



## **Biomass burning emissions estimates in the boreal forests of Siberia**

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Wildfire is the main boreal forest disturbance and can burn 10-30 million hectares annually, thus modifying the global carbon budget through direct fire emissions, postfire biogenic emissions, and by maintaining or altering ecosystems through establishing the beginning and end of successional processes. Fires in the Russian boreal forest range from low-severity surface fires to high-severity crown fires. Estimates of carbon emissions from fires in Russian boreal forests vary substantially due to differences in ecosystems types, burned area calculations, and the amount of fuel consumed. There is an urgent need to obtain more accurate and impartial fire carbon loss estimates in the boreal forests of Siberia due to their considerable contribution to the regional and global carbon balance.

We examined uncertainties in estimates of carbon emissions. Area burned in the Siberian region was analyzed and compared using distinct methodologies. Differences between mapped ecosystems were also compared and contrasted to evaluate the potential for error resulting from disparate vegetation structure and fuel consumption estimates. Accurate fuel consumption estimates are obtained in the course of fire experiments with pre- and post-fire biomass measuring. Our large-scale experiments carried out in the course of the FIRE BEAR (Fire Effects in the Boreal Eurasia Region) Project provided quantitative and qualitative data on ecosystem state and carbon emissions due to fires of known behavior in major forest types of Siberia that could be used to verify large-scale carbon emissions estimates.

Carbon emissions from fires vary annually and interannually and can increase several times in extreme fire years in comparison to normal fire years. Climate change and increasing drought length have increased the probability of high-severity fire occurrences. This would result in greater carbon losses and efflux to the atmosphere.

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