3.138 Atmospheric Ammonia in the Summertime Arctic.

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Abstract:

The budget of atmospheric ammonia (NH_3) in the summertime Arctic is poorly understood, but ammonia can play a key role in new particle formation in this relatively pristine environment. Motivated by the lack of in situ NH_3 measurements in the Arctic, observations were made using online ion chromatography (AIM-IC) and laser spectroscopy (QC-TILDAS) techniques in both marine and terrestrial environments. The marine atmosphere in the eastern Canadian Arctic was investigated onboard the Canadian Coast Guard Ship Amundsen in the summers of 2014 and 2016. Median NH_3 mixing ratios measured from the ship were 220 pptv in 2014 and 140 pptv in 2016. Ocean-atmosphere exchange of NH_3 was quantified using measurements of sea surface water NH_4^+ concentrations, showing net deposition of NH_3 to the Arctic Ocean in both years. In summer 2016, NH_3 was measured at a tundra site in Alert, NU, revealing a median NH_3 mixing ratio of 230 pptv. Measurements of soil NH_4^+ content and pH showed that the tundra can also act as a source for atmospheric NH_3 under certain conditions. Additional sources that can be important in the region include colonies of migratory seabirds and boreal biomass burning. The loss of atmospheric NH_3 through wet deposition was quantified in both 2016 campaigns. The relatively high levels of atmospheric ammonia indicate a much larger flux of NHx through the Arctic ocean/atmosphere/biosphere system than previously recognized.