Project: **1002**

Project title: **Forcing in the long-wave spectrum due to aerosol-cloud interactions: satellite and climate modelling vs. HALO (FLASH)**

Project lead: **Johannes Quaas**

Report period: **1.7.2016 - 30.6.2017**

In the report period, we assessed the simulated ice crystal number concentration in the ECHAM-HAM aerosol-climate model (Stevens et al., 2013; Zhang et al., 2012) using satellite observations DARDAR-LIM (based on Delanoë and Hogan, 2010).

Some results on the geographical distribution for the ice crystal number concentration (ICNC) are shown in Fig. 1 for isothermal surfaces between -10 and -80 °C, with spacing 10°C. The results are from a simulation for October 2006 to February 2008. The same distributions inferred from active satellite observations are presented in Fig. 2. It can be observed that the retrieved and simulated ICNC are within the same order of magnitude but discrepancies still appear, such as the lack of increase of the ICNC with decreasing temperature, which only appears in the satellite observations. The spatial distribution of ICNC also is different between the two dataset, with smaller contrasts between high and low values in the observations, although strong increases near orographic areas (driven by strong updrafts) are observed in both Fig. 1 and Fig. 2.

Given the novelty of these results, further simulations and a thorough evaluation against in situ observations are necessary. To reach this goal, comparisons to measurements of the HALO aircraft as well as an evaluations using high resolution simulations from the ICON model (Heinze et al., 2017) are intended over the next project period.

References

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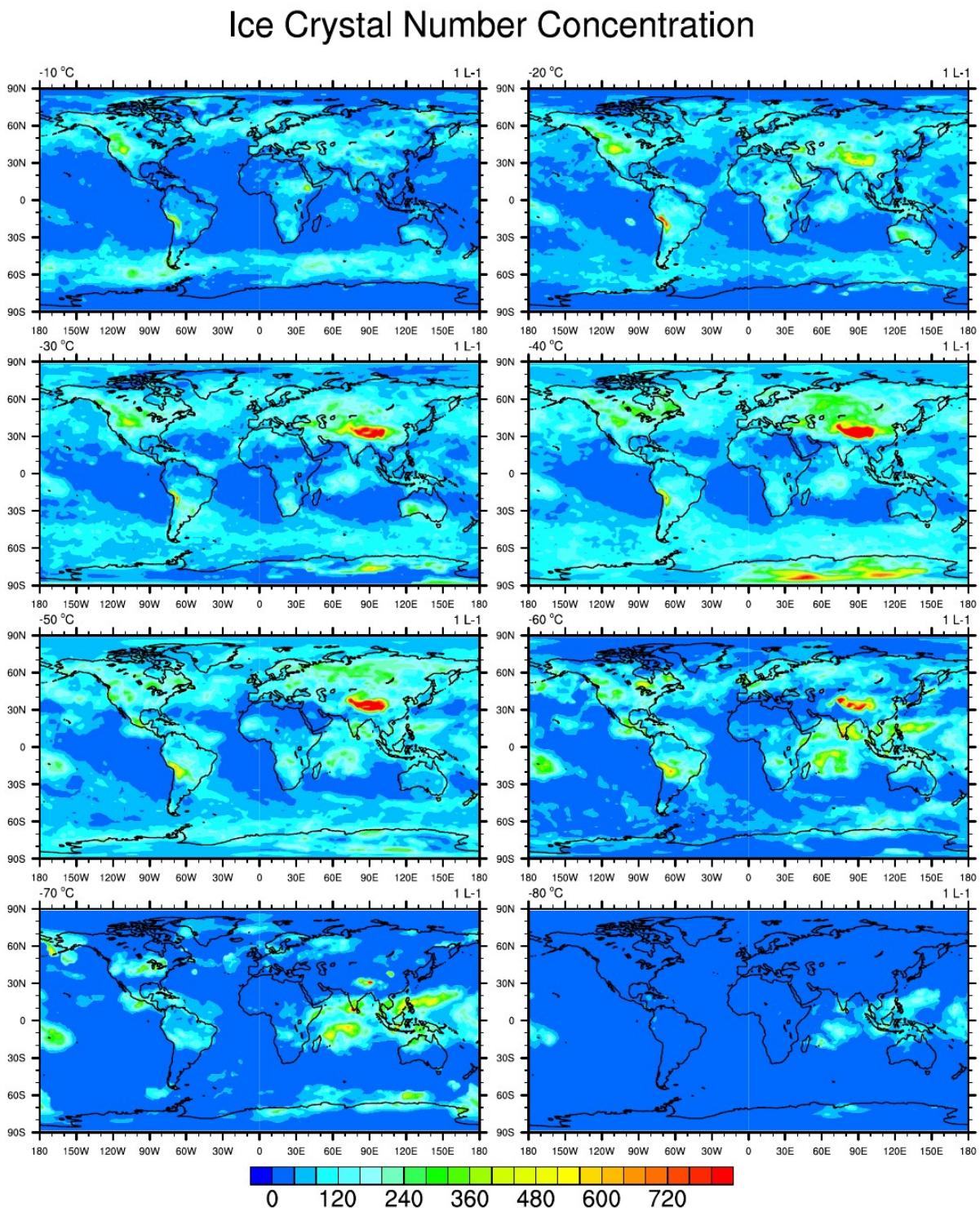

