

SATELLITE-BASED MODELING OF GROSS PRIMARY PRODUCTION OF DECIDUOUS FOREST AND GRASSLAND SITES IN EUROPE

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ABSTRACT

The satellite-based Vegetation Photosynthesis Model (VPM) that estimates seasonal dynamics of gross primary production (GPP) of vegetation was applied to 5 European forest and grassland sites. The relatively simple VPM model is based upon light absorption by leaf chlorophyll, leaf water content and leaf age. The current version of the VPM model relates the Enhanced Vegetation Index (EVI) to light absorption by leaf chlorophyll and the Land Surface Water Index (LSWI) to leaf water content, modifying implied functional relationships within the model according to daily air temperature and photosynthetically active radiation input. We used site-specific climate data and CO₂ flux data of the year 2002 from three beech forest sites and two grassland/cropland sites of the CARBOEUROPE network for testing. The 10-day composite images (1-km spatial resolution) in 2002 from the VEGETATION sensor were used to calculate EVI, LSWI and Normalized Difference Vegetation Index (NDVI). The seasonal dynamics of VPM-predicted GPP agreed well with estimated GPP from net ecosystem exchange (NEE) measurements at the sites. The results demonstrate a strong potential of the VPM model for scaling-up of GPP from individual forest and grassland CO₂ eddy flux tower sites in the evaluation of such ecosystem responses across Europe. Furthermore, the relationship of simple functions within the VPM to essential climate driving variables, allows use of the model in guiding calibration at European scale of more detailed process-based models required for assessing climate scenarios.