Reprocessed and Bias-Corrected CMORPH Covering the Entire TRMM/GPM Era

P. Xie, R. Joyce, F. Sun, S. Wu, Y. Yarosh, and S.-H. Yoo

NOAA Climate Prediction Center

1. Objective

❑ Reprocessing CMORPH for the entire TRMM/ GPM era (1998-present) using a consistent version algorithm and fixed versions of inputs throughout the data period

❑ Performing bias correction/magnitude adjustment

❑ Blending bias-corrected CMORPH with gauge analysis

2. CMORPH Reprocessing

❑ **Inputs**

- PMW level-2 retrievals (GPROF 2004)
- CPC Geo sat IR at 4 km (Janowiak et al, 1999)
- NESDIS daily snow maps

❑ **Algorithm**

- CMORPH algorithm as of 2009
- Joyce et al (2004)
- *No KF enhancements*

3. Bias Correction Over Land

❑**Algorithm:** PDF matching against daily gauge analysis

Step 1: Historical PDF matching:
- Daily PDF tables at 0.25° grids
- Use 15-years (1998-2012) CMORPH and gauge analysis precipitation, collocated over a sliding window of ±15 days centered at the target day

Step 2: Real-time PDF matching:
- Daily PDF tables at 0.25° grids
- Use 30-day CMORPH and gauge analysis precipitation ending at target day
- Down-scale to 8 km/30 minute.

