Are Elevated Nutrient Levels in Arctic Tundra Ponds Due to Permafrost Thawing?

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Are Elevated Nutrient Levels in Arctic Tundra Ponds Due to Permafrost Thawing?

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Continued warming of the arctic tundra in northern Alaska can have important ecological implications for freshwater ecosystems. An increased active layer depth can lead to nutrient release from permafrost. Comparisons of water quality parameters from the 1970s and 2008-09 from tundra ponds in Barrow, Alaska indicated an increase in water column Total Phosphorus (TP), Soluble Reactive Phosphorus (SRP), Total Dissolved Phosphorus (TDP) and algal biomass (phytoplankton) over time. We designed an incubation experiment to look at nutrient release rates from permafrost and active layer cores under different warming scenarios. Although water column data have shown an increase in phosphorus species over the past 40 years, permafrost core incubations showed high concentrations of nitrogen species being released from sediment. In particular, ammonia concentrations were significantly higher in permafrost incubations compared to the active layer incubations. Understanding the release of nutrients from the permafrost can help delineate nutrient concentrations that will be added to arctic tundra pond ecosystems with warming.