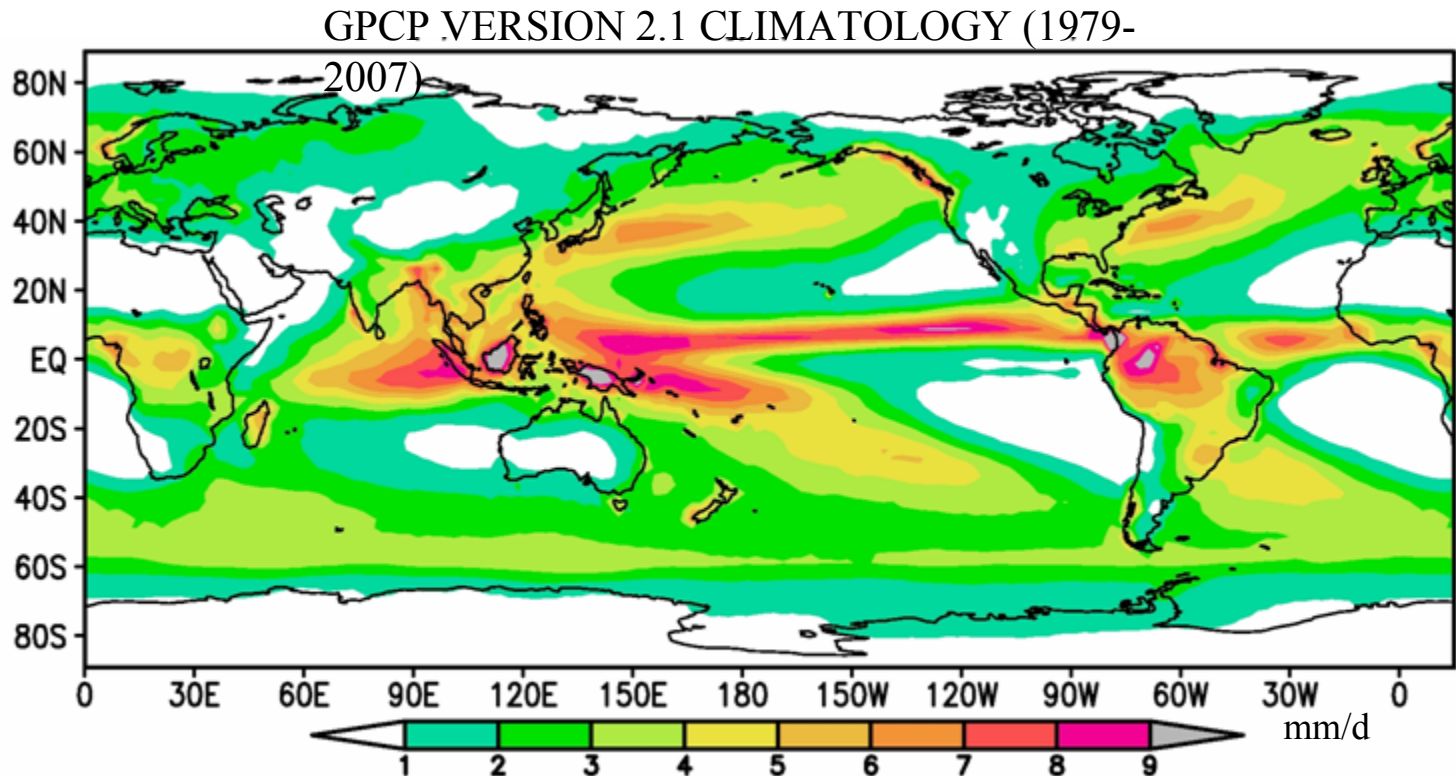


Global Precipitation Climatology Project (GPCP)

Robert Adler (GPCP Coordinator)
U. of Maryland-College Park

George Huffman
NASA/Goddard/SSAI

GPCP is one of several global data projects of the WCRP/GEWEX and reports to the GEWEX Radiation Panel (GRP)



<http://lwf.ncdc.noaa.gov/oa/wmo/wdcamet-ncdc.html>

<http://precip.gsfc.nasa.gov>

GPCP Global Precipitation Products

- Monthly, 2.5° Merged Analysis (1979-present)
Adler et al. (2003) J. Hydromet.
Huffman et al. (2009) GRL
- Pentad, 2.5° Merged Analysis (1979-present)
Xie et al. (2003) J. Climate
- Daily, 1° Merged Analysis (1997-present)
Huffman et al. (2001) J. Hydromet.

