UNIVERSITÄT LEIPZIG

The Leipzig Institute for Meteorology (LIM), Germany, invites applications for

Two PhD Positions

1. **Validation of satellite observations of Arctic clouds**
2. **Evaluation of ECMWF and ICON forecast quality of cloud properties using airborne dropsonde and cloud measurements in the Arctic**

The positions are funded within the Transregional Collaborative Research Center TR172 on "ArctiC Amplification: Climate Relevant Atmospheric and SurfaCe Processes, and Feedback Mechanisms (AC)³" (www.ac3-tr.de) by the German Research Foundation (DFG, Deutsche Forschungsgemeinschaft). Within the TR172, LIM together with the collaboration partners (Universities of Cologne and Bremen, TROPOS and Alfred Wegener Institute) aim to better observe, understand, and simulate processes leading to the current drastic climate changes in the Arctic.

Terms of employment

The PhD positions (65% TV-L E13) are awarded for 3 years with possible extension to up to four years. The positions are open starting from January 2021. We offer a productive and interdisciplinary working group including comprehensive supervision and integration into the thriving Leipzig Graduate School on Clouds, Aerosol and Radiation (http://www.lgs-car.tropos.de/).

Details are given below.

Qualification requirements

For the PhD positions we expect strong interest in atmospheric science, in particular in cloud physics, remote sensing, radiative transfer, and climate. Applicants should have a Master in Meteorology or a related field. Experience in high-level scientific programming for data analysis is desirable. Candidates must possess excellent communication skills in written and spoken English.

Applications

Interested candidates should send a cover letter describing background; a CV, training and research interests; certificates; and the contact information of two referees as a single PDF to

michael.schaefer[at]uni-leipzig.de.

Review of applications will begin immediately and continue until the position has been filled.

Selection

The selection for the position will be based solely on scientific merit without regard to gender, religion, national origin, political affiliation, marital or family status or other differences. Among equally qualified candidates, handicapped candidates will be given preference.

Detailed project descriptions

Information on the Collaborative Research Center TR172 Arctic Amplification are presented on the web page:

www.ac3-tr.de

1. Validation of satellite observations of Arctic clouds

The understanding of Arctic cloud processes crucially depends on the availability of appropriate observations. However, comprehensive field measurements (long-term ground based or short-term campaigns) require costly research infrastructure that need to be operated in the harsh Arctic environment. Therefore, observations of cloud processes within the Arctic Circle are sparse. Satellite remote sensing techniques can partly help to fill the gap of missing field observations in Arctic regions. However, although they may cover large spatial and temporal scales, they are unable to provide the required spatial and temporal resolution to investigate small-scale or short-term processes in clouds. Furthermore, they have problems to discriminate clouds from highly reflecting surfaces. In comparison, airborne observations, such as spectral imaging of reflected solar radiation, provide areal measurements with a high spatial resolution down to several meters, although these techniques also suffer from the discrimination issues. If supplemented by active remote sensing instrumentation like radar or lidar, airborne observations may serve to mimic satellite measurements. Examples for such a complementary aircraft configuration similar to satellite instrumentation are the Polar 5 instruments operated during a series of aircraft campaigns carrying a remote sensing instrumentation similar to the A-Train.

The general goal of this project is to systematically compare airborne remote sensing observations (passive/active) with respective satellite data characterizing clouds in the Arctic. The investigations aim to identify the influence of the coarser spatial and temporal resolution on the observations with respect to the retrieval of optical and microphysical cloud properties. Parameters, which strongly depend on the different resolution shall be identified and parameterized for future applications of space borne remote sensing.

To approach this topic, available data of specially coordinated flight tracks with mostly A-Train satellite overpasses from previous Arctic airborne campaigns (RACEPAC, ACLOUD, AFLUX, MOSAiC-ACA) will be employed. Those airborne data sets include passive imaging and non-imaging spectral and broadband radiance and irradiance measurements, active radar and lidar observations, dropsonde measurements, and in-situ observations. Further coordinated flights with satellite overpasses will be performed during future airborne campaigns, including a steadily increasing airborne instrument suite.

For more information contact: michael.schaefer[at]uni-leipzig.de

2. **Evaluation of ECMWF and ICON forecast quality of cloud properties using airborne dropsonde and cloud measurements in the Arctic**

During the past years, the performance of numerical weather prediction models like ECMWF or ICON improved steadily. Their horizontal and vertical resolution have been increased, while the uncertainty of their predicted parameters and the required computational time could be reduced. Therefore, such models became a valuable tool to investigate the occurrence of different cloud types in specific synoptic situations, which is crucial especially in Arctic regions, where local observations are sparse. Furthermore, in such regions, they help to identify interesting upcoming cloud situations and to design most suited flight patterns for airborne campaigns. During past campaigns (ACLOUD, AFLUX, or MOSAiC-ACA) numerous dropsonde and cloud (in-situ, remote sensing) measurements have been collected. The objective of this project is to use these data to evaluate the ECMWF and ICON forecast quality of cloud properties in the Arctic in different synoptic situation.

Profile data of temperature and humidity from dropsonde measurements shall be used, which were captured during several research flights North of Svalbard during past campaigns. Additional image data, radar, and lidar measurements are available to further characterize the cloud situation during the flights. The results shall lead to a quantitative evaluation of the prediction quality of ECMWF and ICON, which will be tested during further airborne campaigns like HALO-$(AC)^3$ in 2022.

For more information contact: michael.schaefer[at]uni-leipzig.de