

Organic Nitrogen in the Snowpack throughout the United States Rocky Mountains

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Excess reactive nitrogen (Nr) deposition is occurring in sensitive ecosystems in the Rocky Mountains. In some high alpine lakes in Rocky Mountain national park and the Greater Yellowstone Area, this deposition has passed critical thresholds and is causing biogeochemical changes. Nr deposition is monitored by the National Atmospheric Deposition Program National Trends Network (NADP/NTN) and Clean Air Status and Trends (CASTNET) network that measure inorganic nitrate and ammonium. The NADP Ammonia Monitoring Network (NADP/AMoN) began measuring ammonia gas in 2010 at over 50 sites across the U.S. Missing Nr components from these networks include organic nitrogen (ON). Special monitoring studies at Rocky Mountain and Grand Teton national parks found significant contributions of wet ON deposition and high ambient concentrations of ON gas that could contribute to Nr deposition. However the spatial extent of the contribution of ON to Nr deposition is not known. Every year the U.S. Geological Survey collects snowpack samples at over 50 sites throughout the United States Rocky Mountains. Similar to the NADP, these samples are analyzed for the inorganic ionic composition, including oxidized and reduced nitrogen compounds. A benefit of the snowpack samples is that they contain contributions from both dry and wet deposition, but the multi-month long sample collection period provides opportunities for chemical and biological processing of the deposited Nr. To better understand the contribution of ON to the Nr deposition, the 2012 and 2013 snowpack samples were also analyzed for total nitrogen from which ON was estimated. It was found that 10-60% of the Nr in the 2012 samples was ON. ON was poorly correlated with inorganic oxidized and reduced N indicating different sources responsible for the ON or possibly different atmospheric/snowpack rates of processing.

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