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Measuring ice and liquid water content in moderately supercooled clouds with Cloudnet

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The interaction between ice nuclei and clouds is an important topic in weather and climate research. Recent laboratory experiments and field in-situ field campaigns present more and more detailed measurements of ice nucleating particles (INP) at temperatures close to 0°C. This brings moderately supercooled mixed-phase clouds into the focus of current cloud research. One current example is the European Union BACCHUS project. A major goal of BACCHUS is the analysis of the anthropogenic impact on ice nucleation.

Within this project, we use the Leipzig Aerosol Cloud Remote Observations System (LACROS) and the Cloudnet framework in order to get quantitative insight into the formation of ice in mixed-phase layered clouds with cloud top temperature (CTT) from -40 to 0°C. Depolarization measurements from lidar and radar show a clear dependence between particle shape and the temperature under which the particles have been formed. The special focus of this work is on the CTT range from -10 to 0°C. An algorithm is presented to decide between ice and liquid water precipitation falling from the clouds showing that between 10% and 30% of all layered clouds show ice precipitation with CTT between -5 and 0°C. For these slightly supercooled clouds an average ice-water-content between 10e-7 and 10e-8 [kg per cubic meter] is found.