

Ecole Doctorale des Sciences Fondamentales

Title of the thesis: Investigation of new particle formation over the remote ocean: from the ocean surface to the marine free troposphere

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University : UCA

Summary :

Aerosol particles are ubiquitous in the atmosphere. They are of climate importance because they interfere with solar and terrestrial radiation, and they also play a role in cloud formation. Over the ocean, particles can be emitted into the atmosphere as sea spray, or result from the formation of new nanometric particles from gaseous precursors of marine origin.

Based on the results of an oceanographic campaign conducted in 2020 off the coast of New Zealand as part of the ERC Sea2Cloud project, we showed that the formation of new particles by nucleation took place within large enclosures (ASITs) simulating the ocean-atmosphere interface (Chamba et al. 2023). The identified precursors were nitrogen compounds of marine origin, but neither their exact nature nor the biogeochemical processes responsible for their emission could be identified. **Similar experiments were recently carried out on board the oceanographic vessel Le Marion Dufresne**, allowing to monitor the size distribution of the newly formed particles and their chemical composition using mass spectrometry (Vocus B2). **The first part of the thesis will make use of the Marion Dufresne data, to identify the chemical compounds responsible for nucleation in the open ocean atmosphere and, in collaboration with our international collaborators, studying their biological origin.**

Once the fluxes of chemical species relevant for marine nucleation in the surface layer have been identified, **the second part of the thesis will focus on the transport of chemicals to higher altitude** where nucleation could be favoured by the conditions specific to this region of the atmosphere. With this aim, the PhD student will spend several months on Réunion island in order to carry out measurements using an original experimental set-up currently being developed (field simulation chamber, mass spectrometry) as part of the ERC HAVEN project.

Job requirements: This is a multidisciplinary thesis in the fields of marine biogeochemistry and atmospheric sciences. The candidate must hold a Master's or Engineering degree (Bac +5) in one of these fields. Previous experience with data analysis and knowledge of scientific programming (e.g. Python, R, Matlab) is expected. A more specific knowledge of the instrumentation used to characterise aerosols and their precursors (mass spectrometry in particular) will be a particular advantage for this recruitment. The candidate will also be expected to have the human qualities to work as part of a team, as well as the ability to work more independently, particularly during his/her stay in Réunion. At least one reference letter should be included with the application.

Conditions: The PhD funding is offered on a full-time basis for 36 months (temporary contract) with a starting date aimed on 01-Oct-2025. The successful student will be part of the Ecole Doctorale des Sciences Fondamentales and graduate from Université Clermont Auvergne at the end of their contract. During the first part of their thesis, the student will be hosted at LaMP, in Clermont Ferrand;

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he/she will then spend several months on Réunion Island (note that accommodation costs will be paid by the student during this long-term mission) before returning to LaMP to finalize their thesis.

Information and application: for any information and application, please contact Dr. Karine SELLEGRI (k.sellegri@opgc.fr) or Dr. Clémence ROSE (c.rose@opgc.fr). Deadline for application: 16-March-2025.