Project acronym: GLIN

Project title: Inversion layers in Greenland - a Multi-Site approach

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Discipline: Earth Sciences & Environment: Other - Earth Sciences

Station(s): Sermilik Research Station (Greenland/Denmark)

Arctic inversion layers are characteristic for the lower troposphere. They manifest in a temperature increase with height that evokes stability for the air below. This stable layer has multiple consequences for the environment. While vertical gradients of flora and fauna are impacted by them, they also have a direct consequence on physical characteristics such as cloud formation, thaw depths or snow cover. Their role in the energy balance ranges from radiative fluxes to the turbulent fluxes. Furthermore, inversions impede atmospheric mixing which in turn is relevant for the distribution of pollutants or aerosols.

The depth and strength of the inversion layer varies in space and time. Generally, the strength increases with latitude and it is stronger in winter than in summer. However, the picture is more complex and depends largely on surface property, synoptic conditions and local topography.

Measuring inversion depths and strength is locally restricted to radiosondes or passive microwave technology. Especially in the near-surface layer where large changes occur, a refinement and validation of coarsely gridded climate data is desired. With this project we propose to measure atmospheric inversions at high temporal resolution on two sites in East Greenland during summer 2019 using UAV-based atmospheric measurements. On Villum Research Station in the high Greenlandic Arctic we can add, topically seamlessly, to the existing atmospheric focus and hit an end member of inversion strength in a spatial context. As a contrast, we do comparable measurements on Sermilik Station further South, where we can specifically study the glacier's impact on build-up and removal of inversions. The dataset will build the basis for parameterizations of spatial inversion upscaling efforts.