



## **Water limited ecosystem carbon fluxes estimated with C-Fix: inclusion of soil water derived with METEOSAT and ERS Scatterometer imagery**

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Carbon emission and fixation fluxes are key variables to guide climate change stakeholders in the use of remediation techniques. To develop support tools for Kyoto Protocol implementation, a sound application perspective is offered by expert systems based on earth observation (EO). This allows to estimate vegetation carbon fixation using a minimum of meteorological data. The core module of this type of expert system is a production efficiency based model (C-Fix). C-Fix estimates the carbon mass fluxes, gross primary productivity (GPP), NPP and net ecosystem productivity (NEP) at various spatial scales. Global carbon budget studies are currently still dominated by non-EO based approaches. Based on the knowledge that a strong coupling exists between the carbon and hydrological cycles, it is essential to take water limitation in carbon studies into account. Explicitly, water availability for vegetation must be estimated, preferably with synoptic thermal or scatterometer EO data. We present a method to assess soil moisture content (SMC) based on thermal inertia determined with optical and thermal METEOSAT imagery. SMC is an input of C-Fix. Thermal inertia multi-temporal data are transformed into a surface soil moisture saturation index (SMSIO) time series. Subsequently, SMSIO is converted into a 1 m SMC profile. This approach is similar to the Soil Water Index (SWI) derived from ERS Scatterome-

ter data. A comparison between water limited NEP estimated with SMC derived from METEOSAT data and water limited NEP derived from SWI data, is made for European forest sites in the EUROFLUX Eddy flux tower network for the year 1997. Preliminary results show that the slope, intercept,  $R^2$  and RRMSE values of NEP limited by METEOSAT SMC compared with EUROFLUX NEP measurements for the Vielsalm forest site (Wallonia) are 0.94, -0.01, 0.51 and 1.34, respectively. The slope, intercept,  $R^2$  and RRMSE of NEP using SWI is 1.14, -0.02, 0.56 and 1.45, respectively.

**Keywords:** Earth observation, carbon fixation, water limitation, thermal inertia, soil moisture content, METEOSAT, ERS Scatterometer, European forests.