Geophysical Research Abstracts
Vol. 20, EGU2018-9116-3, 2018
EGU General Assembly 2018

The role of clouds in future Greenland surface mass balance projections

Stefan Hofer (1), Andrew Tedstone (1), Xavier Fettweis (2), and Jonathan Bamber (1)

(1) University of Bristol, School of Geographical Sciences, Bristol, United Kingdom (s.hofer@bristol.ac.uk), (2) Laboratory of Climatology, Department of Geography, University of Liège, Liège, Belgium

Global temperature rise due to increasing atmospheric greenhouse gas concentrations has been shown to be especially pronounced in the Arctic. The projected total contribution from Greenland Ice Sheet (GrIS) melt to the barystatic sea level rise depends mostly on the emission scenario. However, outputs from regional climate models and GCMs also show significant differences in total GrIS melt even within one emission scenario of up to a factor of two.

In this study, we use the regional climate model MAR forced by CMIP5 GCM output to show that differences in longwave radiation anomalies are likely to be the main cause of different projections of melting over the Greenland Ice Sheet during the 21st century. The different accumulated melt amounts however, can't be explained by differences in atmospheric temperature levels alone. We show that a large proportion of the difference in downwelling longwave radiation and subsequent variation in total melt between the models stems from differences in modelled cloud properties which alter the longwave emissivity of the atmosphere. Therefore, it is essential for accurate future projections of GrIS surface mass balance to further develop the representation of cloud processes in (regional) climate models.