[although produced using different data sets and algorithms, products are integrated, i.e. they add up, with the monthly product controlling means, biases and trends]

produced ~ 3 months after observation time

GPCP Components/People

- Merge Center--Huffman/Adler, NASA Goddard/U. of Maryland
(TOVS/AIRS data from Susskind, Goddard)
- Gauge Center--Schneider, German Weather Service, Global
Precipitation Climatology Center (GPCC)
- Microwave-Land Center--Ferraro, NOAA NESDIS
- Microwave-Ocean Center--Chiu, Chinese U. Hong Kong/ George
Mason U.
- Geosynchronous Center--Xie, NOAA/NWS/CPC (also does pentad
merge)

*GPCP products/papers cited in 1000+ journal
papers--citation list is available on-line*

GPCP Monthly Precipitation Analysis

- Monthly, globally complete, 2.5° lat./long., 1979-present
- Input data--Precipitation estimates from:
 - SSM/I over ocean Chiu(CUHK/GMU)
 - SSM/I over land Ferraro (NOAA/NESDIS)
 - Geosynchronous IR and OPI Xie (NOAA-NCEP-CPC) TOVS/
AIRS Susskind (NASA-Goddard)
 - Raingauge Schneider (German Weather Service)
 - Merger procedure Huffman/Adler (NASA-Goddard)

Key features of analysis procedure: Stepwise bias removal (e.g., microwave adjusted geo IR estimates), blending using inverse error weighting, error estimates

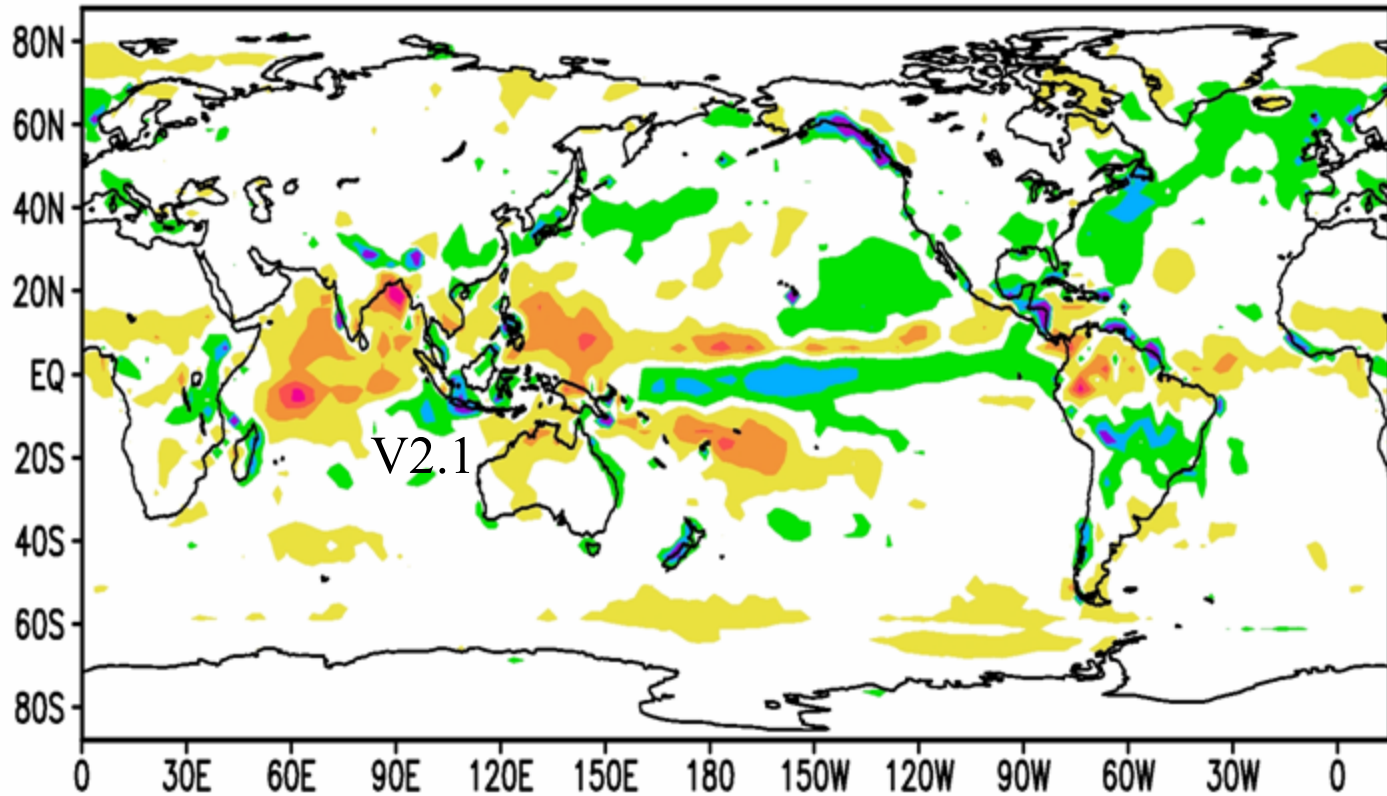
SSM/I We use single SSM/I (F8, F11, F13) Tb's (from RSS) to calibrate/adjust geo-IR and take into account diurnal cycle – ocean means and trends driven by microwave (since 1988).

