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GPP estimates in a biodiesel crop using MERIS products

M. L. Sánchez, N. Pardo, I. Pérez, M.A. García, and V. Paredes
Dept. of Applied Physics, University of Valladolid, Spain (marisa@fa1.uva.es)

Greenhouse gas emissions in Spain in 2008–2009 were 34.3 % higher than the base-year level, significantly above the burden-sharing target of 15 % for the period 2008–2012. Based on this result, our country will need to make a major effort to meet the committed target on time using domestic measures as well as others foreseen in the Kyoto Protocol, such as LULUFC activities. In this framework, agrofuels, in other words biofuels produced by crops that contain high amounts of vegetable oil such as sorghum, sunflower, rape seed and jatropha, appear to be an interesting mitigation alternative. Bearing in mind the meteorological conditions in Spain, sunflower and rape seed in particular are considered the most viable crops. Sunflower cultivated surface in Spain has remained fairly constant in recent years, in contrast to rapeseed crop surface which, although still scarce, has followed an increasing trend.

In order to assess rape seed ability as a CO_2 sink as well as to describe GPP dynamic evolution, we installed an eddy correlation station in an agricultural plot of the Spanish plateau. Measurements at the plot consisted of 30-min NEE flux measurements (using a LI-7500 and a METEK USA-1 sonic anemometer) as well as other common meteorological variables. Measurements were performed from March to October.

This paper presents the results of the GPP 8-d estimated values using a Light Use Efficiency Model, LUE. Input data for the LUE model were the FPAR 8-d products supplied by MERIS, the PAR in situ measurements, and a scalar f varying, between 0 and 1, to take into account the reduction of the maximum PAR conversion efficiency, ε_0, under limiting environmental conditions. The f values were assumed to be dependent on air temperature and the evaporative fraction, EF, which was considered as a proxy of soil moisture. ε_0, a key parameter, which depends on biome types, was derived through the results of a linear regression fit between the GPP 8-d eddy covariance composites observed and the LUE concurrent 8-d model estimates. The model fitted observed GPP 8-d satisfactory (R^2=91%). The ε_0 value obtained, 2.777 g C m^{-2} MJ^{-1}, was substantially higher than the typical values reported in the literature for other types of agricultural crops.