International Master 2 Atmospheric Sciences: Research Training 2020-2021

Laboratory: SAGE

Supervisor: RIFFAULT Véronique

Tél : 03.27.71.26.04, E-mail : veronique.riffault@imt-lille-douai.fr

Collaborator: F. de BRITO Joel, TISON Emmanuel

CaPPA Work Package: Workpackage 3 - Aerosol observations

Linking aircraft fuel exhaust composition and secondary aerosol composition

Aviation is one of the strongest growing transport sectors, with an expected growth of 5% annually in the next decade. As ground transport currently undergo a clear decarbonization, aircraft remains dependent on combustion engines for the upcoming years, due to high power-to-weight ratio required. In the meantime, synthetic fuels can help mitigate the climatic impact of the aviation industry. Aviation emissions are not limited to greenhouse gases like CO_2 or water but include as well other gases like nitrogen oxides (NO_x), sulfur oxides (SO_x), soot and other primary aerosols, as well as organic gases that can lead to the formation of secondary organic aerosols. Those aerosols can be formed by nucleation from gaseous precursors in the cooling exhaust gas downstream the combustor, when the concentration of preexisting particles has decreased, favoring homogeneous nucleation versus heterogeneous one (absorption of gases onto preexisting particles).

This project aims at studying the role of different fuels on the chemical composition and characteristics of submicron aerosol particles. It is based on the dataset obtained during laboratory experiments involving a High-Resolution Time-of-Flight Aerosol Mass Spectrometer (HR-ToF-AMS) from IMT Lille Douai, within the scope of the UNREAL ANR project. The main objective will be to link changes in chemical characteristics with formation processes of those experiments. Further activities will involve get a hands-on experience with the HR-ToF-AMS, potentially included in further chamber experiments at the time of the internship. If successful, the student will be considered for a PhD position for a field campaign in the Amazon rainforest expected to take place in 2023.

Key words: Aerosol particles, Mass Spectrometry, Aircraft emissions