Title	**Characterization of the cloud conditions at Ny-Ålesund using sensor synergy and representativeness of the observed clouds across Arctic sites**

Author's full name	Tatiana Nomokonova (1), Kerstin Ebell (1), Ulrich Löhnert (1), Marion Maturilli (2), Christoph Ritter (2), Roland Neuber (2)
Author's affiliations	1) Institute for Geophysics and Meteorology, University of Cologne, Cologne, Germany 2) Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Potsdam, Germany
First author's email	tnomokon@uni-koeln.de

Included in session:

- ☐Svalbard research in the future
- ☐Tool Box new tools, methods, platforms to conduct research in Svalbard
- ☐From observation to integrated studies - wider use of data
- ☐Drivers of environmental changes - climatic and other human factors
- ☐A global context for Svalbard research - connecting to the world
- ☒Atmosphere research in Svalbard
- ☐Terrestrial research in Svalbard
- ☐Glaciological research in Svalbard
- ☐Marine research in Svalbard

Presentation preference (☒ oral, ☐ poster). The Advisory Scientific Committee will select presentation format.

Abstract text (Times New Roman 11) and figures. The abstract must not exceed one page in total. This leaves room for a text of about 3500 characters – space for figures will reduce this number.
Word file only.
A book of abstracts will be published in connection with the conference.
Submit no later than August 10 to **abstract@rcn.no**

Clouds are one of the crucial components of the hydrological and energy cycles and thus affecting the global climate. Their special importance in Arctic regions is defined by cloud's influence on the radiation budget. Arctic clouds usually occur at low altitudes and often contain highly concentrated tiny liquid drops. During winter, spring, and autumn periods such clouds tend to conserve the long-wave radiation in the atmosphere and, thus, produce warming of the Arctic climate. In summer though clouds efficiently scatter the solar radiation back to space and, therefore, induce a cooling effect. An accurate characterization of the net effect of clouds on the Arctic climate requires long-term and precise observations. However, only a few measurement sites exist which perform continuous, vertically resolved observations of clouds in the Arctic, e.g. in Alaska, Canada, and Greenland. These sites typically make use of a combination of different ground-based remote sensing instruments, e.g. cloud radar, ceilometer and microwave radiometer in order to characterize clouds.

Within the Transregional Collaborative Research Center (TR 172) "Arctic Amplification: Climate Relevant Atmospheric and Surface Processes, and Feedback Mechanisms (AC)³" (www.ac3-tr.de) comprehensive observations of the atmospheric column are performed at the German-French Research Station AWIPEV at Ny-Ålesund, Svalbard. Ny-Ålesund is located in the warmest part of the Arctic where climate is significantly influenced by adiabatic heating from the warm ocean (Maturilli, et al., 2016). Thus, measurements at Ny-Ålesund will complement our understanding of cloud formation and development in the Arctic.

This particular study is devoted to the characterization of the cloud macro- and microphysical properties at Ny-Ålesund and of the atmospheric conditions, under which these clouds form and develop. To this end, the information of the various instrumentation at the AWIPEV observatory is synergistically analysed: information about the thermodynamic structure of the atmosphere is obtained from long-term radiosonde launches. In addition, continuous vertical profiles of temperature and humidity are provided by the microwave radiometer HATPRO. A set of active remote sensing instruments performs cloud observations at Ny-Ålesund: a ceilometer and a Doppler lidar operating since 2011 and 2013, respectively, are now complemented with a novel 94 GHz FMCW cloud radar. As a first step, the CLOUDNET algorithms, including a target categorization and classification, are applied to the observations (Illingworth et al., 2007).

In this study, we will present a first analysis of cloud properties at Ny-Ålesund including for example cloud occurrence, cloud geometry (cloud base, cloud top, and thickness) and cloud type (liquid, ice, mixed-phase). The different types of clouds are set into context to the environmental conditions such as temperature, amount of water vapour, and liquid water. We also expect that the cloud properties strongly depend on the wind direction. The first results of this analysis will be also shown.

References

[1] M. Maturilli, M. Kayser, Arctic warming, moisture increase and circulation changes observed in the Ny-Ålesund homogenized radiosonde record, *Theoretical and Applied Climatology,* DOI 10.1007/s00704-016-1864-0, (2016).
[2] A. Illingworth, R. Hogan, E. O'Connor, and D. Bouniol, *Cloudnet, Bulletin of the American Meteorological Society*, 88(6), 883 (2007).