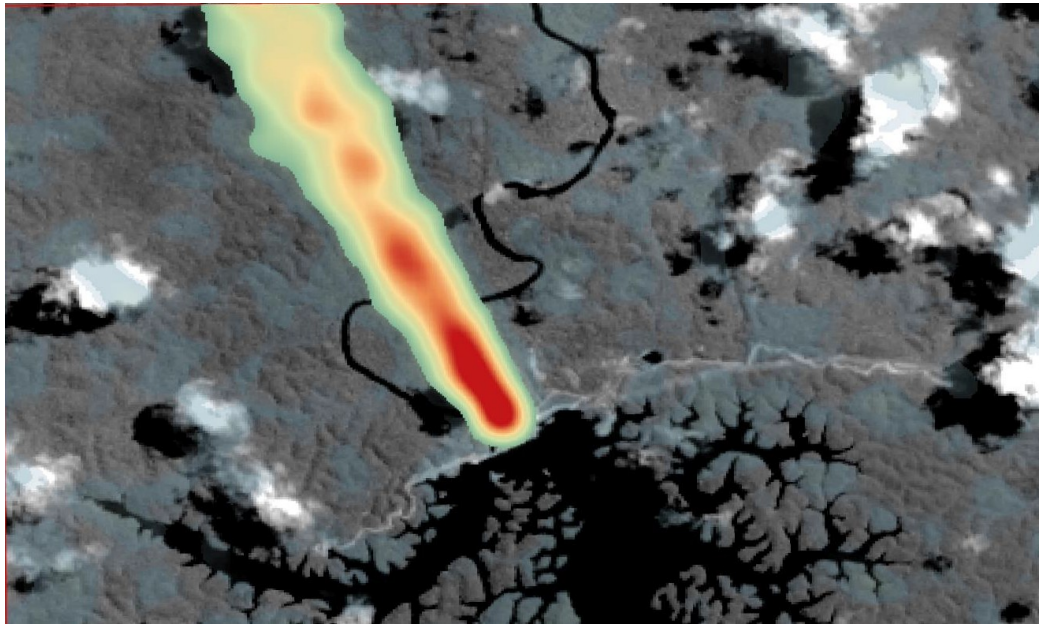
Identification and Quantification of Methane Emissions Using High Resolution Remote Sensing



Daniel Madar, PhD

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המשרד להגנת הסביבה
وزارة حماية البيئة
Ministry of Environmental Protection
שלום עם הסביבה

DTU Technical University of Denmark

Bar-Ilan University
אוניברסיטת בר-אילן

אוניברסיטת בן-גוריון בנגב
Ben-Gurion University of the Negev

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AUTHORIZED PARTNER

Methane leaks from “well to wheel”

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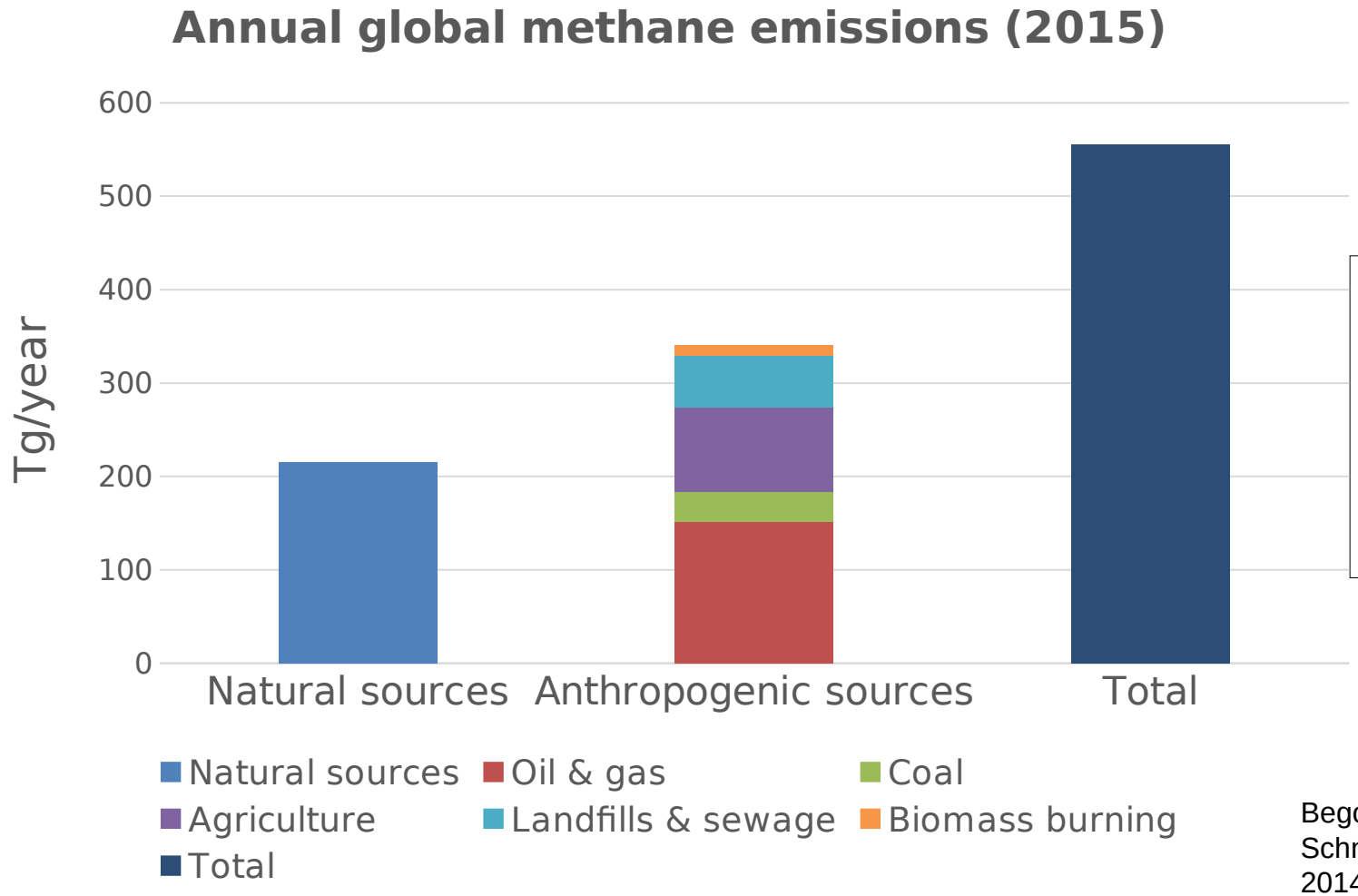
Half of all anthropogenic methane emissions are from fossil fuels