GPCP Plans

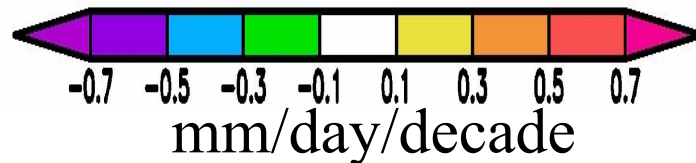
(Version 3/Reprocessing)

- Continuation of current products (heritage products—at least for 1-2 years)
- Minimization of data set time boundaries, (or other) boundaries
- Higher time and space resolutions (~ 3 hr, 25 km) for part of the period (e.g., *1998-present*)
- **New passive microwave algorithm (GPROF), new passive microwave data (SSM/IS, AMSR, TRMM, AMSU)**
- Integration of high time/space resolution period with longer period with coarser time/space resolution
- Rain/snow discrimination (by temperature)

Maps of Linear Change for Versions 2.1 for 1979-2007

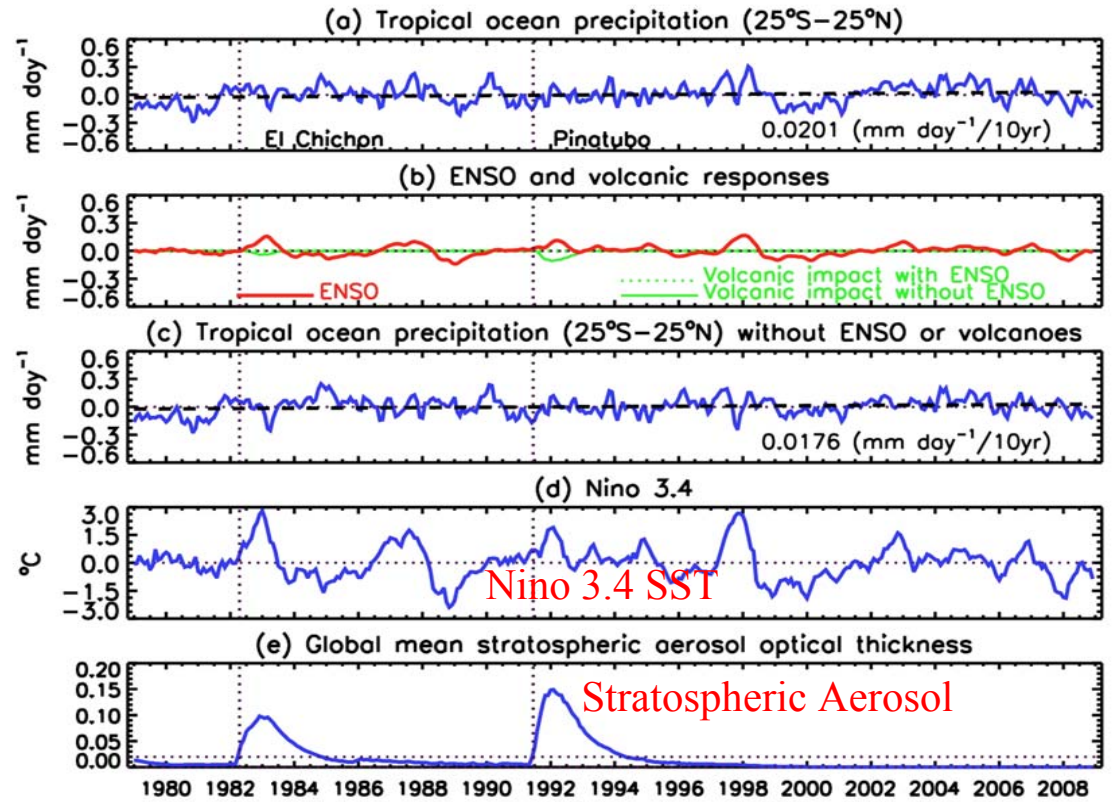


(b) Linear changes in annual-mean precipitation (1988-2007; v2.1)

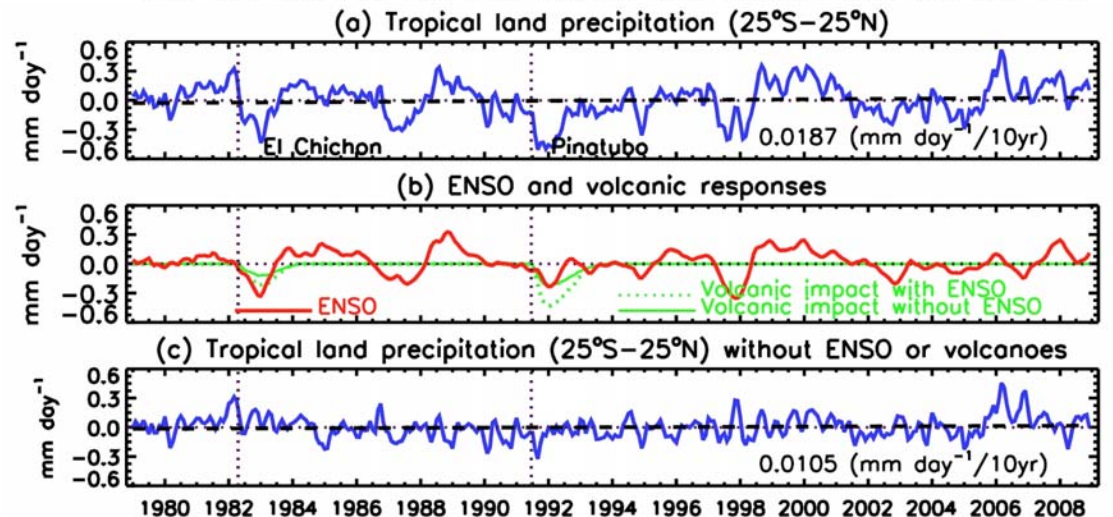


GPCP monthly data used to quantify ENSO and volcano signals in tropical precipitation

Ocean



Land

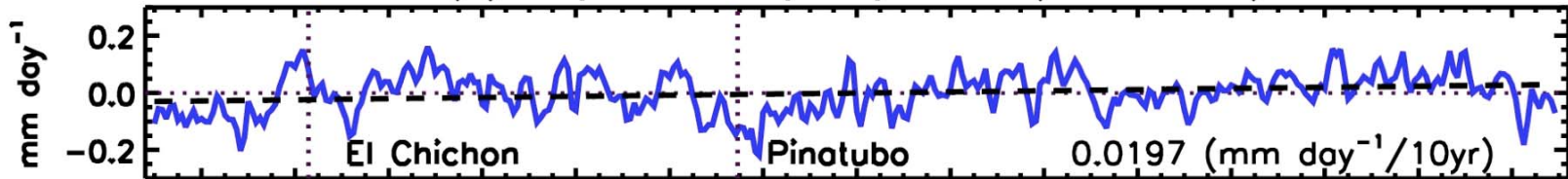


GPCP monthly data used to quantify ENSO and volcano signals in tropical precipitation

