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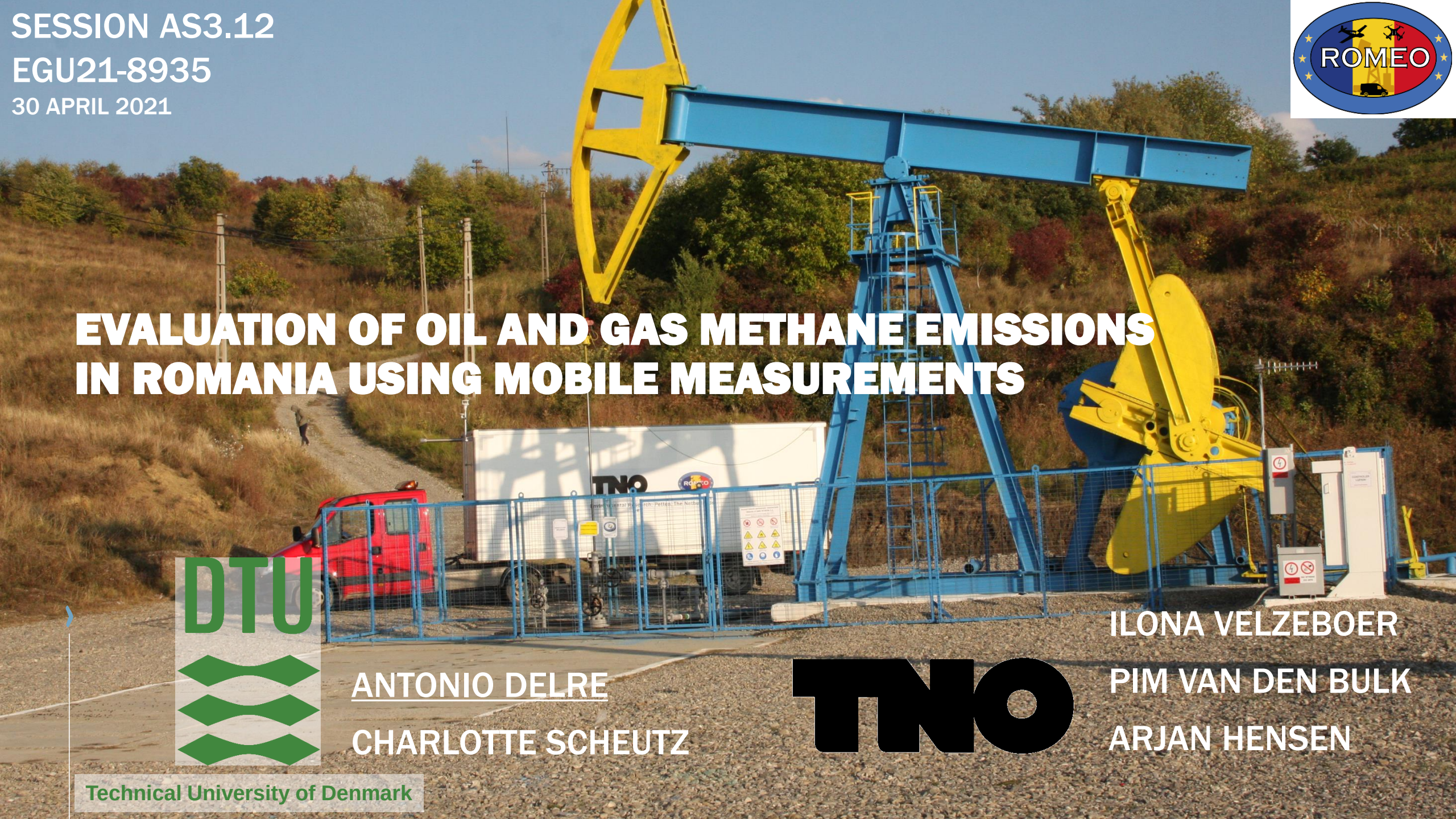