1 Tg (Teragram) = 1^{12} gram = 1 million tons (1 Mt)

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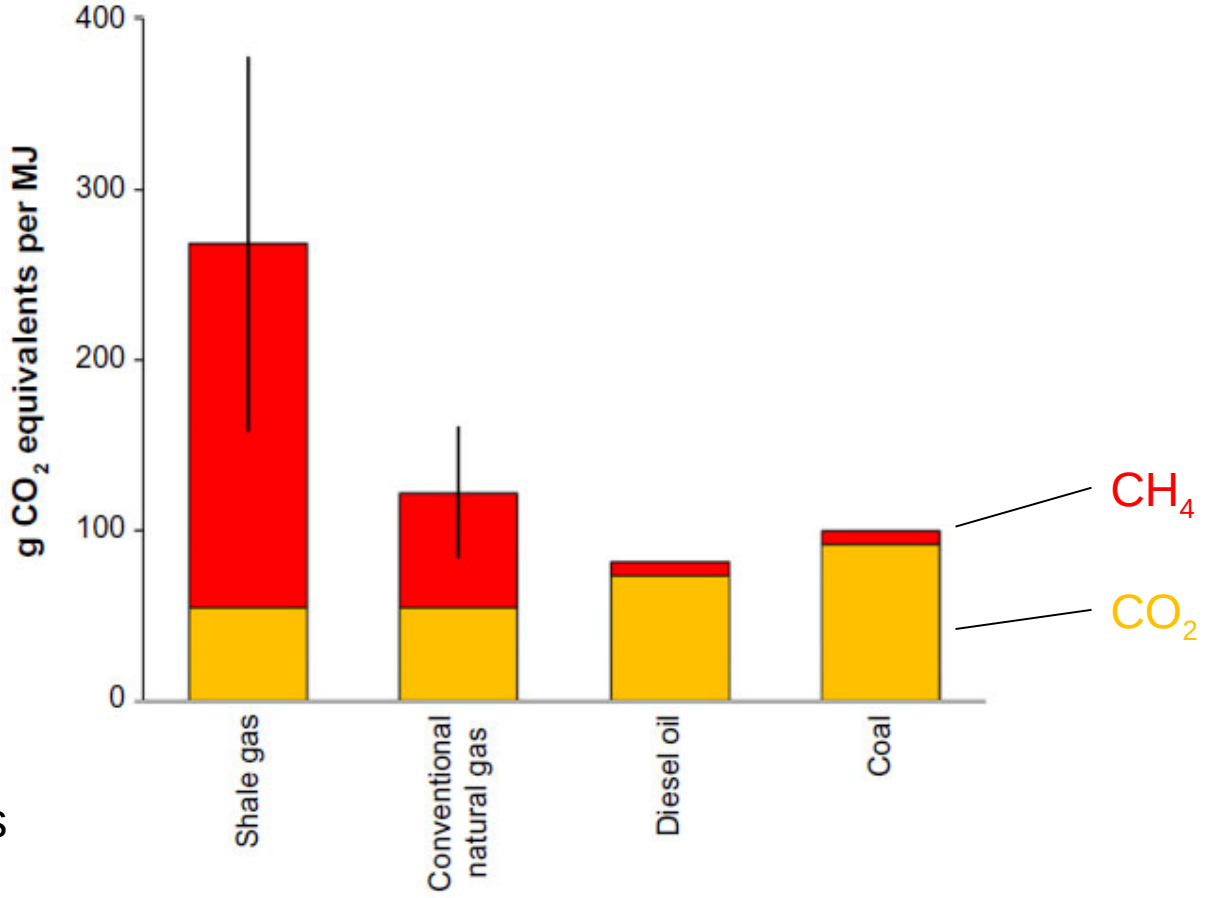
Begon et al. 2014;
Schneising et al. 2014;
Turner et al. 2016;
Howarth 2017;
Petrenko et al. 2017;
Worden et al. 2017.

3-6% of produced natural gas, leaks to the atmosphere (up to 12% in Shale gas)

Fossil fuels life cycle GHG emissions



- Using GWP_{20} values

Howarth 2015; Caulton et al., 2014; Howarth, 2014; Lavoie et al. 2017; Howarth, Santoro, & Ingraffea, 2011; Schneising et al., 2014; Larsen et al., 2015.

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In Israel, we might be losing 187-373 million ILS worth of natural gas annually (53-106 million USD)

- NG in Israel has >95% methane.
- 2016 data: 3-6% emissions out of 9.66 BCM NG that were used, are equal to 0.29-0.58 BCM.
- In the world, 110-220 billion ILS worth of NG is emitted (30-60 billion USD).

Caulton et al., 2014; Howarth, 2014; Howarth, Santoro, & Ingraffea, 2011; Lavoie et al., 2017; Schneising et al., 2014, Larsen et al., 2015, Mekonen 2017.

