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Significant Permafrost Nitrous Oxide Emissions Observed on a Regional Scale

Jordan Wilkerson
Harvard University, Department of Chemistry, Cambridge, Massachusetts, USA (jwilkerson@g.harvard.edu)

As the planet warms, greenhouse gas emissions from thawing permafrost can potentially increase the net radiative forcing on our climate structure. However, knowledge about Arctic N2O emissions is sparse, and the fluxes are typically assumed to be negligible. Increasing evidence suggests emissions from permafrost thaw may be a significant source of N2O particularly through thermokarst features and cryoturbated peat circles. This evidence, though, is either based on lab experiments or in situ chamber studies, which have extremely limited spatial coverage. Consequently, it has not been confirmed to what extent these high emissions are representative of broader Arctic regions. Using an airborne eddy covariance flux technique, we measured N2O fluxes over the North Slope of Alaska in August 2013. From these measurements, we directly show that large areas of this Arctic region have significant N2O emissions. If our measurements represent other thermokarst/permafrost laden regions, N2O from permafrost composes $\sim$10% of the global, natural N2O budget.