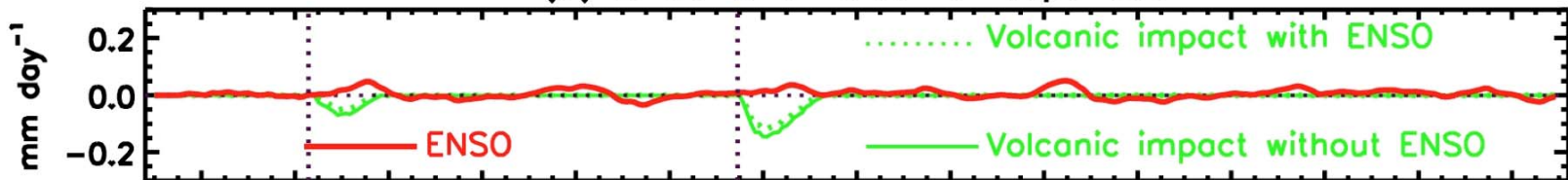
[retrieval of small climate signals indicative of homogeneity and value of GPCP data set]

Ocean and Land Combined

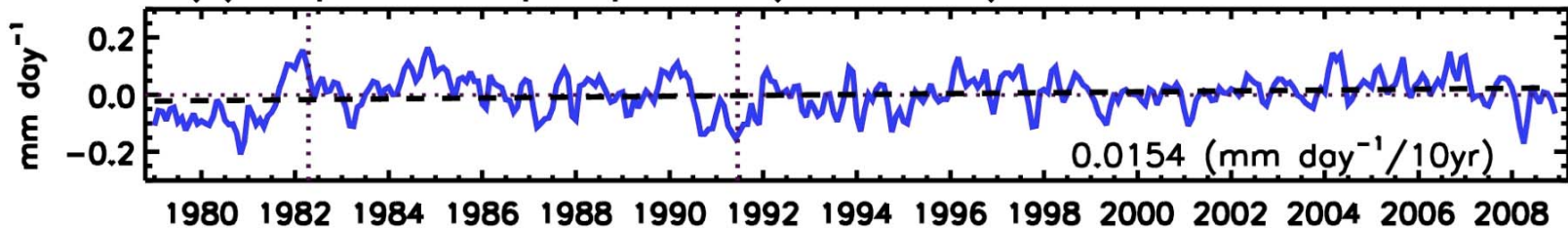
(a) Tropical total precipitation (25°S–25°N)