❑**Gauge Analysis**
- CPC unified daily gauge precipitation at 0.25° grids

4. Bias Adjustment Over Ocean

❑**Algorithm:** PDF matching against pentad GPCP

- Pentad PDF tables at 2.5° grids
- Use 3-pentad CMORPH and GPCP precipitation ending at the pentad of the target day
- Down-scale to 0.25 °/daily and then to 8 km /30 minute
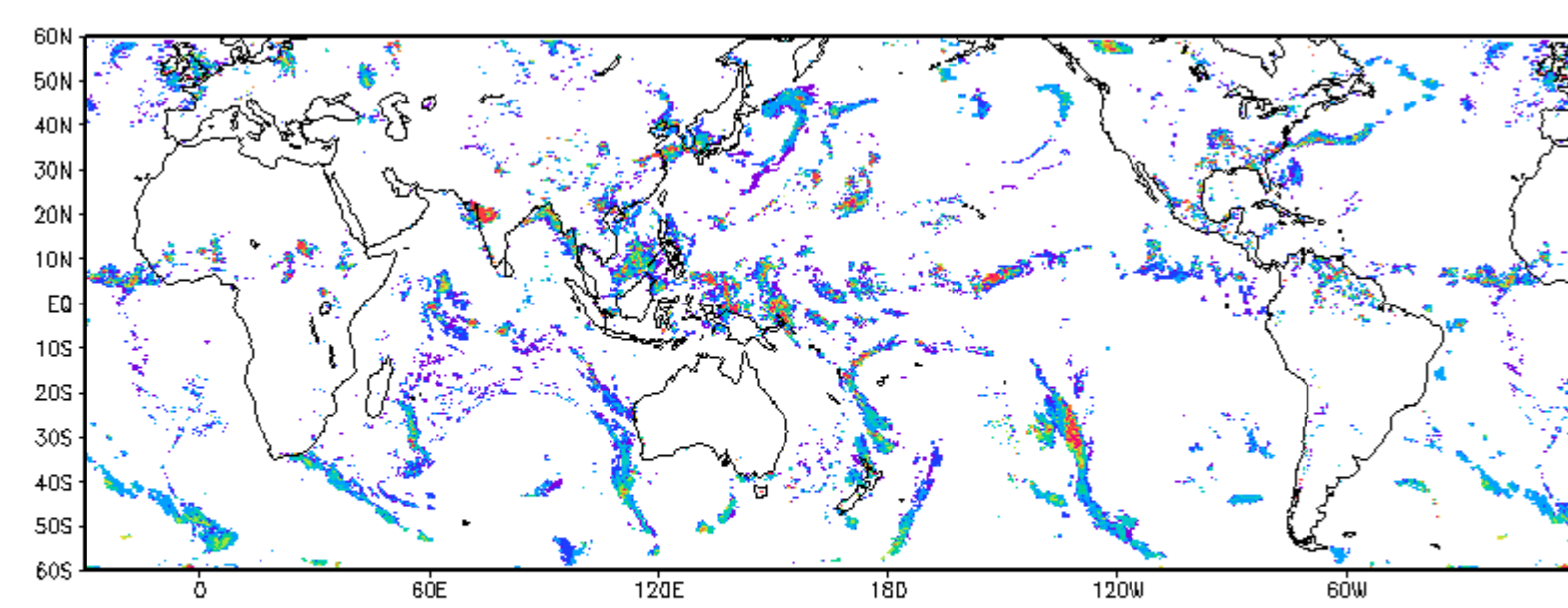
CMORPH real-time bias-adjusted precipitation (mm/hour) at 8 km/ 30-minute resolution on July 1, 