Announcement of a topic for:
Master Theses

Topic	Dynamics of Arctic Oscillation in different forcing scenarios: Implications to lapse rate feedback
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Description:	In recent decades the global temperature has been rising at an unprecedented rate, and it might be above the pre-industrial level at the end of the 21st century (IPCC 2022). Impor- tantly, the enhanced surface warming in the Arctic compared to the global average is well documented (Chapman and Walsh 1993; Hansen et al. 2006; Solomon et al. 2007). The main indicators of Arctic warming are, for instance, surface air temperatures, reduced sea-ice area, etc. Additionally, the Arctic Oscillation (AO) refers to an atmospheric circulation pattern over the mid-to-high latitudes of the Northern Hemisphere and is also an indicator of Arctic warming. The most obvious reflection of the phase of this oscillation is the north-to-south location of the storm-steering, mid-latitude jet stream (Thompson et al., 1998). Thus, AO strongly influences the weather and the climate in the mid-latitudes (Thompson et al., 2001). Further, the lapse rate feedback refers to the deviation from the uniform temperature change throughout the troposphere, one of the dominant causes of Arctic amplification (Linke and Quaas, 2021). The proposed master thesis explores the positive and negative phases of AO in different emission scenarios using the CMIP-6 simulations (preferably with RFMIP). And investigate the lapse rate feedback mechanism in the positive and negative phases of AO.

Literature:	1. IPCC, 2022: Summary for Policymakers [H.-O. Pörtner, D.C. Roberts, E.S. Poloczanska, K. Mintenbeck, M. Tignor, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem (eds.)]. In: Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press. 2. Chapman, W.L. & Walsh, J.E. (1993). Recent variations of sea ice and air temperature in high latitudes. Bull. Am. Met. Soc., 74, 33–47. 3. Hansen, J., M. Sato, R. Ruedy, K. Lo, D. W. Lea, and M. Medina-Elizade, 2006: Global temperature change. Proc. Natl. Acad. Sci. USA, 103, 14 288–14 293. 4. Solomon, S., D. Qin, M. Manning, M. Marquis, K. Averyt, M. M. B. Tignor, H. L. Miller Jr., and Z. Chen, Eds., 2007: Climate Change 2007: The Physical Science Basis. Cambridge University Press, 996 pp. 5. Thompson, D.W.J., and J.M. Wallace, 2001: Regional Climate Impacts of the Northern Hemisphere Annular Mode. Science, 293, 85-89. 6. Thompson, D.W.J., and J.M. Wallace 1998: The Arctic Oscillation signature in wintertime geopotential height and temperature fields. Geophys. Res. Lett. 25, 1297-1300. 7. Linke, O. and Quaas, J., 2022. The Impact of CO2-Driven Climate Change on the Arctic Atmospheric Energy Budget in CMIP6 Climate Model Simulations. Tellus A: Dyn. Meteorol. Oceanogr., 74(2022), pp.106–118. http://doi.org/10.16993/tellusa.29