

C16-T157A: Assessment and enhancement of MERRA land surface hydrology estimates

Rolf Reichle, Randal Koster, Gabrielle De Lannoy, Bart Forman, Qing Liu, Sarith Mahanama, Ally Toure, and the MERRA team
NASA Global Modeling & Assimilation Office, Code 610.1, NASA-GSFC, Greenbelt, MD, USA (Rolf.Reichle@nasa.gov, +1-301-614-5693)

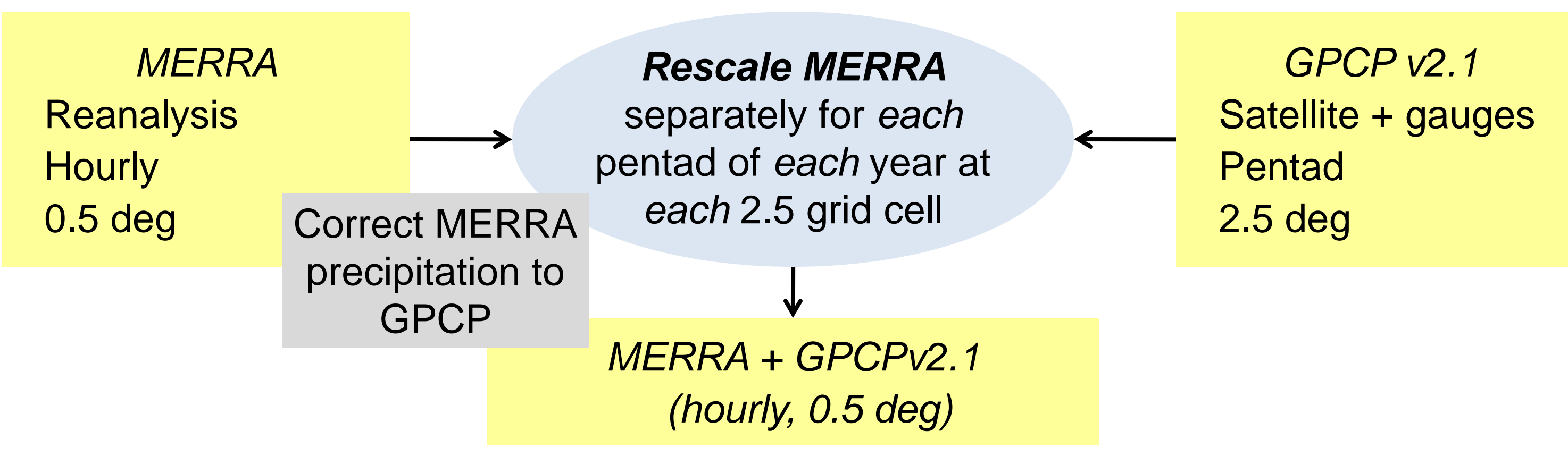
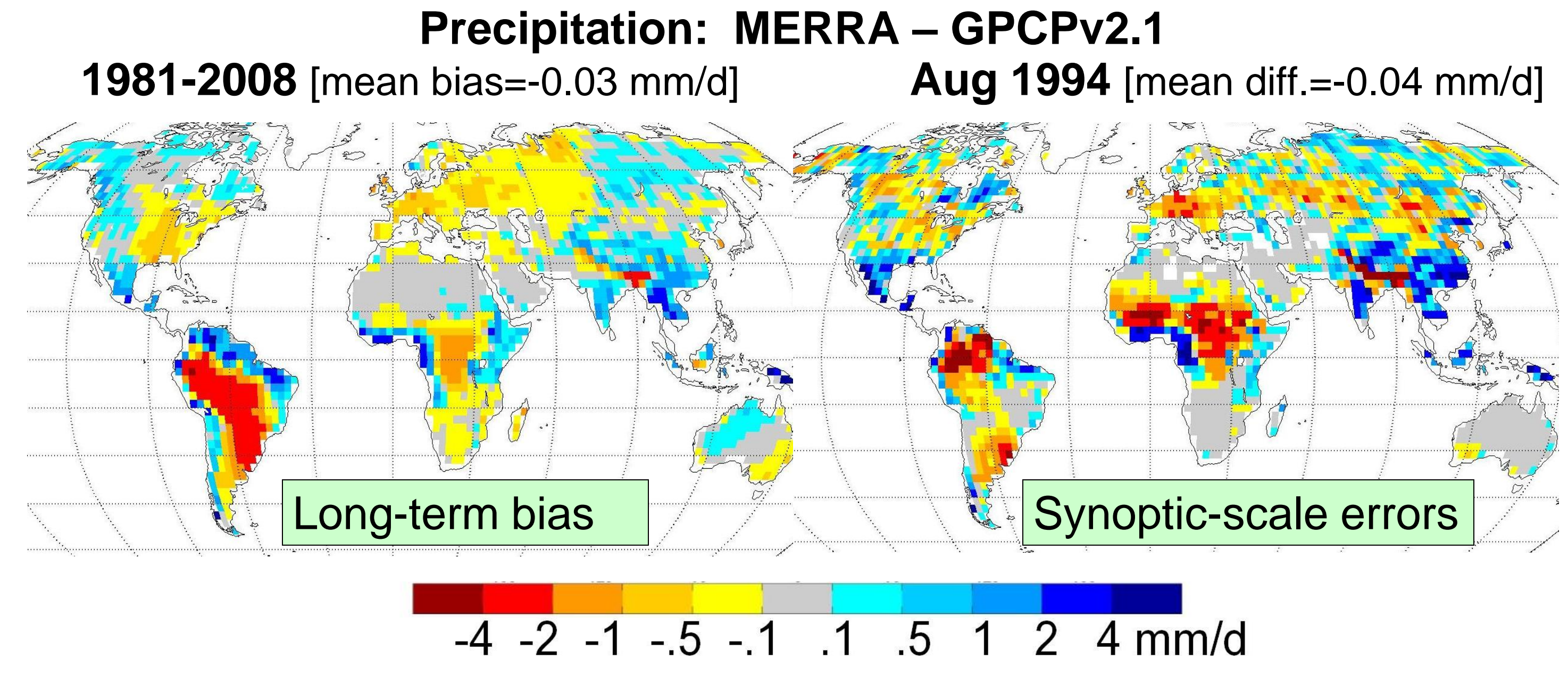
Objective: Assess & enhance MERRA land surface hydrology.

