The hindcast data of Pusan National University coupled general circulation model (PNU CGCM) and August-October sea-surface temperature (SST) in the northern Barents-Kara Sea (BKI) and the sea-ice extent (SIE) in the Chukchi Sea (East Siberian Sea index [ESI]) are used for predicting 20km resolution anomalous 2m air temperature (aT2m) over Mongolia for boreal winter. For this purpose, area-averaged 2m air temperature (TI) and sea-level pressure (SLP) over Mongolia are defined. Then four large-scale indices, TI.mdl and SHI.mdl obtained from PNU CGCM, and TI.MLR and SHI.MLR obtained from multiple linear regressions on BKI and ESI, are incorporated using the artificial neural network (ANN) method for the prediction and statistical downscaling to obtain the monthly and seasonal 20km resolution aT2m over Mongolia in winter. An additional statistical method, which uses BKI and ESI as predictors of TI and SHI together with dynamic prediction by the CGCM, is used because of the relatively low skill of seasonal predictions by most of the state-of-the-art models and the multi-model ensemble systems over high-latitude landlocked Eurasian regions such as Mongolia. The results show that the predictabilities of monthly and seasonal 20km resolution aT2m over Mongolia in winter are improved by applying ANN to both statistical and dynamical predictions compared to utilizing only dynamic prediction. The predictability gained by the proposed method is also demonstrated by the probabilistic forecast implying that the method forecasts aT2m over Mongolia in winter reasonably well.

**Key words:** ANN, CGCM, Mongolian temperature, seasonal prediction

※ This work was carried out with the support of Rural Development Administration Cooperative Research Program for Agriculture Science and Technology Development under Grant Project No. PJ01345205, Republic of Korea.