

Methane emissions from a UK landfill site – Emission ratios and flux estimation

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Methane is well known as a greenhouse gas, but its budget of emissions and sinks remains uncertain. Landfilling and waste management are major sources of methane. The presented study aims to contribute to a better estimation of the UK's greenhouse gas budget by determining emission ratios and estimating emission fluxes for methane from a landfill site near Ipswich.

Methane emissions from waste are produced under anaerobic conditions during the decomposition process of waste. It can be directly formed by methanogenic bacteria or as a product of carbon dioxide reduction. Filled up patches of the landfill site are covered and the produced gas is recovered and used for energy production. Highest concentrations in methane were observed from the direction of the power station. For an efficient recovery system no methane emissions or even uptake of methane can be expected from these areas. While many studies focus on the processes in the cover soils, we were investigating the emissions from the active and uncovered part of the landfill site itself and the power station.

During a two week field campaign measurements of CH₄ together with CO₂, CO and N₂O were taken with an in-situ FTIR (Ecotech) within a radius of 320 m from the uncovered area, which was still filled with new incoming waste. The data are analysed in detail for emission ratios of CH₄ to CO₂. Thereby a consistent ratio in favour of CO₂ is found for these emissions.

To estimate the dilution of the trace gas emissions during the transport, we have applied a Computational Fluid Dynamics (CFD) model constraint with local wind measurements and a detailed topographic map of the landfill site. From the comparison of the model calculations with the in-situ concentration data we can estimate emission fluxes of the active site of the landfill.