Assimilating GCOM-W AMSR2 Radiance Data in Future GEOS Reanalyses

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1. Introduction

- Advanced Microwave Scanning Radiometer 2 (AMSR2) is aboard the Global Change Observation Mission 1st - Water (GCOM-W1) satellite which was launched in 2012 and is a part of A-Train satellite constellation.
- GMAO is going to assimilate its brightness temperature (Tb) for atmospheric profiles and sea surface temperature analyses.
- Cloud control variables are used for atmospheric analysis in current GDOE all-sky GPM/GMI microwave radiance data assimilation framework.
- However, cloud analysis increments are not fed back to GEOS model’s forecasts.

2. Procedures of Assimilating AMSR2 Tb

- Clouds are identified in observations and in forecast (model) during assimilation even though cloud contents are not assimilated.
- Observed clouds (CLW_obs) are retrieved from observed brightness temperature (Tb) data, using the retrieval algorithm developed by K. Garrett for AMSR2.
- Guess clouds (CLW_guess) are retrieved from forecasted Tb by a radiative transfer model (CRTM) that includes Tb from GMS profiles including clouds.
- Current test is conducted with Tb data at channels 9 (23.8V GHz), 11 (36.5V GHz), and 12 (36.5H GHz).
- CLW_obs vs CLW_guess (Y-axis), and Tb clear-sky conditions (X-axis).
- Dashed lines are 1-sigma; cloud threshold values for cloudy conditions.

3. Impacts of AMSR2 Data

- Exp. – Control
- [Exp. = ECMWF] [Exp. = GPROF] [Control = ECMWF] [Control = GPROF]

4. Future Development And Summary

- AMSR2/GCOM-W1 brightness temperature data can be assimilated with GEOS in all-sky conditions.
- GDOE analyzed moisture and clouds are improved after assimilating these observations.
- A new “variational” thinning method is developed in order to assimilate more observations in cloudy conditions.
- Other radiance data made by microwave imagers such as TRMM/TMI will be tested for the production of future GDOE reanalysis.

Summary

- AMSR2/GCOM-W1 brightness temperature data can be assimilated with GDOE in all-sky conditions.
- GDOE analyzed moisture and clouds are improved after assimilating these observations.
- A new “variational” thinning method is developed in order to assimilate more observations in cloudy conditions.
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