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About Picarro

Picarro is a leading provider of solutions to measure greenhouse gas (GHG) concentrations, trace gases and stable isotopes across many scientific applications, along with the energy and utilities markets.

Cavity Ring-Down Spectroscopy - our patented Cavity Ring-Down Spectroscopy (CRDS) is at the heart of all Picarro instruments and solutions, enabling the detection of target molecules at part per billion, or better, resolution.

Scientific Instruments - our portfolio of Picarro gas analyzers and systems enables scientists around the world to measure GHGs, trace gases and stable isotopes found in the air we breathe, water we drink and land we harvest. The ultra-precise and easy-to-use instruments are deployed across the globe offering unmatched performance in a variety of field conditions.

Gas Solutions - Picarro is the industry leader in analytics-driven leak detection and methane emissions quantification solutions, enabling our energy customers to increase capital efficiency while simultaneously improving the safety of their infrastructure.

Industrial Solutions - Picarro's industrial solutions range from mobile leak detection technology for utilities companies to trace gas analysis for semiconductor fabrication and pharmaceuticals isolators.

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Methane emissions – sources & impact as on Global Warming

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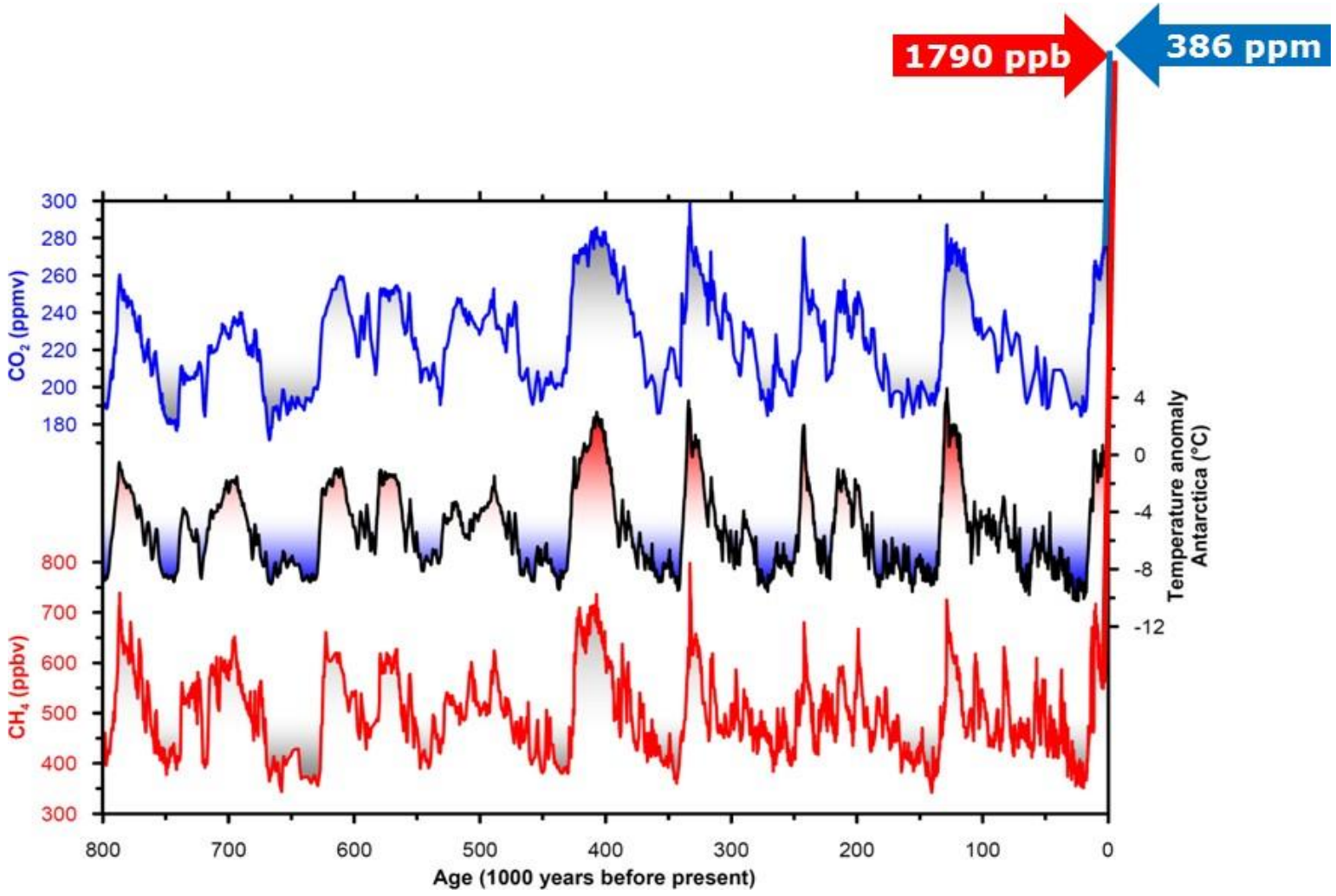
Methane – an important Greenhouse gas

