FLUXNET GPP Synthesis Proposal

Title

Upscaling mean annual GPP from ecosystem level to the global land surface

Contributors

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Scientific contribution

- Methodological advances in scaling from flux tower sites to the globe
- Global value of mean annual GPP and uncertainty
- Spatial distribution of mean annual GPP and uncertainty

FLUXNET data used

Daily GPP fluxes plus meteorological data as recorded in the La Thuille dataset

Project description

The FLUXNET initiative makes available a significant amount of NEE measurements from all biomes worldwide. In addition, several methods were developed for partitioning NEE into GPP and TER (Reichstein et al., 2005; Lasslop et al., in press). In this paper we aim to estimate total sums and spatial details of mean annual GPP at the land surface by combining GPP estimates at the flux towers with remote sensing and meteorological data. In doing so, we are using remotely sensed fAPAR and land cover from several sensors, and different climate datasets. Methods to estimate global mean annual GPP comprise pure regression analysis to climate variables (Lieth, 1975), the light-use efficiency approach (Monteith, 1972), regression trees, and an artificial neural network. In addition, WUE=GPP/ET is scaled to whole watersheds following Beer et al., Global Biogeochemical Cycles, 2009 by using several remotely sensed maps of LAI and land cover, and maps of soil texture type, c4/c3 ratio, and several VPD maps. The application of precipitation minus interception minus runoff at the watershed scale gives then GPP estimates at the watershed scale. We perform bootstrapping of the regression parameters at the flux tower scale and apply a lot of remote sensing and climate maps for thorough estimation of uncertainties. These estimates based on upscaling from flux tower measurements will be compared to independent results by 18O inversions.

First results

Fig 1 shows the distribution and median values of the different methods with different input data (M=regression tree, C=WUE, E=LUE, N and L: Miami model following Lieth). We are close to the 120 PgC/a that are reported by the IPCC.

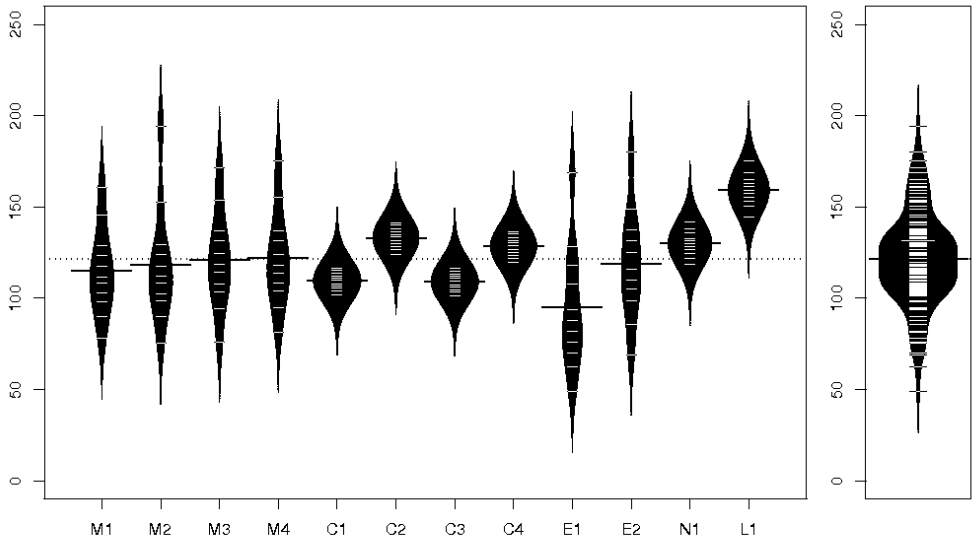
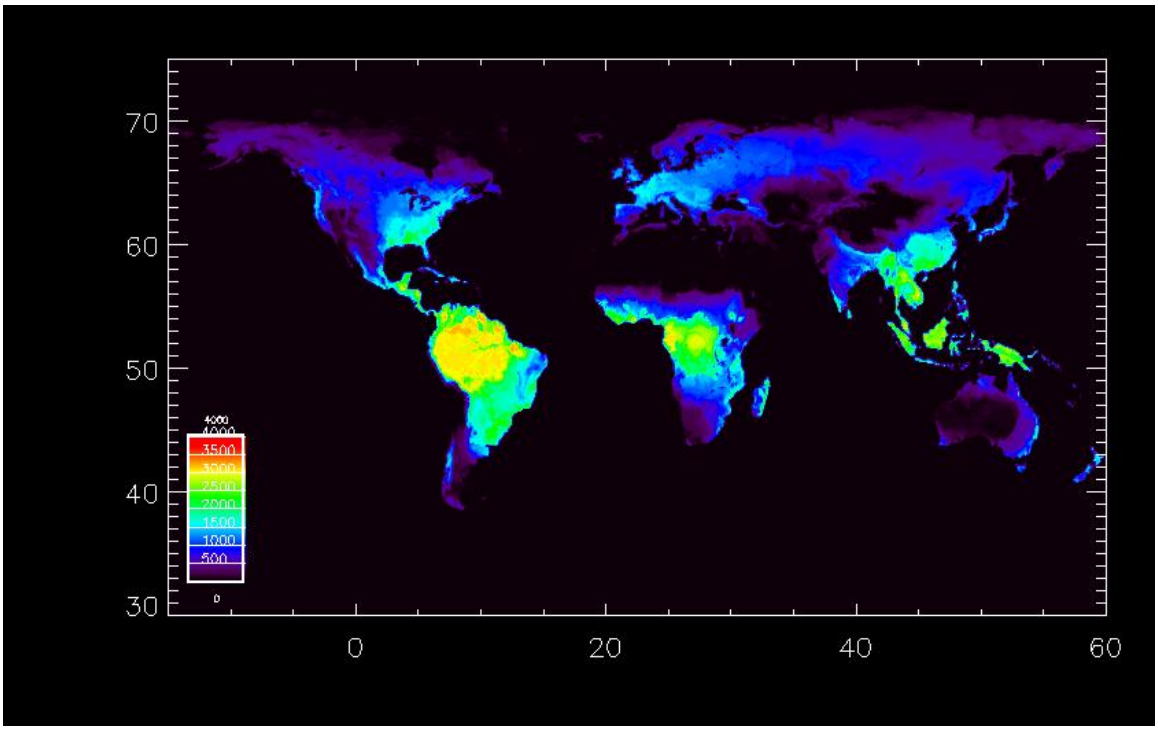