2007, 0 UTC. Merging bias correction over land and bias adjustment over ocean
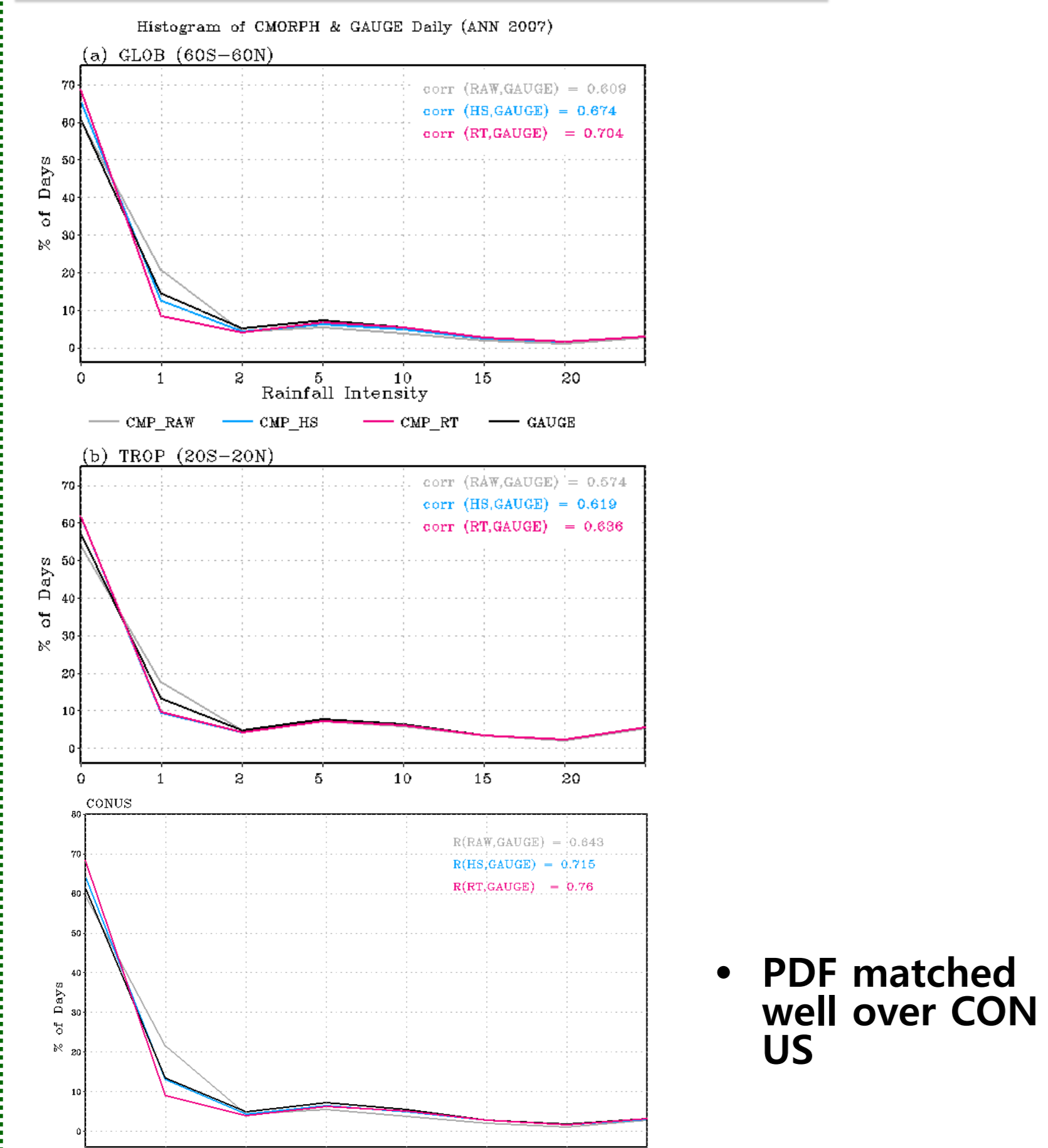
5. Example: Daily Global Precipitation
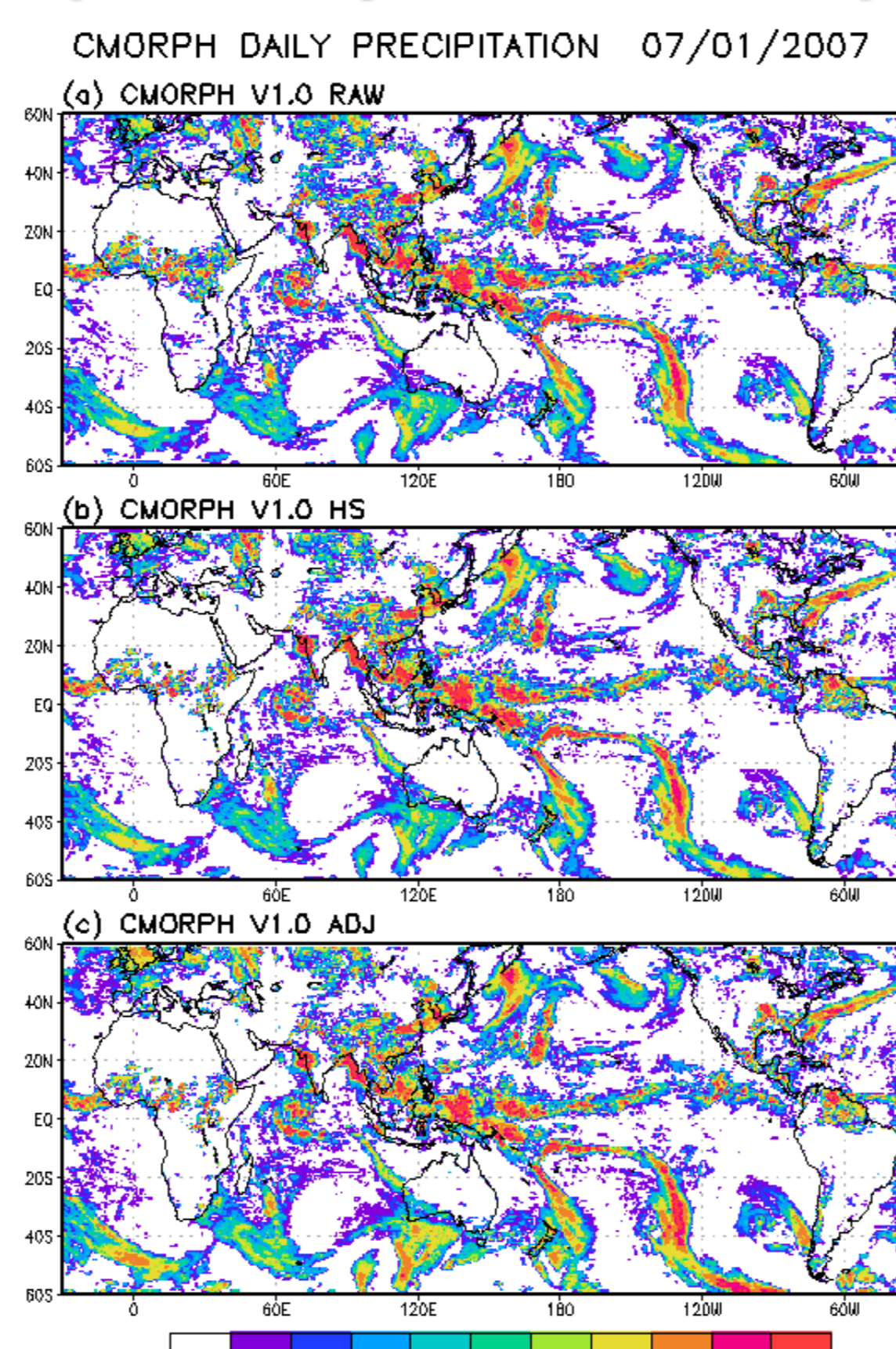