EVALUATION OF OIL AND GAS METHANE EMISSIONS IN ROMANIA USING MOBILE MEASUREMENTS

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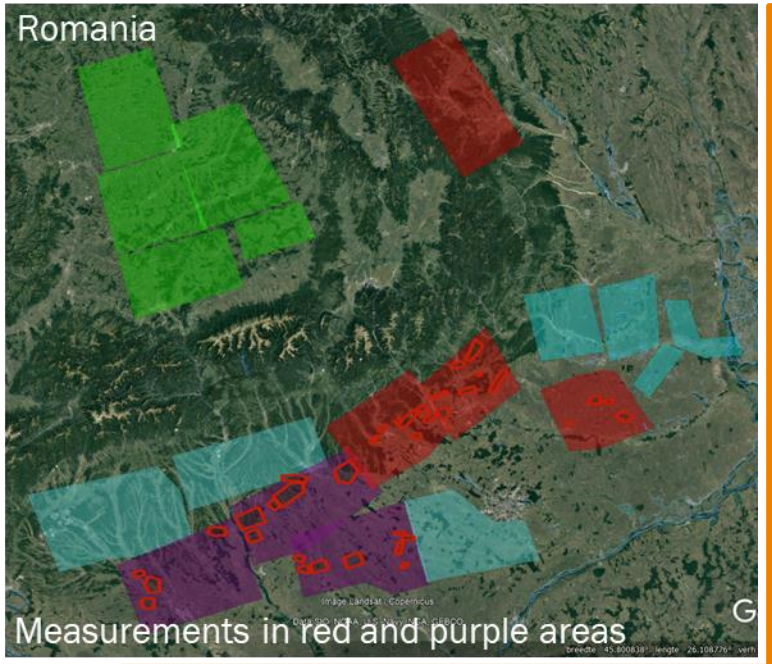
BACKGROUND

ROMEO (ROMANIAN METHANE EMISSIONS FROM OIL & GAS)

ROMEO

Romania: pioneer country in oil and gas (O&G)

- Largest producer of O&G in Central and Eastern Europe
- ROMEO measurement campaign: evaluate methane emissions from onshore O&G in Romania, 2019[1]
  - Main goal: combined bottom-up / top-down quantification of Romanian CH_4 emission related to O&G
  - Basin scale quantification: by aircraft measurements
  - Facility/well scale quantification: by vehicle- and drone-based measurements



- **Mobile measurements with tracer release to quantify emissions**
  - Technical University Denmark (DTU) and TNO

[1] ROMEO, 2019. ROMEO - ROmanian Methane Emissions from Oil & gas. URL http://romeo-memo2.wikidot.com/

