Geophysical Research Abstracts
Vol. 16, EGU2014-16528, 2014
EGU General Assembly 2014

Simulation results of aboveground woody biomass and leaf litterfall for African tropical forest with a global terrestrial model

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The response of tropical forest vegetation to global climate change could be central to predictions of future levels of atmospheric carbon dioxide. Tropical forests are believed to annually process approximately six times as much carbon via photosynthesis and respiration as humans emit from fossil fuel use. Of all tropical forests worldwide, the role of African tropical forest is not very well known and both the quantity as well as the dynamics of tropical forest carbon stocks and fluxes are very poorly quantified components of the global carbon cycle. Furthermore, African tropical forest spatial carbon stocks patterns as measured in the field are not as well represented by the global biogeochemical models as they are for temperate forests.

In this study, a first simulation for the African tropical forest with the process based global terrestrial ecosystem model ORCHIDEE was done. In this work, ORCHIDEE included deep soils, seasonal leaf litterfall and phosphorus availability mechanisms for tropical evergreen forests included. The ORCHIDEE model run outputs are evaluated against reported field inventories, investigating seasonal variations in leaf litterfall and spatial variation in aboveground woody biomass. A comparison between modeled and measured leaf litterfall was made at a semi-deciduous Equatorial rainforest site in the Republic of Congo at the Biosphere reserve Dimonika south of Gabon. Also, simulated woody aboveground biomass was compared against site-level field inventories and satellite-based estimates based on a combination of MODIS imagery with field inventory data from Uganda, DRC and Cameroon.

First comparison results seem promising and show that the radiation driven leaf litterfall model results correspond well with the field inventories and that the mean of the modelled aboveground woody biomass matches the available field inventory observations but there is still a need for more ground data to evaluate the model outcome over a large region like this.