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NEE and GPP dynamic evolution at two biomes in the upper Spanish plateau

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In order to assess the ability of dominant biomes to act as a CO_2 sink, two eddy correlation stations close to each other in central Spain have been concurrently operational since March 2008 until the present. The land use of the first station, AC, is a rapeseed rotating crop consisting of annual rotation of non-irrigated rapeseed, barley, peas, rye, and sunflower, respectively. The land use of the second, CIBA, is a mixture of open shrubs/crops, with open shrubs being markedly dominant. The period of measurements covered variable general meteorological conditions. 2009 and 2012 were dominated by drought, whereas 2010 was the rainiest year. Annual rainfall during 2008 and 2009 was close to the historical averaged annual means.

This paper presents the dynamic evolution of NEE-8d and GPP-8d observed at the AC station over five years and compares the results with those concurrently observed at the CIBA station. GGP 8-d estimates at both stations were determined using a Light Use Efficiency Model, LUE. Input data for the LUE model were the FPAR 8-d products supplied by MODIS, PAR in situ measurements, and a scalar f, varying between 0 and 1, to take account of the reduction in maximum PAR conversion efficiency, ε_0, under limiting environmental conditions. f values were assumed to be dependent on air temperature and evaporative fraction, EF, which was considered a proxy of soil moisture. ε_0, a key parameter, which depends on land use 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.

Over the five-year study period, both biomes behaved as CO_2 sinks. However, the ratio of the NEE-8d total accumulated at AC and CIBA, respectively, was close to a factor two, revealing the effectiveness of the studied crops as CO_2 sinks. On an annual basis, accumulated NEE-8d exhibited major variability in both biomes. At CIBA, the results were largely dominated by the prevailing annual rainfall, whereas at AC results were also strongly dependent on type of crops. Similar results were obtained for GPP 8-d. The LUE model fitted observed GPP 8-d satisfactorily at both biomes (R^2 >86%). The $\varepsilon_0$value in the rotating crop station, AC, was approximately 1.7 higher than at the open shrub station, CIBA.

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