remote sensing, not only requires understanding the link between these traits and plant's spectral signature but also how these traits interact and how the combined interaction will affect the spectral signature of vegetation. The natural resources department (NRS) of the Faculty ITC is leading in the innovative applications of wide range of remote sensing data (including new generation of multi spectral, VIS/NIR/thermal hyperspectral, and LIDAR) and models including empirical and radiative transfer models to quantify, map and monitor plant traits. Client traits have been successfully retrieved at the laboratory, field, airborne and satellite levels. We have examined the retrieval of plant traits in different ecosystems including rangelands, crop lands, wetlands and forest at leaf and at canopy level. Many of these traits were estimated using spectral information obtained from narrow wavelengths existing in hyperspectral data in the VIS/NIR regions. Our investigations, through the work of number of PhD's, have successfully utilized thermal hyperspectral and LiDAR measurements to map and quantify these plant traits at leaf and canopy levels.