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Leibniz-Institut für  
Troposphärenforschung

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

<b>Module name</b>	<b>The lapse-rate feedback in the Arctic</b>
<b>Number</b>	LGS-CAR-14
<b>Aims</b>	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.
<b>Basics</b>	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
<b>Contents</b>	<ol style="list-style-type: none"> <li>1. Lecture: Arctic feedbacks and the role of the lapse-rate feedback (Nicole Feldl)</li> <li>2. Lecture: The lapse-rate feedback and Arctic processes (Kyle Armour)</li> <li>2. Lecture: What determines the surface temperature / surface energy budget (Kerstin Ebell and Marion Maturilli)</li> <li>3. Lecture: What determines the lack of mixing / role of mixed-phase clouds (Vera Schemann)</li> <li>4. Lecture: Modelling the role of clouds for the Arctic temperature profile across scales (Roel Neggers)</li> <li>5. Lecture: Moist intrusions and Arctic climate (Rodrigo Caballero)</li> </ol>
<b>Methods</b>	Atmospheric modelling; In situ and remote sensing observations; re-analysis; theoretical considerations
<b>Type</b>	Two-day block course (days 1/2 – lectures; day 3 – contributions/discussions) Virtual meeting, <a href="https://uni-leipzig.zoom.us/j/61609985250?pwd=cTdjVUJYXQ2SVZVTWZXdTkwazE2Zz09">https://uni-leipzig.zoom.us/j/61609985250?</a> pwd=cTdjVUJYXQ2SVZVTWZXdTkwazE2Zz09 Meeting ID: 616 0998 5250; Passcode: 387493
<b>Date</b>	15 – 17 March 2021
<b>Time</b>	1.00 p.m. (Day 1) – 12.30 p.m. (Day 3)
<b>Work load</b>	16 hours presence / 50 hours self-study
<b>Examination</b>	Practical tasks during ATM (reporting about lectures, lead in discussions)
<b>Credit points</b>	2
<b>Responsible scientists</b>	Johannes Quaas
<b>Guest lecturers</b>	Rodrigo Caballero (U Stockholm) Nicole Feldl (University of California, Santa Cruz) Kyle Armour (University of Washington, Seattle)
<b>Recommendations for literature</b>	Goosse et al. N Comm 2018; Block et al. Tellus 2020; Lauer et al. Met Z 2020



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## Program schedule

### *Monday, 15 March 2021*

- 16.00 h Preparation of PhD candidate contributions (Johannes Quaas, Olivia Linke)
- 16.45 h Welcome, opening remarks (Johannes Quaas)
- 17.00 h Arctic feedbacks and the role of the lapse-rate feedback (Nicole Feldl)
- 17.45 h Discussion
- 18.00 h Break
- 18.15 h The lapse-rate feedback and Arctic processes (Kyle Armour)
- 19.00 h Discussion
- 19.15 h End day 1

### *Tuesday, 16 March 2021*

- 9.30 h What determines the lack of mixing / role of mixed-phase clouds (Vera Schemann)
- 10.15 h Discussion
- 10.30 h Break
  
- 10.45 h What determines the surface temperature / surface energy budget (Marion Maturilli and Kerstin Ebell)
- 11.30 h Discussion
- 11.45 h Break
  
- 14.00 h Modelling the role of clouds for the Arctic temperature profile across scales (Roel Neggers)
- 14.45 h Discussion
- 15.00 h Break
  
- 15.15 h Moist intrusions and Arctic climate (Rodrigo Caballero)
- 16.00 h Discussion
- 16.15 h End day 2

### *Wednesday, 17 March 2021*

- 9.30 h Breakout-group discussions
  - (a) Surface temperature change
  - (b) Inversion, mixing, and clouds
  - (c) Free-tropospheric temperature change
- 11.00 h Break
- 11.30 h Reports
- 12.30 h Final discussion
- 13.00 h End