International Session (Oral) | Symbol A (Atmospheric, Ocean, and Environmental Sciences) | A-AS Atmospheric Sciences, Meteorology & Atmospheric Environment

[A-AS02_29AM2]Data Assimilation in Earth Sciences

Convener:*Hirohiko Ishikawa(Disaster Prevention Research Institute, Kyoto University), Shigeo Yoden(Division of Earth and Planetary Sciences, Graduate School of Science, Kyoto University), Takeshi Enomoto(Disaster Prevention Research Institute, Kyoto University), Seon-Ki Park(Ewha Women's University), Chun-Chieh Wu(National Taiwan University), SHINICHI MIYAZAKI(Graduate School of Science, Kyoto University), Yoichi Ishikawa(JAPAN Agency for Marine-Earth Science and Technology), Chair:Takeshi Enomoto(Disaster Prevention Research Institute, Kyoto University)

Tue. Apr 29, 2014 11:00 AM - 12:41 PM 314 (3F)

In numerical weather prediction, the observation,prediction and data assimilation techniques have developed dramatically,achieving improvements of forecast skills of high-impact weather eventssuch as bomb cyclones, super typhoons, torrential rain, tornadoes andhot spells. Data assimilation techniques have been applied toatmospheric transport, ocean circulation and earthquakes and a number ofadvanced techniques have been proposed. In this session, with invitedspeaker Prof Emeritus Yoshikazu Sasaki, we review the recent developmentof data assimilation techniques, discuss methodologies and applicationsof their applications and project future directions for further development.

12:35 PM - 12:41 PM

[AAS02-P02_PG]Assimilation of TRMM-PR bright band heights

3-min talk in an oral session

*Takeshi ENOMOTO[1], Munehisa YAMAMOTO[2] (1.Disaster Prevention Research Institute, Kyoto University, 2.Graduate School of Science, Kyoto University)

Keywords:melting layer, satellite data assimilation in cloudy area, observing-system experiment

Bright band heights in TRMM PR 2A23 are assimilated as temperature observations. Bright bands are strong radio echo from the melting layer. Bright band heights are located several hundred m below the 0C isotherms (Harris et al. 2000). In the TRMM PR algorithms (Awaka et al 2009), bright band heights are computed as the nadir projection of the distance between the satellite and the Earth ellipsoid minus the distance between the bright band peaks. Although the 0C isotherms from reanalysis or operational analysis are required in detection of bright bands, bright band heights are direct observations. Because bright band heights are valuable information to complement sparse direct measurements over ocean, the analysis can be improve when assimilated. Satellite radiances are mainly used in cloud-free area and assimilation of water substances are not straightforward. By contrast, because bright bands are associated with stratiform clouds, bright band heights are easily assimilated as conventional data over cloudy regions.The data assimilation system ALEDAS2 (Enomoto et al. 2013) used in this study is composed of the atmospheric general circulation model for the Earth Simulator (AFES) and the local ensemble transform Kalman filter (LETKF). The resolution of the model is T119L48 (1 degree horizontally and 48 levels vertically) and the ensemble size is 63. ALERA2 produced with this system is regarded as the control. Bright band observations are processed as follows. First, each record is regarded as a 0C temperature observation at 500 m above the bright band height. Second, in order to avoid excessive horizontal correlations and computational load, super-observations are produced by the average of observations within 0.5 degree radius linearly weighted with the distance and converted to the LETKF input format in the 1 h window.The number of the original bright band heights in January 2010 is 2572986 and that of the super-observations is 61905. The super-observations are widely distributed in the tropics and subtropics between 35S and 35N. In the Northern Hemisphere bright bands are clustered along the 30N over ocean, indicating bright bands due to stratiform associated with cyclones along the storm track (Yamamoto et al. 2006). A few bright bands are detected in the horse latitudes between the equator and 25N. In the Southern Hemisphere bright bands are distributed in the tropical and subtropical convergence zones. ALEDAS2 uses the 7 h data window for each analysis time every 6 h. The number of temperature observations increases by a few percent in synoptic hours of 0 and 12 UTC, but by a factor of 1.5 or 2 at 6 and 18 UTC.In a preliminary experiment from 0 UTC 3 January for 4 d, the analysis ensemble spread, a measure of the analysis error, is reduced by 0.51 Pa and 0.94 Pa over the globe and in the Souther Hemisphere (35S--0), respectively at 0 UTC 7 January. The root mean square of the analysis increment increases by 2.4 % and 5.9 % in the global domain and in the Souther Hemisphere (35S--0).