Referee I, comment #1: The paper is concise; however some parts are a little difficult to follow especially the description of the calculation of canopy N content and N re-translocation from senescing leaves and needles in the Materials and Methods (page 9764). Perhaps a presentation in formulas or in a table format might be more helpful for the reader to follow. In addition, it is not very clear in these calculations which parameters were derived from literature, which were deduced from measurements done within those experiments and which are directly measured in this experiment. I would suggest explicating this for all variables presented in table 2 page 9785

Response: We included a more explicit description on how we calculated the canopy N content and retranslocation.

The canopy N content (N_c), i.e. the N content of the leaves or needles per unit ground area, was calculated as the product of the measured leaf area index (I_{LAI}) and the average N content per unit leaf area (N_l) using measured N concentrations and specific leaf areas (A_{SLA}) from beech leaves (30 and 15 m^2 kg^{-1} for leaves in canopy top and base, respectively) and Douglas fir needles (79 and 54 m^2 kg^{-1} for canopy top and base, respectively), i.e.

$$N_c = \overline{N_l}\, L_{AI}\, \overline{A_s} \quad (1)$$

For the boreal pine stand, Nc was calculated as the product of average needle N content (N_{conc} mass N per unit dry mass), obtained in the present study, and estimated canopy needle dry masses (M_c, i.e. 466 g m^{-2}) that were derived from biometric relationships based on measured trunk diameters at 1.3 m and tree heights as input (Repola, 2009).

$$N_c = \overline{N_{\mathrm{conc}}}\, M_c \quad (2)$$

The N re-translocation, R_N, in beech was estimated as the product of the measured I_{LAI} and the difference in N content per unit leaf area in summer and that of fallen leaves.

$$R_{\mathrm{N}} = I_{\mathrm{LAI}} \left(\overline{N_{\mathrm{l_s}}} - \overline{N_{\mathrm{l_w}}}\right) \quad (3)$$

In the conifer stands, the fallen needles were separated from the rest of the litter. The annual dry mass of green and active needles that were later shed in a year was estimated as the product of a published mass loss factor (r_M) between green and brown needles (1/1.53, Helmisaari, 1992) and the measured amount of needle litter production. This needle mass was then multiplied with the differences in N contents between green and brown needles. From mass balance equations and litter production (L) the mass loss factor for the Dutch fir forest was estimated to be 1/1.48, i.e. very similar to that of pine.

$$R_{\mathrm{N}} = \frac{L}{r_{\mathrm{M}}} \left(N_{\mathrm{conc_s}} - N_{\mathrm{conc_w}}\right) \quad (4)$$

References

Helmisaari, H. S.: Nutrient retranslocation within the foliage of *Pinus sylvestris*, Tree Physiol.,10, 45–58, 1992.

Repola, J.: Biomass equations for Scots pine and Norway spruce in Finland, Silva Fennica, 43,625–647, 2009.