3.037 The role of biomass burning and other natural sources affecting the Arctic summer atmospheric composition.

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Abstract:

The Arctic lower troposphere in summer time is generally characterized by relatively clean and pristine conditions, due to less efficient transport from lower latitudes and more efficient wet removal processes during this time of the year. As a result, local and regional natural/biological sources play a more important role in the Arctic under these conditions. In this study, we use GEM-MACH, an on-line chemical transport model, to investigate sources and processes influencing summertime atmospheric composition in the Canadian Arctic. Model simulations of an intensive field campaign conducted over the Canadian high Arctic during the summer of 2014 were carried out, and results were compared with in-situ measurements from multiple platforms. Here we focus on North American (NA) boreal biomass burning, emissions from seabird (guano) colonies, and the process of terrestrial bi-directional exchange of ammonia. We show that the episodes of relatively high aerosol concentrations observed in the Canadian high Arctic during transient periods are contributed by the NA wildfire emissions, either by direct impact of biomass burning plumes or indirectly through the accumulative impact of biomass burning emissions on the NA background concentrations. We also show that both NA boreal wild fires and emissions from seabird colonies are contributors to periods of high NH3 concentrations observed in the Arctic. The impact of emission from seabird colonies is particularly important in the Arctic summer (due to its intensity and close proximity, and given the relatively short atmospheric lifetime of NH3). In addition, NH3 observed in the Canadian high Arctic can also be influenced by the terrestrial bi-directional exchange process.