PhD Position on Modeling Arctic Aerosol-Cloud Interactions using WRF-Chem

Specifics of position: This position is funded by the joint PhD program between Imperial College London (ICL) and Centre national de la recherche scientifique (CNRS), therefore the candidate will work in close collaboration with our ICL PI, Dr. Edward Gryspeerdt, and with the PhD student funded at ICL as part of this project.

Title: QUANTIFIcation of the rolE of aerosol-clouD interactions in Arctic climate (QUANTIFIED)

Scientific Context: The Arctic is experiencing rapid warming, with temperatures rising four times faster than the global average. Sea ice decline, a reliable indicator of climate change, underscores the urgency of understanding Arctic atmospheric dynamics. Aerosols, though mitigating some warming effects, remain a significant uncertainty in climate projections, particularly in the Arctic. Our project aims to address this gap by integrating satellite observations and modeling techniques, focusing on aerosol-cloud interactions in the Arctic using the Weather Research and Forecasting model with Chemistry (WRF-Chem).

Host Institutes: This position is a joint position and can be located at LATMOS and/or IGE depending on the preference of the candidate with regular visits between the two labs.

- LATMOS: The Atmospheres and Space Observations Laboratory is a joint research unit specializing in the study of the physico-chemical processes governing the Earth's and planetary atmospheres and their interfaces with the surface, the ocean and the interplanetary environment. The team involved in this project is located at Pierre et Marie Curie Campus of Sorbonne Université.
- IGE: Institute of Environmental Geosciences is a joint research unit of the CNRS, Grenoble Alpes University, INRAE, Grenoble INP and IRD, the Institute of Environmental Geosciences (IGE). IGE conducts research on climate, the pollution of our planet and environmental risks, particularly in regions where societal and environmental issues are most prevalent : the polar regions, the intertropical zone, and mountain regions. The team involved in this project is located on the Campus of Université Grenoble Alpes.

Objectives: The primary objective of QUANTIFIED is to determine whether Arctic aerosols contribute to warming or cooling compared to pre-industrial levels. Specific objectives include characterizing aerosol and cloud properties using satellite observations, integrating aerosol and cloud physics into WRF-Chem, validating model simulations, quantifying direct and indirect aerosol effects on regional Arctic climate, and fostering collaboration to enhance understanding of Arctic aerosol-cloud interactions.

Scientific Methodology: Our approach combines satellite observations and modeling to assess aerosol-cloud interactions. We aim to develop methods for constraining aerosol forcing in the Arctic, integrating observational data to validate model simulations. This iterative process will involve close collaboration between modeling and observation teams, leading to a comprehensive understanding of Arctic aerosol-cloud interactions.

Added Value of International Cooperation: Our collaboration between Imperial College London and CNRS offers diverse expertise and resources, enhancing the project's scope and impact. This international cooperation strengthens research outcomes and facilitates knowledge exchange, fostering a multidisciplinary approach to Arctic climate science.

Plan for Engaging PhD Students: PhD students will receive joint supervision, offering cross-training in modeling and satellite observations. We prioritize integrated research, data-model integration, hands-on training, and open science principles. Regular meetings and research exchanges ensure effective collaboration and skill development.

Planned Activities: Activities include conducting research using modeling, participation in international conferences and project meetings.

International collaboration: This work will be done in collaboration with researchers focusing on aerosols and clouds within the international team of the CERTAINTY project (https://certainty-aci.eu/).

Position Funding: This open position is 100% funded by CNRS. The PhD student will work at LATMOS (Paris), IGE (Grenoble), or both with visits to Imperial College London and our European Partners within the CERTAINTY project.

Requirements: A second year masters degree (M2) in atmospheric dynamics, atmospheric chemistry, model development, numerical simulations of the Earth system, or similar.

Timing: Applications are being accepted from now until a suitable applicant is found. Interested applicants are encouraged to contact the French PIs:

- Jean-Christophe Raut, LATMOS (Paris)
- Louis Marelle, LATMOS (Paris)
- Jennie Thomas, IGE (Grenoble)

via email as soon as possible. The PhD is funded for 3 years with a start date of 1 September 2024.

This PhD position presents an exciting opportunity to contribute to cutting-edge research addressing critical uncertainties in Arctic climate dynamics. If you are passionate about climate science and eager to explore aerosol-cloud interactions using advanced modeling techniques, we encourage you to contact us to apply: louis.marelle@latmos.ipsl.fr, jennie.thomas@univ-grenoble-alpes.fr, and jean-christophe.raut@latmos.ipsl.fr.