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Changes of Land Cover and Land Use and Greenhouse Gas Emissions in Northern Eurasia

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Northern Eurasia accounts for about 20% of the Earth's land surface and 60% of the terrestrial land cover north of 40°N. It contains 70% of the Earth's boreal forests and more than two-thirds of the Earth's land that is underlain by permafrost. The region is covered by vast areas of peatland, complex tundra in the north and semi-deserts and deserts in the south, including the Mongolia plateau. The surface air temperature has increased in the last half century and this increase will continue during this century. We present the results of climate change effects on biogeochemical processes and mechanisms governing the carbon and water dynamics in the region. Future research will address on how patterns of land use in Northern Eurasia may change in the future due to: 1) Economic pressures for providing food, fiber and fuel to a growing global population; 2) Expansion of management of land for cropping, pasture, and forestry into areas that experience a more favorable climate in the future; and 3) Abandonment of management in areas that experience a less favorable climate and the implications of these changes for (1) the exchange of CO2 and CH4 between terrestrial ecosystems and the atmosphere; (2) terrestrial carbon storage and primary productivity; (3) water supply; and (4) radiative forcing of the atmosphere through changes in surface albedo. We use a system of linked models that include the MIT Emissions Prediction and Policy Analysis (EPPA) model of the world economy, the SiBCliM bioclimatic vegetation model, and the Terrestrial Ecosystem Model (TEM) with land-cover/ land-use modeling and biogeochemical modeling based on current relationships as observed through satellite and remote sensing data.