- Reduced precipitation rate in the eastern Pacific ITCZ for bias-adjusted CMORPH
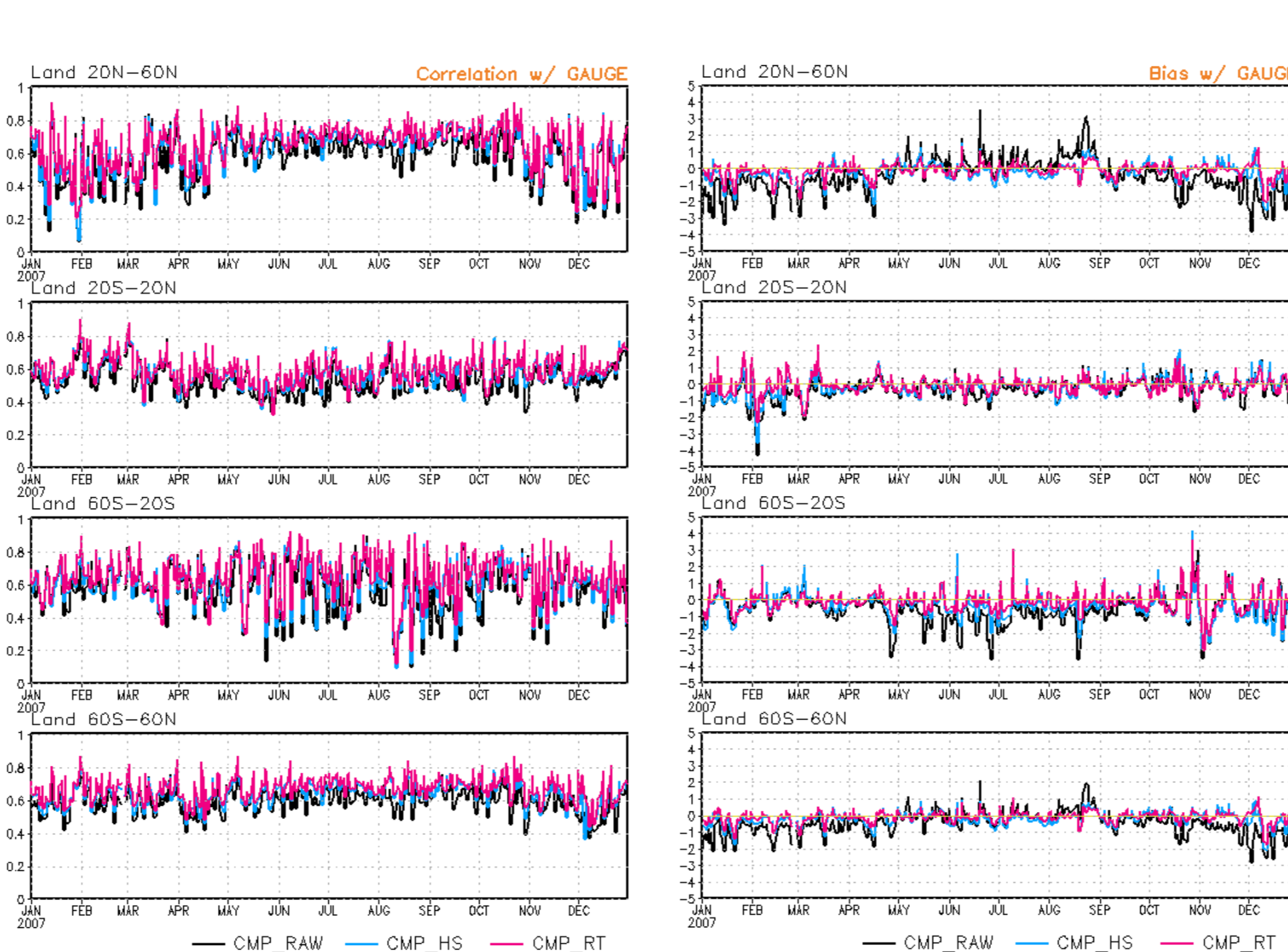
6. Example: Monthly Mean Precipitation
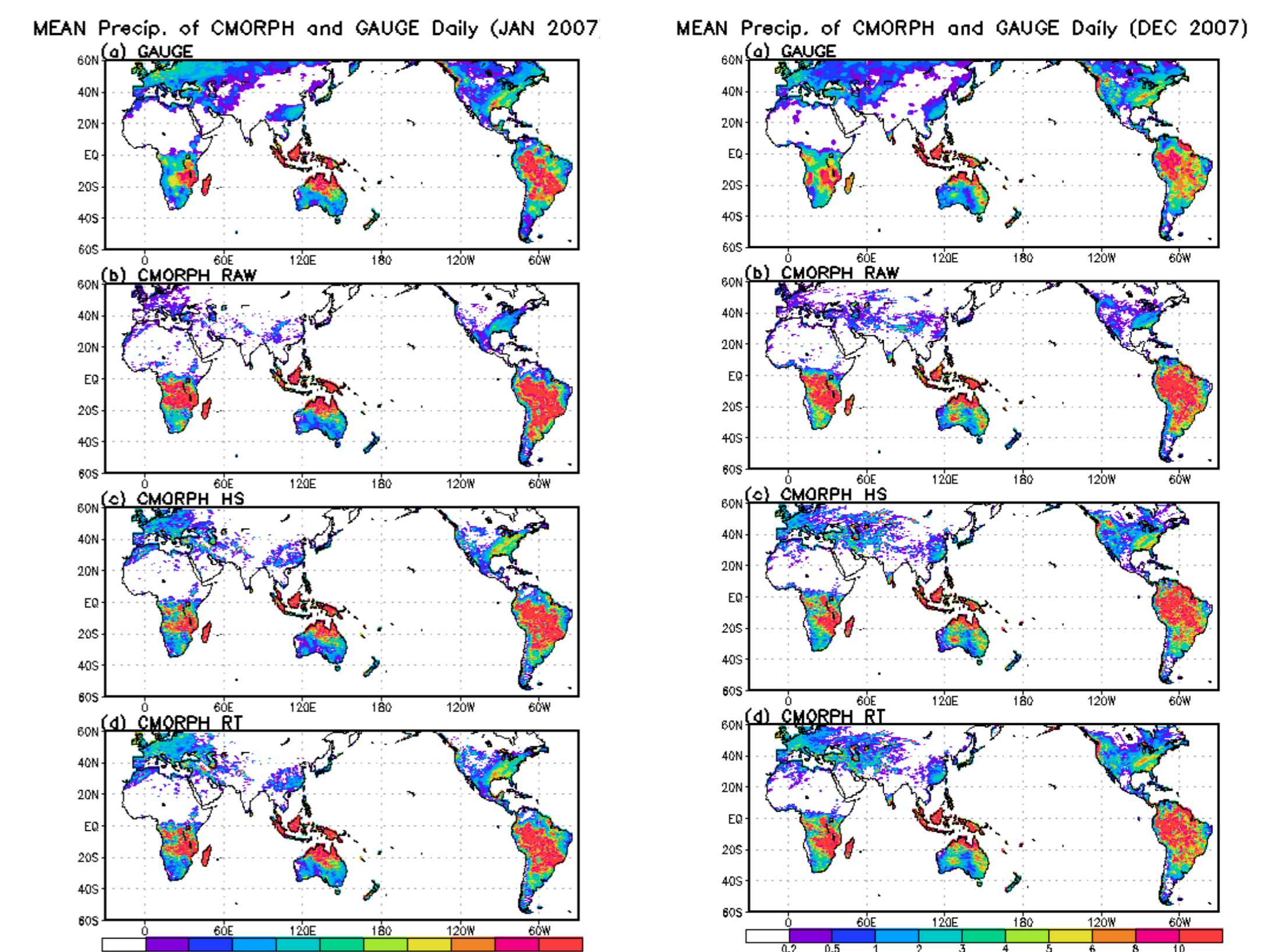
- Very close agreement with the observation in spatial patterns

