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Methane emissions in the Northern Territory's Beetaloo Sub-basin

How much background methane is being emitted, and from where?

This project measured baseline methane emissions from natural and human-derived sources in the Beetaloo Sub-basin. The results will inform the community, the Northern Territory (NT) Government and the gas industry, and support appropriate policy and resource management decisions in relation to proposed shale gas exploration activities.

KEY POINTS

Fires, cattle, termites, wetlands, natural geological seeps, water bores and existing mineral and petroleum wells can all emit methane into the atmosphere. These are called background emissions.

- This project conducted mobile surveys to measure background methane emissions in the central part of the Beetaloo Sub-basin in the wet, dry and fire seasons.
- Having this baseline of methane emissions enables additional emissions from future industries, such as shale gas, to be identified and quantified.
- Surveys were conducted in the dry, fire and wet seasons.
- The average atmospheric methane concentration across the survey area ranged from 1.80 to 1.82 ppm.
- These results are close to the normal background concentrations of approximately 1.8 ppm expected in rural or natural areas.
- Each survey observed isolated pockets of slightly elevated methane concentrations in some areas.
- The sources of these were identified as predominantly grazing cattle and other less dominant sources from townships, fires, termites, wetlands and a small section of above-ground pipeline.

The Beetaloo Sub-basin

The Beetaloo Sub-basin lies south-east of Katherine, spanning an area of about 30,000 square kilometres. One of the most prospective areas for shale gas in Australia, it contains an estimated prospective resource of 178,200 petajoules (PJ) of gas.

Community concerns

The recent Scientific Inquiry into Hydraulic Fracturing in the Northern Territory highlighted community concerns about the potential of the onshore gas industry to release methane into the atmosphere. Without a comprehensive baseline of existing background emissions, any potential emissions from gas developments ('fugitive emissions') would not be quantifiable.

Objectives of this project

Between July 2018 and February 2019, researchers collected comprehensive data on background methane emissions in the central region of the Beetaloo Sub-basin. This project is the first stage of a comprehensive methane monitoring project that will collect data for a larger area of the basin.

The project also investigated fluxes and identified sources where elevated methane levels were detected.

Results

To capture the seasonal variability in emissions, mobile surveys were conducted in the dry season (Jul – Aug 2018), the fire season (Sep – Oct 2018) and the wet season (Dec 2018 – Jan 2019).

Almost 15,000 km were covered over 29 days during the three surveys.

The average atmospheric methane concentration across the survey area ranged from 1.80 to 1.82 ppm. This is close to the normal background concentrations of approximately 1.80 ppm expected in rural or natural areas. Each survey observed isolated pockets of slightly elevated methane concentrations in some areas; the sources of these were identified as predominantly grazing cattle and other less dominant sources such as townships, fires, termites, wetlands and a small section of above-ground pipeline.

The methane elevations were quite small, with the maximum concentrations less than 2.6 ppm (i.e. about 0.8 ppm above background).

Methane emission rates from large fires (common in the region at some times of the year) are likely to be more significant but are challenging to quantify using mobile surveys.

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Slightly elevated methane concentrations up to approximately 2.3 ppm were detected near valves on an above-ground section of the Daly Waters to McArthur River gas pipeline in all surveys.

How methane emissions were measured

Data was collected using mobile surveying methods. With this method, a state-of-the-art methane gas analyser mounted on a 4WD vehicle continuously measured existing methane concentration as the vehicle was driven across the landscape. Gas analysers can reliably detect very small concentrations of methane (2 parts per billion (ppb)).

Mapping methane sources, concentrations and fluxes

This project combined concentration data from the surveys with spatial data to produce detailed maps of methane concentration.

Methane concentration is a measure of the abundance of methane in the air, usually defined as the proportion of the total volume (e.g. parts per million or billion). Flux is defined as the rate of flow of gas per unit time (grams/second). The flux of methane from sources such as production wells can be estimated by the measurement of methane concentrations in the air around the wells and simultaneously measured meteorological data to infer plume dispersion from the source or by introducing a tracer at known concentrations into the plume to be measured. Provided that the tracer gas is well mixed with the methane plume, the methane emission rate can be estimate via the ratio of the the tracer. Both concentration and flux measurements are required to be able to provide baseline levels of methane and to quantify the natural and anthropogenic methane emissions, where these background emissions are occurring and how much methane is being released to the atmosphere.

CSIRO researchers measuring methane fluxes from a termite mound

FREQUENTLY ASKED QUESTIONS

What is methane and where does it come from?

Methane, a colourless, odourless, non-toxic gas, comes from two sources:

- the decomposition of organic matter, such as in lakes, rivers, wetlands and soils, or
- from deep beneath the earth's surface where gaseous methane has formed geochemically under elevated temperature and pressure conditions.

What is the impact of methane?

Methane is a greenhouse gas. It can absorb infra-red radiation from the earth and then radiates this heat back into the surrounding atmosphere, warming it. Methane is a more potent greenhouse gas than carbon dioxide.

Where can I find more information?

- Read the final report: methane monitoring project
- Northern Territory Inquiry final report
- About the Beetaloo Sub-basin

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