(b) ENSO and volcanic responses

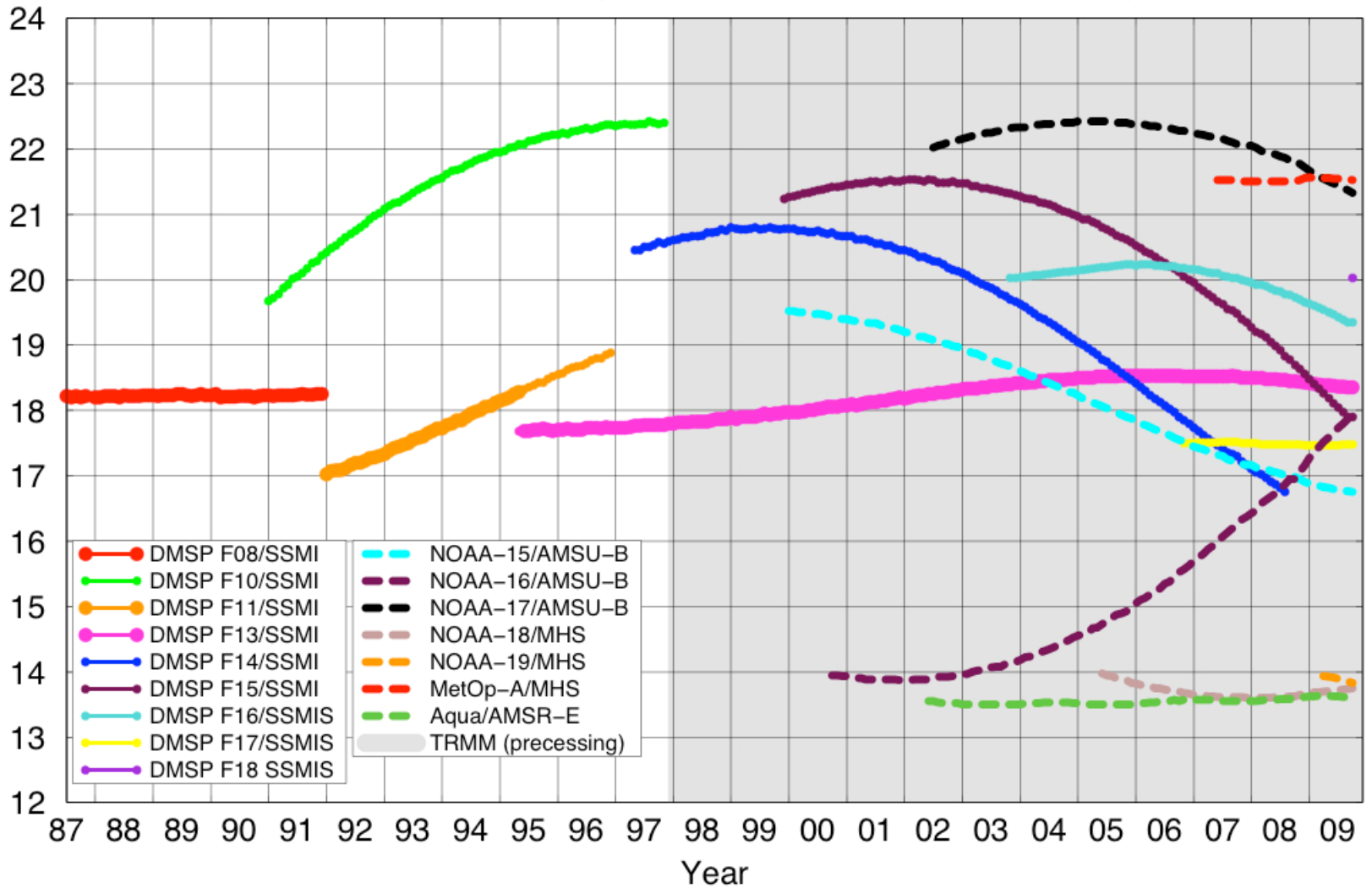


(c) Tropical total precipitation (25°S–25°N) without ENSO or volcanoes



Equator-Crossing Times (Local)

1987–2009, Ascending Passes (F08, MetOp–A Descending)



Thickest lines denote GPCP calibrator.