TRACER GAS DISPERSION METHOD (TDM)
DESCRIPTION AND APPLICATION AT OIL WELL

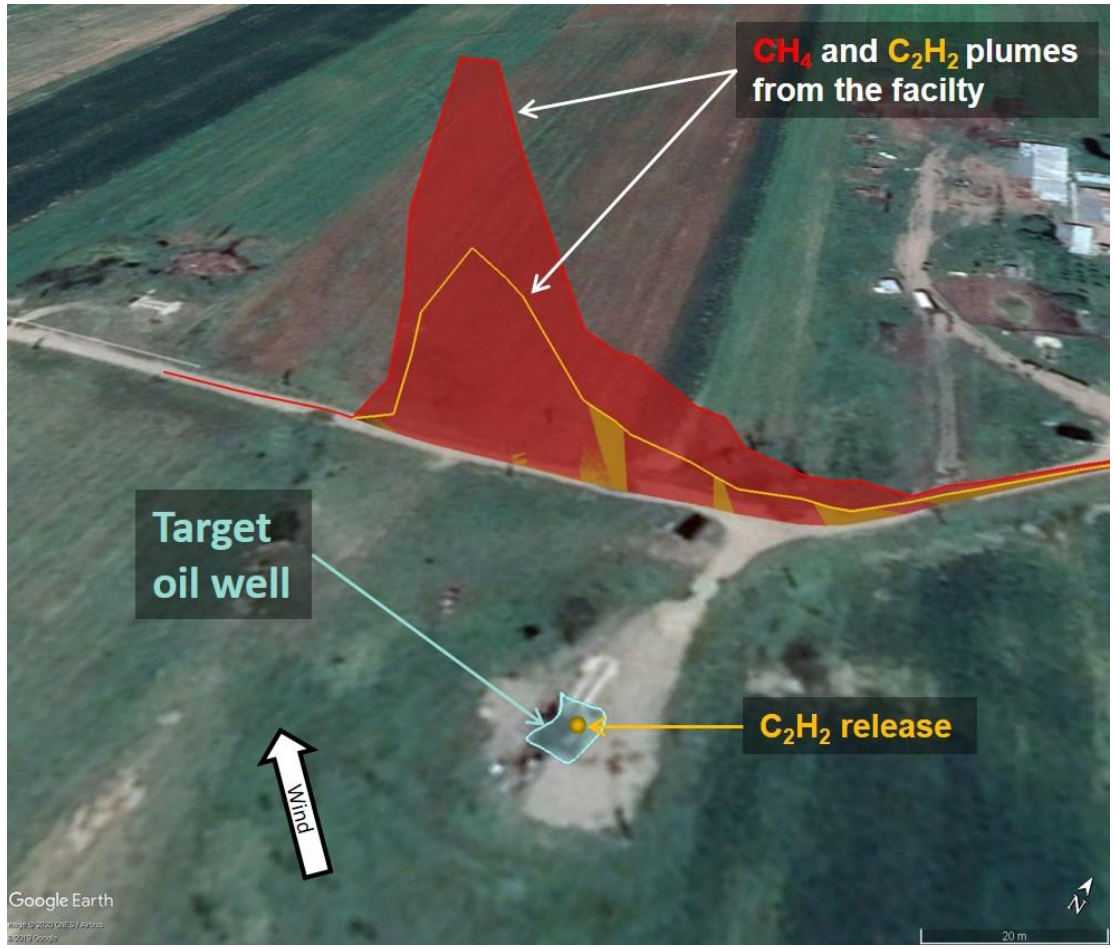
PRINCIPLE →

$$\left(\frac{E_{target}}{E_{tracer}}\right)_{source} = \left(\frac{C_{target}}{C_{tracer}}\right)_{downwind}$$

$$E_{target} = E_{tracer} \cdot \frac{\int_{start}^{end}(C_{target} - C_{baseline\ target})dx}{\int_{start}^{end}(C_{tracer} - C_{baseline\ tracer})dx}$$

E = emission rate; *C* = concentration

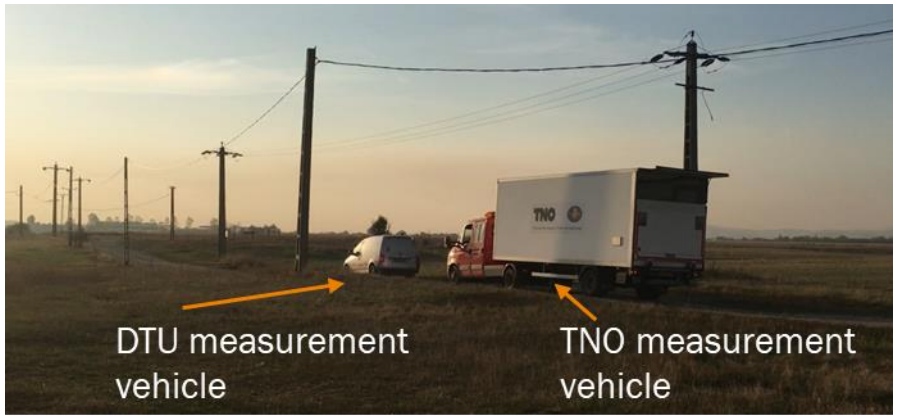
→ Emission tracer is known
→ Concentration target and tracer are measured
- by multiple plume traverses
→ Emission target will follow from equation above



