Ecole Doctorale des Sciences Fondamentales

Title of the thesis: Biological aerosols in remote sampling locations

Supervisor : Karine SELLEGRI
Laboratory : LaMP
University : University Clermont Auvergne/CNRS
Email and Phone : evelyn.freney@uca.fr ; 04 73 40 73 69, K.Sellgri@opgc.fr
Possible co-supervisor : Evelyn Freney
Laboratory : Laboratory of meteorology and physics
University : University Clermont Auvergne/CNRS

Summary :
Early studies on atmospheric aerosol particles identified airborne biological aerosol particles as an important contributor to the aerosol population. They are present in numerous atmospheric environments and exist in a wide range of sizes from several nanometers up to several hundreds of micrometers. These biological aerosol particles can be entire units or fragments from living organisms including microorganisms, and can be either dead or alive. These can include fungi, bacteria, spores, pollen, and animal or plant debris. These biological species can play a potentially important role in cloud formation processes acting as cloud condensation nuclei and heterogeneous ice nuclei.
There is an increasing number of studies on the variability of these biological aerosol particles but they are concentrated on short term intensive field campaigns. However, the number of studies dedicated to long-term characterizing biological aerosols in the atmosphere, their mechanisms of dispersion, seasonal variability and their role in cloud processes is still very low.
The first objective of this thesis is first to provide an analysis of the biological properties of aerosols on background natural sites around the world (puy de Dôme, Chacaltaya (Bolivia), Reunion Island and Amsterdam Island (South Indian Ocean), mobile platform of the research vessel Marion Dufresne...), including information on the dominant types of biological aerosols and how they vary according to environmental parameters. These biological aerosol measurements will be compared with on-line measurements of aerosol chemistry (measured with an aerosol chemical speciation monitor) for sites that have them, a second objective being to provide chemical fingerprints of potential sub-micron-sized biological aerosols. Finally, an important objective will be to evaluate the impact of biological aerosols on cloud properties, and in particular their link with their ice nucleating capacity.
This work is fully in line with several research projects, including the European project ACTRIS and the national project OBS4CLIM, as well as with the activities of the National Observation Service CLAP.