MERRA = Modern-Era Re-analysis for Research and Applications

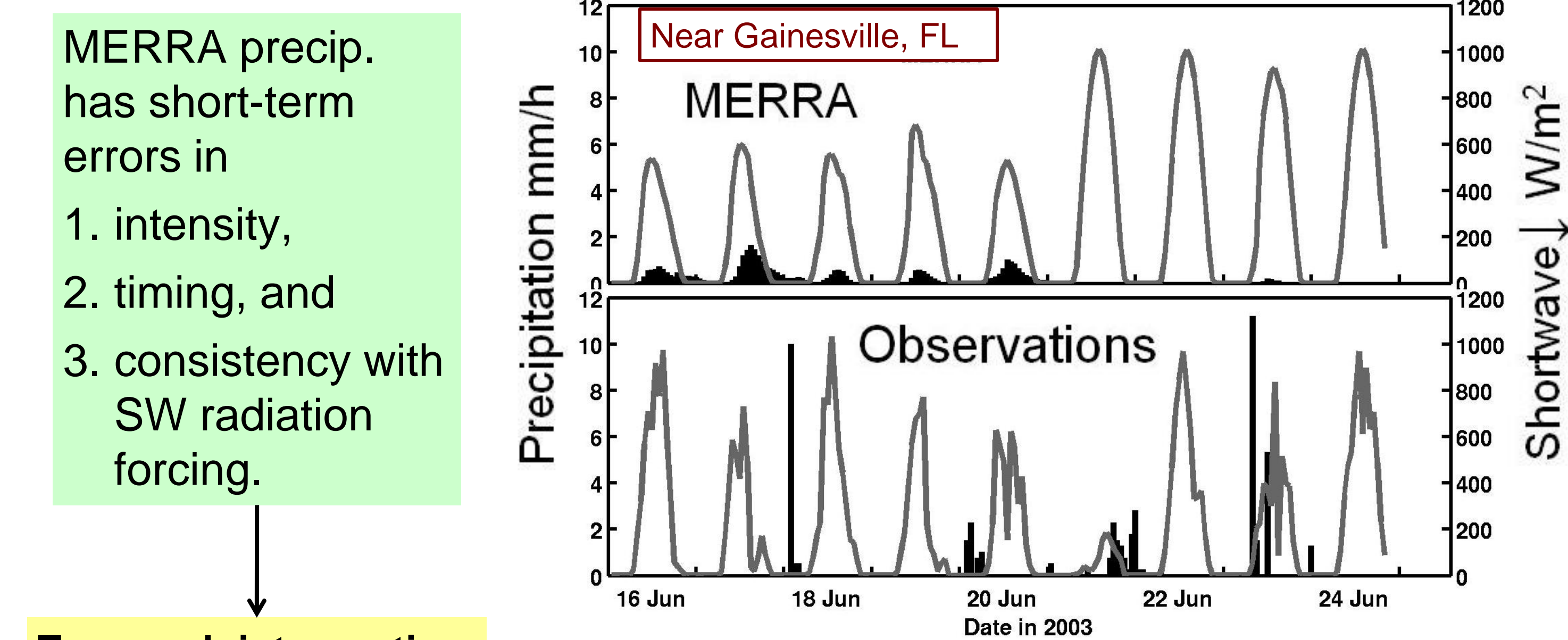
- Generated by the NASA Global Modeling and Assimilation Office
- Global, 1979-present** (~1 month latency)
- Resolution: **Lat=0.5° Lon=0.67°**, 72 vertical levels, **hourly** (surface fields)
- Free to the public:** <http://disc.sci.gsfc.nasa.gov/mdisc/>
- Lots of documentation** (wiki, atlas, papers, ...)

1. ISSUES AND SOLUTIONS

a) Correct MERRA precipitation with GPCP observations:



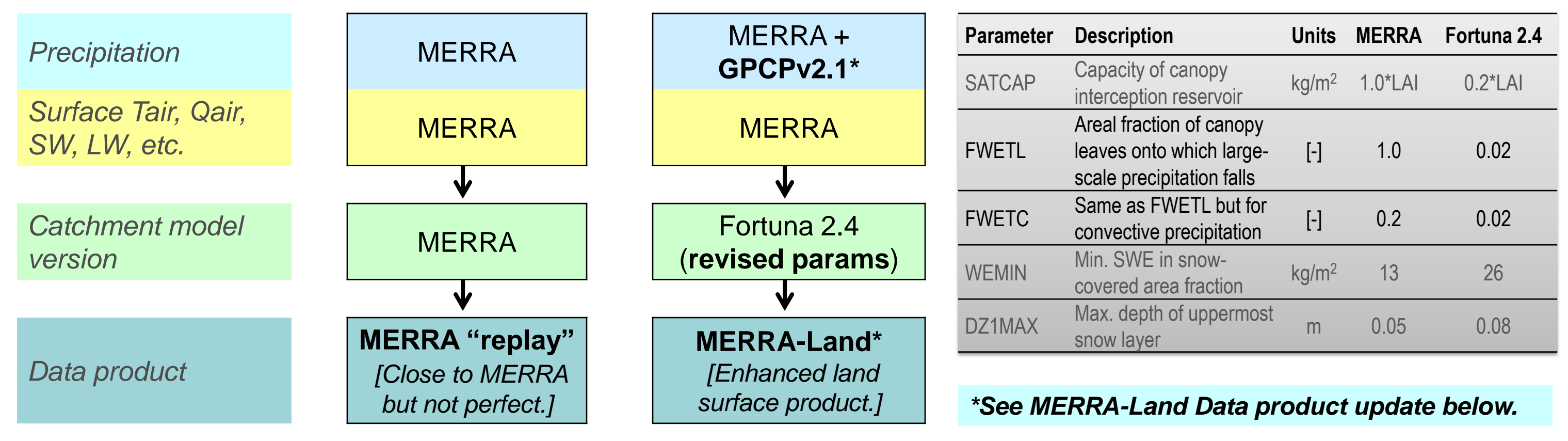
b) Adjust Catchment model interception parameters:



