Geophysical Research Abstracts, Vol. 7, 10271, 2005
SRef-ID: 1607-7962/gra/EGU05-A-10271

Estimating the current carbon balance of Northern Eurasia by incorporating satellite-derived land cover information into a Dynamic Global Vegetation Model

C. Beer(1), C. Schmullius(1) and W. Lucht(2)

(1) Department of Geoinformatics and Earth Observation/Friedrich-Schiller University Jena,
(2) Potsdam Institute for Climate Impact Research

Carbon dioxide and water exchanges between the land surface and the atmosphere are connected with each other. Plants impact the soil water balance by transpiration or interception of precipitation. On the other hand, soil moisture determines carbon uptake (photosynthesis) and carbon release due to decomposition and disturbances. In permafrost regions of the Boreal Zone this link is even intensified by the impact of permanently frozen ground. Besides a control of the onset of photosynthesis by thaw depth, there exist further feedbacks between vegetation and soil moisture. For example, vegetation damps the heat flow to the ground having a consequence on thaw depth and soil moisture.

Dynamic Global Vegetation Models aim at calculating this CO2 exchange between the land surface and atmosphere on a regional to global scale subject to climate and soil texture. The concept of average individuals is applied to scale the relevant processes to a spatial resolution of 0.5°. In this work satellite-derived land cover information is used to include the heterogeneity of the real land surface in this scaling process. The impact of satellite data on model results is investigated by evaluating two simulation experiments with and without the consideration of land cover information. Our region of interest is Northern Eurasia.

Two global land cover products are used. The MODIS Vegetation Continuous Fields Product (500 m resolution) gives the percent tree and grass coverage within each 0.5° grid cell while the composition of Plant Functional Types as well as the fraction of agriculture is determined by the GLC2000 product (1 km resolution). The potential vegetation coverage of the Lund-Potsdam-Jena DGVM (LPJ-DGVM) is constrained

by the observed coverage. This leads to annual results of Net Primary Productivity in Siberia that are more comparable to results by forest inventories. Furthermore thaw depth, that is explicitly modelled in the applied version of the LPJ-DGVM, and soil moisture are shifted by the satellite-derived vegetation coverage. This has consequences on the simulation of fire probability and heterotrophic respiration. As a sum of these components, the consideration of land cover information within the LPJ-DGVM alters the calculation of net carbon exchange in Siberia.