Analysis of methane mitigation actions in the Permian basin using TROPOMI: drastic reduction of oil and gas activity scenario

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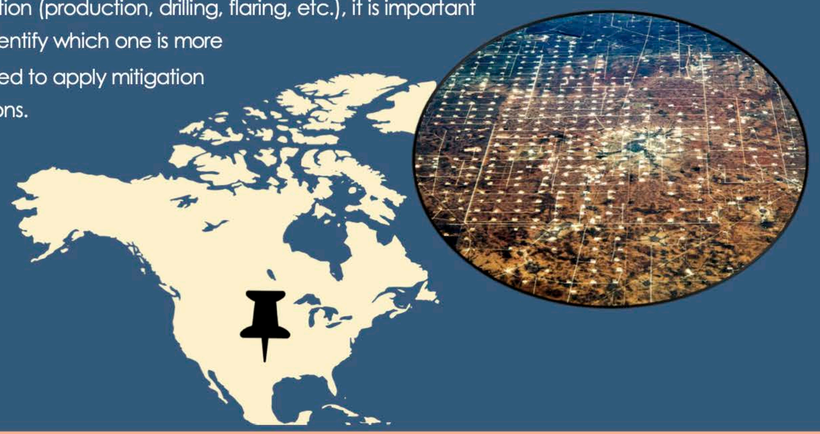
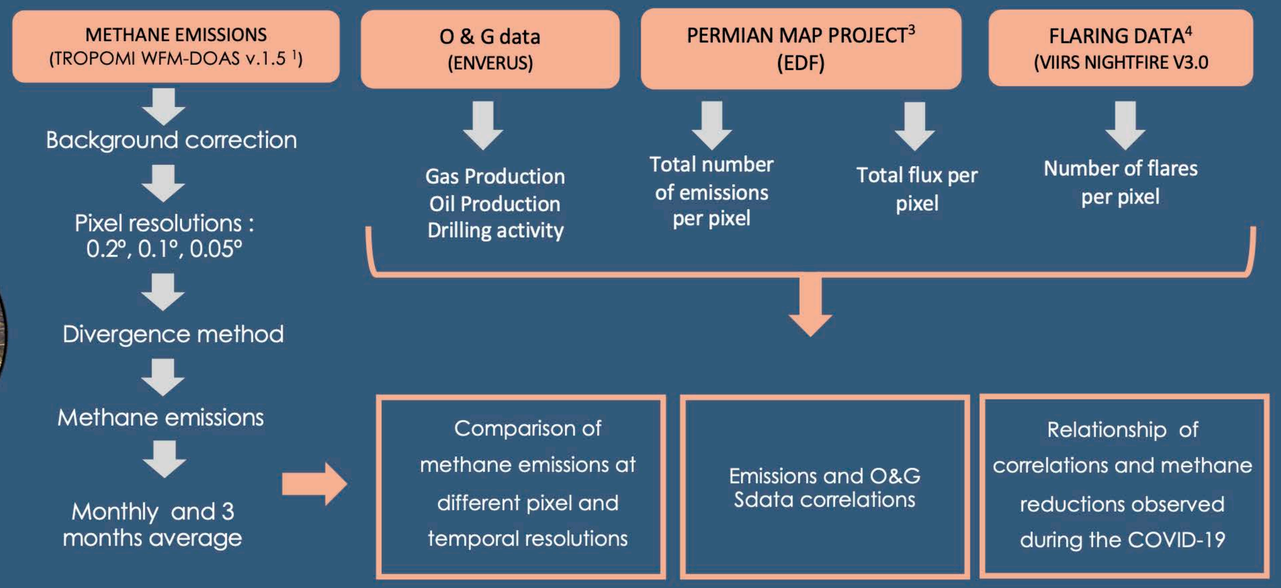
Introduction

TROPOMI satellite instrument is monitoring the whole world on a daily basis including the Permian basin, the largest unconventional oil and gas production region on Earth. The continuous monitoring of oil and gas basins has a crucial implication to achieve the reduction of at least 1/3 of global anthropogenic methane emissions, but also to explore the stakeholders of them. With different activities occurring at the same location (production, drilling, flaring, etc.), it is important to identify which one is more related to apply mitigation actions.



