Project: **1100**
Project title: **Climate model PArameterizations informed by RAdar**
Principal investigator: **Johannes Quaas**
Report period: **2020-01-01 to 2020-12-31**
Text: maximum of two pages incuding figures.

The work consisted of the two research axes in the sub-project on the GCM parameterisations PARA, which focused on the ICON-A GCM; and the sub-project on ground-based radar observations vs. ICON-NWP in the PICNICC sub-project.

The GCM work on PARA progressed as anticipated. The simulations were highly instrumental in making progress in revising the cloud microphysical parameterisations. An example is shown in Fig. 1: Using the subgrid scale variability, typically the ice conversion to snow is enhanced, and subsequently cloud ice is reduced. This is now an improved result that makes use of a detailed comparison to satellite data, involving now the satellite forward simulator.

The work on PICNICC was slightly delayed since the PhD candidate was more heavily involved in the observational field work than anticipated. This is a main reason why less computing time was consumed than anticipated. However, the first important steps towards the comparison to ground-based radar were performed.

For the domain around Punta Arenas in South Chile, a grid with 10 km resolution was created to test ICON settings. First test runs in which the number of cloud condensation nuclei and ice nucleating particles was varied were performed and the impacts on cloud structure and hydrometeor type were assessed. For the 10 km test grid, the prevailing hydrometeor type seems to be sensitive to the CCN/ INP concentrations chosen in the runs with 2-moment microphysics scheme. A radar forward operator (PAMTRA) was applied to the meteogram output of the ICON model. Forward-modeled radar reflectivities can be seen in Fig. 2. The cloud structure and reflectivity values agree in a reasonable range with observations. In the future, further studies will be carried out with a finer model resolution and nested domains.

Figures

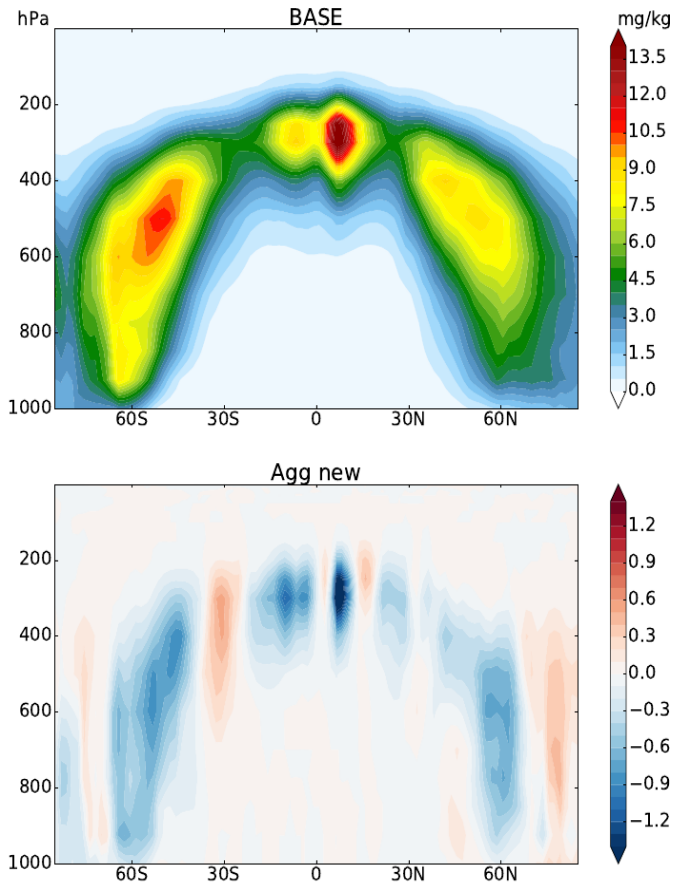

Fig. 1. Specific cloud ice with a new subgrid-scale variability scheme that now is tied to the variability as constrained by satellite observations. Using the subgrid scale variability, typically the ice conversion to snow is enhanced, and subsequently cloud ice is reduced.

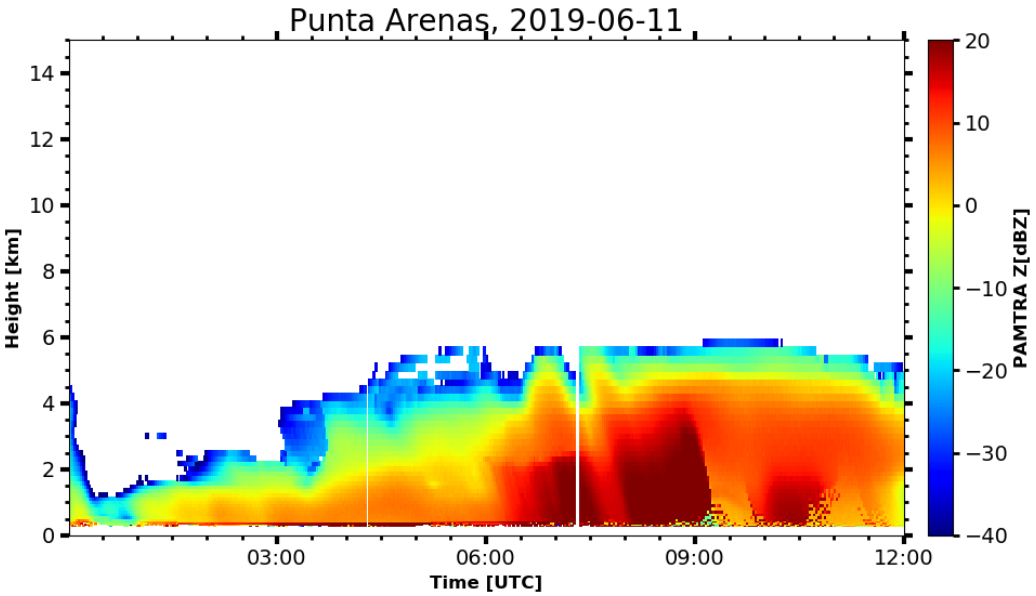

Fig. 2. Forward-simulated radar reflectivity on the basis of an ICON-NWP simulation for Punta Arenas, Chile.