

Ecole Doctorale des Sciences Fondamentales

Title of the thesis: Interactions between cloud microorganisms and atmospheric nitrogenated compounds

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Summary :

Nitrogen oxides play a key role in atmospheric chemistry by regulating oxygenated oxidants. Their increasing production leads to photochemical smogs or acid rains. Ammonia is another source of atmospheric nitrogen. By reacting with organic matter these inorganic nitrogen compounds form organic nitrogenated compounds (amines, nitro or nitroso compounds...)

It has been found recently that living microorganisms in clouds could have an impact on cloud water composition and that their metabolism could be impacted in return. This thesis is aimed to study interactions between microorganisms and the main nitrogenated compounds found in atmospheric water (NO_x, ammonia, nitric acid, amines, amino acids, nitrophenols...)

Two aspects will be considered:

1. Impact of microorganisms on the chemical composition of atmospheric water: Microcosms will be inoculated with strains collected at the puy de Dôme station. Various analytical techniques (HPLC, fluorescence, luminescence...) will be used to follow the evolution of cloud water composition.
2. Impact of nitrogenated compounds, in particular the potentially toxic nitrogen oxides, on microorganisms. This will be investigated with biochemical assays on the main markers of microbial cellular activity (ATP, glutathione, NAD/NADH...).

The PhD student will work at the interface between analytical chemistry and microbiology. The applicant should have some knowledge in biochemistry and/or in analytical chemistry, organisational and communication skills and should be able to work in synergy with collaborators.