



Tracking Methane Emissions using Hyperspectral Satellite Imaging

Young scientist position

The Laboratoire des Sciences du Climat et de l'Environnement (LSCE) and Kayrros (a Paris based EO startup), are looking for a motivated postdoc / young scientist candidate for a joint project focused on using shortwave infrared measurements acquired by hyperspectral satellite imagers to detect anomalous methane emissions in the atmosphere.

Background

Anthropogenic methane emissions come from mostly two sources: the oil, coal and gas industry on one hand, agriculture and waste management on the other. Methane has a lifespan of 12 years, much shorter than CO₂, but a global warming potential (GWP) that is 85 five times higher than that of CO₂, over a 20 years window. This means that mitigating methane emissions can have a very significant short term impact on warming. The latest methane budget estimates anthropogenic methane emissions at about 380 Mt/y (bottom-up), of which 108 Mt/y is coming from the oil and gas sector and 227 Mt/y are attributed to agriculture and waste management. Oil and gas emissions are concentrated in a few dense clusters around shale basins such as the Permian in the US, pipelines and major fields in e.g. Turkmenistan or Algeria. Countries and companies with high operational standards tend to have lower emission rates, and the fact that the list of key emitters is relatively short means that the oil and gas sector is both a low cost and high short term impact greenhouse gas emissions mitigation target.

Various satellites are already operating to monitor the earth and already provide established methodology for emission indicators. The launch of a new generation of satellites (Sentinel-5P amongst others) with an increased spatial resolution, recently made it possible to refine these indicators and better quantify the sources of emissions. New sensors and satellites are coming online every year and the goal of this internship will be to use these new sensors to improve detection and attribution of methane sources.

The goal of this project is to turn the raw time series of hyperspectral images from earth observation satellites into methane emission estimates, which means working with four-dimensional data sets (longitude, latitude, wavelength and time) with significant spatial, spectral and temporal correlation patterns. Anomaly detection, inpainting, denoising and prediction techniques are used to detect and quantify anomalous emissions of methane (cf picture below for an illustration). This project will mix topics such as machine learning, tensor methods, signal processing, and fluid mechanics.

Requirements

- Programming skills, preferably in Python.
- Basic understanding of satellite images and spatial analyses.
- Knowledge on machine learning and deep learning.

Selection Criteria:

- PhD in remote sensing, machine learning or related field.
- Autonomy, ability to work in a team and time management skills.
- Experienced in multidisciplinary team-based activities with the ability to effectively communicate with colleagues and with staff from the partners of a project.

What Kayrros and the LSCE can offer you:

LSCE is a world-class research laboratory established as a collaboration between CEA, CNRS and the University of Versailles Saint-Quentin (UVSQ). It is part of the Institute Pierre Simon Laplace (IPSL). LSCE hosts approximately 300 researchers, engineers and administrative staff including many PhD and master's students. This project will provide the employee with the opportunity to work directly on advanced methods with researchers from the LSCE and other institutions. The purpose of this joint position between LSCE and Kayrros is to develop R&D that becomes sustainable and could lead to a permanent position opening at Kayrros during or after the position duration.

Location: Laboratoire des Sciences du Climat et de l'Environnement (<https://www.lsce.ipsl.fr>) located about 20 km from the heart of Paris in the Orme des Merisiers green area.

Kayrros is an earth observation startup founded in 2016. It now employs about 150 people between Paris, New York, Houston, Singapore, Bangalore and London. Kayrros' mission is to track carbon using satellite imaging and alternative data sets, following oil & gas production, storage, demand and finally emissions and sequestration. The postdoc will involve constant interactions with the Paris team. Much of the R&D is located in offices on rue Lafayette, in the center of Paris.

Contract duration: Up to 24 months.

Starting date: The position is available from Nov 2020 and will remain open until filled.

Salary: Competitive salary with full social and health benefits, commensurate with work experience.

How to apply: Applicants should submit a complete application package by email. The application package should include (1) a curriculum vitae including most important recent publications, (2) statement of motivation (3) answers to the selection criteria above (4) names, addresses, phone numbers, and email addresses of at least two references.

Contact

[Thomas Lauvaux, thomas.lauvaux@lsce.ipsl.fr](mailto:thomas.lauvaux@lsce.ipsl.fr)

[Philippe Ciais, philippe.ciais@lsce.ipsl.fr](mailto:philippe.ciais@lsce.ipsl.fr)

[Alexandre d'Aspremont, aspremon@ens.fr](mailto:aspremon@ens.fr)
<https://www.lsce.ipsl.fr>
<https://www.kayrros.com>

2020-07-16 10:30:00
Emission rate kg/hr : 4889.759
Wind speed m/s : 2.0

