**Significant emissions of methane and nitrous oxide
following clear-cutting of a boreal forest stand**

Patrik Vestin1, Meelis Mölder1, Elin Sundqvist1,Margareta Hellström1, Anders Båth1,
Leif Klemedtsson2, Anders Lindroth1

*1 Department of Earth and Ecosystem Sciences, Lund University, Sweden*

*2 Department of Plant and Environmental Sciences, Gothenburg University, Sweden*

Clear-cutting and subsequent site preparation is common forest management practice in Sweden. According to the Swedish National Forest Inventory, an average of 196 000 ha were clear-cut annually during the period 2005-2009. The net effects of final fellings on greenhouse gas fluxes are not well understood. Increased substrate availability for decomposers following harvest may result in higher carbon dioxide (CO2) emissions from soils and in increased nitrogen mineralization. This may be further enhanced by increased soil temperatures after site preparation. In addition, removal of trees causes reduced evapotranspiration and subsequently a raised ground water table, which may have consequences for methane (CH4) and nitrous oxide (N2O) fluxes. The net effects of clear-cutting on CH4, N2O, CO2 and H2O fluxes were studied at Norunda forest in central Sweden. Micrometeorological measurements (i.e. flux-gradient and eddy covariance) allowed for quantification of CO2, CH4, N2Oand H2O fluxes at two different plots on a new clear-cut. Measurements of CH4, CO2 and H2O fluxes started in May 2010 while N2O flux measurements begun in June 2011. Soil chamber measurements (CO2, CH4 and H2O) were carried out in the adjacent forest stand during the main growing season of 2010 and at the clear-cut during October-November 2010. The clear-cut became waterlogged after harvest (more pronounced at plot 1) and preliminary results indicate a switch from a weak CH4 sink to a significant CH4 source at both plots. Daily average fluxes during the period 20 May through 30 November 2010 were of the order of -6.3 – +142.5 µmol m­-2h-1 (Fig.1) with mean values of 39.0 µmol m­-2h-1 (plot 1) and 16.3 µmol m­-2h-1 (plot 2). The preliminary results also indicate enhanced CO2 emissions and increased soil temperatures at disturbed microsites. Raw N2O data imply N2O fluxes of the order of 1-10 µmol m­-2h-1 during daytime (well-mixed) conditions. Available data, including 2011, will be further analyzed and presented at the conference.

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| Figure 1. Daily average CH4 fluxes at plot 1 (circles) and plot 2 (triangles) measured with the flux-gradient technique at the Norunda clear-cut during the period 20 May – 30 November 2010. Both plots are, on average, significant CH4 sources. The decreasing trend from mid-June through late July coincides with a period with low amounts of precipitation and decreasing soil water content. |