- After CO_2, Methane is the 2nd most important GHG
- Methane Emissions (since the industrial revolution) are **responsible for 50% of the global warming**
- Current Atmospheric Methane concentrations are higher than ever within the last 800’000 years



https://www.iceandclimate.nbi.ku.dk/research/past_atmos/composition_greenhouse/

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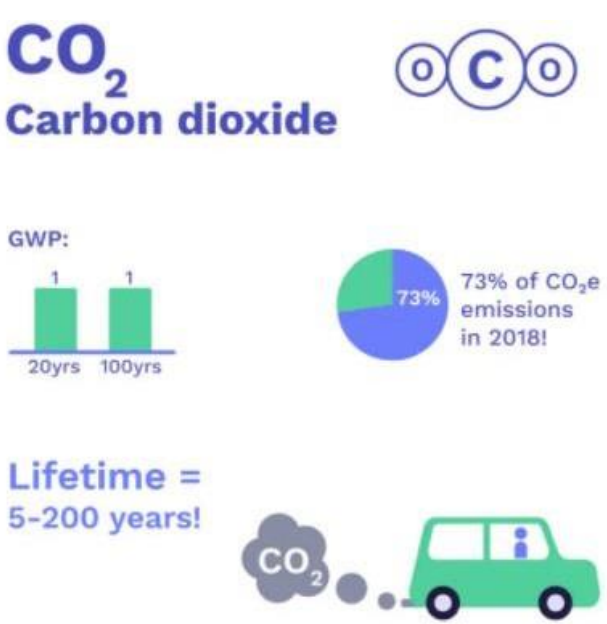
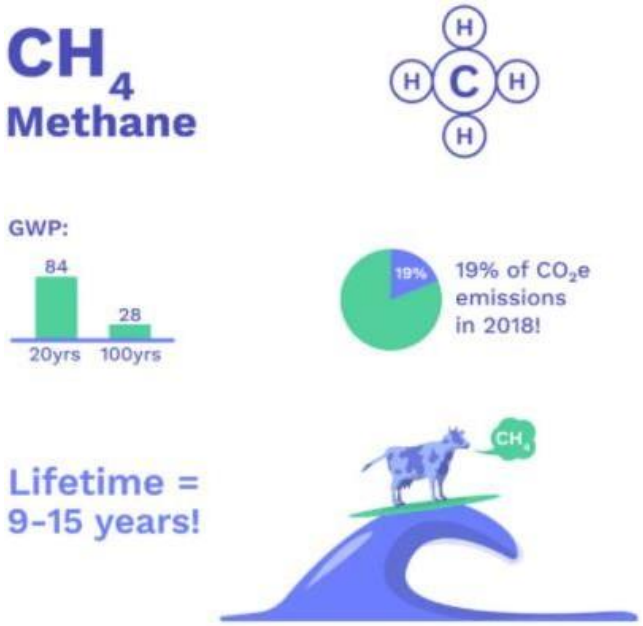
Global Warming Potential of Methane

- The Global Warming Potential (GWP) measures of how much energy the emissions of 1 ton of a gas will absorb over a given period, relative to the emissions of 1 ton of carbon dioxide (CO_2)
- Methane (CH_4) has an **84 times stronger "warming potential" than CO_2 ,** so methane leaks are accelerating Global Warming, especially in the next 20 years





