





## PhD GRANTS 2024

**PhD project title:** Hygroscopic properties of marine aerosols and molecular pre-ordering mechanisms of water by NPIs for the generation of wet and icy aerosols

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## PhD project summary (max. 20 lines):

Clouds have an impact on the Earth's energy balance and climate system through albedo and precipitation intensity. The microphysical properties of these clouds are influenced by atmospheric properties such as temperature, water content and the presence of heterogeneous nuclei. Nucleating particles (NPIs) of droplets and ice particles constitute a unique subset of aerosols whose sources and compositions are very diverse: dust, minerals, combustion products and spray aerosols. They induce and control the immersion freezing of particles/droplets, and thus the cloud formation of a parcel of mixed-phase air. However, the role and mechanism by which NPIs model the arrangement of water molecules remain unresolved. The aim of this PhD thesis is to better understand the mechanism by which INP aerosols model the arrangement of water molecules. The project will examine the water structure of different supercooled aqueous microdroplets as a function of temperature up to the temperature of onset of ice nucleation. More specifically, the solutions under study will contain soluble marine ions from seawater (majority inorganic ions) as well as (nitrogen-based) organic ions (NOx). Aerosol nucleation properties (immersion mode) will be characterized beforehand. The candidate will then study the temperature dependence of the hydrogen bond network (water structure by micro-Raman spectroscopy and optical imaging) in micro-droplets in the presence of different salt inclusions with varying ice nucleation capacities. These results will be compared with the structure of water without inclusions.