Geophysical Research Abstracts,
Vol. 10, EGU2008-A-00195, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-00195
EGU General Assembly 2008
© Author(s) 2008

Fire impact on carbon budget of Siberian Pinus sylvestris forests

E. Kukavskaya (1), G. Ivanova (1), D. McRae (2)

(1) Russian Academy of Sciences, Siberian Branch, V.N. Sukachev Institute of Forest, Krasnoyarsk, 660036, Russia, (2) Natural Resources Canada, Canadian Forest Service, 1219 Queen Street East, Sault Ste. Marie, Ontario, P6A 2E5, Canada

(kea-fire@mail.ru / Phone: (3912) 494462)

Russian boreal forests play an important role in global carbon budgets since they comprise up to 20% of the global terrestrial biomass. Wildfires are an important disturbance in Siberian forests burning 10 - 15 million hectares annually. These fires have a profound impact on forest-atmospheric carbon exchange as a result of direct fire emissions during burning and postfire biogenic emissions mainly due to tree mortality. An increase in the area annually burned is expected as a result of climate change that should result in greater carbon losses and effluxes to the atmosphere. A series of 4-ha experimental surface fires were conducted in mature Scots pine (Pinus sylvestris) lichen (Cladonia sp.)/feathermoss (Pleurozeum schreberi) sites located in central Siberia. The prefire above-ground carbon pool consisted of tree biomass (66 – 82 %), and ground fuels made up by ground vegetation (5 – 9 %) and the organic forest floor (up to 12 %). Without fire, mature Scots pine forests represent a net sink for atmospheric carbon. However, our experimental surface fires resulted in a 18 – 72 % reduction of ground fuels which produced direct carbon emissions of 4.8 – 15.4 t/ha depending on the prevailing drought conditions at the time of burning. Direct carbon release from our fires of low ($<$2000 kW/m), moderate (2001 - 4000 kW/m), and high ($>$4001 kW/m) intensity was 4.5, 5.4, and 12.6 times that of normal carbon emissions being released to the atmosphere annually by forests, respectively. For several years after fires, the increase of above-ground carbon was found to be strongly correlated with fireline intensity. High-intensity fires enhanced dead biomass carbon on the site

through tree mortality, while moderate- and low-intensity fires had no major effect on carbon distribution in Scots pine ecosystems. Independently of fireline intensity, all postfire sites became carbon sources to the atmosphere for at least 3-5 year after burning. Further investigations are needed to assess the long-term duration of fire impacts on carbon balance relationships.