Abstract

A new ensemble prediction system has been developed to facilitate climate research in the Meteorological Research Institute (MRI). The system, MRI-EPS (MRI Ensemble Prediction System), has been constructed by expansion of the ensemble forecasting system developed for operational one-month forecasting in the Japan Meteorological Agency (JMA). The MRI-EPS has the ability to calculate initial perturbations in the southern hemisphere (SH) as well as in the northern hemisphere (NH) and tropical region (TR). The perturbations used for ensemble forecasting are made with a breeding of growing mode (BGM) methodology.

This report outlines the MRI-EPS and explains the fundamentals relevant to ensemble prediction. The MRI-EPS can generate initial perturbations separately for the NH, SH, and TR. For convenience of users, daily perturbations of the NH and the SH up to 25 modes and perturbations of the TR up to two modes have already been calculated and stored for the period from 1 October 2001 to 31 March 2013. The MRI-EPS is therefore ready to perform ensemble prediction experiments using these perturbations for the global region with a lead time up to 34 days. A detailed Japanese manual for users of the MRI-EPS at MRI is also provided as an Appendix of this report.

To evaluate the performance of the MRI-EPS, we conducted the following two forecast experiments: we assessed the influence of the newly obtained SH perturbations on the forecast skill for the SH; and we investigated the predictability of the stratospheric sudden warming (SSW) that occurred in December 2001, an event that was thoroughly examined by Mukougawa *et al.* (2005). As a result, we found that the SH perturbation improves the forecast skill for the SH as well as the NH perturbation does for the NH. We also found that the skill of prediction of the December 2001 SSW was almost the same for the MRI-EPS and the JMA operational system. Furthermore, we found that application of the perturbations obtained with the MRI-EPS were very useful to predictability studies using the MRI climate model.