Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Institute for Atmosphere and Climate Sciences
D-USYS

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Zurich, May 22nd 2023

3 to 3.5 year fully funded PhD at ETH Zurich in role of freezing mode for the ice nucleation activity of mineral dusts

The Atmospheric Physics group at ETH Zurich (IAC-ETH) invites applications for a 3 – 3.5-year PhD position funded by the Swiss National Science Foundation (SNSF) project "The role of particle size, organic matter, and freezing mode for ice nucleation on mineral and soil dusts". The project has a total of 3 PhD positions (see advertisements below for two more) who will closely collaborate.

Project background: Ice-nucleating particles (INPs) represent a minute fraction of atmospheric aerosol, but they are key actors in cloud processes including precipitation formation, as they initiate the ice phase in clouds. Although mineral dusts are probably the most important and best-established type of atmospheric INPs, there are still major unknowns that preclude a reliable prediction of ice crystals forming on them. Different factors have been identified that influence their freezing temperatures. Apart from the mineral type, these are particle size, interactions with solutes and water, adsorption of organic molecules, and freezing mode. Yet, some of these factors do not seem to matter in general, but only for some mineral types. Therefore, attempts to generalize them to all types of mineral INPs produce conflicting results.

Our group has longstanding experience in the investigation of atmospheric INPs and a history of developing cloud chambers and cold-stage experiments, among them the microfluidic device MINCZ, the drop freezing assay DRINCZ and the continuous flow diffusion chamber HINC. Moreover, a broad range of analytical techniques for aerosol characterisation are available in our group and at ETH Zurich.

Job description of the experimental PhD position:

- Measurement of the IN activity of size selected clay and feldspar particles in HINC in the condensation freezing mode.
- Using two HINCs in series via a droplet/ice evaporation/sublimation set up to investigate the effect of pre-activation on ice nucleation during two subsequent cloud forming cycles.
- Collaboration with the two PhD projects listed below to ensure similar sizes and particle types are being measured, to compare across different freezing modes and particle preparation techniques.

The successful candidate should hold a MSc (or equivalent) in chemistry, physics, engineering, atmospheric/environmental sciences, or a related field. Knowledge of oral and written English is required. Knowledge of aerosol measurement techniques and data analysis in Igor, MATLAB, Python or similar software is highly desired, and some knowledge of LabVIEW would be an asset, but not necessary. We are looking for a highly motivated, committed, and creative person.

We look forward to receiving your online application that includes a CV, academic transcripts, work certificates (if any) and a 1-page motivation letter stating previous research experience and interests. Please provide the contact information of at least two referees. Note that we exclusively accept applications submitted through our online application portal. Applications will be reviewed on a rolling basis until filled (no deadline). Applications via email or postal services will not be considered.

The start of the project is scheduled for September.

For more information on this position, contact zamin.kanji@env.ethz.ch and visit our website.

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Zurich, May 22nd 2023

3 to 3.5 year fully funded PhD at ETH Zurich in role of particle size and mixing state for ice nucleation on mineral dust

The Atmospheric Physics group at ETH Zurich (IAC-ETH) invites applications for a 3–3.5-year PhD position funded by the Swiss National Science Foundation (SNSF) project "The role of particle size, organic matter, and freezing mode for ice nucleation on mineral and soil dusts". The project has a total of 3 PhD positions (see advertisements below for one more) who will closely collaborate.

Project background: Ice-nucleating particles (INPs) represent only a tiny fraction of the atmospheric aerosol, but they are key actors in cloud processes including precipitation formation, as they initiate the ice phase in clouds. Although mineral dusts are probably the most important and best established type of atmospheric INPs, there are still major unknowns that preclude a reliable prediction of ice crystals forming on them. Different factors have been identified that influence their freezing temperatures. Apart from the mineral type, these are particle size, interactions with solutes and water, adsorption of organic molecules, and freezing mode. Yet, some of these factors do not seem to matter in general, but only for some mineral types. Therefore, attempts to generalize them to all types of mineral INPs produce conflicting results.

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Job description of the PhD position:

- Development of an experimental procedure to fractionate mineral dust samples in different size classes.
- Analysis of the size classes with respect to mineralogical composition (XRD) and surface area (BET).
- Analysis of the samples with Transmission Electron Microscopy (TEM) and (Energy Dispersive X-ray spectroscopy (EDX) to determine the mixing state of the particles and their morphology.
- Measurement of the ice nucleation activity with MINCZ and DRINCZ.
- Correlation of the ice nucleation activity of the different size classes with their mineralogical composition and morphology. Interpretation of the results.

The successful candidate should hold an MSc (or equivalent) in chemistry, physics, engineering, atmospheric/environmental sciences, or a related field. Knowledge of oral and written English is required. Knowledge of aerosol measurement techniques and data analysis in Igor, MATLAB, Python or similar software is highly desired. We are looking for a highly motivated, committed, and creative person.

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The start of the project is scheduled for September.

For further information on this position contact claudia.marcolli@env.ethz.ch and visit our website (https://iac.ethz.ch/group/atmospheric-physics.html).

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Zurich, May 22nd 2023

3 to 3.5 year fully funded PhD at ETH Zurich in role of biogenic macromolecules for ice nucleation of fertile soils

The Atmospheric Physics group at ETH Zurich (IAC-ETH) invites applications for a 3–3.5 year PhD position funded by the Swiss National Science Foundation (SNSF) project "The role of particle size, organic matter, and freezing mode for ice nucleation on mineral and soil dusts". The project has a total of 3 PhD positions (see advertisements above for two more) who will closely collaborate.

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Our group has longstanding experience in the investigation of atmospheric INPs and a history of developing cloud chambers and cold-stage experiments, among them the microfluidic device MINCZ, the drop freezing assay DRINCZ and the continuous flow diffusion chamber HINC. Moreover, a broad range of analytical techniques for aerosol characterisation are available in our group and at ETH Zurich.

Job description of the PhD position:

- Measurement of the IN activity of collected soil dust samples with MINCZ and DRINCZ.
- Analysis of the soil dusts with respect to mineralogical composition (XRD) and surface area (BET).
- Thermogravimetric and spectroscopic analysis of the soil dusts to infer the composition of the organic matter.
- Measurement of the ice nucleation activity of macromolecules such as cellulose, lignin, and proteins with MINCZ and DRINCZ.
- Correlation of the ice nucleation activity of the collected soil dust samples with their composition. Interpretation of the results.

The successful candidate should hold an MSc (or equivalent) in chemistry, physics, engineering, atmospheric/environmental sciences, or a related field. Knowledge of oral and written English is required. Knowledge of aerosol measurement techniques and data analysis in Igor, MATLAB, Python or similar software is highly desired. We are looking for a highly motivated, committed, and creative person.

We look forward to receiving your online application that includes a CV, academic transcripts, work certificates (if any) and a 1-page motivation letter stating research experiences and interests. Please provide the contact information of at least two referees. Note that we exclusively accept applications submitted through our online application portal. Applications will be reviewed on a rolling basis until filled (no deadline). Applications via email or postal services will not be considered.

The start of the project is scheduled for September.

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