

GC33F-05 Bottom-up assessment of the Net Ecosystem Carbon Balance of Russian forests in 2010 for comparison to Top-down estimates. (Invited)

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The verified full carbon assessment of Russian forests (FCA) is based on an Integrated Land Information System (ILIS) that includes a multi-layer and multi-scale GIS with basic resolution of 1 km and corresponding attributive databases. The ILIS aggregates all available information about ecosystems and landscapes, sets of empirical and semi-empirical data and aggregations, data of different inventories and surveys, and multi-sensor remote sensing data. The ILIS serves as an information base for application of the landscape-ecosystem approach (LEA) of the FCA and as a systems design for comparison and mutual constraints with other methods of study of carbon cycling of forest ecosystems (eddy covariance; process models; inverse modeling; and multi-sensor application of remote sensing). The LEA is based on a complimentary use of the flux-based method with some elements of the pool-based method. Introduction of climatic parameters of individual years in the LEA, as well as some process-based elements, allows providing a substantial decrease of the uncertainties of carbon cycling yearly indicators of forest ecosystems. Major carbon pools (live biomass, coarse woody debris, soil organic carbon) are estimated based on data on areas, distribution and major biometric characteristics of Russian forests presented in form of the ILIS for the country. The major fluxes accounted for include Net Primary Production (NPP), Soil Heterotrophic Respiration (SHR), as well as fluxes caused by decomposition of Coarse Woody Debris (CWD), harvest and use of forest products, fluxes caused by natural disturbances (fire, insect outbreaks, impacts of unfavorable environment) and lateral fluxes to hydrosphere and lithosphere. Use of landscape-ecosystem approach resulted in the NECB at $573 \pm 140 \text{ Tg C yr}^{-1}$ (CI 0.9). While the total carbon sink is high, large forest areas, particularly on permafrost, serve as a carbon source. The ratio between net primary production and soil heterotrophic respiration, together with natural and human-induced disturbances are major drivers of the magnitude and spatial distribution of the NECB of forest ecosystems. We also present comparison to the recent top-down estimates of the Siberian carbon sink.

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