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How can we find the methane emitters?

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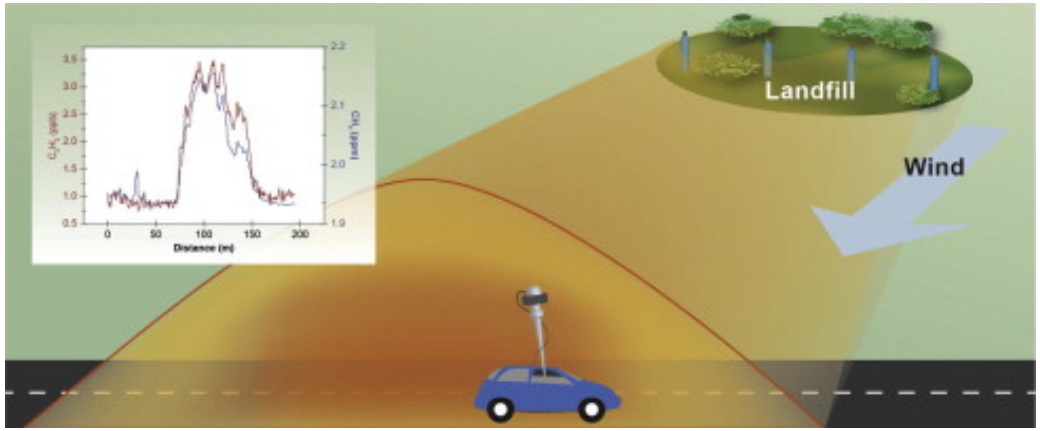
We will perform ground measurements



Mønster et al. 2014

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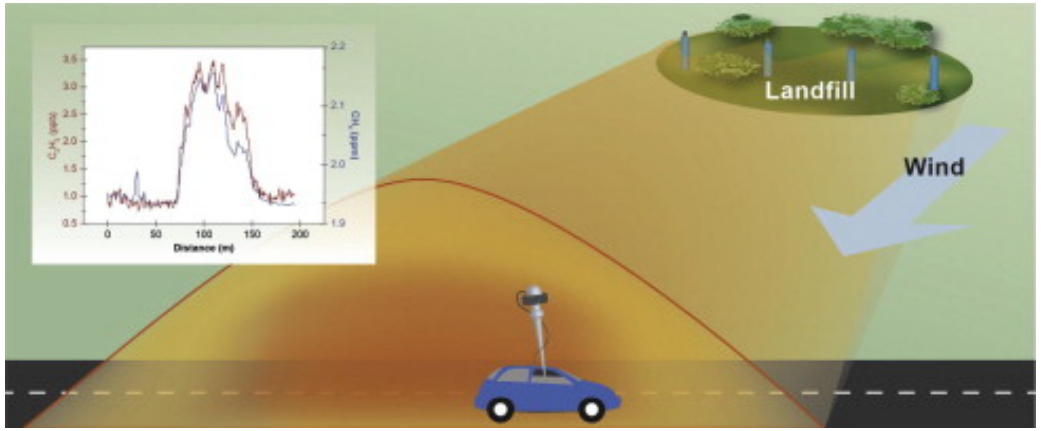
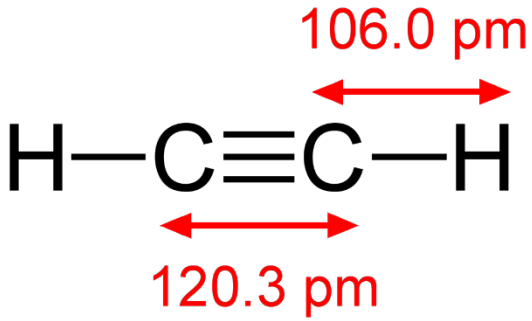
We will perform ground measurements

