ICP Forests

LRTAP
Long-range Transboundary Air Pollution

PROJECT INFORMATION

Project title: Estimating and Forecasting Forest Ecosystem Productivity by Integrating Field Measurements, Remote Sensing and Modelling"

Project ID: 94

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PROJECT DESCRIPTION

GENERAL OBJECTIVE OF THE PROJECT

Main objective of the research is to develop and test methods and workflows for cost-effective and reliable estimation of annual productivity (GPP, NPP), primarily focusing of lowland forests at the local and national scale, by using existing research infrastructure for measurement of carbon fluxes (EC monitoring system), freely available high temporal resolution data from remote sensing (MODIS) and state of the art model (Biome-BGC). The proposed research should provide first information about the quality of MODIS GPP and NPP estimates for forests in Croatia. Field measurement campaigns combined with state of the art digital photogrammetry will be performed to test and validate data from remote sensing and model simulations.

SPECIFIC OBJECTIVE FOR WHICH ICP FORESTS DATA IS NEEDED AND METHODOLOGY

Data requested from ICP FORESTS database (LAI and Litterfall) are needed for the assessment of Specific Leaf Area (SLA; in m^2/gC). In fact ICP Forests also contains information (for some plots) of SLA for different tree species so we would use this information directly in our calculations.

Information on SLA would be used for the assessment of the part of the Net Primary Production of forests that comes from growth of foliage (NPP_foliage). For areas were forest cover is not complete and NPP from grasses in significant, and it would have be accounted for, will be added to the part of leaf NPP from woody species into combined NPP_foliage. This would be made by calculating weighted mean of the SLA (SLA_w.m.) based on the shares of tree species and estimated share of grasses. We will estimate NPP_foliage from Leaf Area Index (LAI) estimates from MODIS (MOD15A2 product), SLA_w.m., and average foliage lifetime (t; deciduous: t =1; evergreen: t > 1):

$$\text{NPP\_foliage} = \text{LAI} \times (\text{SLA\_w.m.} \times \tau)^{-1}$$

Estimate of NPP_foliage is required to obtain the estimate of the NPP_aboveground_woody from MODIS annual NPP data product (MOD17A3) and appropriate root-to-shoot ratio (RS). This would be obtained using equation:

$$\text{NPP\_aboveground\_woody} = (\text{NPP\_MODIS} - \text{NPP\_foliage}) \times (1 + RS)^{-1}$$

Here the RS is weighted root-to-shoot ratio calculated using species-specific RS and information on the share of a given tree species in a given MODIS pixel from the existing forest management plans.

We will then compare those estimate of NPP_aboveground_woody with the estimates from field measurements (i.e. tree cores) on a national level, using data from sampled from 350 plots placed across Croatia (200 plots in various forest ecosystems, and 150 plots in focused at lowland forests.

Requested data on **Growth and Yield** at ICP level II plots **are requested only for those plots for which there are LAI and Litterfall, i.e. SLA data** and will be used for categorization of the stands by stocking level and possible analysis on the SLA variability with respect to stocking level. Also, biomass data would be used for getting insight of the tree species shares on a given plot.

Finally, depending on the number of plots for which we would be granted access to which have the required data, and in case we would be granted access to the information on the plot centre coordinates at accuracy of at least 100 m (or better), we could perform the analysis of MODIS NPP estimate with the NPP estimated based on Growth and Yield data and Litterfall, as well as to attempt to create algorithm for partitioning MODIS NPP estimate into NPP of different components (woody, woody_a.g., woody_b.g., and non-woody). This task is not originally foreseen in the project EFFEctivty but we are open for ideas and invite anybody who might have interest in scientific collaboration on this task to contact us and join us in the research. All contributors to any publication that might result from our joint efforts, in accordance with the Vancouver Protocol (see the Application Form), will be offered co-authorship.