



**Doctoral Thesis Title:** New remote sensing methods for the monitoring of methane emissions and gas flaring activity

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**Abstract:** The detection and repair of methane leaks from fossil fuel production activities have been identified as a key climate change mitigation strategy. In addition, emission source identification remains elusive for most of the world's methane hotspot regions. Several types of optical satellite sensors have recently shown potential to support this task. This study will combine multiple multispectral and hyperspectral data to develop new satellite-based methods to analyze methane emissions and gas flaring, two interrelated environmental hazards associated with fossil fuel production activities. This work will support climate change and environmental governance by analyzing the relationship between methane emissions and flaring activities at different temporal and spatial levels.

**Available Means:** Desktop/laptop computers for data processing, NAS storage unit for data storage, cloud computing platforms such as Google Earth Engine will be used for the processing of Sentinel-2/3 and Landsat data

**References:**

Gorroño, J., Varon, D. J., Irakulis-Loitxate, I., and Guanter, L.: Understanding the potential of Sentinel-2 for monitoring methane point emissions, *Atmos. Meas. Tech.*, 16, 89–107, <https://doi.org/10.5194/amt-16-89-2023>, 2023

Naus, S., et al., Assessing the relative importance of methane super-emitters and diffuse area sources in quantifying total emissions for oil and gas production areas in Algeria, (preprint) <https://eartharxiv.org/repository/view/5547/>, 2023

Pandey, S., van Nistelrooij, M., Maasackers, J.D., Sutar, P., Houweling, S., Varon, D. J., Tol, P., Gains, D., Worden, J., Aben, I., Daily detection and quantification of methane leaks using Sentinel-3: a tiered satellite observation approach with Sentinel-2 and Sentinel-5p, <https://doi.org/10.48550/arXiv.2212.11318>, 2022

Varon, D. J., Jervis, D., McKeever, J., Spence, I., Gains, D., and Jacob, D. J.: High-frequency monitoring of anomalous methane point sources with multispectral Sentinel-2 satellite observations, *Atmos. Meas. Tech.*, 14, 2771–2785, <https://doi.org/10.5194/amt-14-2771-2021>, 2021

Watine-Guiu, M., Varon, D. J., Irakulis-Loitxate, I., Balasus, N., Jacob, D.J., Geostationary satellite observations of extreme methane emissions from a natural gas pipeline, (preprint) <https://doi.org/10.31223/X5K661>, 2023.