


**Internship proposal 2011-2012**

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*Title for the scientific project*

Clusters – Clouds – Climate: Atmospherically relevant aerosol nanodroplets studied by synchrotron radiation

**Scientific project :** Liquid water is omnipresent in nature, but in spite of this our understanding of aqueous systems at the microscopic level is far from complete. One example of this is ionic solutions, for which our understanding of the surface being ion-free is now undergoing a qualitative change into some ions being present, and even enriched, at the surface. There is a need to qualitatively explore these novel surface phenomena, as well as to quantify the effects for specific environmentally important systems. Such surface effects are especially important for microscopic systems, such as molecular clusters and aerosol particles in the atmosphere. These objects partly counteract the antropogenic greenhouse effect by increasing Earth's albedo, as well as strongly affecting the formation of clouds, which have been identified by the IPCC as a key uncertainty in predicting climate change.

The two main questions are how the clusters/aerosol particles themselves affect Earth's radiation budget, and their influence upon cloud formation, thereby affecting the radiative forcing through cloud properties. In collaboration with atmospheric scientists, we address these questions by a close collaboration between observations, laboratory studies and simulations, with the aim of obtaining qualitative and quantitative results to be included in atmospheric modeling.

During the internship period, we will study the connection between atomic build-up, structure, and formation processes of aqueous molecular clusters and aerosol particles. The focus will initially be on fundamental systems, such as aqueous SO<sub>x</sub>, ammonium and amine ions, the CO<sub>2</sub>/carbonate systems as well as surface-active organic molecules.

Two key points of the project is our ability to form and to probe relevant model systems. We will form model systems using a micro-jet source for liquid samples, and an aerosol source, which will be commissioned during autumn 2011. Our main tools to probe the model systems are core-level spectroscopies, such as XPS and XAS, using synchrotron radiation.

For more information, see <http://www.physics.uu.se/molcond/content/fundamental-environmental-molecular-science-liquids-and-nanoparticles-1>

**Techniques in use :**

Core-level spectroscopy, such as XPS and XAS, in connection with synchrotron radiation

**Applicant skills :**

Knowledge of atomic and molecular physics, as well as solid state physics. Aptitude for experimental physics.

**Granted internship :** yes ( \_\_\_\_€/month) / no  
**C'nano IdF laboratory (France only) :** yes / no  
**Possibility for a thesis :** yes (type of grant : \_\_\_\_\_) / no