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Formulation and validation of the day-2 GPROF cross-track precipitation retrieval scheme

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The Global Precipitation Measurement (GPM) mission Core Observatory, launched in February 2014, heralded a new era in the estimation global precipitation. The Core Observatory, with the GPM Microwave Imager (GMI) and Dual-frequency Precipitation Radar (DPR), acts as a reference for other satellite-based passive microwave sensors that form the GPM constellation. This constellation comprises of 7 conically-scanning 'imagers' and 6 cross-track 'sounders'; in the very near future it is anticipated that the cross-track sensors will form the majority of the passive microwave instruments.

The Goddard PROFiling (GPROF) scheme is a physically-based Bayesian precipitation retrieval scheme. The day-1 version of the GPROF incorporated a pre-GPM surface reference data (conical-scanning) or modelled data (cross-track) to derive the database used in the retrieval process; the availability data from the GMI and the DPR now permits the use of satellite-based reference data from which to construct the database. An initial database for the conically-scanning sensors is constructed using the GMI and DPR matchups; since the GMI encompasses the precipitation-sensitive frequencies of the other conical-scanning sensors migration of this database to the other sensors is relatively straightforward. Extension of the technique to the observations from cross-track sensors is more challenging, and has to accommodate their different (and range of) frequencies and Earth incidence angles (affecting resolution, atmospheric path and polarization).

Results from the latest version of GPROF are presented here for both the conical and cross-track sensors. Comparisons are made between the new and old versions of GPROF for a range of temporal and spatial scales, and with reference to surface radar data sets over the United States and Western Europe.