

**Toward A Globally-Applicable Uncertainty Quantification Framework for Satellite
Multisensor Precipitation Products based on GPM DPR**

Zhe Li¹, Daniel B. Wright¹, Samantha H. Hartke¹, Dalia B. Kirschbaum², Sana Khan^{2,3}, Viviana
Maggioni⁴, Pierre-Emmanuel Kirstetter^{5,6}

¹Department of Civil and Environmental Engineering, University of Wisconsin–Madison, Madison, WI, USA

²NASA Goddard Space Flight Center, Greenbelt, MD, USA

³Earth System Science Interdisciplinary Center, University of Maryland, MD, USA

⁴Civil, Infrastructure and Environmental Engineering Department, George Mason University, Fairfax, VA, USA

⁵School of Meteorology and School of Civil Engineering and Environmental Science, University of Oklahoma,
Norman, OK, USA

⁶NOAA/National Severe Storms Laboratory, Norman, OK, USA

Version: JUNE 07, 2021

Corresponding author: Dr. Zhe Li (zli875@wisc.edu)

Contents of this file

Tables S1

Figures S1 to S3

Table S1. The contingency tables for IMERG, benchmarked against GV-MRMS and 2BCMB. For each pair of the estimates, hits (top left), false alarms (top right), misses (bottom left), and correct non-detects (bottom right) are shown. The total paired data sample size over CONUS is 20,986,107.

	$P_{\text{IMERG}} \geq 0.1 \text{ mm h}^{-1}$	$P_{\text{IMERG}} < 0.1 \text{ mm h}^{-1}$
$P_{\text{GV-MRMS}} \geq 0.1 \text{ mm h}^{-1}$	714,440 (3.4%) ^a	444,222 (2.1%)
$P_{\text{GV-MRMS}} < 0.1 \text{ mm h}^{-1}$	437,897 (2.1%)	19,389,548 (92.4%)
$P_{\text{2BCMB}} \geq 0.1 \text{ mm h}^{-1}$	681,936 (3.2%)	301,416 (1.4%)
$P_{\text{2BCMB}} < 0.1 \text{ mm h}^{-1}$	470,401 (2.2%)	19,532,354 (93.1%)

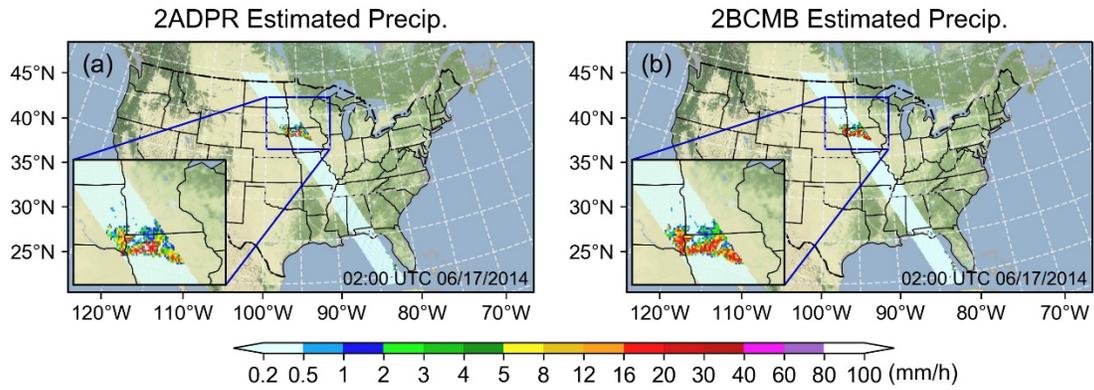


Figure S1. Coincident precipitation estimates from regridded (a) 2ADPR, and (b) 2BCMB for 02:00–03:00 UTC 17 June 2014. The swath coverage and retrieved precipitation spatial pattern of the two DPR derived products are similar, though 2BCMB shows enhanced precipitation intensities (which are closer to GV-MRMS observations, as shown in Figure 1b in the main article).

