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Carbon flux dynamics in boreal forest fire scars

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Climate change predictions suggest that warming is to be most pronounced at high latitudes (Kattenberg et al. 1996), with a possibility of boreal forest warming of 4-6ºC in the next 50-100 years (IPCC, 2001). This has lead to the suggestion that changes in boreal forest soil carbon storage could significantly alter the global soil carbon balance (Ohashi et al. 2005). It is possible that climate change will lead to an increase in fire regime e.g. size, frequency, intensity or any combination of these. Fire is the most significant factor controlling succession in the boreal forest biome (Zackrisson 1977) and it is possible that a greater frequency of fires will result in a higher proportion of young forest, relative to intermediate, mature and old forest. Studies of carbon flux dynamics in boreal forest fire chronosequences has become a fertile area for modern research (Bond-Lamberty et al. 2004; Czimczik et al. 2006; O'Neill et al. 2006). Much of this research, however, has been carried out in black spruce (*Picea mariana*) dominated systems, and this implies a need for further research in other boreal regions, particularly areas dominated by different species, such as pines (Pinus spp) and firs (Abies spp).

My research is investigating carbon flux dynamics in a Canadian boreal forest jack pine (*Pinus banksiana*) dominated fire scar chronosequence. Fieldwork is carried out at Sharpsand Creek experimental burn site, near Thessalon, Ontario, Canada. In the summer of 2006, an experiment was set up to compare mean soil respiration between

two fire scar age categories, those burnt in 1948 and those burnt in 1991. Three replicate scars were chosen from each scar age category. In the approximate centre of each scar, six measurements were taken of soil respiration, soil temperature and soil moisture from an area 10m x 5m. Soil respiration values were later adjusted for soil temperature using a Q_{10} value of 2. There was no significant difference in mean adjusted soil respiration between the two scar age categories, (independent samples t test: N= 35; df = 33; P = 0.117).

Fieldwork in May 2007 will aim to compare soil respiration along a fire scar chronosequence of 1948, 1975 and 1991 fire scars, using larger sample sizes, and also to obtain soil respiration responses to soil temperature and soil moisture. A carbon flux model for the field site will be developed based upon the Joint UK Land Environment Simulator (JULES) model. The model will then be run into the future under different IPCC scenarios of increasing atmospheric temperature and CO_2. This model will then be applied to other fire scars in Canada.

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