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Global Precipitation Measurement (GPM) Microwave Imager Falling Snow Retrieval Algorithm Performance

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Retrievals of falling snow from space represent an important data set for understanding the Earth's atmospheric, hydrological, and energy cycles. While satellite-based remote sensing provides global coverage of falling snow events, the science is relatively new and retrievals are still undergoing development with challenges and uncertainties remaining. This work reports on the development and post-launch testing of retrieval algorithms for the NASA Global Precipitation Measurement (GPM) mission Core Observatory satellite launched in February 2014. In particular, we will report on GPM Microwave Imager (GMI) radiometer instrument algorithm performance with respect to falling snow detection and estimation.

Since GPM's launch, the at-launch GMI precipitation algorithms, based on a Bayesian framework, have been used with the new GPM data. The at-launch database is generated using proxy satellite data merged with surface measurements (instead of models). One year after launch, the Bayesian database will begin to be replaced with the more realistic observational data from the GPM spacecraft radar retrievals and GMI data. It is expected that the observational database will be much more accurate for falling snow retrievals because that database will take full advantage of the 166 and 183 GHz snow-sensitive channels.

Furthermore, much retrieval algorithm work has been done to improve GPM retrievals over land. The Bayesian framework for GMI retrievals is dependent on the a priori database used in the algorithm and how profiles are selected from that database. Thus, a land classification sorts land surfaces into ∼15 different categories for surface-specific databases (radiometer brightness temperatures are quite dependent on surface characteristics). In addition, our work has shown that knowing if the land surface is snow-covered, or not, can improve the performance of the algorithm. Improvements were made to the algorithm that allow for daily inputs of ancillary snow cover values and also updated Bayesian channel weights for various surface types.

We will evaluate the algorithm that was released to the public in July 2014 and has already shown that it can detect and estimate falling snow. Performance factors to be investigated include the ability to detect falling snow at various rates, causes of errors, and performance for various surface types. A major source of ground validation data is ground-based radar composites. We will also provide qualitative information on known uncertainties and errors associated with both the satellite retrievals and the ground validation measurements. We will report on the analysis of our falling snow validation completed by the time of the EGU conference including the first complete northern hemisphere winter season. If available, results from improvements in the Bayesian database will be reported.