



The influence of anomalous atmospheric conditions on cloud properties at Ny-Ålesund

Tatiana Nomokonova (1), Kerstin Ebell (1), Ulrich Löhnert (1), Marion Maturilli (2), and Christoph Ritter (2)

(1) University of Cologne, Institute for Geophysics and Meteorology, Cologne, Germany (tnomokon@uni-koeln.de), (2) Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Potsdam, Germany

Arctic warming is currently one of the most discussed topics in atmospheric research. Besides the observed significant trend in the near-surface temperature, moisture and temperature anomalies on daily to monthly time scales occur frequently in the Arctic [1]. The positive and negative anomalies in temperature and amount of water vapour are often driven by certain weather patterns which are related to the transport of warm and moist air from North Atlantic or the transport of cold and dry air from the Polar regions. These anomalous conditions will potentially affect cloud occurrence and their phase partitioning and therefore, influence the radiation budget.

In this study we look at temperature and water vapour anomalies which occur at Ny-Ålesund. We identify anomalous situations using daily two-meter surface temperature and integrated water vapour to calculate frequency of occurrence of extreme events. We consider cases as extreme events when temperature or water vapour are below the 10th and larger than the 90th percentiles for negative and positive anomalies, respectively.

For the analysis, we use observations of the various instrumentation from the AWIPEV (the German Alfred Wegener Institute for Polar and Marine Research and the French Polar Institute Paul Emile Victor) observatory. Two-meter temperature is obtained from long-term Baseline Surface Radiation Network (BSRN) observations. The integrated water vapour is provided by a microwave radiometer. Cloud observations at Ny-Ålesund were performed by a set of active remote sensing instruments: a ceilometer operating since 2011 was complemented with a 94 GHz FMCW cloud radar in 2016. In order to get information on vertical distribution of hydrometeor types, the CLOUDNET algorithms have been applied to the observations, including also a target classification.

In this study, we present an analysis of clouds occurring under different anomaly conditions at Ny-Ålesund. We analyse the occurrence of clouds and hydrometeors, cloud type (liquid, ice, mixed-phase) as well as cloud microphysical properties. We relate different types of clouds occurring within these anomalous episodes to the weather patterns and atmospheric circulations. The analysis is also performed for different seasons.

In the future we will also analyse the cloud radiative effect for these temperature and water vapour anomalies. If such anomalies will occur more often in the future, this might lead to larger impact on Arctic climate.

We gratefully acknowledge the funding by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) – Projektnummer 268020496 – TRR 172, within the Transregional Collaborative Research Center “Arctic Amplification: Climate Relevant Atmospheric and Surface Processes, and Feedback Mechanisms (AC)³”. We acknowledge Ewan O’Connor for providing the Cloudnet algorithms.

References

[1] J. E. Overland and M. Wang, 2016: Recent Extreme Arctic Temperatures are due to a Split Polar Vortex, *Journal of Climate*, 29, 5609-5616, doi: 10.1175/JCLI-D-16-0320.1.