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TITLE: Fire Emissions Estimates in Siberia: Evaluation of Uncertainties in Area Burned, Land Cover, and Fuel Consumption

ABSTRACT BODY: Wildfire is one of the main disturbance factors in the boreal zone of Russia. Fires in the Russian boreal forest range from low-severity surface fires to high-severity crown fires. Estimates of carbon emissions from fires in Russia vary substantially due to differences in ecosystem classification and mapping, burned area calculations, and estimates of fuel consumption. We examined uncertainties in different parameters used to estimate biomass burning emissions. Several fire datasets (Institute of Forest burned area product, MCD45, MCD64, MOD14/MYD14, official data) were compared to estimate uncertainties in area burned in Siberia. Area burned was found to differ significantly by data source, with satellite data being by an order of magnitude greater than ground-based data.

Differences between mapped ecosystems were also compared and contrasted on the basis of five land cover maps (GLC-2000, Globcover-2009, MODIS Collection 4 and 5 Global Land Cover, and the Digitized Ecosystem map of the Former Soviet Union) to evaluate the potential for error resulting from disparate vegetation structure and fuel consumption estimates. The examination of land cover maps showed that estimates of relative proportion of fire by ecosystem type varied substantially for the same year from map to map. Fuel consumption remains one of the main uncertainties in estimates of biomass burning emissions in Siberia. 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. Global climate change is expected to result in increase of fire hazard and area burned, leading to impacts on global air quality and human health. Accurate emission estimates are required by air quality agencies to calculate local emissions and to develop strategies to mitigate negative smoke impacts.

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INDEX TERMS: [4337] NATURAL HAZARDS / Remote sensing and disasters, [1610] GLOBAL CHANGE / Atmosphere, [0468] BIOGEOSCIENCES / Natural hazards.

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