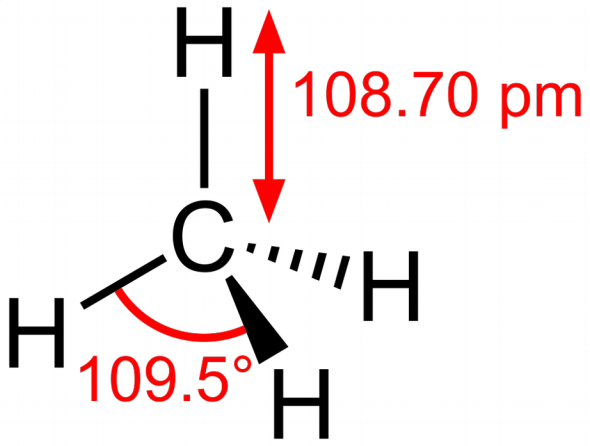


Mønster et al. 2014

Acetylene



https://en.wikipedia.org/wiki/Acetylene



https://en.wikipedia.org/wiki/Methane

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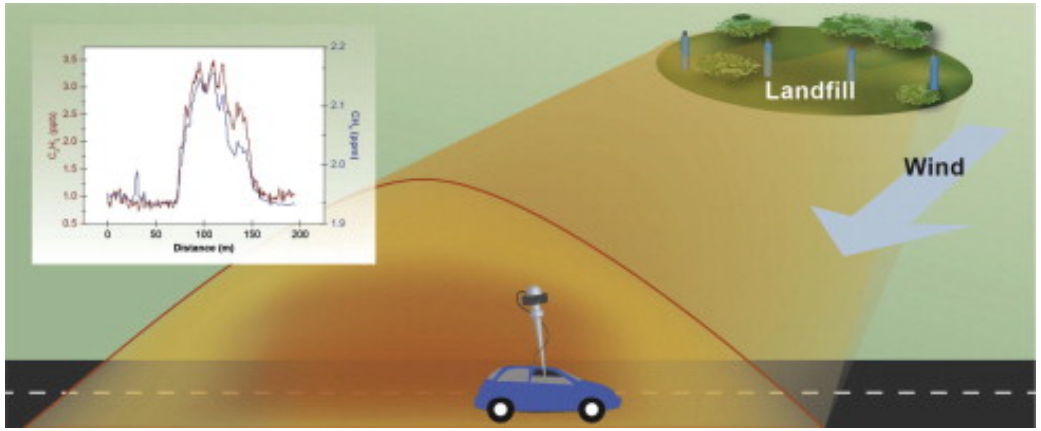
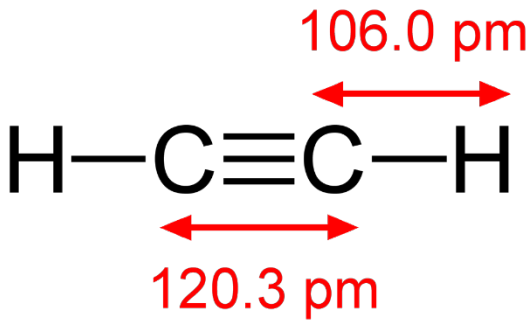
We will perform ground measurements



Mønster et al. 2014

Acetylene



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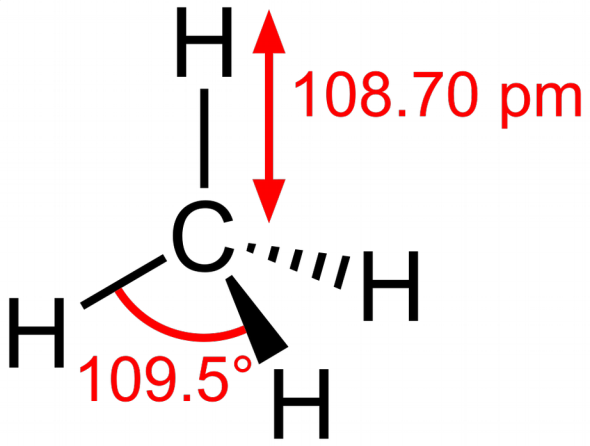

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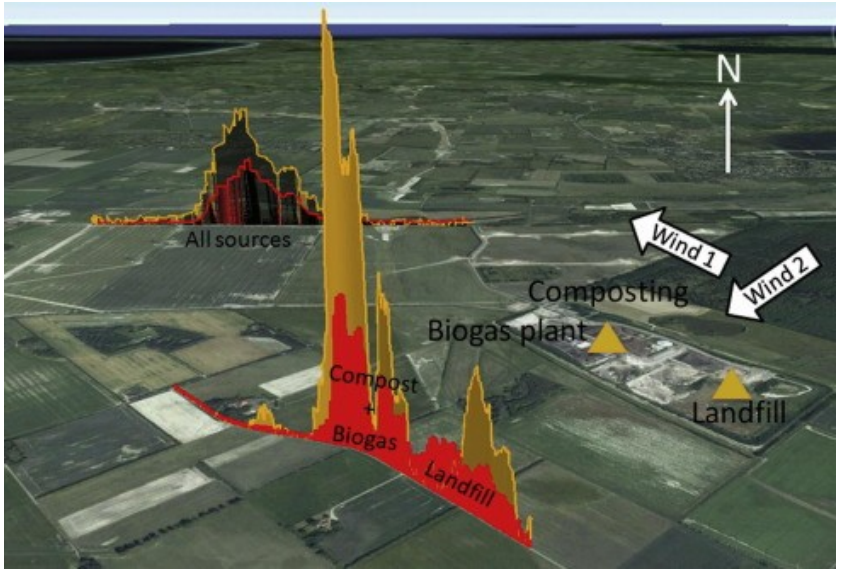

Mønster et al. 2015

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We will perform high resolution satellite measurements

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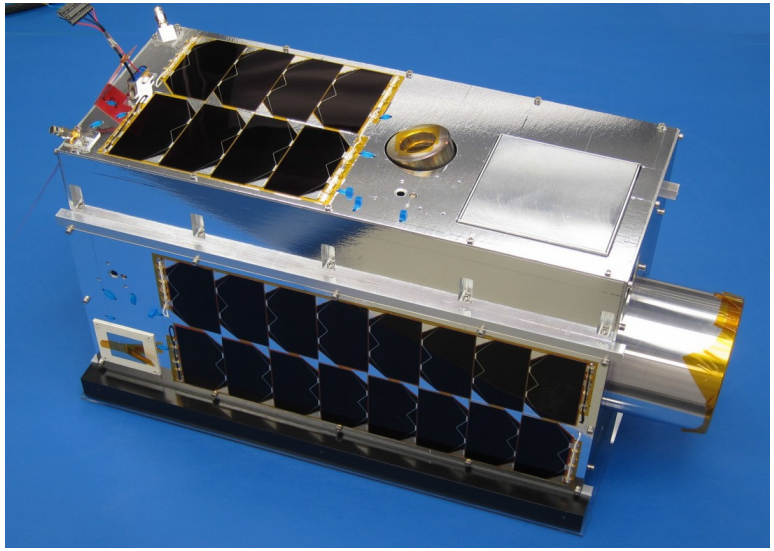
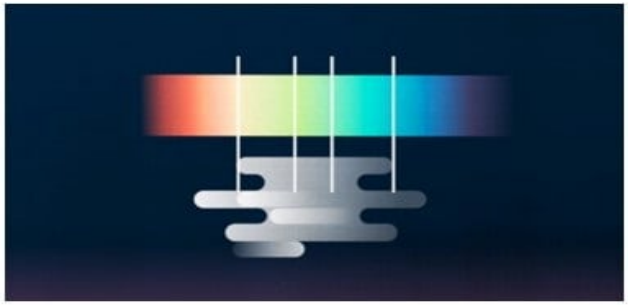


