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Application of EnVAR using the mixed-lognormal PDF of and a new displacement correction method for precipitation to all-sky MWI TB assimilation

The present study introduced a non-Gaussian Probability Distribution Function (PDF) and a new displacement correction method for precipitation into the dual scale neighboring Ensemble-based Variational assimilation (EnVar) scheme in order to assimilate all-sky Microwave Imager (MWI) brightness temperatures (TBs) into a Cloud-Resolving Model (CRM).

The present study chose the precipitation forecast error from the existing non-Gaussian PDFs which were applicable for all rainy regions. We validated the fitness of these PDFs to the precipitation forecast error of various disturbance cases with the chi-square values of Lien et al (2016) to find that the mix-lognormal distribution was optimal. We introduced two PDF regimes, rain-free and rainy, to apply the mix-lognormal distribution to the EnVar.

Next, we developed a new precipitation displacement correction method which employed pseudo PDF regimes at points where ensemble forecast did not give PDF regimes corresponded with the observation.

We performed assimilation experiments using real MWI TB observations for a Typhoon Etau (T1518) case (17 UTC 7th -8th Sep. 2015). The results showed that the impact of the mixed-lognormal PDF was insignificant, and that use of the pseudo regimes greatly reduced the precipitation displacement error.

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