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Catchment-scale C and N balances in a northern boreal supersite in Finland - combining atmospheric and aquatic fluxes

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Boreal forests and peatlands interact with the atmosphere by exchanging greenhouse gases (GHGs) which are relevant to global warming. In addition to that, carbon (C) and nitrogen (N) are exported via the aquatic system within the catchment and from terrestrial system into the lakes and finally into the oceans. To obtain an unbiased estimate of the ecosystem C and N balance, not only the land-atmosphere fluxes, but also the lateral water-carried fluxes need to be accounted for. In this presentation we will summarize the GHG balances and aquatic fluxes within a northern boreal catchment (68°N, 24°S). The catchment is located in Pallas area in Northern Finland and consists of a spruce forest on mineral soil and a minerotrophic fen. Long-term CO_2 balances have been measured with the eddy covariance method, as well as the CH4 balance of a fen. The CH4 exchange in the forest and the N2O fluxes at both ecosystems have been determined with the chamber method. The concentrations of total and dissolved organic C and N, as well as NH4+ and NO_3- in the percolation water of the forest soil have also been measured. The amount of percolated water was estimated as the difference between the precipitation and evapotranspiration, which was directly measured with the eddy covariance method. In addition, we measured the concentrations of total and dissolved C and N, NH4+ and NO_3-, as well as the stream discharge rate downstream from the wetland. From these data, fluvial losses for the forest and wetland parts of the catchment were estimated and combined with the ecosystem-atmosphere exchange to construct a full C and N balance of the terrestrial part of this catchment.