



Effects of nitrogen deposition on carbon budget in the forest ecosystems at different silvicultural regimes

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Increased nitrogen depositions have been recognized as a factor affecting the carbon cycle in the forests of boreal zone. The purpose of our study was to estimate in regional scale the changes in main carbon pools of forest ecosystems at different anthropogenic impact scenarios. A model of forest growth and elements cycling EFIMOD (Chertov et al., 1999, 2003; Komarov et al., 2003) has been used to simulate the dynamics of carbon in middle-age forest stands located in the southern part of Moscow region, Russia. The influence of different nitrogen loads on net primary production (NPP) and carbon sink in soil organic matter (SOM) has been computed on the example of the 104 plots with Pine and/or Spruce trees in dominant. Simulation of some silvicultural regimes (either natural developing or selective cutting or clear cutting) at three levels of nitrogen deposition corresponding to background and intensive nitrogen loads has been considered. The results obtained have shown that augmentation of nitrogen inputs from 10-12 kg/ha/yr up to 20-25 kg/ha/yr reveals the increase of total NPP on 10-20%. Maximum response from nitrogen surplus was discovered in Spruce forests. Accordingly to modelling results, additional nitrogen is used up, first of all, on the increase of leaves/needles fraction in total NPP values. Most evident cumulative effect from nitrogen surplus was revealed after 25-30 years in all forest types. When nitrogen surplus is 6-10 kg N/ha/yr in comparison with background levels, the values of carbon sink in SOM increase on 200-350 kg C/ha. Felling it is known to result in decreasing total pool of carbon in the forests because of both the wood biomass removal from the plots and rapid mineralization of SOM. Regional values of carbon output fluxes from the forested lands with harvested wood biomass varied from 20-25% up to 35-40% of NPP depending on cutting types. Reduction of carbon sink in SOM has lower average values.