Model Parameter Estimation Using Ensemble Data Assimilation: A Case with the Nonhydrostatic Icosahedral Atmospheric Model NICAM and the Global Satellite Mapping of Precipitation Data (GSMaP)

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This study aims to improve precipitation forecasts from numerical weather prediction (NWP) models through effective use of satellite-derived precipitation data. Kotsuki et al. (2017, JGR-A) successfully improved the precipitation forecasts by assimilating the Japan Aerospace eXploration Agency (JAXA)' s Global Satellite Mapping of Precipitation (GSMaP) data into the Nonhydrostatic Icosahedral Atmospheric Model (NICAM) at 112-km horizontal resolution. Kotsuki et al. mitigated the non-Gaussianity of the precipitation variables by the Gaussian transform method for observed and forecasted precipitation using the previous 30-day precipitation data.
This study extends the previous study by Kotsuki et al. and explores an online estimation of model parameters using ensemble data assimilation. We choose two globally-uniform parameters, one is the cloud-to-rain auto-conversion parameter of the Berry' s scheme for large scale condensation and the other is the relative humidity threshold of the Arakawa-Schubert cumulus parameterization scheme. We perform the online-estimation of the two model parameters with an ensemble transform Kalman filter by assimilating the GSMaP precipitation data. The estimated parameters improve the analyzed and forecasted mixing ratio in the lower troposphere. Therefore, the parameter estimation would be a useful technique to improve the NWP models and their forecasts. This presentation will include the most recent progress up to the time of the meeting.

Keywords: Data Assimilation, GSMaP precipitation, NICAM, LETKF, Parameter Estimation

