UNIVERSITÄT LEIPZIG

RESEARCH ACADEMY LEIPZIG

TROPOS
Leibniz-Institut für Troposphärenforschung

Leipzig Graduate School Clouds, Aerosols and Radiation (LGS-CAR)

Module name	**The lapse-rate feedback in the Arctic**
Number	LGS-CAR-14
Aims	Understanding of the processes that determine the temperature lapse rate in the Arctic; including clouds, the radiation budget, the surface energy budget, and large-scale advection. Modelling and observational approaches. Understanding of changes in a warming climate.
Basics	Processes determining the surface energy budget; inversion strength, mixing, and the role of clouds; free-tropospheric lapse rate and radiative-advective equilibrium; observations of changes
Contents	1. Lecture: Arctic feedbacks and the role of the lapse-rate feedback (Nicole Feldl) 2. Lecture: The lapse-rate feedback and Arctic processes (Kyle Armour) 2. Lecture: What determines the surface temperature / surface energy budget (e.g. Marion Maturilli or Kerstin Ebell as CCA2 leaders?) 3. Lecture: What determines the lack of mixing / role of mixed-phase clouds (e.g. Vera Schemann/CCA3 lead?) 4. Lecture: The role of meridional advection for the Arctic free-tropospheric energy budget (e.g. Susanne Crewell/Annette Rinke/CCA4 lead?) 5. Lecture: Modelling the role of clouds for the Arctic temperature profile across scales (Roel Neggers) 7. Lecture: The Arctic lapse rate in large-scale models / Changing Arctic temperatures in the past (tbd) (Rodrigo Caballero)
Methods	Atmospheric modelling; In situ and remote sensing observations; re-analysis; theoretical considerations
Type	Two-day block course (days 1/2 – lectures; day 3 – contributions/discussions)
Date	15 – 17 March 2021
Time	1.00 p.m. (Day 1) – 12.30 p.m. (Day 3)
Work load	16 hours presence / 50 hours self-study
Examination	Week after the ATM (individual appointments)
Credit points	2
Responsible scientists	Johannes Quaas
Guest lecturers	Rodrigo Caballero (U Stockholm) Nicole Feldl (University of California, Santa Cruz) Kyle Armour (University of Washington, Seattle)
Recommendations for literature	Block et al. Tellus 2020 Lauer et al. Met Z 2020

UNIVERSITÄT LEIPZIG

RESEARCH ACADEMY LEIPZIG

TROPOS
Leibniz-Institut für Troposphärenforschung

Program schedule

Monday, 15 March 2021

13.00 h Welcome, opening remarks (Johannes Quaas)
13.15 h Arctic feedbacks and the role of the lapse-rate feedback (Nicole Feldl)
14.15h Discussion
14.45 h Coffee

15.15 h The lapse-rate feedback and Arctic processes (Kyle Armour)
16.15 h Discussion
16.45 h What determines the lack of mixing / role of mixed-phase clouds (Vera Schemann)
17.45 h Discussion
18.00 h End day 1

Tuesday, 16 March 2021

9.30 h What determines the surface temperature / surface energy budget (Marion Maturilli and Kerstin Ebell)
10.30 h Discussion
10.45 h Coffee

11.15 h The role of meridional advection for the Arctic free-tropospheric energy budget (Susanne Crewell and Annette Rinke)
12.15 h Discussion
12.30 h Lunch (own)

14.00 h Modelling the role of clouds for the Arctic temperature profile across scales (Roel Neggers)
15.00 h Discussion
15.15 h Coffee

15.45 h The Arctic lapse rate in large-scale models / Changing Arctic temperatures in the past (tbd) (Rodrigo Caballero)
16.45 h Discussion
17.15 h End day 2

Wednesday, 17 March 2021

9.30 h Round-table discussions
(a) Surface temperature change
(b) Inversion, mixing, and clouds
(c) Free-tropospheric temperature change
11.00 h Coffee
11.30 h Reports
12.30 h Final discussion

13.00 h End