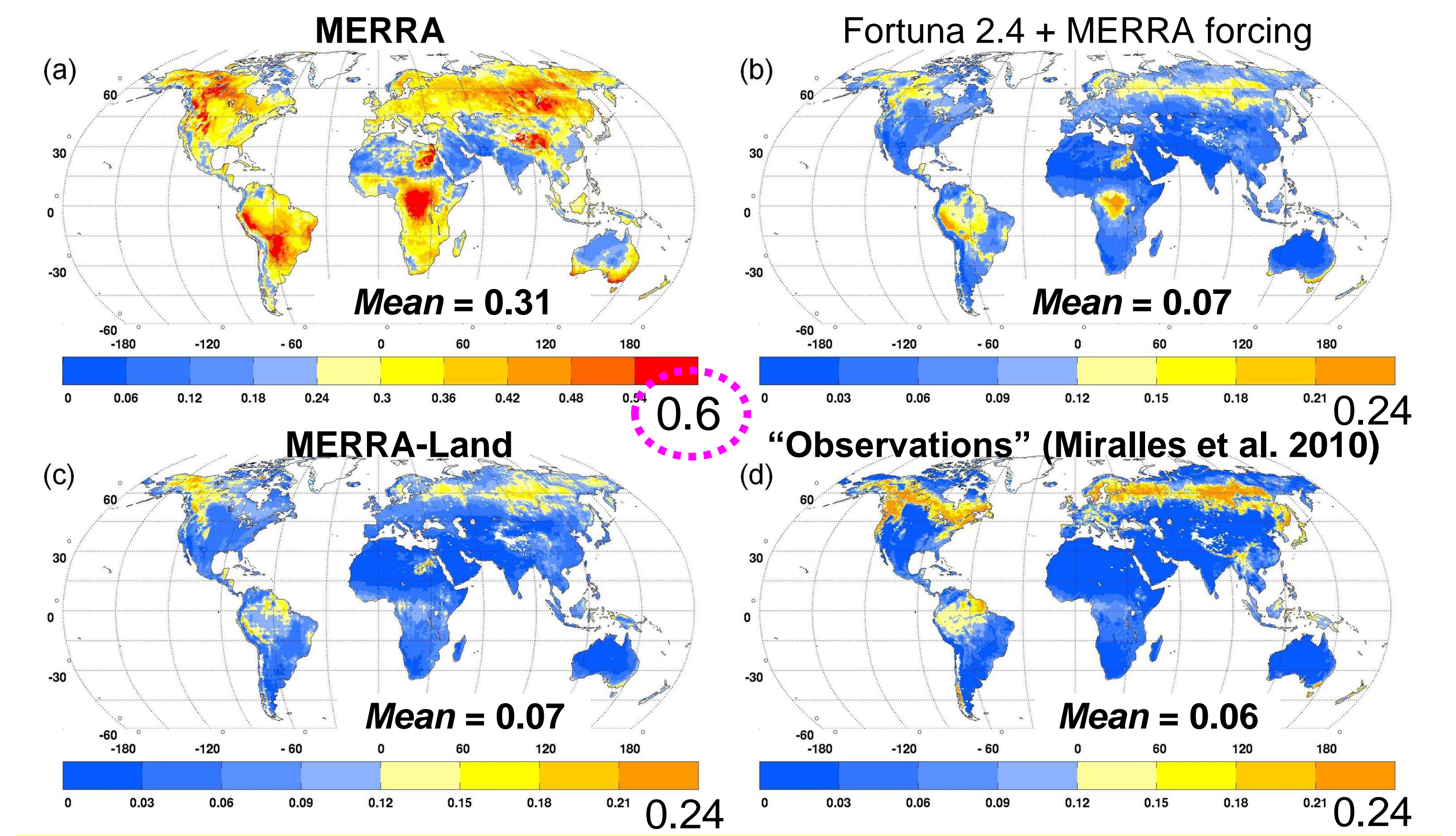
Too much interception loss, not enough water reaches the soil.