Example with acetylene (C_2H_2) tracer

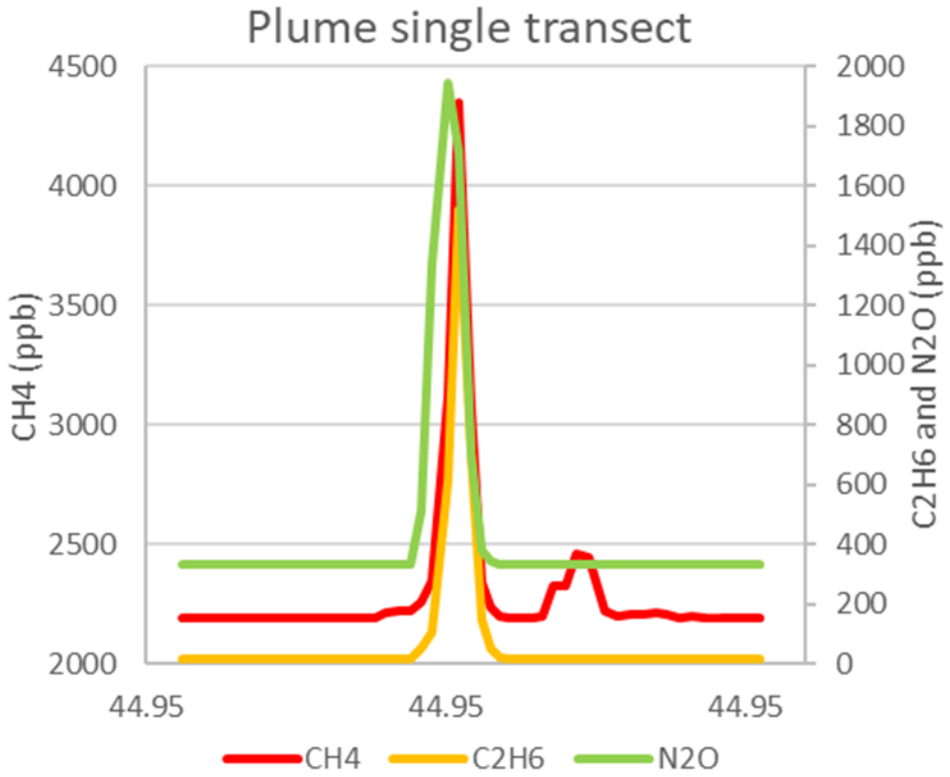
TDM APPLICATION
APPLICATION AT OIL WELL

- Placement of anemomenter (windspeed + wind direction)
  - For atmospheric dispersion modelling
- Placement of tracer at oil well
- Mobile lab: Measurement vehicle
  - Analytical instrument to measure methane and tracer
  - Global Navigation Satellite System
- Measure downwind of the oil well
  - Multiple plume traverses

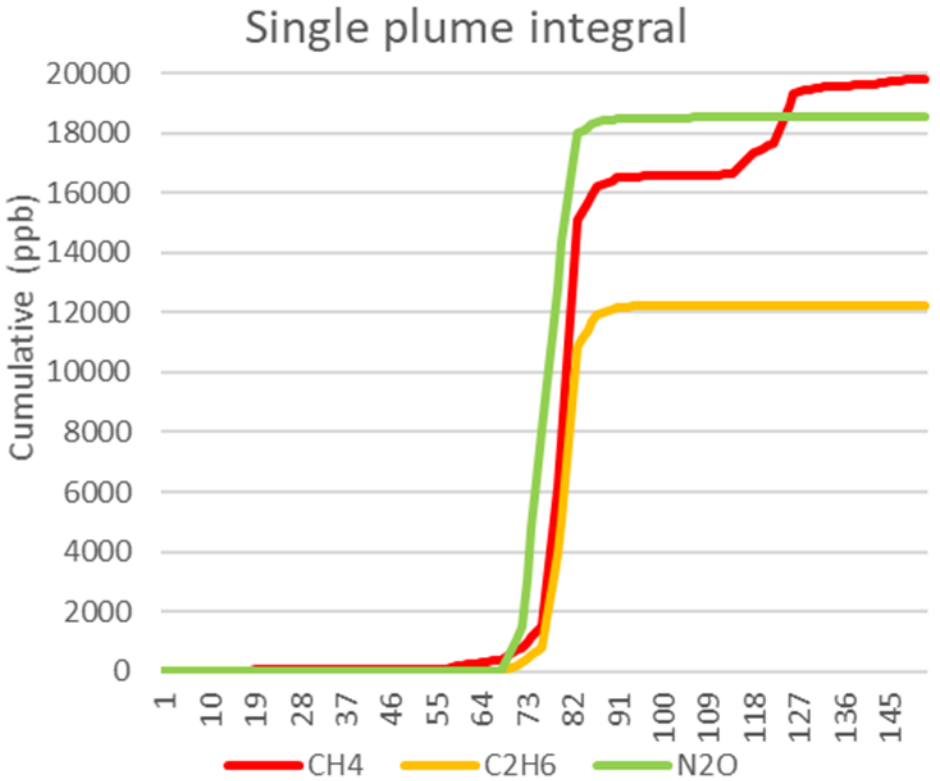


FROM CONCENTRATION TO EMISSION

EXAMPLE WITH N_2O TRACER



Concentration measurement of a single transect for CH_4, C_2H_6 and N_2O.



integral of the measured plumes from the left figure for CH_4, C_2H_6 and N_2O

Emission level: average of a set of emission estimates for individual plume traverse

