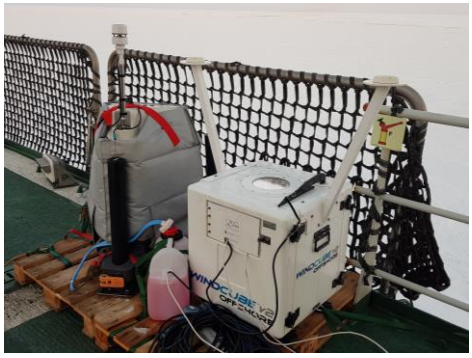
Bachelor/Master Thesis at the University Centre in Svalbard (UNIS)

Atmospheric wind profiles in the marine boundary layer

Description	Meteorological researchers at UNIS are interested in learning more about atmospheric boundary layer effects in Svalbard and the Arctic in general. As part of the "Nansen Legacy"-project (https://arvenetternansen.com/), scientists from UNIS and the University in Bergen (UiB) installed two lidars onboard the research vessel "Kronprins Haakon" during a cruise in spring 2021, in order two measure wind profiles in the marine boundary layer over a fast range of sea and sea ice conditions. The objective of this thesis is to investigate the vertical structure of the measured wind profiles. The first step in this thesis will be to develop a method to combine the measurements from the two different instruments into single, continuous wind profiles. In combination with additional standard meteorological measurements, the following research questions will be addressed: How well do the measurements agree with theoretical concepts like the Ekman Spiral, the logarithmic wind profile and its adaptations for non-neutral conditions? How much do local factor like the atmospheric stability and the sea ice conditions impact the profiles, compared to the overall synoptic situation. Finally, the measured profiles shall be compared to the respective model data from the AROME-Arctic weather forecasting model of the Norwegian Meteorological Institute. How well do measurements and model agree? Does the model capture all measured features in the profiles? This work will be conducted in cooperation with UNIS and the University in Bergen (UiB). The candidate will have the opportunity to be located in Longyearbyen.  Fig. 1: "Kronprins Haakon" in the sea ice  Fig. 2: The instruments installed onboard
Tasks	▪ Literature review on Arctic meteorology and relevant boundary layer processes ▪ Developing a method to combine the measurements from the two instruments ▪ Analyzing the wind profiles with respect to… … the respective synoptic situation … theoretical concepts like the logarithmic wind profile or the Ekman Spiral … the impact of different sea ice conditions/ABL stability ▪ Comparing the measurements to model data from e.g. AROME-Arctic ▪ Critical discussion of the results
Requirements	▪ Interest in meteorological data analysis ▪ Basic skills in programming (preferably Python) ▪ Independent and reliable work style with a detail-oriented mindset
Contact	▪ Lukas Frank (lukasf@unis.no) ▪ Marius Jonassen (mariusj@unis.no) ▪ Frank Nilsen (frankn@unis.no)

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