Announcement of a topic for:

Seminar Research	**X**	
Seminar Methods	**X**	
Master Theses	**X**	(please mark one or more)

Topic	How tropical is the Arctic energy balance?
Release Date	15.8.24
Supervisor (contact)	Maximilian Maahn Leipzig Institute for Meteorology Room 1.11 maximilian.maahn@uni-leipzig.de
Additional Contact	
Second Reviewer	Johannes Quaas
Description:	The lapse rate in the Arctic used to be is largely determined by the balance between radiative cooling of the atmosphere and advective heating by energy transport from lower latitudes ("radiative-advective equilibrium") (Serreze and Barry, 2014). However, analysis of model results obtained in the (AC)3 project demonstrated that at least in certain conditions, the Arctic shifts more towards radiative-convective equilibrium, where the importance of advection for atmospheric heating decreases, and the significance of latent heating increases (Linke and Quaas, 2022). The Arctic atmosphere, at least occasionally, is increasingly moving from its Arctic atmospheric energy balance to a more tropical one. The idea of the thesis is to use 17 years of satellite-based cloud observations from the CloudSat satellite to investigate whether there are already trends in the number of Arctic connective clouds (Sassen and Wang, 2008) in the last years. The student will learn methods for analyzing big data sets with Python, but basic Python coding skills are advantageous.
Literature:	• Linke, O., and J. Quaas, 2022: The Impact of CO2-Driven Climate Change on the Arctic Atmospheric Energy Budget in CMIP6 Climate Model Simulations. Tellus A: Dynamic Meteorology and Oceanography, 74, doi:10.16993/tellusa.29. • Sassen, K., and Z. Wang, 2008: Classifying clouds around the globe with the CloudSat radar: 1-year of results. Geophysical Research Letters, 35, 2007GL032591, doi:10.1029/2007GL032591. • Serreze, M. C., and R. G. Barry, 2014: The Arctic Climate System. 2nd ed. Cambridge University Press, https://www.cambridge.org/core/product/identifier/9781139583817/type/book.