Simple approach used to counter this problem: Change Catchment model interception parameters.

2. ENHANCED DATA PRODUCT: MERRA-LAND*

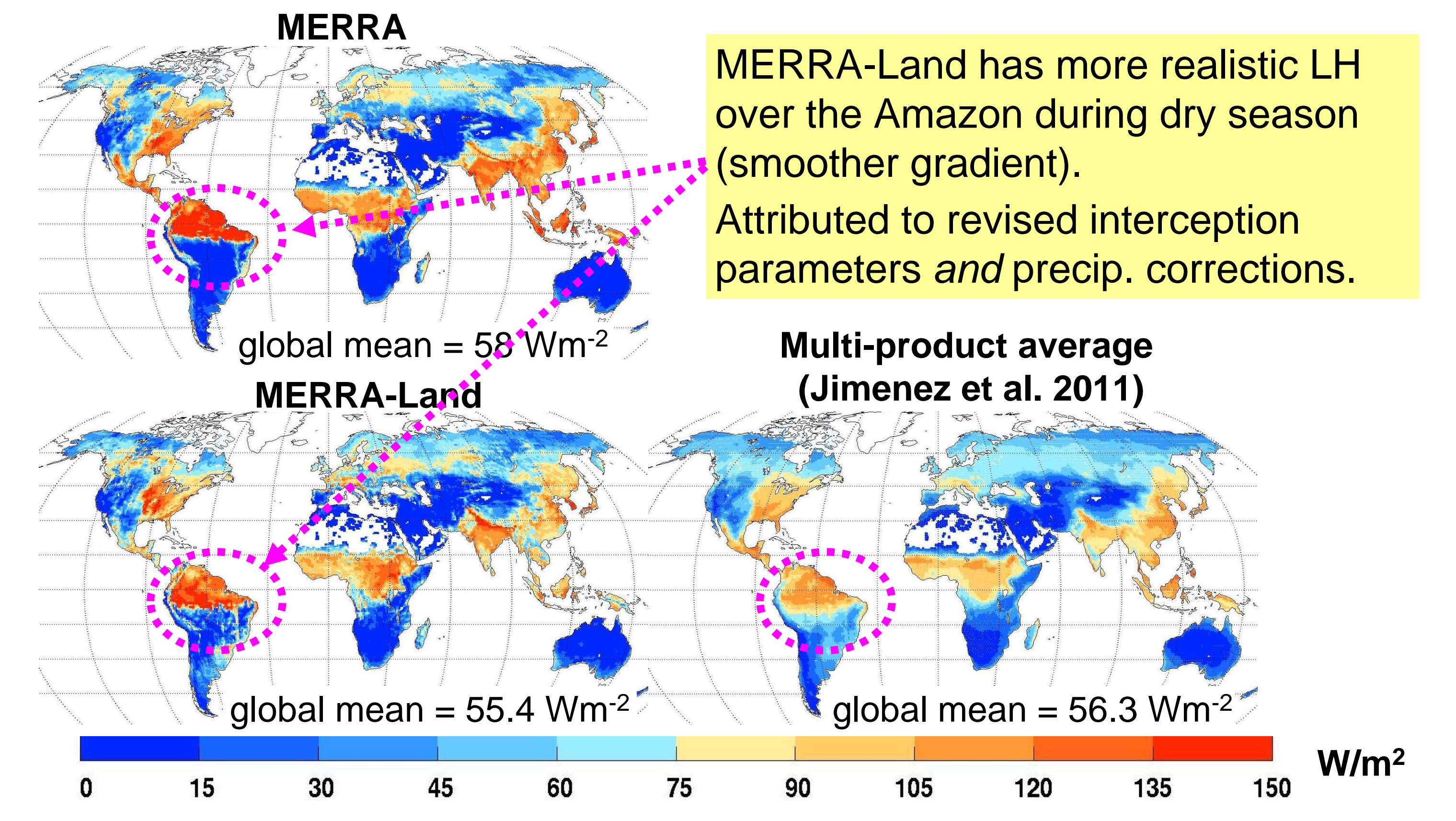


a) Interception loss fraction = canopy evap. / rainfall (2003-07):



