Using Cavity Ring Down Spectroscopy to measure greenhouse gas concentrations and estimate flux to the atmosphere using a closed flux chamber

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TITLE

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RUNNING TITLE

Using CRDS to measure greenhouse gas concentrations and flux

ABSTRACT

Atmospheric methane concentrations have risen from 823 ppb in 1841 to 1824ppb in 2013. In that time methane concentrations have risen more rapidly than carbon dioxide levels. Methane also has twenty-one times more global warming potential than carbon dioxide which makes methane an increasingly important greenhouse gas. Demand for potentially cleaner energy sources such as coal seam gas (CSG) has also brought more attention to methane and the need to understand the global methane budget. While the majority of sources and sinks have been identified their individual contributions to the atmosphere are poorly understood. New technology using Cavity Ring Down Spectroscopy (CRDS) allows for parts per billion atmospheric variations in greenhouse gas concentrations to be measured every 2-4 seconds. Methane concentrations were measured at a number of field sites including natural and anthropogenic sources, both as background levels in the atmosphere and inside a closed flux chamber. In the swamps examined in this study methane flux as measured using the flux chamber varied by up to two orders of magnitude for the same wetland. These results suggest that it is difficult to accurately determine the global output of methane from wetlands. The CRDS was also used to measure atmospheric concentrations of methane around cities, farms, coal mines and CSG production areas. CRDS is a useful tool to help understand individual sources and how much methane they could emit.

KEYWORDS

Methane, greenhouse gas, cavity ring down spectroscopy, global methane budget, closed flux chamber

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