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Mapping canopy N in European forests using remote sensing and environmental variables

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Nitrogen is an essential nutrient for vegetation growth and N concentration, in leaf or canopy, is linked to several vegetation processes, including photosynthetic capacity, leaf life span and above ground net primary productivity (NPP). Predicting carbon uptake by terrestrial vegetation remains a fundamental challenge, tackled with dynamic global vegetation models (DGVM). To account for N role in vegetation growth, DGVM includes an N cycle module, and canopy N is a state variable in these models. However, canopy N data is not available at global scales, which complicates the necessary calibration and validation of the DGVM N cycle modules. In this context, applying remote sensing techniques to sense canopy N at large scales represent an interesting opportunity and has already yielded significant results at local and regional scales. Our research project focuses on generating a canopy N map over a larger scale, namely European forests. To do so, we use canopy N concentration data from the ICP forest database (800 European forest plots) and relate it to both remote sensing products (average MODIS reflectance, MOD13Q1) and globally available environmental variables, including soil (soilgrid), climate (WorldClim), elevation (EU-DEM) and plant functional type data. The relationship is analyzed with both multiple linear regression and random forest statistical method. Preliminary results show significant relationships between the variables and that PFT is the strongest predictor of canopy N value. We can then use these relationships to generate maps of canopy N at the European scale. Here we show how well these maps fit data, but we also like to discuss how well these maps fit with canopy N maps generated by DGV-models