Monitoring

Each GHGSat satellite orbits the Earth in a polar orbit (north-



Spectroscopy

Each gas absorbs light at different wavelengths, creating a

Products and Services

Raw measurements of gas concentrations around a source are

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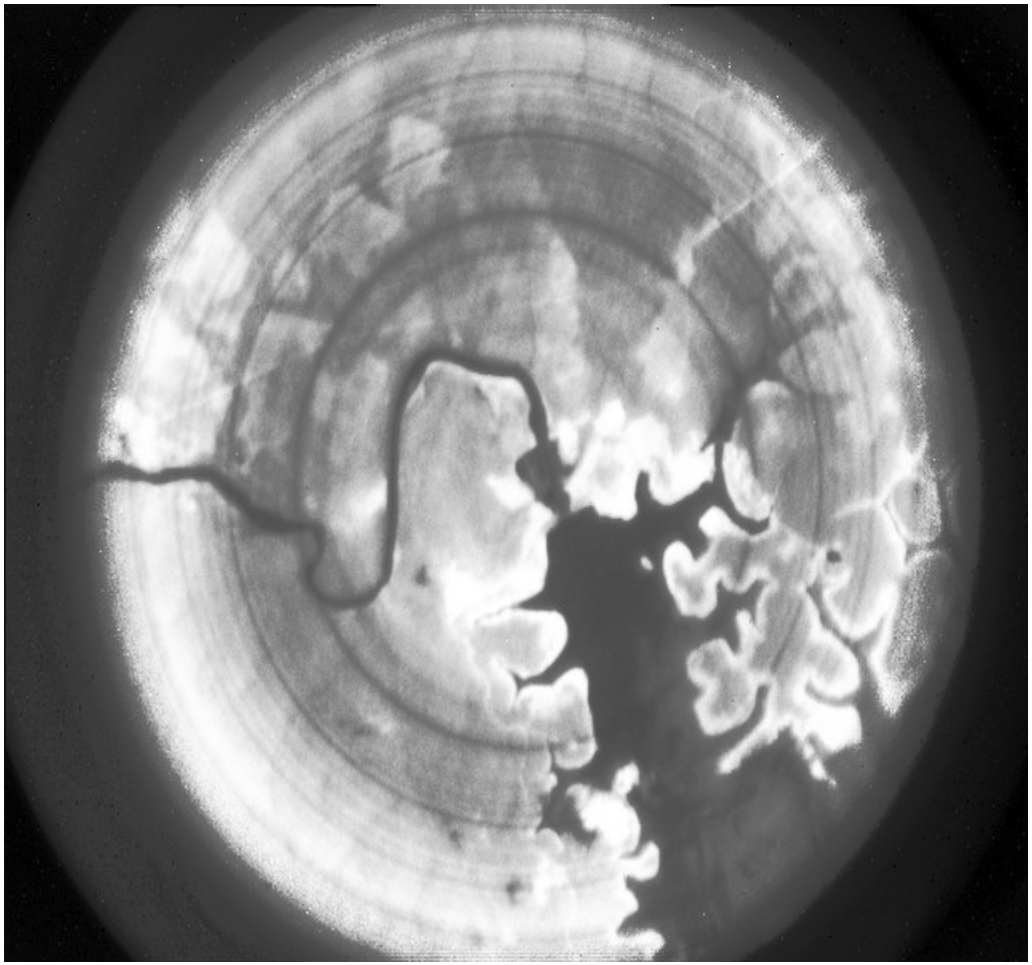
The satellite measures the absorption of IR radiation by greenhouse gases



.GHGSat inc

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One measurement can cover most of the Haifa Bay industrial area

Today:

50 m resolution

Field of view =

12km X 12km ~

60,000 pixels

2019:

