Monitoring urban CO_2 emissions from space across the Eastern Mediterranean

The Laboratoire des Sciences du Climat et de l'Environnement (LSCE) is seeking a highly motivated postdoc / young scientist candidate to join a large European research effort (EMME-CARE) focused on developing new technologies to measure and track urban greenhouse gas emissions from satellite imagery and mesoscale atmospheric modeling over the eastern Mediterranean Sea basin.

Background

Urban Greenhouse Gas (GHG) emissions represent a large fraction of the global fossil fuel emissions, hence a significant fraction of the human-made contribution to the accumulation of GHG in the atmosphere (UNFCCC report[1]). Prompt and effective actions at the city level are critical to mitigate climate change and to support ambitious climate action plans at the national level. To date, the most established and comprehensive approach to track city-level emissions consists of Self-Reported Inventories (SRI's) following rigorous protocols (e.g. ICLEI), combining various activity data and emissions factors to understand and to quantify urban GHG emissions. But recent studies have highlighted the lack of consistency across cities and the complexity of producing an accurate carbon budget with limited resources and data access (Gurney et al., 2021). In support of city-level SRI's, atmospheric monitoring has been suggested as a semi-independent approach to improve the reliability of the approach (Lauvaux et al., 2020), but the spatial extent of these emissions is limited to less than 5% of the Earth's surface. Hence, global monitoring of these emissions requires high granularity and high precision in the atmospheric measurements, and accurate methods to disentangle the local enhancements due to human-made emissions from natural sources and sinks surrounding urban areas.

Research work

The postdoctoral researcher will join a large European research program, i.e. EMME-CARE, led by the Cyprus Institute, to study the use of satellite measurements to detect, to quantify and to track urban-scale GHG emissions across the Eastern Mediterranean. The region encompasses multiple countries and large metropolitan areas comprising various trends of development and climate action plans. As satellite missions reached a first step in spatial and temporal coverage, missions dedicated to the main GHGs (i.e. CO_2, CO) remain limited. Co-emitted species such as NO_2 are currently the most promising source of information to detect urban plumes, despite the added complexity due to chemical reactivity. The postdoctoral researcher will examine the existing data from the ESA mission Sentinel-5 P (i.e. TROPOMI) and perform atmospheric simulations at the mesoscale to define the potential of NO_2 retrievals to quantify and to track city-level GHG emissions. Additional space missions (e.g. OCO-3) and

[1] https://unfccc.int/news/urban-climate-action-is-crucial-to-bend-the-emissions-curve

ground-based instruments deployed over the region will provide column and in situ measurements of GHG's concentrations in parallel with reactive species. This work will support the development of new technologies to monitor urban emissions more rapidly and more effectively, in direct support of current SRI approaches.

Requirements

- Programming skills in Linux environments and parallel computing.
- Expertise in atmospheric sciences, if possible in mesoscale modeling,
- Basic understanding of satellite images and spatial analyses.

Selection Criteria

- PhD in remote sensing, atmospheric sciences, or numerical modeling.
- Demonstrated experience working with imagery data and atmospheric modeling.
- 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.

Additional Information

What LSCE can offer to you:
LSCE is a world-class research laboratory established and a collaboration between CEA, CNRS and the University of Versailles Saint-Quentin (UVSQ). It is part of the Institut 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
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.
Contract duration: Up to 24 months**.**
Starting date: The position is available from March 2021 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 persons
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