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Investigation of greenhouse gas emissions from a landfill site and agriculture in the UK by deployment of an in-situ FTIR

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The main greenhouse gases (GHG) emitted by human activities in the UK are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Understanding and quantifying their emissions is essential to monitor and guide emission reduction measures. The GAUGE (Greenhouse gAs Uk and Global Emissions) project funded by NERC aims to improve the knowledge of the UK GHG budget by an extensive measurement program. In this presentation, we focus on two important sources of these GHG: Waste and agricultural sector.

We are presenting data from the deployment of an in-situ FTIR (Ecotech) for continuous and simultaneous sampling of CO_2, CH_4, N_2O and CO with a high time resolution in the order of minutes. During a two week field campaign at a landfill site near Ipswich in August 2014, measurements were taken within a radius of 320 m of the uncovered and active area of the landfill, which was still filled with new incoming waste. The data are analysed in detail for emission ratios of CH_4 to CO_2. Thereby a consistent ratio in favour of CO_2 is found for these emissions. We have applied a computation fluid dynamics (CFD) model, constrained with local wind measurements and a detailed topographic map of the landfill site, to the in-situ concentration data to calculate emission fluxes of the active site.

Since October 2014 the FTIR has been sampling from a church tower in Glatton as part of a near surface sampling network in East Anglia focusing on regional GHG emissions from agriculture. The site is mainly influenced by south westerly winds. A clear diurnal cycle is observed in summer for CO_2, CH_4 and N_2O, which is less pronounced in the winter months. A simulation of the methane and nitrous oxide concentrations through application of the NAME model to the EDGAR and NAEI emission inventories illustrates some shortcomings in the available emission inventories for the probed region.