

International Master 2 Atmospheric Sciences: Research Training 2020-2021

Laboratory: SAGE

Supervisor: ROMANIAS Manolis

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

Collaborator:

Eventually,

CaPPA Work Package: WP1. From gas phase to aerosols

Tropospheric degradation of (Z)-CF₃CF=CHCl by OH radicals

Hydrochlorofluoroolefins (HCFOs) is a family of compounds that has been developed as alternatives to ozone depleting substances such as chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), and hydrofluorocarbons (HFCs). Nevertheless, HCFOs, can contribute to global warming since the C–F bond absorbs infrared light of the solar spectrum. In addition, the tropospheric oxidation of HCFOs can lead to the formation of trifluoroacetic acid (TFA, CF₃C(O)OH), a strong acid that is mainly removed from the atmosphere by wet deposition. TFA is not readily biodegradable and is toxic to aquatic life. (Z)-CF₃CF=CHCl has recently been identified as a very promising compound of HCFO family, since it has a very short lifetime (i.e. negligible ozone depletion potential) and an insignificant global warming potential. However, the mechanism of the tropospheric degradation of (Z)-CF₃CF=CHCl has never been evaluated in the past and there are no information whether TFA can be formed.

Therefore, the objective of this internship is to investigate the tropospheric degradation of (Z)-CF₃CF=CHCl by OH radicals (the major oxidant of the atmosphere) and determine the yields of the products formed. Laboratory experiments will be carried out inside a thermostatic atmospheric simulation chamber coupled with state of the art spectrometric and spectroscopic analytical techniques (SIFT-MS, multipath FTIR, GC-MS) to monitor in real time both reactants and products. Experiments will be carried out in the wide temperature range of 243-353 K, in presence and absence of NO_x.

Key words: THALAMOS simulation chamber; HCFOs, tropospheric degradation; OH radicals