CMIP5 気候モデルの北半球の積雪に関する再現性検証

阿部　学[1]、野沢　徹[2]、小倉知夫[3]、高田久美子[4]
[1]国立極地研究所・国立環境研究所
[2]岡山大学、[3]国立環境研究所、
[4]国立極地研究所・国立環境研究所・海洋研究開発機構地球環境変動領域

Assessment of snow amount in Northern Hemisphere simulated by CMIP5 climate models

Manabu Abe[1], Toru Nozawa[2], Tomoo Ogura[3], Kumiko Takata[4]
[1]*National Institute of Polar Research (NIPR), National Institute for Environmental Studies (NIES)*
[2]*Okayama University,* [3]*NIES,* [4]*NIPR, NIES, JAMSTEC RIGC*

We have investigated reliability of seasonal mean snow amount simulated by climate models. The observed data used in this study is Snow Water Equivalent (SWE) data version 1.3 produced by the European Space Agency (ESA) GLOBSNOW project (Luojus, *et al.* 2010). In this analysis, seasonal mean data averaged for 1980-2008 are used as the climatological data.
The observed seasonal mean data shows that large SWE distributes in the Northern high-latitude regions in DJF and MAM. Particularly, larger SWE are found in West and East Siberia and Alaska. On the other hand, the SWE is smaller in SON than the both seasons. In a bias analysis with the SWE averaged for the whole Northern high latitude land (40-80N), a lot of climate models have large positive biases in MAM and DJF (Fig. 1)
In MAM, models with smaller SWE than the observed SWE simulated smaller SWE in a region from West Siberia low land to Europe and the northeastern part of Canada. However, models with larger SWE than the observed SWE have larger SWE in both the regions. Also, there is a common feature of larger SWE than the observed SWE in the Central and Eastern Siberia, Central Asia, and Alaska in almost all the models. In DJF, a feature that models with smaller SWE simulated smaller SWE in the West Siberia low land and Central Siberia high land is added in the feature for MAM which is mentioned above. The similar biases to the biases shown in MAM are found in the models with larger SWE, although the biases are smaller in DJF than MAM. In an analysis with the Taylor diagram, spatial pattern correlation coefficients for the models are lower than 0.7 in DJF and MAM, and also varied remarkably between models. Further, the standard deviations for space in SWE are greater than the observed one. Models with smaller SWE biases in DJF and MAM tend to have more similar spatial pattern to the observed pattern.
These results reveal that models have large uncertainties for snow simulation. However, it is noted that the observed data also have uncertainties. Moreover, the large positive biases in SWE can affect surface radiation balance and atmospheric circulation. We therefore need a further analysis for impact of the SWE biases on simulated atmospheric and water circulation, particularly in MAM.

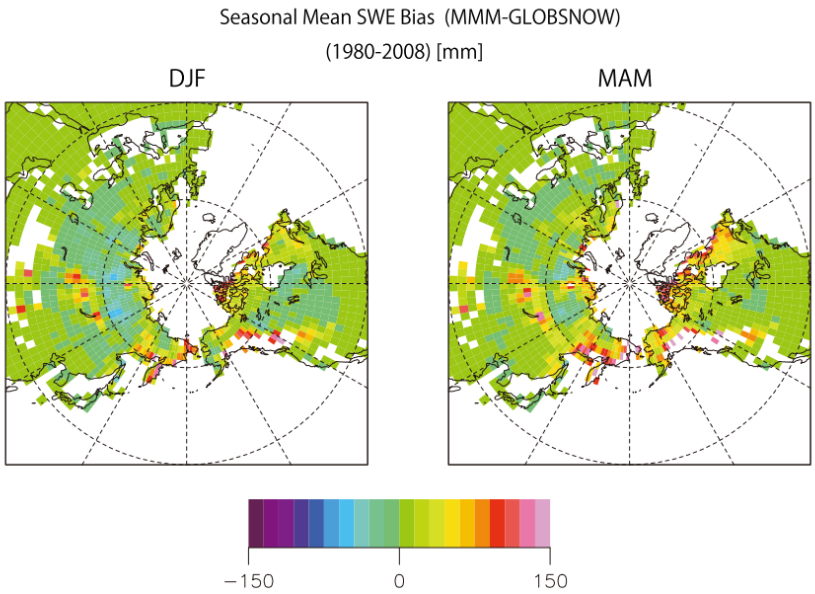

Figure 1 Seasonal mean SWE bias of Multi-model mean in DJF and MAM. Unit is mm.

Acknowledgment
This study has been supported by JSPS KAKENHI Grant Number 25750117.

References

Luojus, K., J. Pulliainen, M. Takala, C. Derksen, H. Rott, T. Nagler, R. Solberg, A. Wiesmann, S. Metsamaki, E. Malnes and B. Bojkov, Investigating the feasibility of the globsnow snow water equivalent data for climate research purposes, Geoscience and Remote Sensing Symposium (IGARSS), 2010 IEEE International, 2010