

STAGE DE RECHERCHE de MASTER

Année Universitaire 2022/2023

LABORATOIRE : Institut Pierre-Simon Laplace/Centre de Modélisation du Climat

SUJET DU STAGE: Aviation et Climat – Estimating the sampling capabilities of commercial aircraft to detect ice-supersaturated regions for contrail mitigation

COORDONNEES DU RESPONSABLE :

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NATURE DU SUJET :

Théorie	Pas du tout	Un peu	Beaucoup
Modélisation num.	Pas du tout	Un peu	Beaucoup
Expérimentation	Pas du tout	Un peu	Beaucoup
Analyse de données	Pas du tout	Un peu	Beaucoup
Instrumentation	Pas du tout	Un peu	Beaucoup

SUJET:

The IPSL (<https://www.ipsl.fr>) and its Climate Modelling Centre (<https://cmc.ipsl.fr>) started an ambitious research project, which aims to investigate the climate impacts of aviation and to develop mitigation strategies. Some of these strategies focus on condensation trails, short contrails, that form behind aircraft and induce a climate warming. Therefore, contrail mitigation is a key factor to reduce the negative impacts of aviation on our climate.

While the conditions for contrail formation are well understood, the prediction of ice-supersaturated regions (ISSR), in which persistent contrails develop, is uncertain. This uncertainty in today's numerical weather prediction models primarily results from a lack in spatial resolution and an imperfect representation of key processes in cloud parameterizations.

The scope of this internship is to develop and test flight track optimizations that are inspired by routing algorithms that rely on swarm intelligence (SI), like ant-based routing or particle swarm optimization. You, the intern, will apply these algorithms on re-analysis data from the European Centre for Medium-Range Weather Forecasts. You will estimate the sampling capabilities of commercial aircraft to reconstruct the predicted ISSR distribution in the re-analysis data. Successive aircraft flights will progressively sharpen an a priori ISSR distribution and subsequent flights will be re-routed to avoid contrail formation. The mitigation potential will be determined.

For an applicable optimization, each aircraft has to be equipped with accurate temperature and relative humidity sensors. You will learn about the difficulties of airborne measurements and determine the required measurement accuracy to successfully probe ISSR regions for the proposed mitigation approach.

Basic English language skills in speaking are preferred.

Still interested? Please send your application to Grégoire Dannel (gregoire.dannel@ipsl.fr), Nicolas Bellouin (nicolas.bellouin@ipsl.fr), Olivier Boucher (olivier.boucher@ipsl.fr), and Kevin Wolf (kevin.wolf@ipsl.fr).

You will join a team of 8-10 scientists and engineers working at Sorbonne University, in Jussieu, on the topic of the climate impacts of aviation.