Project: **1086**

Project title: **High-resolution modelling around supersites for cloud and precipitation observations**

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Report period: **2018-07-01 to 2019-06-30**

During the reporting period simulations around three different supersites and observational campaigns have been performed.

Around JOYCE (Jülich, Germany) several simulations have been performed in order to explore the potential to constrain microphysical parameter and parameterizations by the use of novel triple frequency radar observations. To gain more insights into the details of the microphysical parameterizations, sensitivity experiments are a key tool. Another aspect which has been investigated is the question how the land surface is influencing the cloud formation and distribution of water vapor. While more publications are still in preparation, the sensitivity experiments performed to investigate the distribution of water vapor have already been discussed in Marke et. al. 2019 (submitted).

The simulations around Ny-Ålesund (Svalbard, Norway) were focused on the representation of low-level mixed phase clouds. We investigated the general representation and performed usability studies. We found a strong dependency on the large-scale forcing, which shows the need for sensitivity experiments and the potential for improvements in the general representation of the atmospheric structure. Again the main aim was and is to create a synthesis of these simulations with novel observations. Figure 1 shows a statistical comparison of simulated and observed radar reflectivities. The simulated reflectivities are based on ICON-LEM simulations with 75m edge length and the forward simulator PAMTRA. Some features are captured well, while others are clearly underrepresented. Those statistical analysis create the potential and guidance for more in depths analysis.

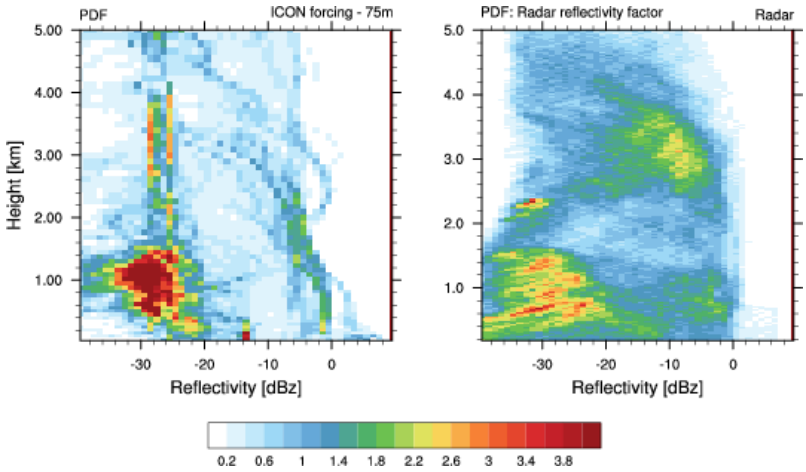

Figure 1: 2D Histogram of simulated (left) and observed (right) radar reflecitivities for 4 days (14.6.-18.6.2017)

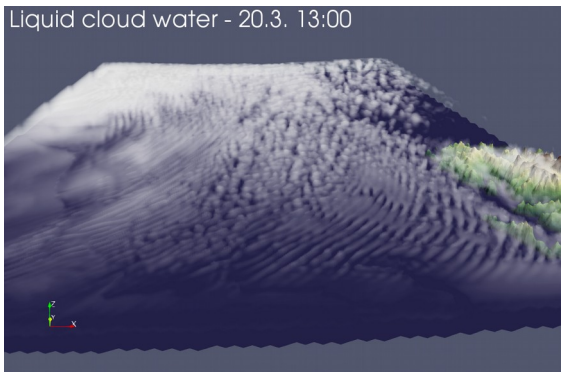

Figure 2: Volume rendering of liquid water snapshot during cold-air outbreak

During the Arctic aircraft campaign Arctic Boundary Layer Fluxes (AFLUX) from March 2019 to April 2019 in Svalbard, we used the ICON-LEM to perform high-resolution forecasts for the flight planning. Those simulations started with NWP simulations and a grid spacing of approx. 2 km (forced by the global ICON), which then have been used to force ICON-LEM simulations at a grid spacing of 600m. Due to the special environment and season high-resolution forecasts can support the flight planning to capture special events like the cold-air outbreak shown in Figure 2. The evaluation of these simulations and the analysis of the potential for high-resolution forecasts will be part of the next request and period.

Publications:

Marke, T., U. Löhnert, V. Schemann and S. Crewell: Detection of land surface induced atmospheric water vapor patterns (submitted)