25 m resolution

Field of view =

12km X 12km ~

230,000 pixels

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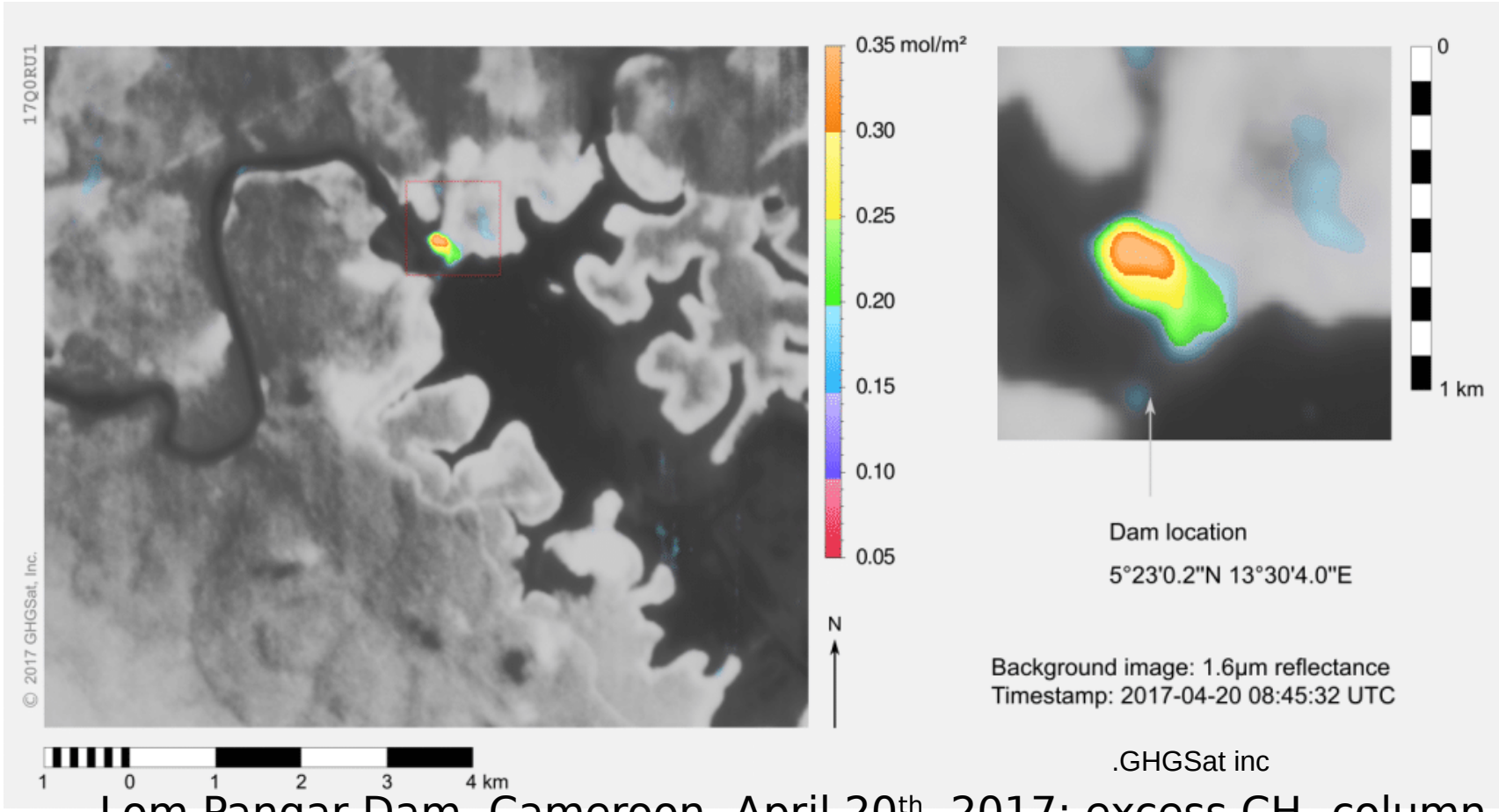
The satellite can identify the exact emission source



