



Quantifying methane emissions sources in the Arctic using measurements and dispersion modelling

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Methane is a greenhouse gas that is particularly important in the Arctic, as the largest emissions source at high northern latitudes (wetlands) increases with increasing temperature. This amplification of any warming from methane makes it particularly important to understand when considering climate change, however present day sources of methane in the Arctic are poorly quantified. For example, different inventories of wetlands emissions vary considerably in both wetland location and methane source strength. The aim of the MAMM project (Methane and other greenhouse gases in the Arctic – Measurements, process studies and Modelling) is to improve our understanding of the methane, carbon dioxide and nitrous oxide atmospheric concentrations, isotopic composition and emissions in the European Arctic.

Field campaigns were held in July 2012, August 2013 and September 2013, in which ground- and aircraft-based measurements were taken of methane, other greenhouse gases and meteorological parameters. A Lagrangian particle dispersion model (NAME, the UK Met Office's Numerical Atmospheric dispersion Modelling Environment) has been used alongside the MAMM field campaign measurements to identify the sources of the methane. The model has been run backwards in time to identify source regions of plumes containing high methane concentrations, for which the carbon isotopes (which will vary dependent on the source) have been analysed.

The model has also been run forwards in time to test whether emissions fluxes (from inventories or from simple calculations based on measurements) are consistent with the aircraft observations of methane concentration. Results from a few case studies will be presented, with a focus on quantifying the emissions fluxes by combining the observations with the dispersion model.