Initial response of the nitrogen cycle to soil warming in Northern Minnesota peatlands

Peatlands store 30% of global soil carbon. Many of these peatlands are located in boreal regions which are expected to have the highest temperature increases in response to climate change. As climate warms, peat decomposition may accelerate and release greenhouse gases. Spruce and Peatland Responses Under Climate and Environmental Change (SPRUCE) project initiated soil warming in 2014 in ten peatland mesocosms (five temperature treatments from ambient (+0^{o}C) to +9°C). Peat cores at three depths (acrotelm, catotelm, deep peat) were analyzed in the laboratory for denitrification, nitrification, and ammonification. Denitrification increased with the addition of nitrogen, but had a weak response to initial temperature increases. The strongest temperature response was in the deep peat. Mineralization rates responded weakly to temperature increases. Nitrification increased only in the catotelm, while ammonification decreased in deep peat. Denitrification and nitrification rates were correlated, decreasing with depth. Ammonification was inversely correlated with nitrification, increasing with depth. As soil temperatures rise, water levels decrease, and decomposition increases we expect nitrification-denitrification to increase, mobilizing nitrate and increasing N_2O releases.