Lom Pangar Dam, Cameroon- April 20th, 2017: excess CH_4 column measurement

Annual emission rate: 20-25 thousand tons of CH_4

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Partners

Prof. Itai Kloog- remote sensing

Satellite imagery

Prof. Charlotte Schutz- methane emissions

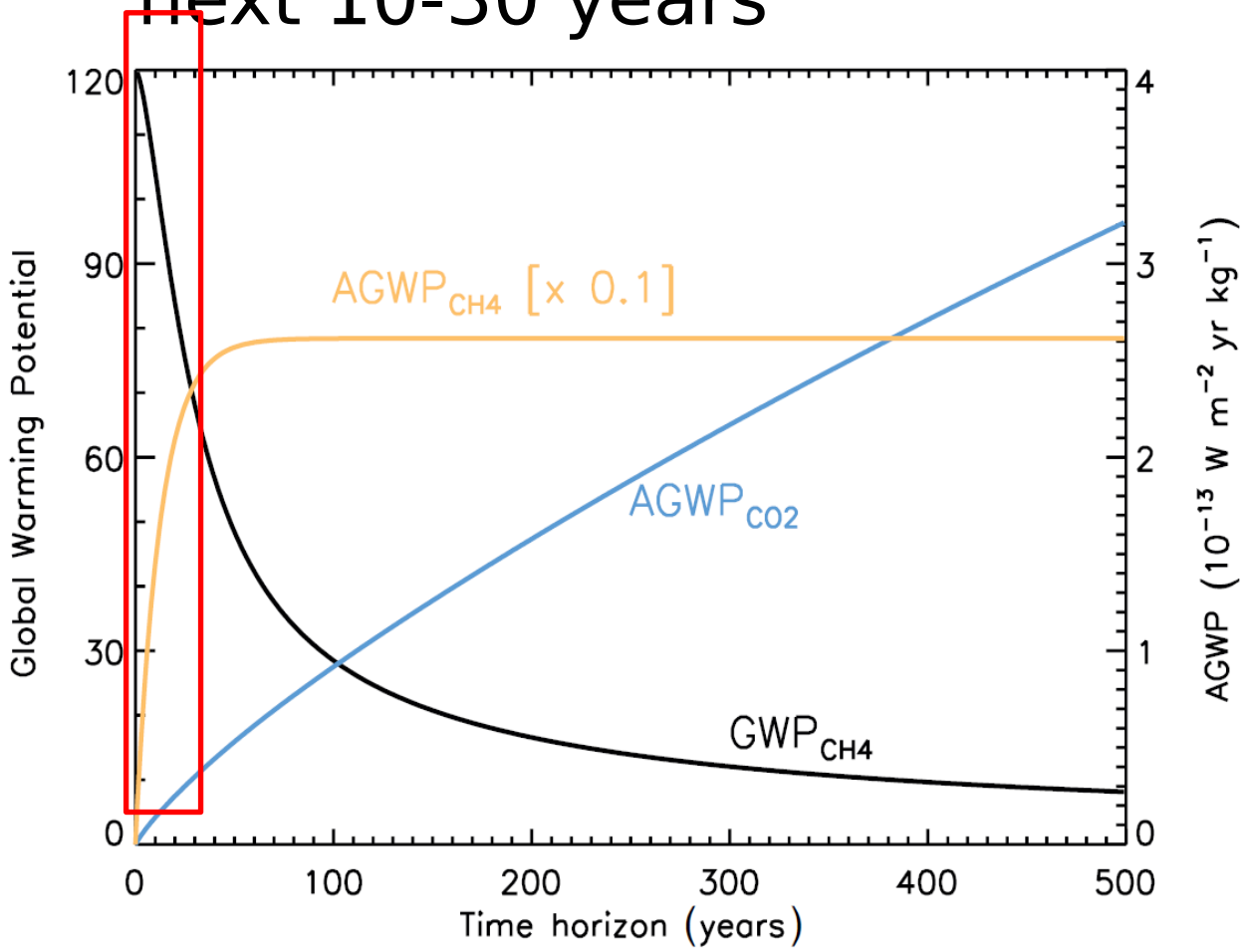
Funding

Dr. Anat Tchetchik- environmental economy

Dr. Daniel Madar +972-50-8722009 danielm@sp-interface.com

GWP_{20} is the relevant value to be used when calculating GHG emissions in the next 10-30 years

CH_4 (GWP_{20}) = 86



IPCC, AR5, 2013.

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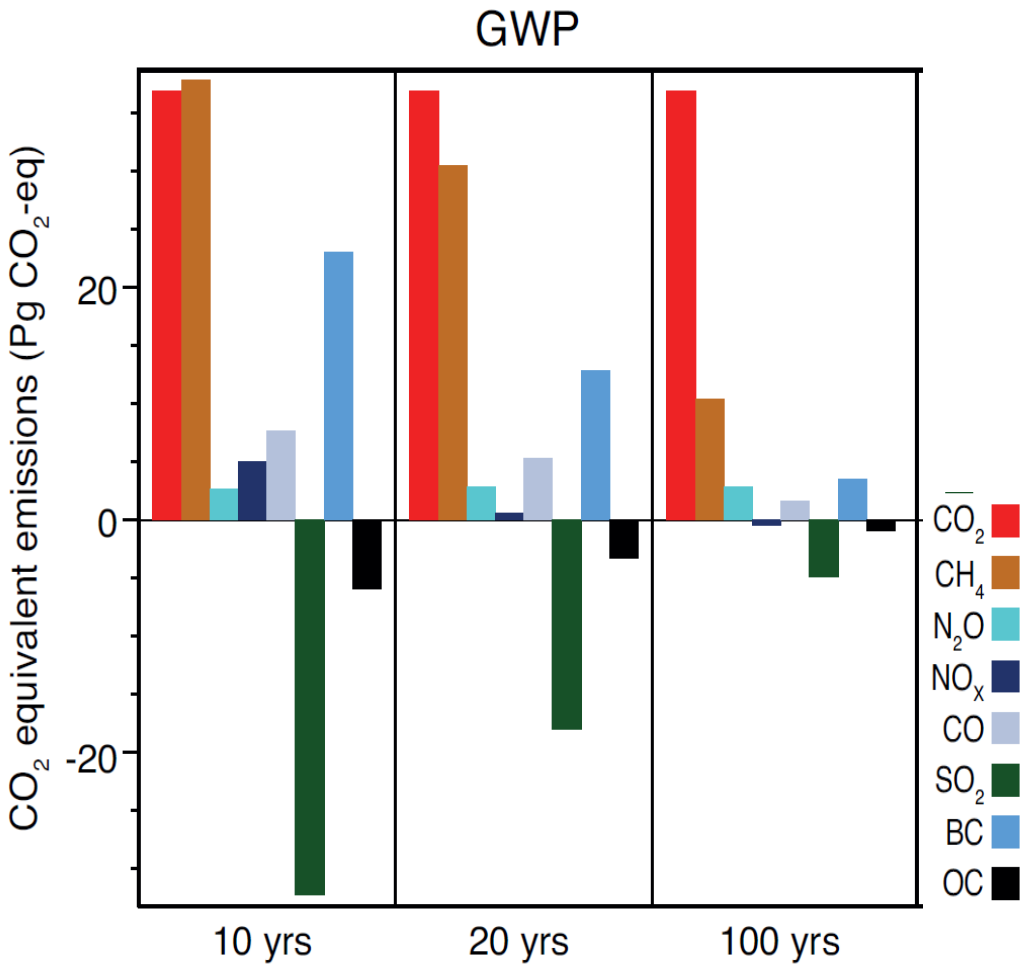
The effect of our annual methane emissions on the next 10-30 years, is at the same scale as that of CO_2

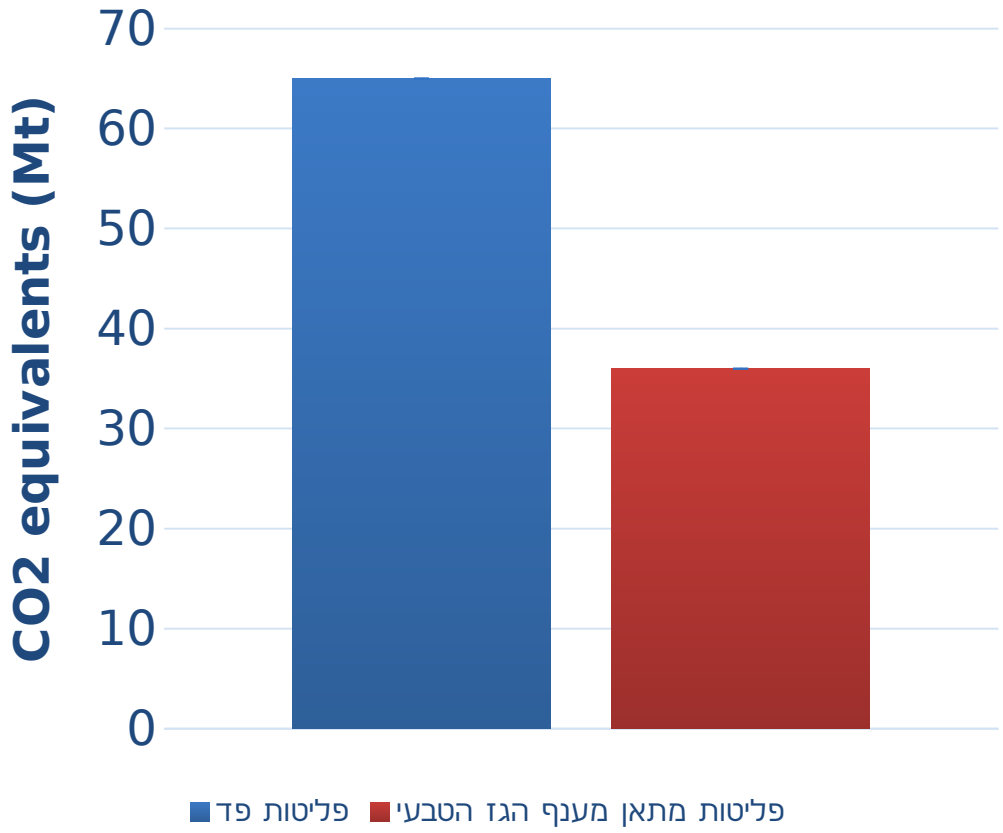
Annual anthropogenic GHG emissions (2008)



