Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07835, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07835
EGU General Assembly 2008

Regional terrestrial vegetation full greenhouse account for Northern Eurasia: a system approach

A. Shvidenko (1), I. McCallum (1), S. Nilsson (1), D. Schepaschenko (1,2), C. Schmullius (3), C.Beer (3), M.Santoro (3), H.Baltzter (4), S.Quegan (5), T. LeToan (6), M. Gusti (1)

(1) International Institute for Applied Systems Analysis, Laxenburg, Austria, (2) Moscow State Forest University, Department of Pedology, Moscow, Russia, (3) Friedrich-Schiller University, Jena, Germany, (4) Lecester University, Leicester, UK, (5) University of Sheffield, Sheffield, UK, (6) CESBIO, Toulouse, France

Full greenhouse gas accounting of terrestrial vegetation (FGGA) for vast regions is a typical large and complex dynamic stochastic fuzzy system which cannot be verified by traditional methods in a direct way. It means that any of the currently employed major approaches to the FGGA (i.e., landscape-ecosystem method; flux measurements; inverse modeling; and process-based models, e.g., Dynamic Global Vegetation Models, DGVMs) if used individually cannot satisfy a major precondition of a verified FGGA - to provide a comprehensive and reliable assessment of uncertainties at all stages and for all modules of the account. Practically, there is only the possibility for providing a verified FGGA – a system integration of all relevant information sources and methods. Such integration should (to a possible extent) eliminate inherent shortcomings of each individual approach and provide a complimentary use of the independently received results. This defines (1) special requirements to the data, design and structure of the accounting schemes, and (2) a need for development of a special methodology for assessing the uncertainties that would combine formal and heuristic procedures.

The above ideas have been used for providing the FGGA of a large region in Central Siberia (from 50 to 76^o north and 86 to 112^o east, of an area $\sim$3.1 x 10^6 km^2). The

landscape-ecosystem approach was used as a background for the accounting. The information basis included a multi-sensor remote sensing concept (12 instruments from 8 satellites were used), data of land account and forest inventory, different cartographical sources, diverse results of measurements *in situ*, etc. Eventually, the land cover has been presented by ∼30,000 parametrized georeferenced polygons. A set of semi-empirical models was used for assessing long-term average values of major components of the FGGA (net primary production, heterotrophic respiration, fluxes due to disturbances, lateral fluxes, others) and relevant corrections of those for actual climatic indicators of individual years. Independent results were received from two DGVMs – LPJ and the Sheffield DGVM. Available data of flux measurements were used for model parametrization, and published results of inverse modeling – for multiple constraints of the final results. The approach used allows a reliable estimation of the uncertainties which were estimated in ranges from 7 to 15% for major fluxes and 30-40% - for the net biome production (CI 0.9). An overall conclusion of the study is that a verified FGGA for large regions of the Northern Hemisphere is possible, although uncertainties of final results remain high and this conclusion is partially based on subjective (personal) probabilities.