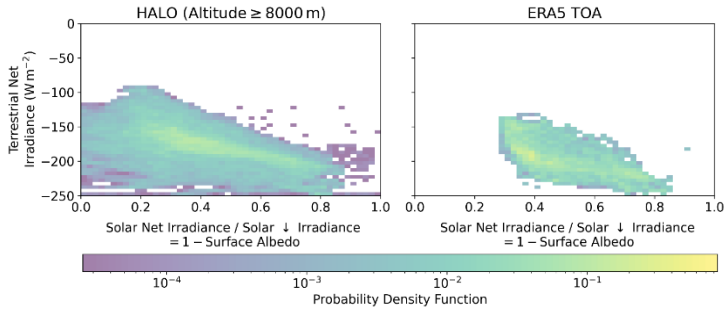
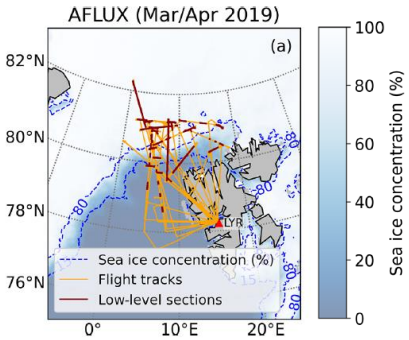
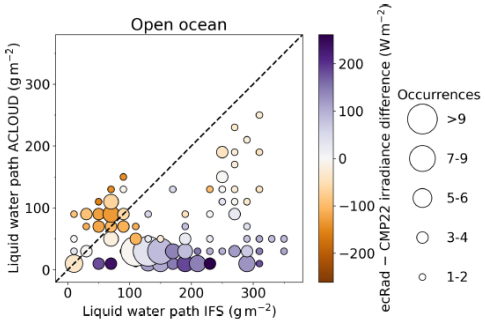
Topic for Master Thesis
Seminar topic: Research & Methods

Group Atmospheric Radiation

Arctic cloud radiative effect – Comparison of observations and ERA5 and ECMWF IFS







Master Thesis:

- The cloud radiative effect (CRE) at the surface is a key parameter for Arctic Amplification.
- CRE was observed during airborne campaigns ACLOUD, AFLUX and MOSAiC-ACA and found to be strongly variable.
- The question of the thesis is how well the CRE is represented in models and reanalysis?
- CRE will be extracted from ERA 5 and IFS simulations along the flight tracks.
- statistical analysis and comparison of CRE data sets
- separation for surface conditions sea ice vs. open ocean and different cloud properties

Sem. Research:
- CRE of Arctic boundary layer clouds
- sensitivity of CRE on cloud, surface, and atmospheric properties
- evaluation of ERA5 and IFS by observations

Sem. Methods:
- airborne observations of CRE
- CRE adjusted for interactions between surface and clouds

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Anmeldung eines Themas für ein/e

Forschungsseminar	**x**	
Methodenseminar	**x**	
Masterarbeit	**x**	(bitte eines oder mehrere ankreuzen)

Thema Datum	Arctic cloud radiative effect – Comparison of observations and ERA5 and ECMWF IFS available from 30. August 2024
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Zweitgutachter	Prof. Dr. Andreas Macke, TROPOS
Kurzbeschreibung:	The cloud radiative effect (CRE) at the surface is a key parameter for Arctic Amplification. The CRE was observed during airborne campaigns ACLOUD, AFLUX and MOSAiC-ACA and found to be strongly variable. The question of the thesis is how well the CRE is represented in models and reanalysis data? **Master Thesis:** - CRE will be extracted from ERA 5 and IFS simulations along the flight tracks. - statistical analysis and comparison of CRE data sets - separation for surface conditions sea ice vs. open ocean and different cloud properties **Sem. Research:** - CRE of Arctic boundary layer clouds - sensitivity of CRE on cloud, surface, and atmospheric properties - evaluation of ERA5 and IFS by observations **Sem. Methods:** - airborne observations of CRE - CRE adjusted for interactions between surface and clouds

Literatur:	Becker, S., Ehrlich, A., Schäfer, M., and Wendisch, M.: Airborne observations of the surface cloud radiative effect during different seasons over sea ice and open ocean in the Fram Strait, Atmos. Chem. Phys., 23, 7015–7031, https://doi.org/10.5194/acp-23-7015-2023, 2023. Müller, H., Ehrlich, A., Jäkel, E., Röttenbacher, J., Kirbus, B., Schäfer, M., Hogan, R. J., and Wendisch, M.: Evaluation of downward and upward solar irradiances simulated by the Integrated Forecasting System of ECMWF using airborne observations above Arctic low-level clouds, Atmos. Chem. Phys., 24, 4157–4175, https://doi.org/10.5194/acp-24-4157-2024, 2024