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Assimilating TRMM Microwave Imager Radiance Data in Future GEOS Reanalyses

The Tropical Rainfall Measurement Mission (TRMM) Microwave Imager (TMI) observed the Earth in lower latitudes between 1997 - 2015. Its conical-scan radiometer has nine channels and measured microwave irradiance between 10 and 89 GHz. These data provide information on atmospheric temperature, humidity, clouds, precipitation, as well as sea surface temperature. Radiance data from other microwave radiometers such as Special Sensor Microwave Imager (SSM/I) and Special Sensor Microwave Imager Sounder (SSMIS) onboard various Defense Meteorological Satellite Program (DMSP) satellites are assimilated in clear-sky conditions in the Modern-Era Retrospective analysis for Research and Applications (MERRA) and its version 2 (MERRA-2) data sets at the Global Modelling and Assimilation Office (GMAO) at NASA Goddard Space Flight Center. The GMAO's Hybrid 4D-EnVar-based Atmospheric Data Assimilation System (ADAS) is enhanced with an all-sky microwave radiance data assimilation capability in the real-time GEOS-Forward Processing (FP) system. Currently, the FP system assimilates Global Precipitation Measurement (GPM) microwave imager (GMI) radiance data utilizing this all-sky capability, and is being extended to use more all-sky data from other microwave radiometers. In this presentation, we will focus on impacts of all-sky TMI radiance data on GEOS analyses of atmospheric moisture, precipitation and other fields, and discuss their applications for future GEOS reanalyses.

Primary authors: JIN, Jianjun (GMAO, NASA); Dr MCCARTY, Will (GMAO, NASA); KIM, Min-Jeong (NASA GMAO/Morgan State University); EL AKKRAOUI, Amal (NASA-SSAI)

Presenter: JIN, Jianjun (GMAO, NASA)

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