



Half hourly GPP and Reco estimates derived from a light response curve including VPD and temperature dependencies

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The net ecosystem exchange (NEE) of carbon measured with the eddy covariance technique is the sum of two main processes, respiration (Reco) and gross primary production (GPP). To understand the dynamics and underlying processes of NEE it is essential to split the measurements into these two components. We provide estimates of half hourly GPP and Reco for FLUXNET sites mainly based on daytime data additional to the existing estimates based on nighttime data from Reichstein et al 2005. We use a modified hyperbolic light response curve which is extended a) by a temperature dependency for the respiration (Lloyd and Taylor model in our case) and b) by a VPD dependency of GPP at light saturation. Including the VPD effect significantly improves the modeled diurnal cycle of GPP derived from the hyperbolic light response curve, reproducing the decrease in photosynthesis in afternoon due to stomatal closure at high VPD. Only the temperature sensitivity, not the base respiration parameter, of the Lloyd and Taylor model was estimated with night time NEE data. Thus, the estimate is independent of a possible systematic bias of night time measurements of NEE that may corrupt the derived component fluxes when using the Reichstein et al method. The estimates using the Reichstein algorithm based on nighttime data, and ours, based mainly on daytime data agree very well except for sites where advection is expected to bias night time NEE measurements. Therefore, the combined use of the two methods allows identifying sites influenced by selective systematic errors like advection, and serves as an indicator for biased estimates that can be implemented operationally in the FLUXNET processing chain.