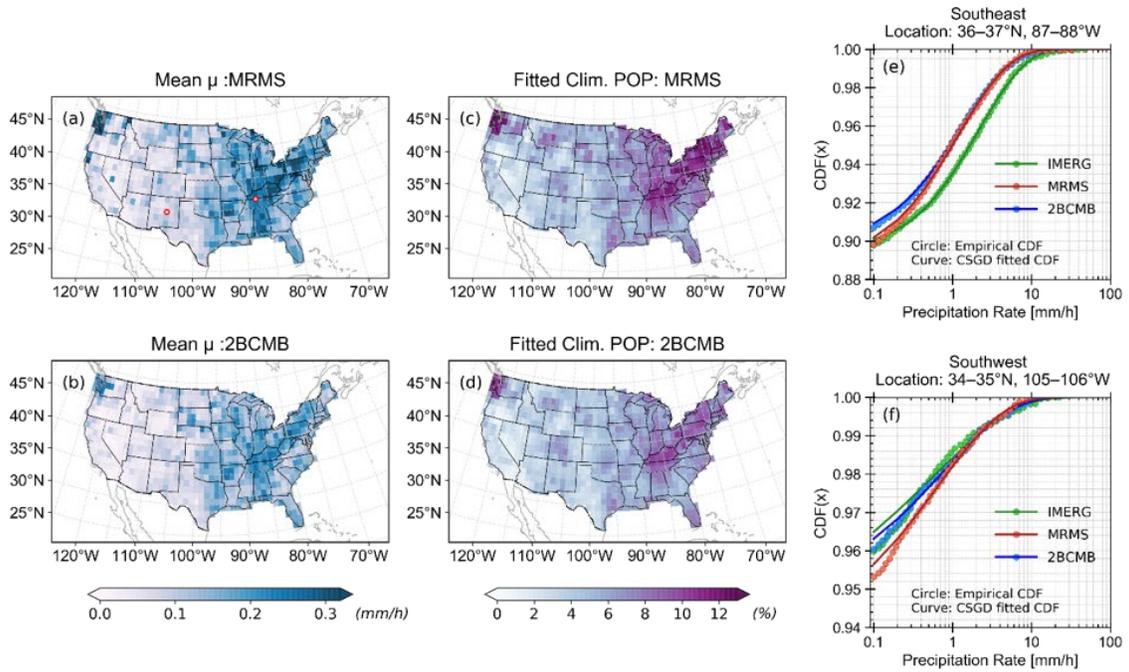


Figure S2. The spatial maps of fitted (a-b) climatological CSGD mean parameter μ and (c-d) POP, and (e-f) the comparison of empirical CDFs (markers) and climatological CSGD fitted CDFs (lines) based on the coincident IMERG, GV-MRMS, and 2BCMB training data samples within the $1^\circ \times 1^\circ$ boxes from the Southeast and Southwest CONUS, respectively. The locations of the two boxes are indicated by red circles in (a).

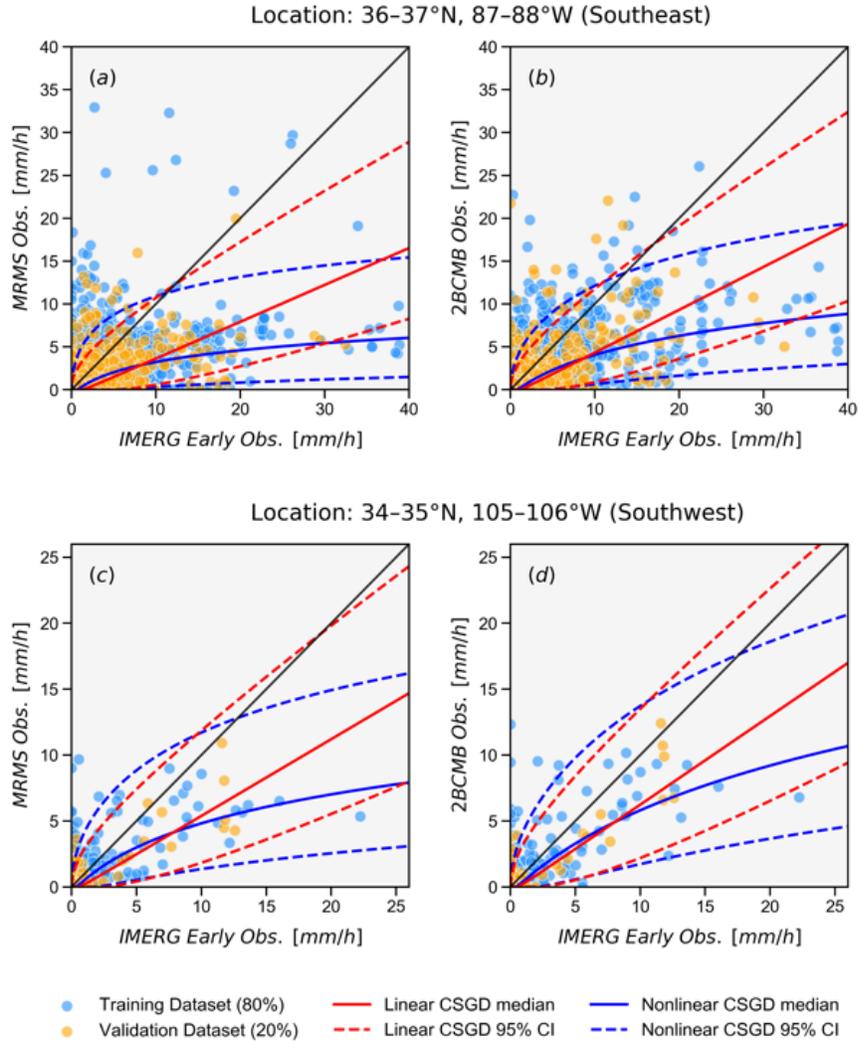


Figure S3. Linear (red lines) and nonlinear (blue lines) conditional CSGD models for (a, b) the Southeast $1^\circ \times 1^\circ$ box, (c, d) Southwest $1^\circ \times 1^\circ$ box, trained and compared against GV-MRMS (left panels) and 2BCMB (right panels). See Fig. 4 for identical results, but plotted on log scales.