International Master 2 Atmospheric Sciences: Research Training 2020-2021

Laboratory: SAGE

Supervisor: ROMANIAS Manolis, THEVENET Frederic

Tél : 03.27.71.22.93, E-mail : emmanouil.romanias@imt-lille-douai.fr; frederic.thevenet@imt-lille-douai.fr

Collaborator:
Eventually,

CaPPA Work Package: WP2. Aerosol microphysical, chemical and optical properties from fundamental heterogeneous processes to remote sensing

Heterogeneous reactivity of Alkyl nitrates with atmospheric particles

Alkyl nitrates (ANs; R-ONO_2, where R- alkyl-chain) are important atmospheric species formed from the oxidation of volatile organic compounds (VOC_S). ANs, are mainly produced (i) during daytime due to the oxidation of VOCs by OH radicals in polluted environments or (ii) during nighttime through the reaction of VOCs with NO_3 radicals. Due to their low reactivity with the oxidants of the atmosphere, ANs are long lived atmospheric species. To that regard, they can be considered as temporary reservoirs of NO_X in the troposphere. The transport of ANs may promote the transport of NOx to remote areas. Although the gas phase degradation of ANs has been studied in the past, till today, the heterogeneous degradation / uptake of ANs on atmospheric particles has been poorly investigated in the literature.
Therefore, the experimental objective of this internship is to investigate the uptake and the reactivity of ANs on atmospheric aerosols (mainly focusing on mineral dusts and sea salts). The ultimate goal of this internship is to evaluate the atmospheric impact of the heterogeneous degradation of ANs. To that regard, accurate kinetic and mechanistic data on the heterogeneous processing of atmospheric aerosols by ANs will be provided. Experiments will be carried out at IMT Lille Douai using photochemical reactors to simulate the conditions existing in the atmosphere. Reactors will be coupled with state of the art analytical instrumentation (SIFT-MS, HONO analyzer, multipath FTIR) to monitor in real time both reactants and products.

Key words: Alkyl nitrates; uptake coefficients; surface kinetics