GPCP Issues Related to This Workshop

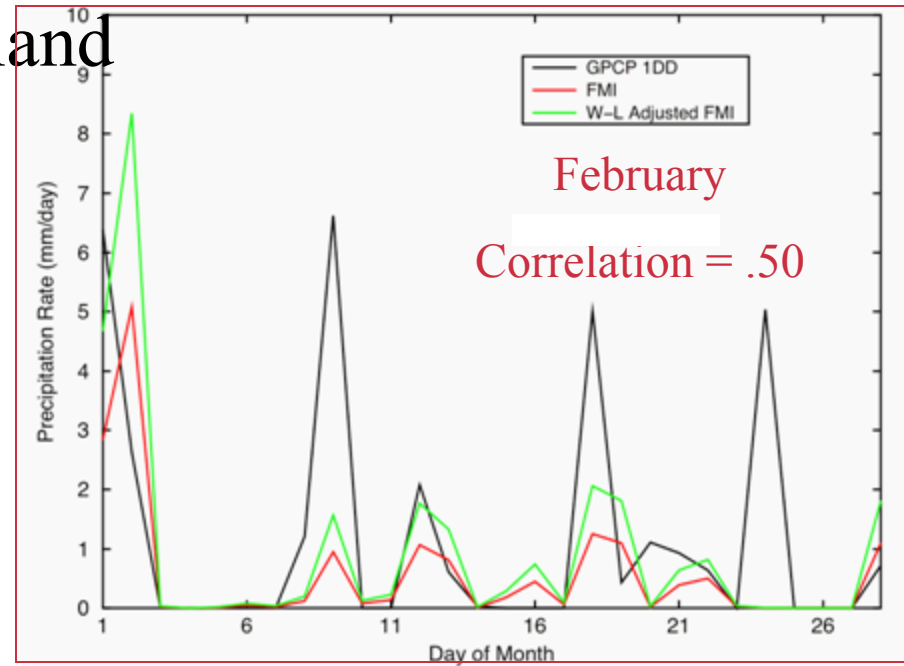
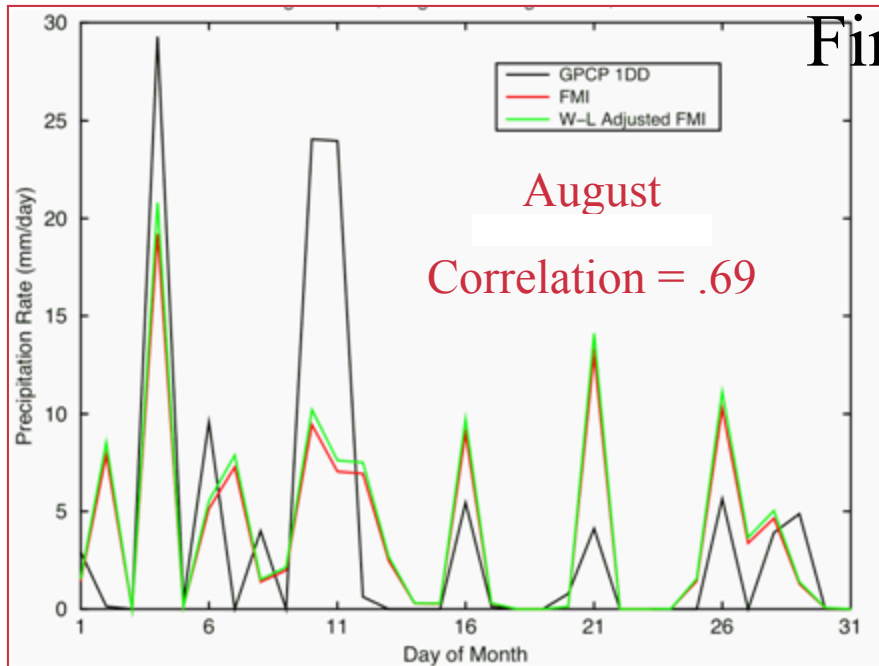
- Production of **current** GPCP products has halted (Sep. 2009) due to F13 failure. Plan has been to switch to F17 SSMI/S Tb's (either RSS? or NOAA?, JCSDA?, CSU?, UPP?) and use F13/F17 overlap period for inter-calibration . However, no inter-calibrated (with SSM/I) F17 SSM/IS Tb's exist today on which to apply Chiu (ocean) and Ferraro (land) algorithms.
- For GPCP V3 (future) the plan is to switch to GPROF and apply to at least F8/F11/F13 SSM/I and F17 SSM/IS with community Tb's. Therefore, GPCP V3 monthly is dependent on inter-calibration with time of these satellites and production of relevant Tb's.
- GPCP also desires inter-calibrated Tb's for all conical scanners, especially for high time resolution analysis (1998-present).

Extra Slides

High Latitude Precipitation Info. (1997- Present)

