Missing sources/sinks of nitrogen revealed by $\delta^{15}N$ inventory of mountain-top peat bog ecosystems

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A nitrogen isotope inventory was taken in two polluted ombrotrophic bogs in the Czech Republic, Central Europe. For the first time, $\delta^{15}N$ time-series of atmospheric deposition was compared with N isotope composition of living *Sphagnum* and of non-living moss throughout vertical peat profiles. We expected isotopically lighter N (lower $\delta^{15}N$ values) in fresh *Sphagnum* and the uppermost peat layers, relative to NH_4^+ and NO_3^- of the atmospheric input, in an analogy to isotopically light N in the biomass of trees, compared to the atmospheric input. Under high N pollution levels, part of the deposited N_r is not metabolized by *Sphagnum*. Rather, it penetrates to greater peat depths. We expected the following $\delta^{15}N$ systematics: *Sphagnum* < atmospheric N_r < deeper peat. In actual fact, atmospheric N_r species contained the isotopically lightest N. At both study sites, the observed $\delta^{15}N$ systematics was: atmospheric N_r < *Sphagnum* < deeper peat. It follows that in our inventory we have missed a sink of isotopically even lighter N, the residue following partial incorporation of atmogenic N_r into *Sphagnum*. This sink probably was not hydrologic at our sites, since runoff was non-existent or negligible. Alternatively, we could have missed an additional source of isotopically heavy N that was incorporated into the living *Sphagnum*. Future research should explore the possibility that this missing source of relatively heavy N is atmospheric N_2. However, high energy is required to break the triple bond of the N_2 molecule, and microorganisms tend to fix N only at low N_r inputs.