Methane and other greenhouse gases in the Arctic – Measurements, Process Studies and Modelling (MAMM)

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The Arctic is a major source of atmospheric methane and other greenhouse gases, of both natural and anthropogenic origin. Arctic greenhouse gas sources need to be quantified, by strength, geographic location, character (e.g. wetlands, gas fields, hydrates), and by temporal variation (daily, seasonally and annually), and their vulnerability to change assessed. To this end, the MAMM project was commissioned as part of the NERC Arctic Research Programme. It involves an integrated series of measurement and modelling activities. Analysis of atmospheric gas concentrations, isotopic character, and source fluxes, are being made from both the ground and from the FAAM aircraft. The measurements (historic and new) are being interpreted using a suite of models (trajectory, forward and inverse) to improve the understanding of the local/regional scale, placing the role of Arctic emissions in the context of large-scale global atmospheric change.

The first measurement campaign was held in August 2012. Surface flux measurements were made at the Sodankylä research station in Finland, together with in-situ surface and aircraft measurements over a wider area. In addition to flights over the Sodankylä wetlands, the aircraft also flew out to Svalbard to investigate marine sources of methane. Further campaigns are taking place in Sweden in August and September 2013.

The initial measurements have been used to infer wetland emission fluxes and confirm that Scandinavian wetlands are a major source of methane in this region. The aircraft also measured a high-CH4 plume over the sea between Norway and Svalbard, which was likely advected from mainland wetland sources.

An overview of results from the field campaign will be presented, alongside results from the NAME model (the UK Met Office's Numerical Atmospheric dispersion Modelling Environment) to help understand the air mass histories of the observations.