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Carbon dioxide evasion from Boreal Headwaters

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Boreal headwaters potentially represent important conduits for the exchange of gaseous carbon between terrestrial ecosystem and the atmosphere. Even if the loss is small in absolute terms compared to the uptake and release directly from forested terrestrial systems, it is a persistent term that is important when discussing the landscape carbon budget. Earlier studies in Sweden by Algesten et al. (2003) and Jonsson et al. (2007) estimate average fluxes of carbon dioxide between boreal streams and rivers and the atmosphere to 0.3 g and 1.6 g C/m2&year respectively. Similar studies in Brocky Burn, Scotland by Hope et al. (2001) show a flux up to 14 g C/m2&year.

This paper presents the results of a study between 2003 and 2007 to determine the flux of carbon dioxide between the headwaters of a 67 km^2 boreal headwater catchment and the atmosphere. This was done by measuring the concentration of carbon dioxide in streamwater and soil water. Injection of a tracer gas to the stream was used to relate these concentrations to evasion rates. Over 600 water samples were taken during the period at different sites within the catchment and at different times of the year.

The super saturation of carbon dioxide in the headwater streams was very high (averaging 10 times equilibrium with the atmosphere), and well correlated to the proportion of mire in the catchment area.) The evasion of carbon from this catchment is ca 5 g C/m2&year. The evasion is higher than earlier estimates, and is a persistent term that should be taken into account when discussing the carbon budget.

References

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