MERRA greatly overestimates interception loss fraction (panel a vs. d). Improvement everywhere from revised interception parameters (panel b). Additional improvement in tropical forests from precip. corrections (panel c).

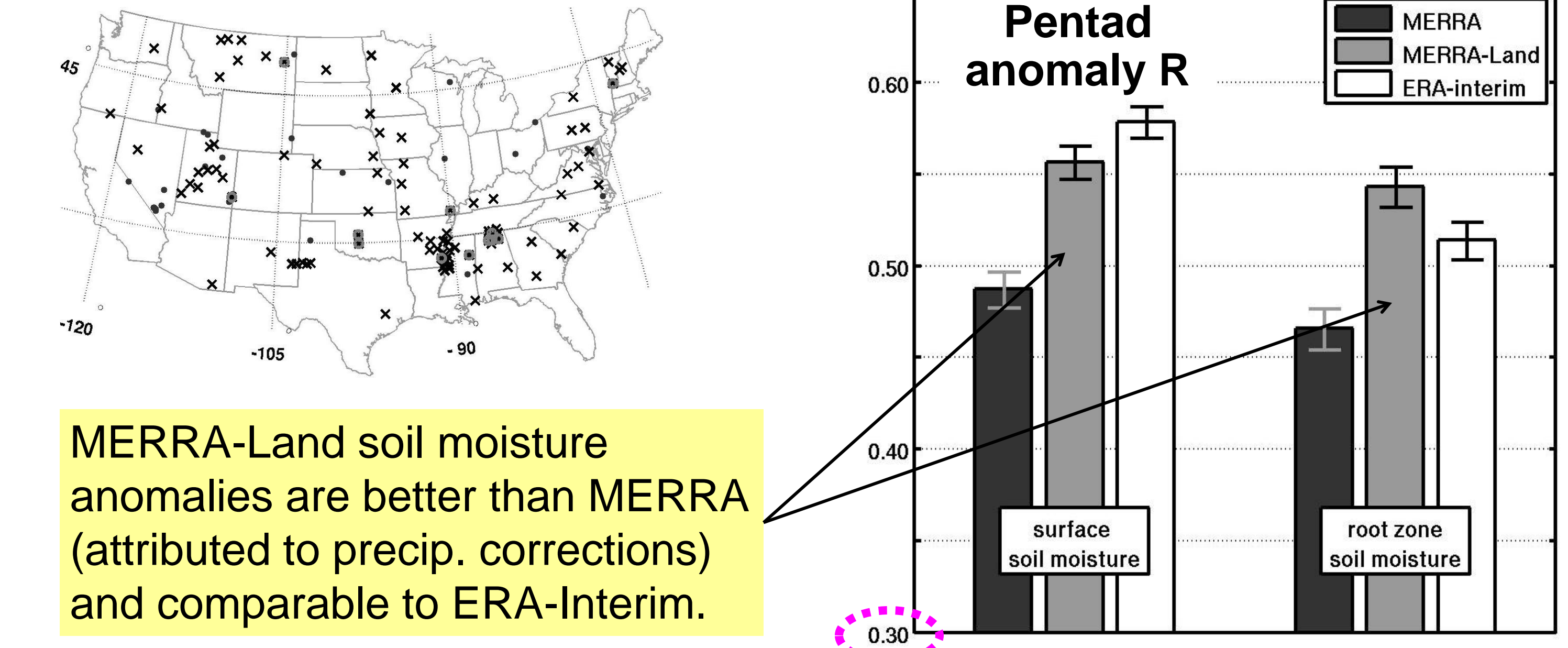
b) Latent heat flux (August 1994):



