Project: 1086
Project title: High-resolution modelling around supersites for cloud and precipitation observations
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Cloud and precipitation formation at specific locations

While our study on the general performance of the ICON-LEM model at the Arctic supersite (**Ny-Ålesund** at Svalbard) got published, our research focus shifted to an improved understanding of phase partitioning and phase transitions in Arctic low-level mixed-phase clouds. For this, we performed additional sensitivity simulations and used a specific postprocessing tool (microphysics wrapper) to calculate the microphysical tendencies. The resulting study is currently under review.

For the simulations at a german location (**JOYCE (Jülich)**, **Cologne and the Rhinarea**), we performed several simulations, which are part of two ongoing master theses. For Joyce, we performed several simulations, which are used for comparison with a scanning microwave radiometer. The observations can give insights on the horizontal distribution of moisture and the interesting connection would be the relation to the heterogeneous surface. The model output is used as input to an instrument simulator, which then can reproduce the observations. This allows us to analyze how well the model can represent the horizontal variability and opens the possibility for further sensitivity studies e.g. with changed or adapted surface structures.

For Cologne and the Rhinearea, the focus is more on urban heat islands and the potential cooling effect of low-level jets. For this a highly resolved topography and high resolution is very essential in order to capture the topographic influence of the rhine valley. The performed simulations are at the moment compared to several observations ins urban and rural places and evaluated based on these different measurements (wind, humidity, etc.). Figure 1 shows as an Example the comparison of the wind direction and speed at different observations and for the different resolutions of the simulation (ongoing work). Depending on the results further sensitivity studies will be performed to further understand the topographic and surface contributions.

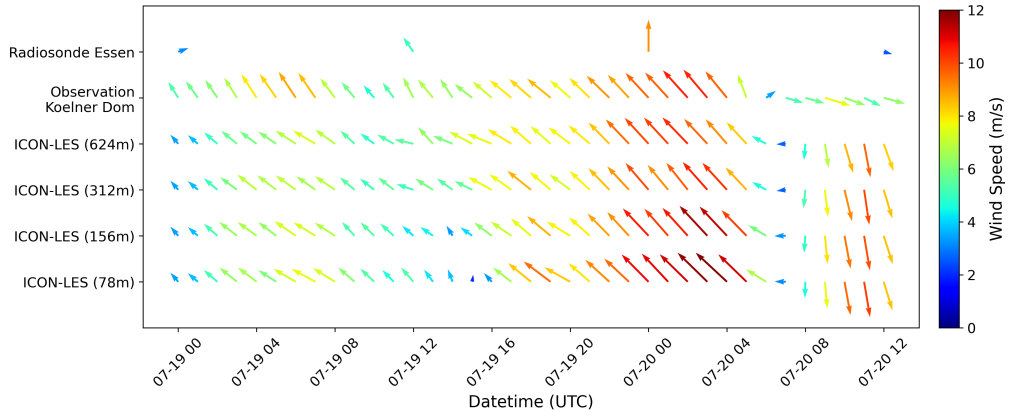

Figure 1: Comparison of the wind direction and speed of two different measurements and the different resolutions of the simulation.

Air mass transformation in the arctic region and the influence on cloud processes

We performed some more detailed simulations for special cases from the HALO-(AC)3 aircraft campaign, that happened in march 2022 with the aim to understand air mass transformations in the Arctic. A special focus is on the cold air outbreaks, which are - due to the very narrow boundary layer over sea ice - often poorly represented in todays weather prediction models.

Additionally, we had to resimulate - due to a major bug in the model - several simulations around three Arctic observational supersites. These simulations are investigated at the moment with respect

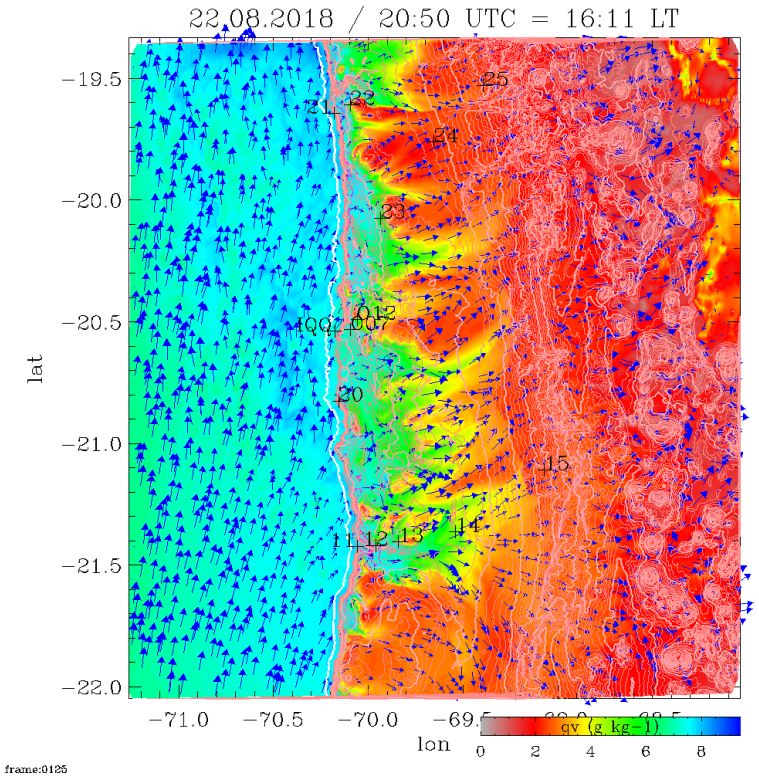

Figure 2: Wind and humidity for the simulations at the coast of Chile (Iquique)

to the very different surface conditions.

Atacama desert (Iquique) in Chile

We performed more detailed simulations for the Atacama desert at the coast of chile. Our main interest was the representation of the local wind systems (sea breeze) as well as the formation (and persistence) of stratocumulus clouds at the coast. The latter is currently investigated in more detail in another ongoing master thesis. Figure 2 shows the analysis of the humidity and wind structure at the coast of Chile. The first impression on the transport processes and wind systems is quite positive, but also leaves room for improvements.