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Fire Impact on Carbon Storage and Emissions in Ecosystems of the Altai-Sayan Ecoregion, Siberia

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Boreal forests contribute considerably to global carbon budget, since they take up vast areas, accumulate much carbon and are sensible to climatic changes. Fires cover annually millions ha of boreal forests, of which the biggest part is in Siberia. Emissions released from biomass burning influence atmospheric chemistry and global carbon cycling. Changing climate and land use affect the number and intensity of wildfires, forest state and carbon emission. In the Altai-Sayan ecoregion found in the south of Siberia and more than a thousand of fires occur annually. We calculated carbon emissions from fires for this region using data on burned biomass. The data was determined by estimating pre- and post-fire fuel biomass using our experimental data obtained in the course of large-scale experiments on fire behavior modeling in various types of Siberian forest. Calculations were made taking account of fire type which determines the contribution of different fuel types to the overall carbon emission, and the fire severity. Maximum emissions from surface fires are observed in May that corresponds to the month with the largest area burned. Because fires occur mainly in spring and spread as running fires, the contribution of duff in carbon emissions is from 15 to 23%. Crown fires occurring in protected areas increase carbon emissions by 4-9%. Release of carbon into the atmosphere from the combustion of biomass constitutes 11% of the total stock of above-ground organic matter in the burned area.

Keywords: wildfires, boreal forests, carbon emissions, Siberia