Project: **1036**

Project title: **ArctiC Amplification: Climate Relevant Atmospheric and SurfaCe Processes, and Feedback Mechanisms, (AC)³ – University of Leipzig contribution**

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Report period: **1.1.2017 - 31.12.2017**

By administrative mistake by the PI, the resources of this project were not adequately used in a large part of the year, but the resources of the ACLOUD project (1037) were over-used instead. We apologize for this serious mistake, which will not happen again.

Since the science has been performed nevertheless (albeit by over-using project 1037), we are able to report here.

The goal of the project was to assess the Arctic clouds as simulated by the ECHAM6 (Stevens et al., 2013) and ECHAM6-HAM2 (Zhang et al., 2012) atmospheric GCM and aerosol-atmosphere GCM, respectively. For this, integrations with prescribed sea surface temperatures, nudged to ECMWF re-analyses were performed, applying the Cloud Feedback Model Intercomparison Project (CFMIP) Observational Simulator Package (COSP; Bodas-Salcedo et al., 2008; Nam and Quaas, 2012) for comparison to the GCM-Oriented CALIPSO Cloud Product (GOCCP, Chepfer et al., 2010).

The central result is shown in Fig. 1: Clouds are heavily underestimated over most parts of the globe, attributable to a lack of low-level clouds especially over oceans (this confirms previous findings, e.g. Nam and Quaas, 2012). More important and very interesting, in contrast, is the fact that over sea ice and snow, cloudiness is substantially overestimated. Sensitivity studies have been performed to investigate this overestimation further. It has been found that this bias is common to ECHAM and ECHAM-HAM, that it is not only caused by erroneous surface fluxes, and that most likely cloud microphysics play a role. The cloud bias also affects biases in relative humidity. A publication is in preparation.

References

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Figures

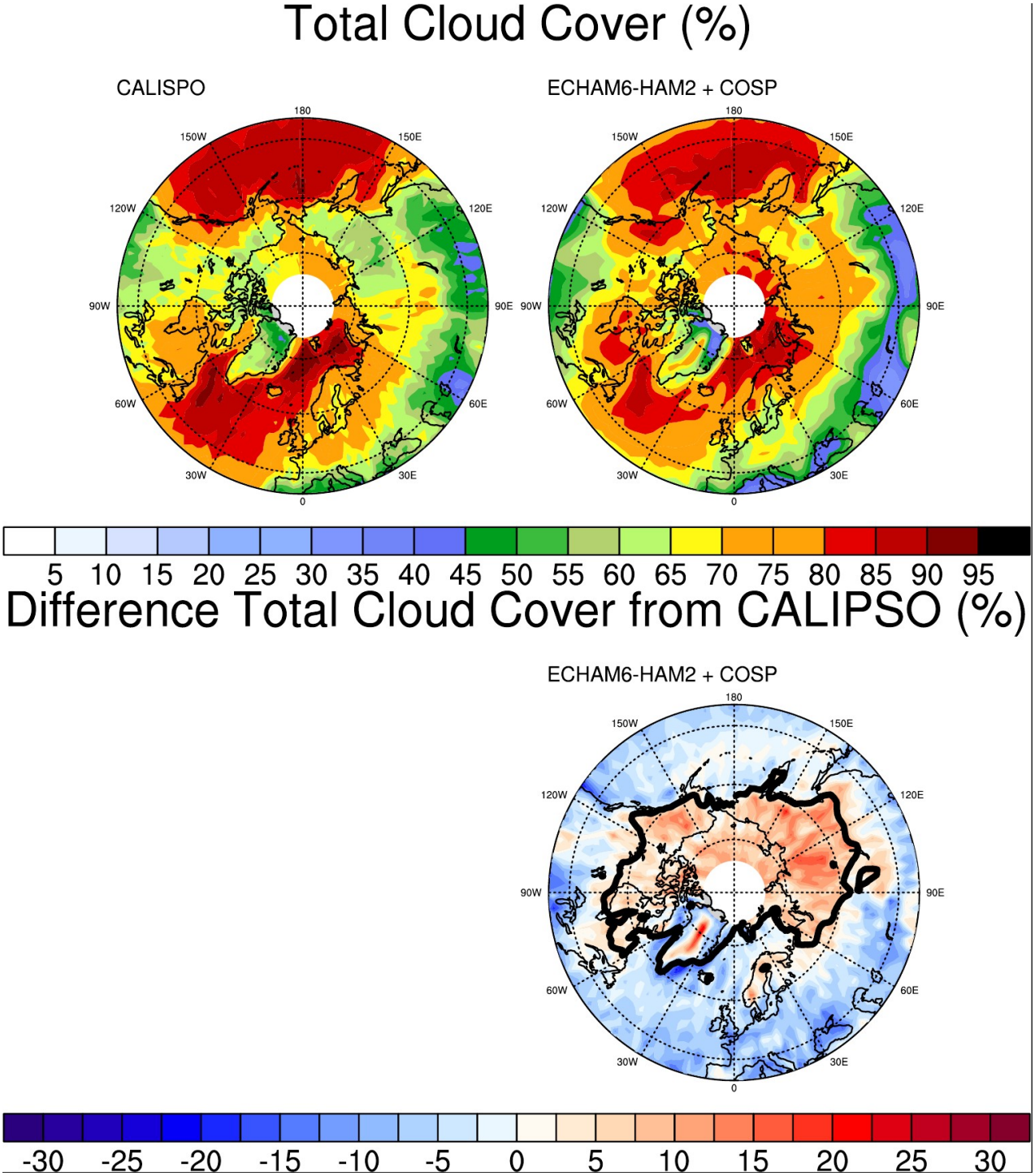

Fig. 1. Cloud cover as derived from the CALIPSO satellite observations (top left), as derived from the ECHAM6-HAM2 aerosol-climate model applying the COSP satellite simulator (top right), and difference between the two (bottom right). The thick black line in the bottom figure is the margin of the sea ice and snow extent.