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Aircraft measurements over Fennoscandia during the MAMM project - highlights from 2012-2014

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This paper will present highlights and conclusions from a 3-year campaign of summer airborne measurements across the Fennoscandian region and over the Barents Sea and Svalbard during the Methane in the Arctic Measurements and Modelling (MAMM) campaign. Beginning in July 2012, the UK Facility for Airborne Atmospheric Measurement (FAAM) Bae-146 Atmospheric Research Aircraft has conducted more than 150 hours of sampling over this Arctic domain in a series of tailored process-driven case studies in the period July to September in each year between 2012 and 2014.

High precision, continuous measurements of methane concentration and its isotopologues were collected on the FAAM aircraft along with measurements of a wide range of other gases (such as CO_2, N2O, O_3, CO, HCOOH), aerosol, and thermodynamic parameters. Together, such measurements provide a dataset from which to assess physico-chemical airmass history and specific local and regional emission processes. The FAAM platform complemented a longer term ground-based measurement deployment to collect data for measurement-led case studies, and regional and global model evaluation.

In this study we will present highlights from case studies of regionally-averaged snapshots of Arctic wetland methane and formic acid net surface flux and we will present conclusions from airborne methane measurements over potential gas seepage areas on the continental shelf off the coast of Svalbard. We will also present the first airborne remote sensing measurements of methane over the region from the FAAM aircraft and we will present a summer climatology of greenhouse measurements across the MAMM campaign. We will conclude by discussing the next steps in completing the Arctic methane picture and what this might mean for the global methane conundrum.