OBSERVATIONAL ASSESSMENT OF SNOW ACCUMULATION ON NORTHERN HEMISPHERE IN CMIP5 CLIMATE MODEL SIMULATIONS AND GLOBSNOW SATELLITE-BASED DATA RECORD

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ABSTRACT

The European Space Agency (ESA) GlobSnow project has produced a daily hemisphere-scale satellite-based snow water equivalent (SWE) data record spanning more than 30-years. The GlobSnow SWE record, based on methodology by Pulliainen [1] utilizes a data-assimilation based approach for the estimation of SWE which was shown to be superior to the approaches depending solely on satellite-based data [2]. The GlobSnow SWE data record is based on the time-series of measurements by two different space-borne passive radiometers (SMMR and SSM/I) measuring in the microwave region, spanning from 1979 to present day. The sensors utilized provide data at K- and Ka-bands (19 GHz and 37 GHz respectively) at a spatial resolution of approximately 25 km. The GlobSnow SWE data record is available through the GlobSnow web-pages (www.globsnow.info).

The GlobSnow satellite-based dataset is inter-compared with climate model simulations from the CMIP5 archive. The objective of this work is to investigate the performance of the CMIP5 models in capturing the evolution of hemispheric scale snow conditions for the period of 1980 to 2010. The climate model simulations on snow cover extent, snow depth and snow water equivalent are evaluated against the GlobSnow SWE record and other existing independent ground-based reference data. The eventual goal is to assess the performance of the CMIP5 models to simulate snow conditions for the time-period that is covered by satellite-based observations.

The results obtained so far indicate a clear decreasing trend in total hemispherical snow mass for the period of 1980 to 2010 in the remote-sensing based data record. The inter-comparison of satellite-based record and climate model simulations show notable differences in capturing the evolution of Hemispherical scale snow conditions. Similar trends of decreasing snow cover are also seen in the investigated CMIP5 models, although there are notable differences between the various climate models. Some of the models capture the overall hemispherical snow mass more accurately than others. In general the winter months (December, January and February) seem to be rather well captured, while the spring season, (March, April and May) appears more challenging for the climate models.

REFERENCES

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