Data and Methodology



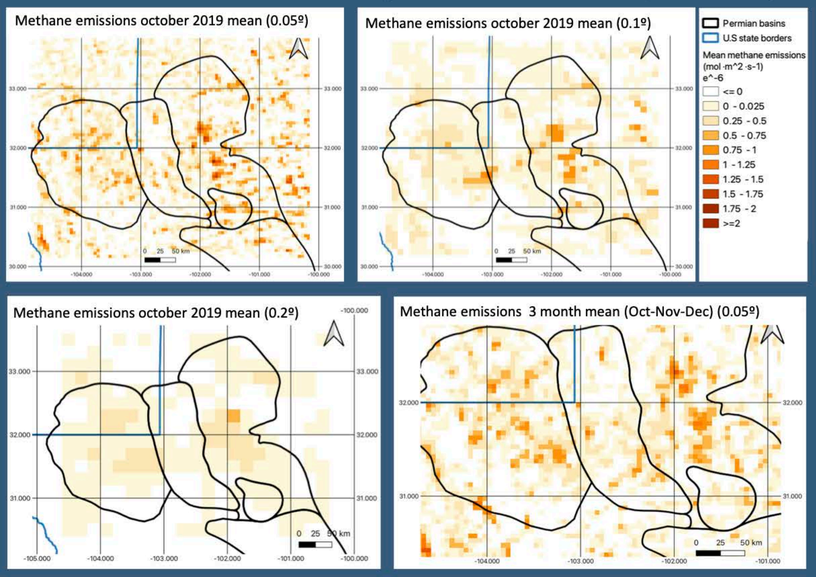
Methane emissions at different pixel resolutions are obtained after applying a background correction based on surface pressure. The divergence method is applied using winds from ECMWF ERA-5[2].

After applying a filter to keep the days of 50% or more coverage over the Permian basin, different temporal averages (1 and 3 months) were obtained.

The O&G data, Permian Map project[3] surveys and Flaring[4], were also scaled and averaged by pixel and monthly.

Results and discussion

Methane emissions comparison at different temporal and spatial resolutions



It can be appreciated that some and of the methane 'hot spots" are persistant in 3 month average, giving an idea of the intermittency of the methane emissions.

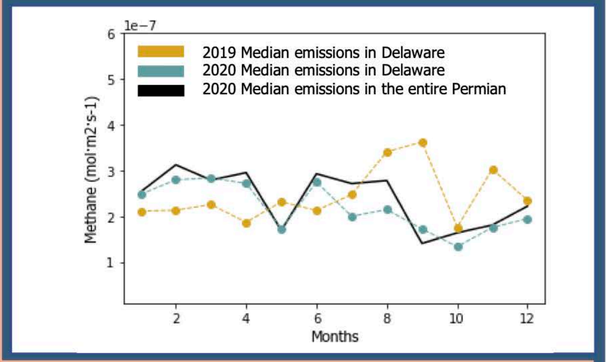
Emissions and O&G data correlations

The spatial correlations have demostrate that 0.2 degrees is the best resolution to relate methane emissions and oil and gas activity. It has been also demostrated the importance of the number of emissions instead of the flux quantity with the high correlations obtained with methane emissions at big scale (entire Permian) and at subasin level.

Production gas has been the key factor related to methane emissions in the Permian basin.

Lessons learnt from COVID-19 and mitigation strategies

Having in to account the impact of the COVID-19 in the median emissions of the Permian basin (bottom figure) and the positive correlatations obtained at all resolutions, we can say that the reduction of gas production in the Permian could have an important impact in methane abatement, as mitigation strategy .



Take home messages

- → Number of emissions per pixel strongly correlated with gas production levels.
- → The increase of resolution improves the colocation of methane emissions with gas production and number of emissions per pixel
- → Methane emissions highly correlated with flaring activity in Midland basin
- → The decrease of gas production in the Permian basin can have an imporant implication in methane emissions reduction

Present at my poster:

July 12th, 18h-19h JST

July 13th, 18h-19h JST

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