EGU2020-1939
https://doi.org/10.5194/egusphere-egu2020-1939
EGU General Assembly 2020

Carbon emissions from wildfires in larch forest ecosystems of Northeast Siberia

Clement J. Delcourt[1], Brian Izbicki[2], Elena A. Kukavskaya[3], Michelle C. Mack[2], Trofim C. Maximov[4], Roman E. Petrov[4], Brendan M. Rogers[5], Rebecca Scholten[1], Tatiana Shestakova[5], Guido van der Werf[1], Dave van Wees[1], and Sander Veraverbeke[1]

[1]Faculty of Science, Vrije Universiteit Amsterdam, Amsterdam, The Netherlands
[2]Center for Ecosystem Science and Society, Northern Arizona University, Flagstaff, AZ, United States of America
[3]V.N. Sukachev Institute of Forest of the Siberian Branch of the Russian Academy of Sciences - separate subdivision of FRC KSC SB RAS, Krasnoyarsk, Russia
[4]Institute for Biological Problems of Cryolithozone, Siberian Branch of Russian Academy of Sciences, Yakutsk, Russia
[5]Woods Hole Research Center, Falmouth, MA, United States of America

The boreal forest is one of the largest terrestrial carbon reservoirs on Earth and accounts for approximately 30% of the world's forest cover. The boreal carbon balance is thus of global significance. Wildfires affect the boreal carbon balance, releasing large amounts of carbon into the atmosphere when soil organic layers and aboveground biomass are combusted. The boreal forest is warming faster than the global average. These higher temperatures lead to increases in the frequency and severity of wildfire disturbance in boreal regions.

Significant progress has been made in quantifying carbon combustion in North American boreal forests, yet few measurements have been conducted in the larch dominated boreal forests of Northeast Siberia. Deciduous needleleaf larch forest growing on continuous permafrost is a unique ecosystem of Siberia. Although these larch forests cover approximately 20% of the boreal biome, the consequences of intensifying fire regimes on the carbon stocks and vegetation dynamics of these ecosystems remain poorly understood.

We conducted a field campaign in larch forests around Yakutsk, Northeast Siberia, during the summer of 2019 with the goal of filling parts of these knowledge and data gaps by collecting ground measurements of carbon combustion from two large fire events in 2017 and 2018. During this campaign, we sampled 42 burned sites in two fire scars that cover gradients of fire severity, vegetation composition and landscape position. Within these sites, we performed a wide range of measurements to quantify aboveground and belowground carbon emissions, constrained by data from 12 unburned sites. We also assessed post-fire recovery and active layer deepening. We investigated major drivers of pre-fire carbon stocks and subsequent combustion at the site level. Our results will reduce uncertainties in larger scale estimates of carbon emissions from Siberian fires which is in turn essential for assessing the implications of the climate-induced intensification of fire regimes for the global carbon cycle.