Fig 2 shows spatial details of the median GPP per m2 ground. Tropics have about 2500-3000 gC/m2, temperate ecosystems about 1500 gC/m2, and boreal zone we estimate 1000 gC/m2 and below.

Uncertainty will be expressed as 1.48 times median absolute deviation. In Fig 3, however, you can see the difference between 60 and 40 percentiles which is a good approximation.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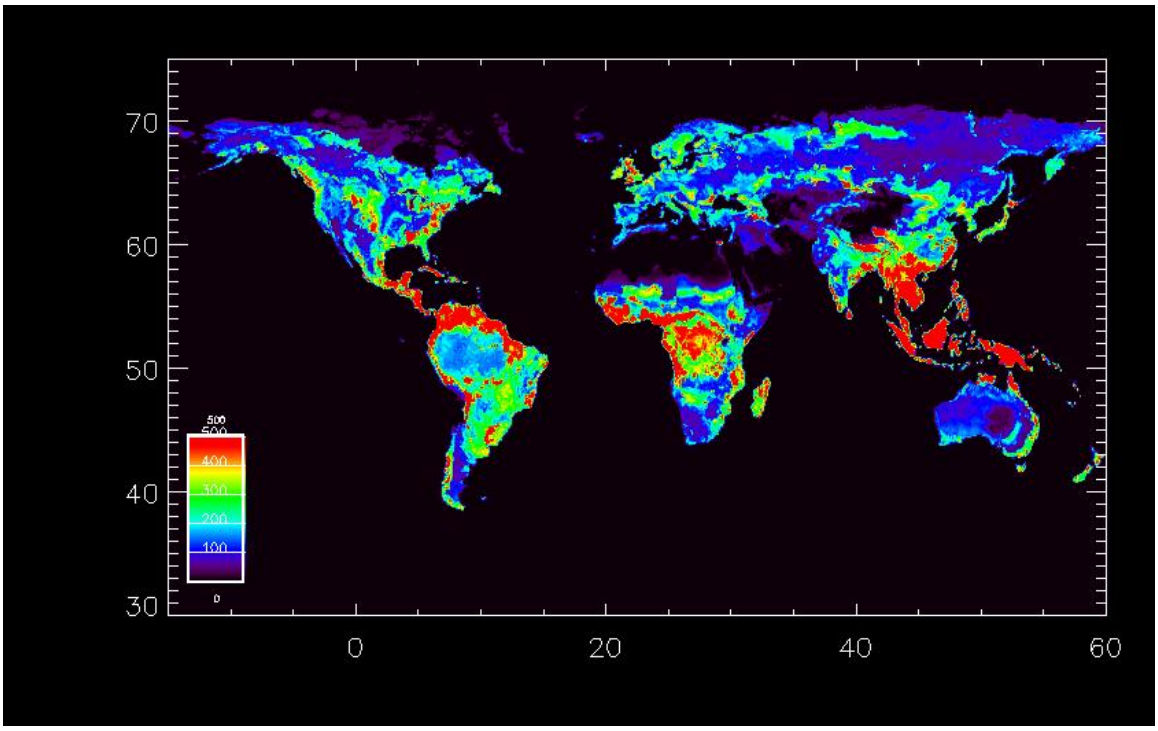
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