Geophysical Research Abstracts,
Vol. 10, EGU2008-A-09683, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-09683
EGU General Assembly 2008

Data oriented estimation of European NEE and its uncertainty

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Estimating the present carbon budget and giving reliable future predictions is one of the major challenges of carbon cycle research. For this purpose, data oriented estimations of the carbon cycle components and the estimation of their uncertainties play a key role. We estimated daily GPP and Reco from 2000 to 2005 comparing model prediction against eddy covariance measurements from the CarboEurope-IP network. The first component was estimated by means of the radiation use efficiency model MOD17. The model requires fraction of adsorbed photosynthetically active radiation, vapor pressure deficit and minimum temperature as daily drivers. The model parameters were optimized with a Monte Carlo - Metropolis method. The respiration component of the carbon cycle was estimated with a semi-empirical model which uses air temperature, precipitation, GPP and maximum leaf area index as predictors of total ecosystem respiration. Model parameters for each plant functional type were derived through nonlinear regression analysis (Levenberg-Marquardt method) and associated standard errors were estimated by using a bootstrap algorithm. Both components GPP and Reco were scaled to an European-wide domain using the REMO meteorological surfaces, the MODIS LAI/FAPAR product and the MODIS vegetation continuous fields. The uncertainty in the model estimate was considered per each plant functional type. A Monte Carlo sampling for the model parameters permitted to propagate the uncertainty in model parameters to the NEE estimate. A further analysis of uncertainties in model structure and in model drivers has to be done in order to provide a total assessment of uncertainties in model predictions.