MERRA-Land has more realistic LH over the Amazon during dry season (smoother gradient). Attributed to revised interception parameters and precip. corrections.

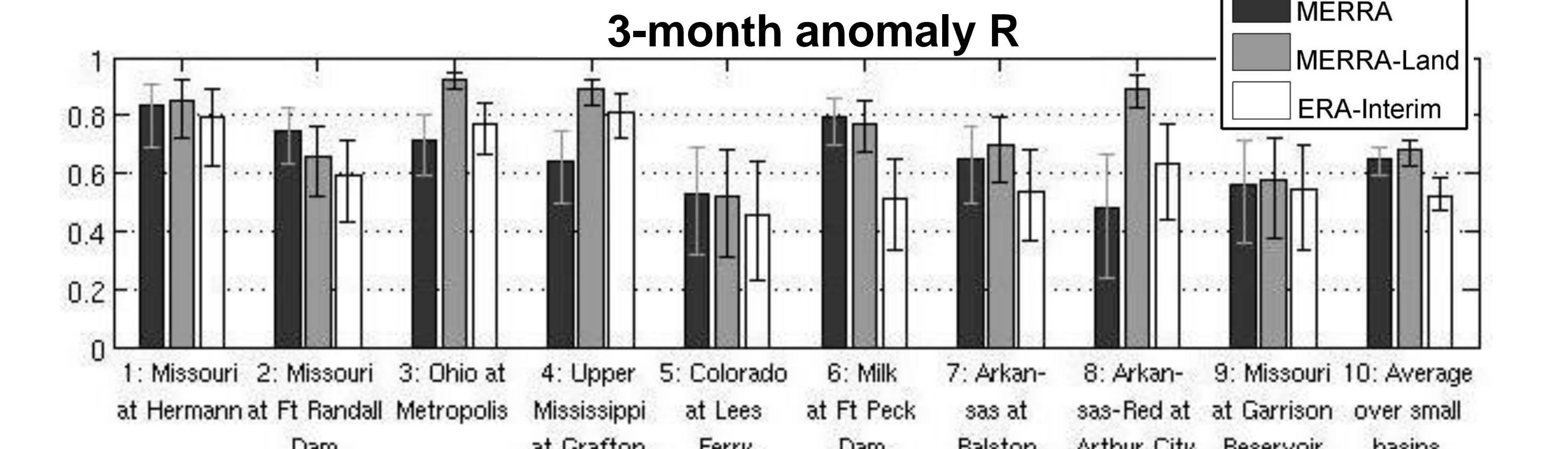
3. VALIDATION

a) Soil moisture vs. SCAN in situ obs. (2002 - 2009):