7. PDF Distribution for 2007

- PDF matched well over CONUS

8. Compared with Gauge Analysis

- Improvement in spatial pattern

9. Compared with Gauge Analysis for 2007

Correlation

Region	RAW	HS	RT
50N-50S	0.613	0.678	0.710
50N-40N	0.560	0.644	0.689
40N-20N	0.661	0.732	0.764
20N-20S	0.574	0.619	0.636
20S-40S	0.632	0.683	0.727
40S-50S	0.557	0.638	0.672

Bias

Region	RAW	HS	RT
50N-50S	-0.365	-0.126	-0.060
50N-40N	-0.617	-0.154	-0.144
40N-20N	-0.119	-0.058	-0.023
20N-20S	-0.257	-0.116	-0.018
20S-40S	-0.444	-0.195	-0.030
40S-50S	-1.832	-0.557	-0.052

10. Comparison with GPCP
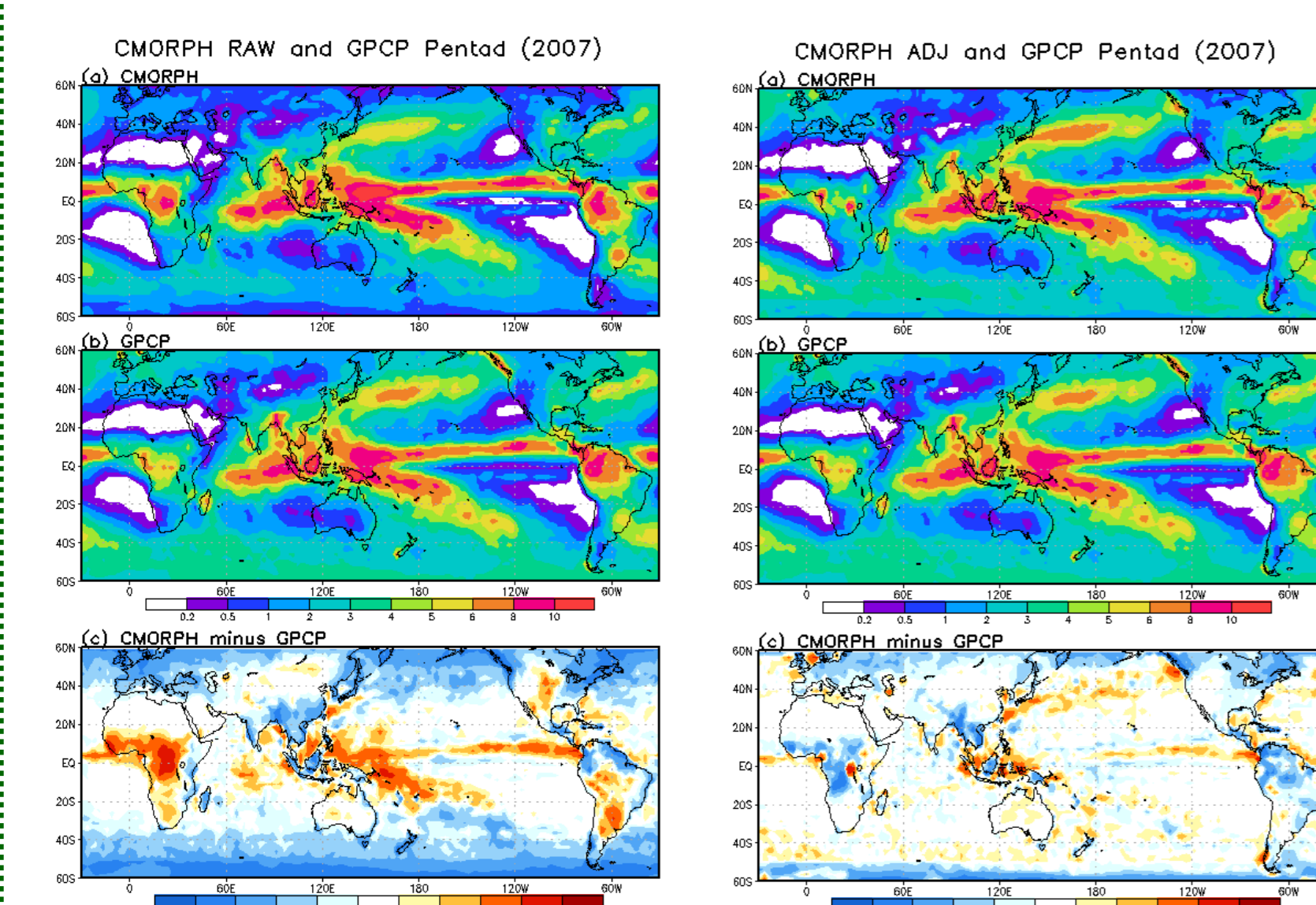
- Removed positive (negative) biases in the tropical (mid-latitude) over ocean
- Bias reduced substantially over land

