Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

MGI016-08 Room: 201B Time: May 27 15:30-15:40

Ensemble reanalysis of the global atmosphere

Takeshi Enomoto[1*]

[1]JAMSTEC

The atmospheric reanalysis has been widely used in analytic and simulation studies of the general circulation in recent years and has become an indispensable tool in the meteorology. With the existing reanalyses common features are extracted from many instances. By contrast the ensemble reanalysis allows statistics of a single instance. The existing reanalysis is composed of five dimensions (space, time and variables). New insights would be discovered by examining the ensemble reanalysis that appends the sixth dimension of the ensemble member.

Using AFES (atmospheric general circulation model for the Earth Simulator) and LETKF (local ensemble transform Kalman filter) we produced ALERA (AFES-LETKF experimental ensemble reanalysis) under the collaboration among the Japan Meteorological Agency, Japan Agency for Marine-Earth Science and Technology and Chiba Institute of Science (Miyoshi et al. 2007a). Operational observations used at JMA are assimilated with an exception of satellite irradiance data. The zonal and meridonal winds, temperature, dew-point depression, geopotential height and sea-level pressure are provided in 40 members for one and a half years. We use this dataset for predictability and observing system research. In the former the analysis ensemble spread is found to increase in prior to occurrence of various meteorological events (Enomoto et al. submitted to GRL). In the latter observing system experiments (OSE) for regional campaigns such as PALAU 2005 (Moteki et al. 2007), MISMO (Moteki et al. submitted to QJRMS) and Arctic drifting buoys (Inoue et al. 2009) have been conducted. Outcomes of OSE include new analysis techniques for ensemble data, evaluation of existing or additional observations and new insights into mechanisms and predictability.

Currently we are preparing for a succeeding dataset, ALERA2. An updated system uses LETKF without local patches to remove noise near the poles (Miyoshi et al. 2007b) with a slightly reduced horizontal resolution but larger ensemble size of 63. The boundary conditions are more frequent and fine. We plan to conduct OSE for regional campaigns conducted in 2008 (PALAU 2008, T-PARC and Mirai cruse in the Arctic Ocean). We also prepare for a longer reanalysis from 2003. Six-hour forecast variables such as precipitation and surface fluxes will be saved. Observation data used for operational forecast at National Centers for Environmental Prediction are obtained from UCAR. In the future various data will preferably be assimilated into CFES, there are many challenging problems concerning the differences in the governing equations and time scales. We start with application of ensemble techniques to assimilation of green-house gas, land surface and sea-ice data.

It is somewhat uncomfortable to obtain input data overseas. We chose to rely on the US institution since we do not have capabilities to collect and conduct quality check individual data. Unfortunately we do not have a Japanese counterpart of UCAR that archives data and develops input/output libraries and visualization tools. Recently the importance of such activities have shared among the Japanse communities and we are moving towards a better future. We would like to contribute to this trend through production and release of the ensemble reanalysis data.

Keywords: data assimilation, ensemble Kalman filter, predictability