

Peat is a large reservoir of stored carbon and peat cores preserve a long-term record of system carbon and nitrogen dynamics. Stable isotopes are one marker of carbon and nitrogen dynamics in peat cores. Here, we investigated controls over $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ patterns in peat cores from the Marcell S1 forested bog in northern Minnesota. In multiple regression analyses, $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ correlated strongly with depth, plot location, %C, %N, and each other. Negative correlation of $\delta^{15}\text{N}$ with %N presumably reflected removal of ^{15}N -depleted N via denitrification, diffusion, or plant N transfer via mycorrhizal fungi. The step increase in the depth coefficient for $\delta^{15}\text{N}$ of $\sim 3\text{‰}$ from -25 cm to -35 cm indicated that the removal process primarily operates at a discrete depth, presumably corresponding to the juncture between aerobic and anaerobic layers defined by the water table. Variability of $\delta^{15}\text{N}$ with plot location in the raised bog may reflect flowpath alterations derived from proximity to uplands. The Suess effect and aerobic decomposition lowered $\delta^{13}\text{C}$ in recent surficial samples. Small increases in $\delta^{13}\text{C}$ at -112 cm (4290 calibrated years BP) and -85 cm (3820 calibrated years BP) may reflect warming of about 1°C during a suspected transitional fen stage (based on paleoecology at a nearby bog). Alternatively, these increases may reflect a signal of carbon dynamics during this stage, when reduced methanotrophy would have retained less ^{13}C -depleted carbon derived from methane. C/N decreased until about -85 cm and thereafter remained steady, suggesting that the active zone of aerobic processing during drought may extend to this depth.