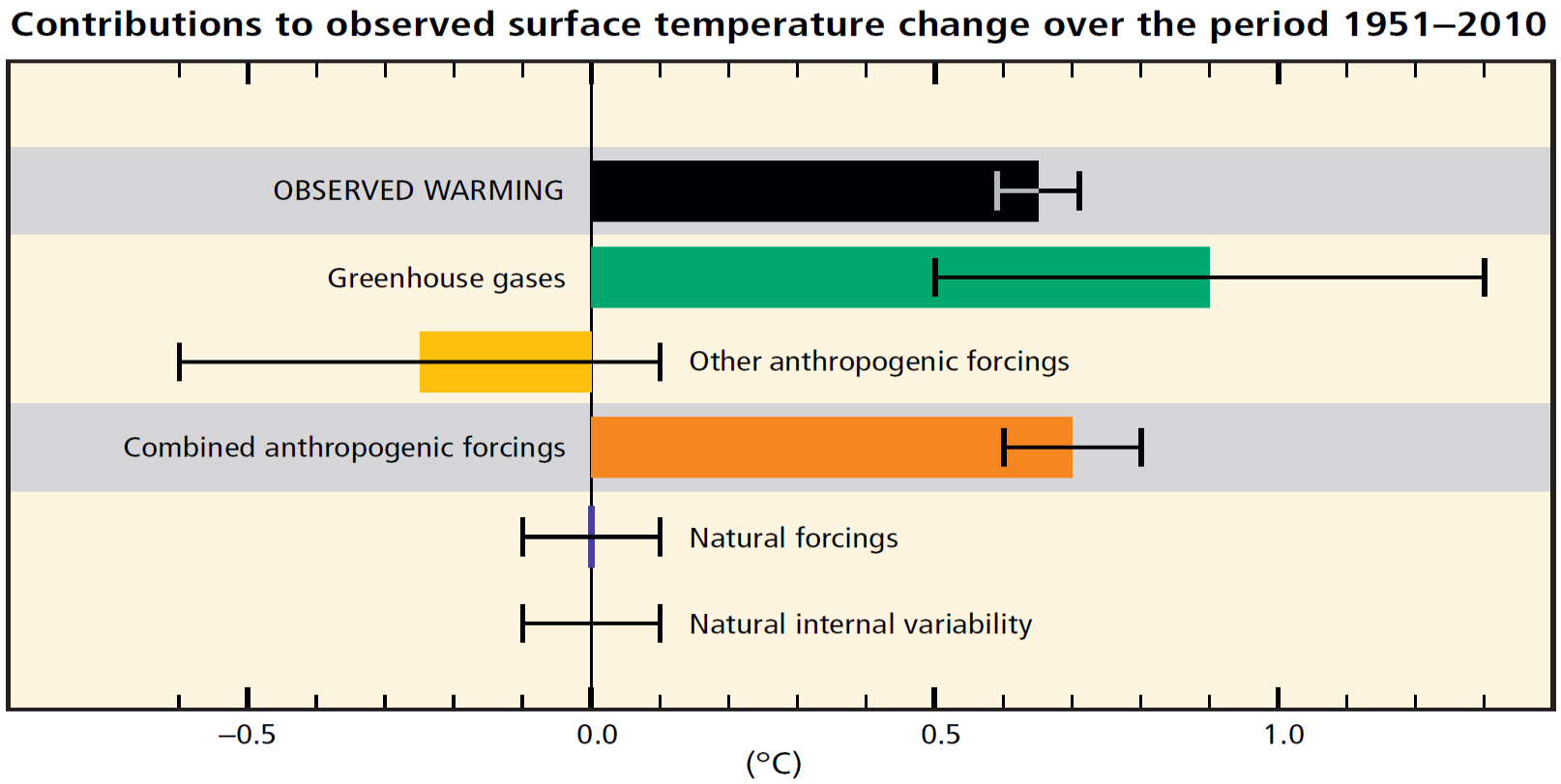
1 Pg (petagram) = 10^{12} g = 1 billion tons

IPCC, AR5, 2013.

מוערך כי היקף דליפות הגז הטבעי שווה ערך ל-25-50% מפליטות הפד"ח השנתיות בישראל



(Caulton et al., 2014; Howarth, 2014; Howarth, Santoro, & Ingraffea, 2011; Lavoie et al., 2017; Schneising et al., 2014, Larsen et al., 2015, Mekonen 2017)



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