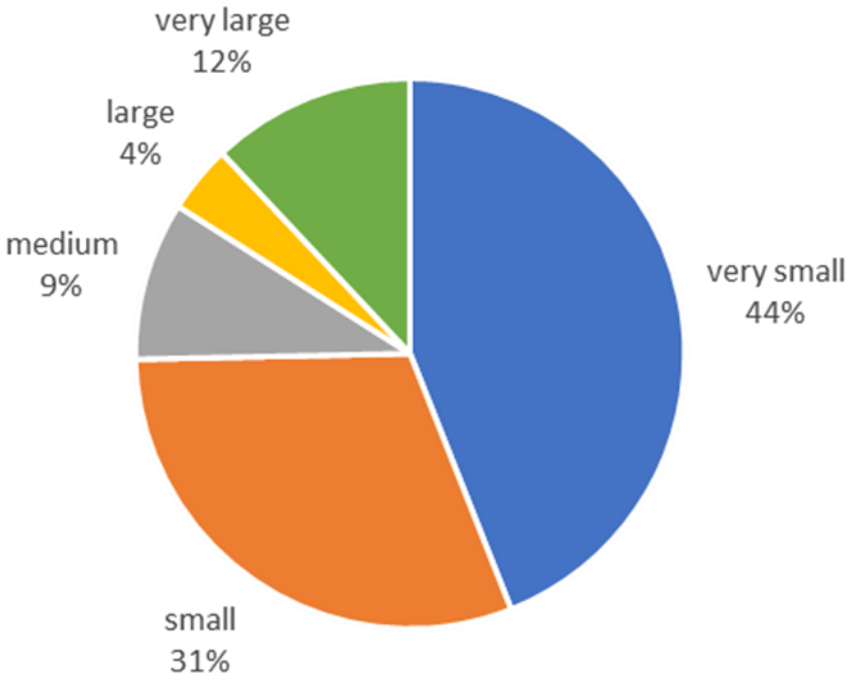
Ethane (C_2H_6): identifies the fossil component; C_2H_6:CH_4 ratio can distinguish oil and gas sources

RESULTS: CH_4 EMISSION QUANTIFICATIONS

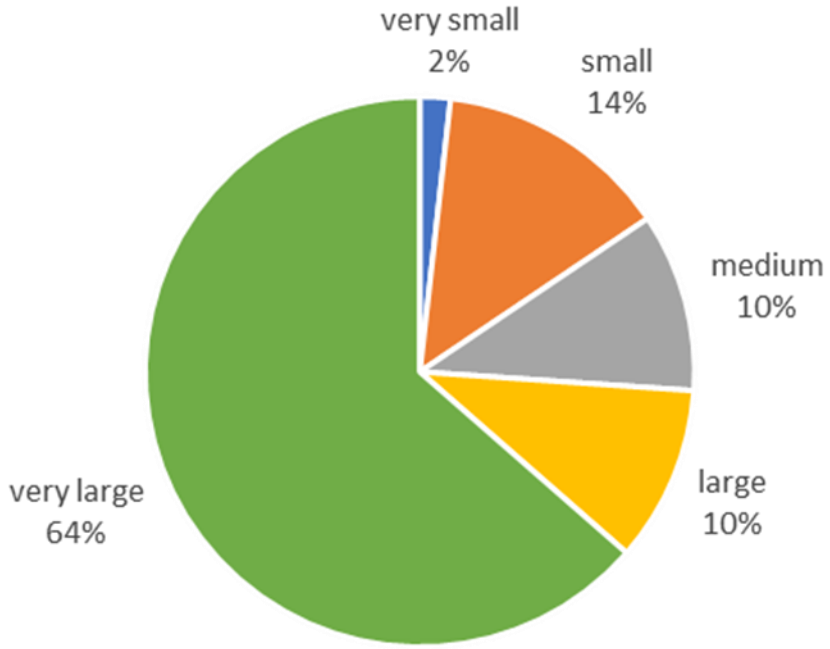
OUT OF 200 INVESTIGATED SITES, 75 SITES WERE QUANTIFIED

Investigated sites were oil wells, gas wells, gas manifolds, and facilities (e.g. oil parks, production batteries, gas compressors, etc.)

Fraction of quantified sites per group



Contribution per group on total quantified emission rate



Quantified sites grouped in bins with different size of emission rate:
Very small: < 4 kg/h
Small: 4 – 20 kg/h
Medium: 20 – 40 kg/h
Large: 40 – 70 kg/h
Very large: > 70 kg/h

Decreasing emissions from the high-emitters would effectively decrease methane emissions from the investigated area

CONCLUSIONS

- 200 sites were investigated and 75 were quantified
- A small number of emitters is responsible of the largest part of the total quantified emissions
- Very large emitters (sites emitting more than 70 kg/h) represent only 12% of the total number of investigated sites, but they are responsible for 64% of the total quantified methane emission

The outcome of this study can help the Romanian O&G companies to set priorities in leak repair, which can then lead to a quick win in emission reduction.

More information can be found soon:

Delre, A., Hensen, A., Velzeboer, I., Bulk, P., van den, Edjabou, M.E., Scheutz, C., 2021 in prep. Fugitive methane and ethane emission quantification from onshore oil and gas sites in Romania, using a tracer gas dispersion method.

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- United Nations Environment Program (UNEP)
- European Commission - DG-Energy

Part of the ROMEO team

THANK YOU FOR YOUR TIME

More information can be found soon:

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