11. Applications in verification of CFSR precipitation
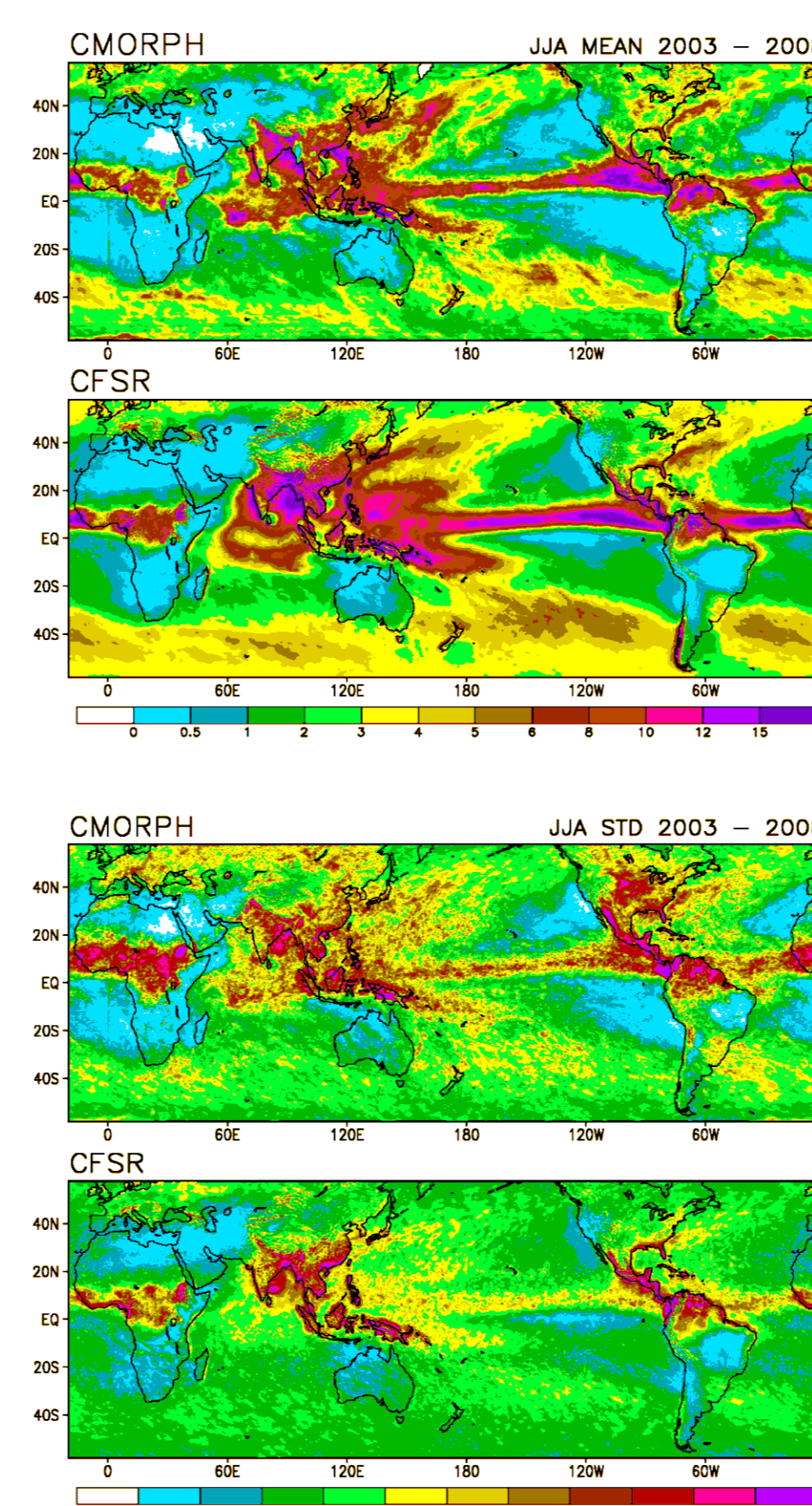
12. Summary

❑CMORPH reprocess completed for 1998 to 2012 using a fixed algorithm and inputs of consistent versions

❑Bias correction is performed through calibration against CPC daily gauge analysis over land and against pentad GPCP over ocean

❑The high resolution (8km-30min) reprocessed and bias corrected CMORPH demonstrated improved applications

❑Both the reprocessed (Version 1.0 Raw) and the bias corrected CMORPH (Version 1.0 CRT) will be released on CPC ftp site