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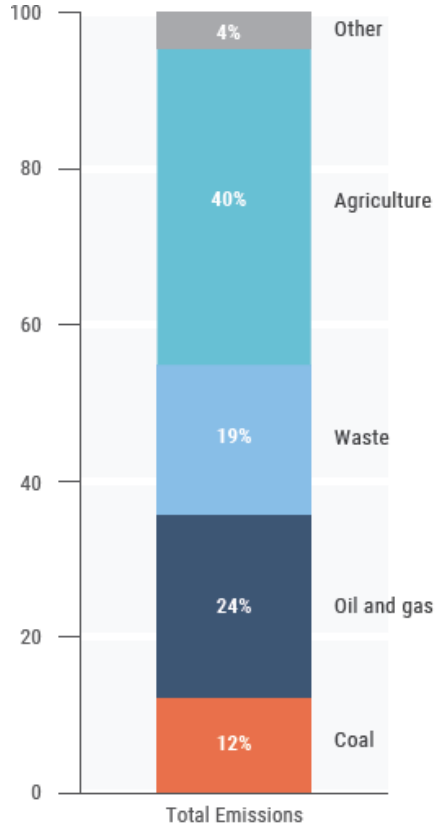
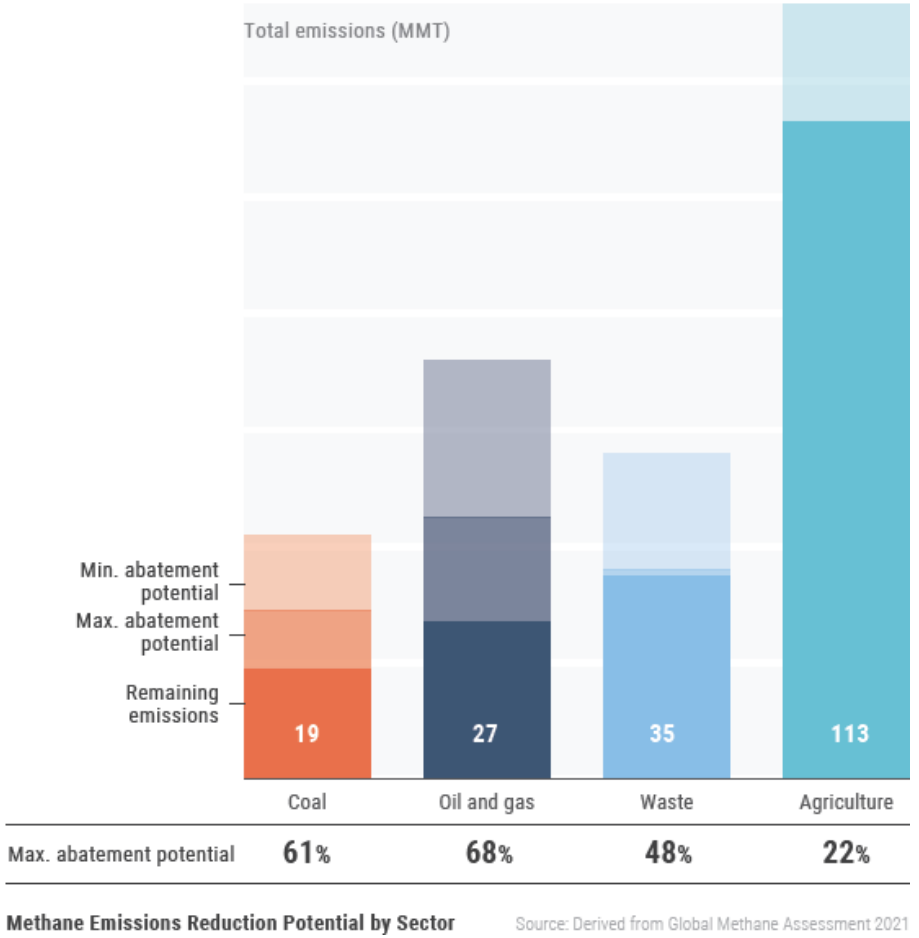
Methane Emissions and abatement potential by sector

- Oil & Gas account for 24% of global Methane emissions
- Oil & Gas sector provides the **largest abatement potential** across all sectors
- 40 – 60% of the emission abatements in the Oil & Gas sector can be achieved at net-zero cost (according to the IEA)





