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# Greenhouse Gas Fluxes from Deciduous and Boreal Forest Soils in Eastern Canada

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The exchange of the important trace gases, methane (CH4), nitrous oxide (N2O) and carbon dioxide ($CO_2$), between forested soils and the atmosphere can show great temporal and spatial variability. We investigated the fluxes of CH4, N2O, and $CO_2$ from deciduous and boreal forest soils in eastern Canada from 2006 to 2008 in 20 sites representative of different soil drainage classes, management schemes and natural disturbance. Well-drained soils consumed atmospheric CH4, while poorly-drained 'cryptic' wetland soils embedded in depressions were a source. CH4 fluxes could be predicted primarily by temperature and moisture, and tree cover exerted an influence mainly through the creation of large soil porosity, leading to increased consumption rates. In contrast, there were very poor relationships between N2O fluxes and environmental variables, reflecting the complex microbial, edpahic and N cycling processes, such as nitrification in well-drained soils and denitrification in poorly-drained soils, which lead to N2O production (or consumption) in soils. At the broad temporal and spatial scale, however, soil C:N ratio was a good predictor of N2O emission rates, through its influence upon N cycling processes. Soil $CO_2$ emission rates showed less spatial and temporal variability, and were controlled by temperature and moisture. Poorly-drained soils in these forests play a critical role in the net global warming potential of forested landscapes. Therefore, soil drainage class integrates many of the biogeochemical processes controlling the flux of these gases and provides a framework for extrapolating results spatially and currently we are developing an estimate of the flux of these gases for the forest regions of Canada.