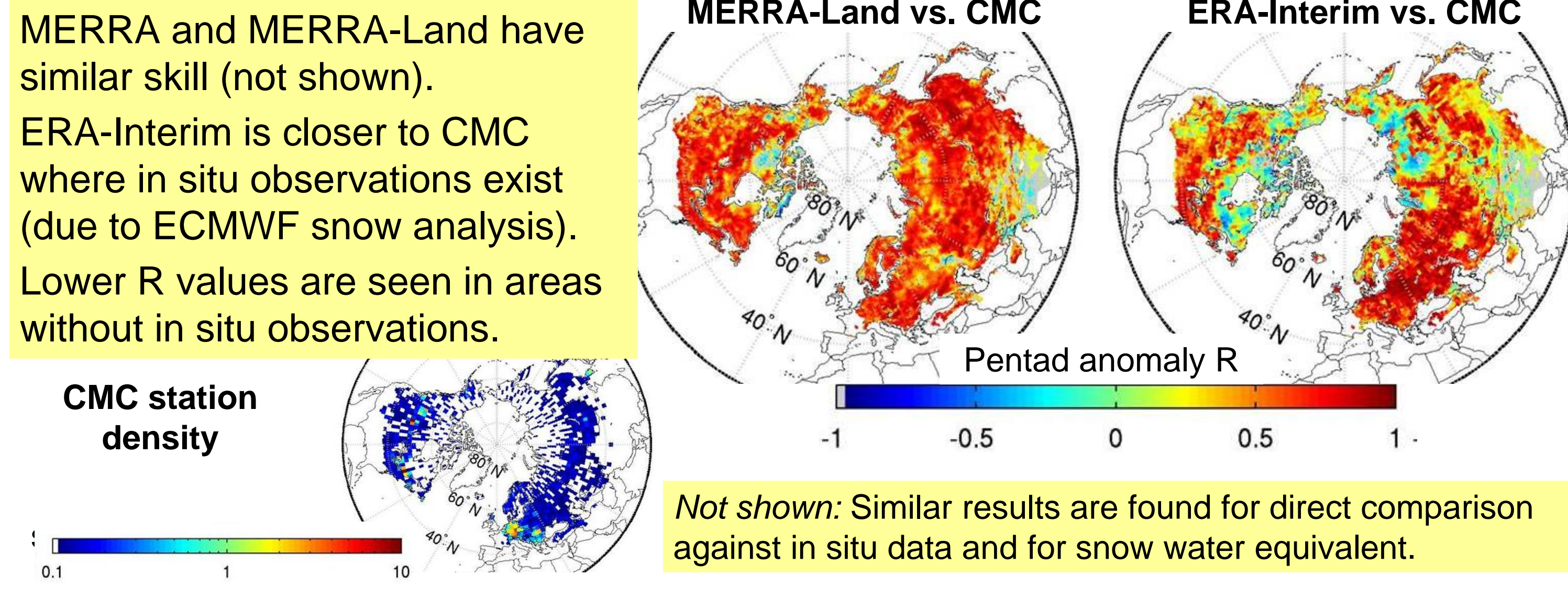
MERRA-Land soil moisture anomalies are better than MERRA (attributed to precip. corrections) and comparable to ERA-Interim.

b) Runoff vs. naturalized streamflow obs. (1989 - 1996...2010):



Significantly better runoff for Ohio, Upper Miss., & Arkansas-Red thru precip corrections. MERRA and MERRA-Land (0.5 deg) appear better than ERA-Interim (1.5 deg). Not shown: In all cases (except one small basin) the revised interception parameters yield improved runoff anomalies (albeit not significant).

c) Snow depth vs. CMC snow analysis (2002 - 2009):



MERRA and MERRA-Land have similar skill (not shown). ERA-Interim is closer to CMC where in situ observations exist (due to ECMWF snow analysis). Lower R values are seen in areas without in situ observations.

Not shown: Similar results are found for direct comparison against in situ data and for snow water equivalent.

***Data Product Update**

We are in the process of generating the **MERRA-Land** data product for public distribution with the MERRA reanalysis. For the official release, MERRA-Land precipitation will be corrected to the NOAA Climate Prediction Center (CPC) Global Unified Precipitation daily 0.5° product because of GPCP latency constraints. The skill of the official MERRA-Land is similar to that shown here.

References This work and related studies appear in the *J. Climate MERRA Special Coll.*

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