Fig. 1: Annual-average geographical distribution of the simulated all-sky ice crystal number concentration (zero in cloud-free conditions) in ECHAM6-HAM2 (l^{-1}) for isothermal surfaces at -10°C (top left), -20°C (top right), etc. to -70°C (bottom left) and -80°C (bottom right).

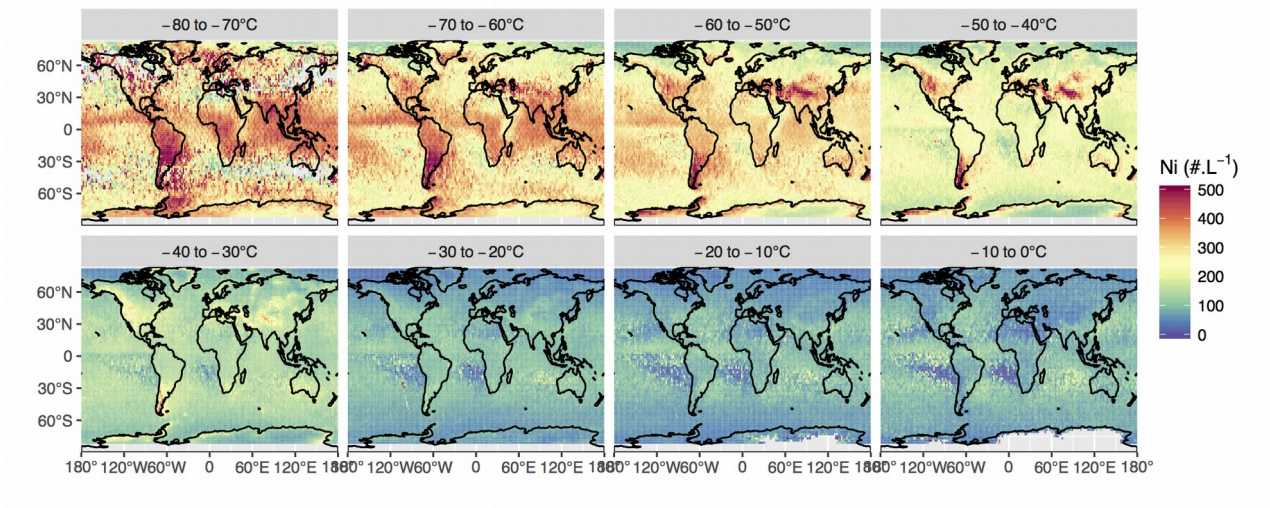

Fig. 2: Same as Fig. 1 for the DARDAR-LIM satellite retrievals.