Source: IMEO 2021 Report

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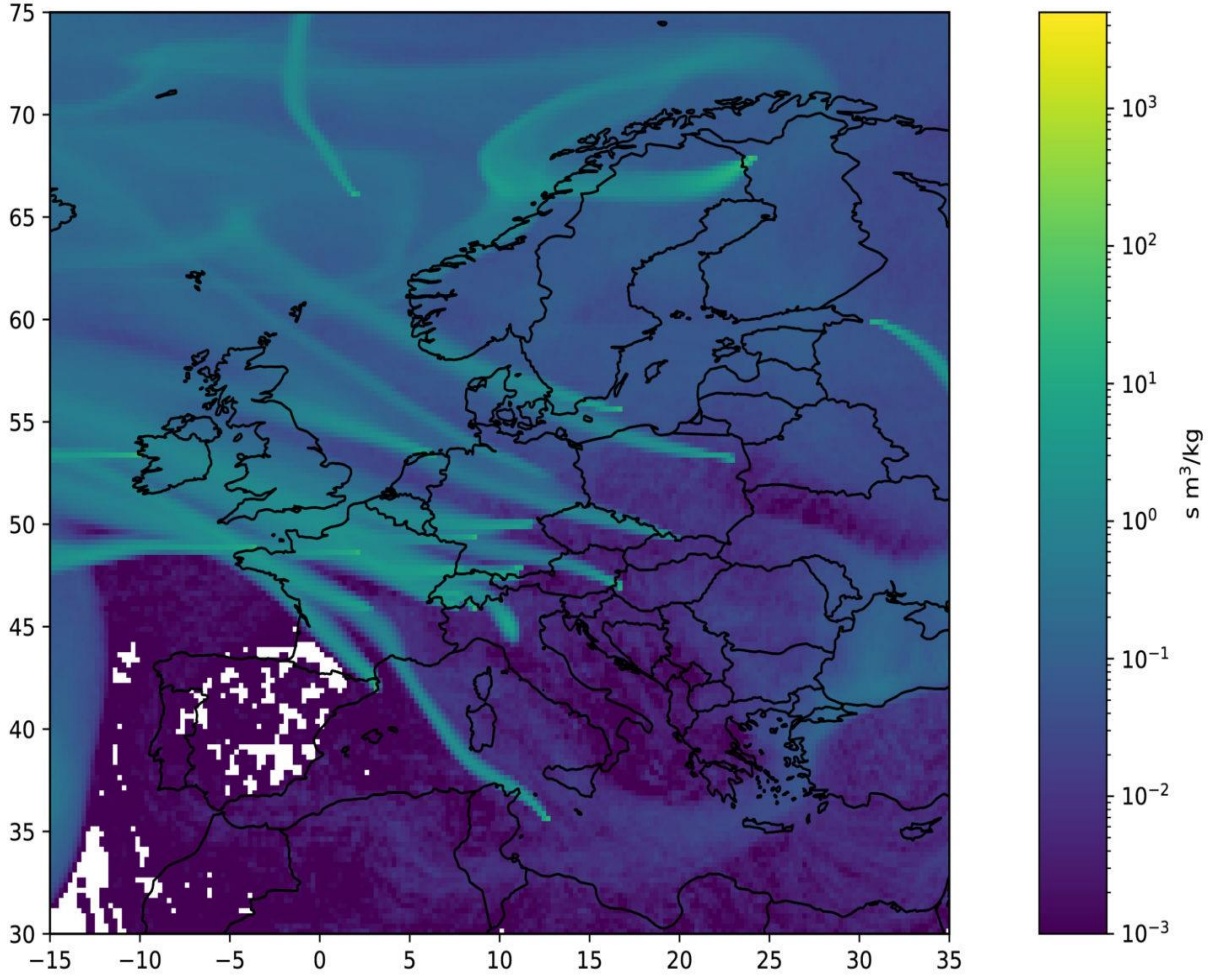
Methan emission verification techniques

1) Satellites (GOSAT, Merlin….)
2) Planes (COMET project)
3) Drones
4) FTIR (Fourier Transformed Infared Spectroscopy
5) Ground base - mobile



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Scientific References - a mobile cavity ring down spectrometer Picarro G2201-*i*

Abstract

Fugitive greenhouse gas emissions from unconventional gas extraction processes (e.g. shale gas, tight gas and coal bed methane/coal seam gas) are poorly understood due in part to the extensive area over which these emissions may occur. We apply a rapid qualitative approach for source assessment at the scale of a large gas field. A mobile cavity ring down spectrometer Picarro G2201-*i* was used to provide real-time, high-precision methane and carbon dioxide concentration and carbon isotope ratios ($\delta^{13}C$), allowing for "on the fly" decision making and therefore an efficient and dynamic surveying approach. The system was used to map the atmosphere of a production coal seam gas (CSG) field (Tara region, Australia), an area containing pre-production "exploration" CSG wells (Casino, Australia), and various other potential CO_2 and CH_4 sources (i.e. wetlands, sewage treatment plants, landfills, urban areas and bushfires). Results showed a widespread enrichment of both CH_4 (up to 6.89 ppm) and CO_2 (up to 541 ppm) within the production gas field, compared to outside. The CH_4 and CO_2 $\delta^{13}C$ source values showed distinct differences within and outside the production field, indicating a CH_4 source within the production field that has a $\delta^{13}C$ signature comparable to the regional CSG. While this study demonstrates how the method can be used to qualitatively assess the location and source of emissions, integration with atmospheric models may allow for quantitative assessment of emissions. The distinct patterns observed within the CSG field demonstrates the need to fully quantify the atmospheric flux of natural and anthropogenic, point and diffuse sources of greenhouse gases from individual Australian gas fields before and after production commences.

Scientific References

Peer Reviewed Literature: Mapping Methane and Carbon Dioxide Concentrations and $\delta^{13}C$ Values in the Atmosphere of Two Australian Coal Seam Gas Fields

Authors

Maher, D.T., Santos, I.R., and Tait, D.R.

Presented at Water, Air & Soil Pollution (2014), vol. 225, p. 2216, doi:10.1007/s11270-014-2216-2

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Thank you

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