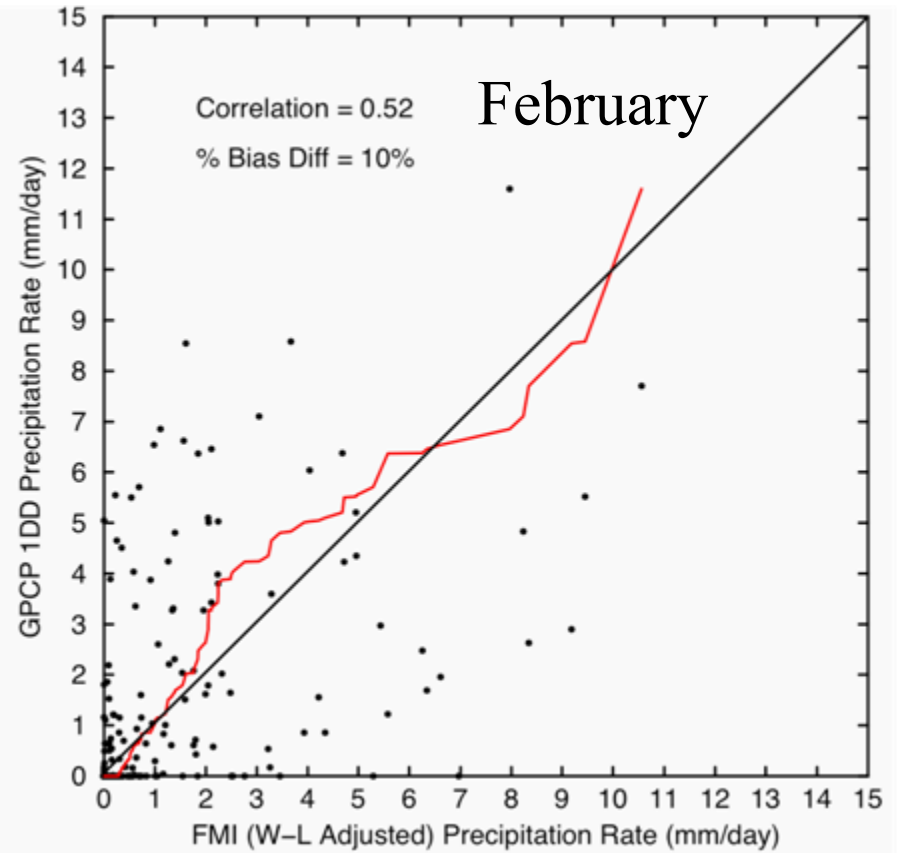
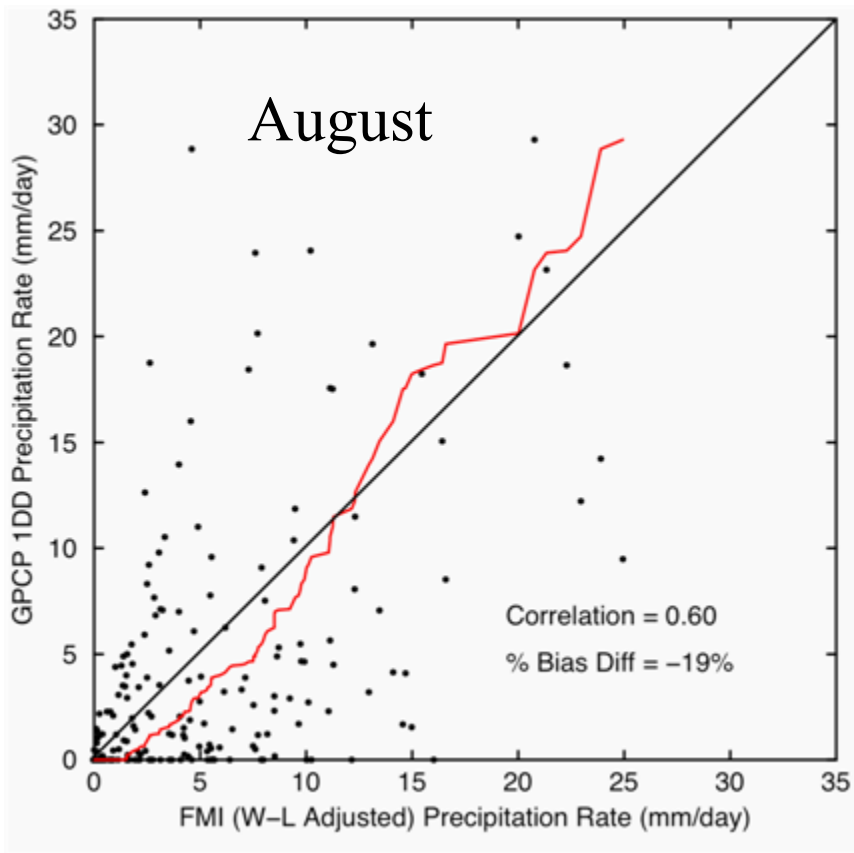
Validation of GPCP Daily 1° lat. x 2° long. Over

Finland



Gauge data is off by 6 hrs. from satellite day (00Z-00Z)

Validation of GPCP Daily 1° lat. x 2° long. Over Finland



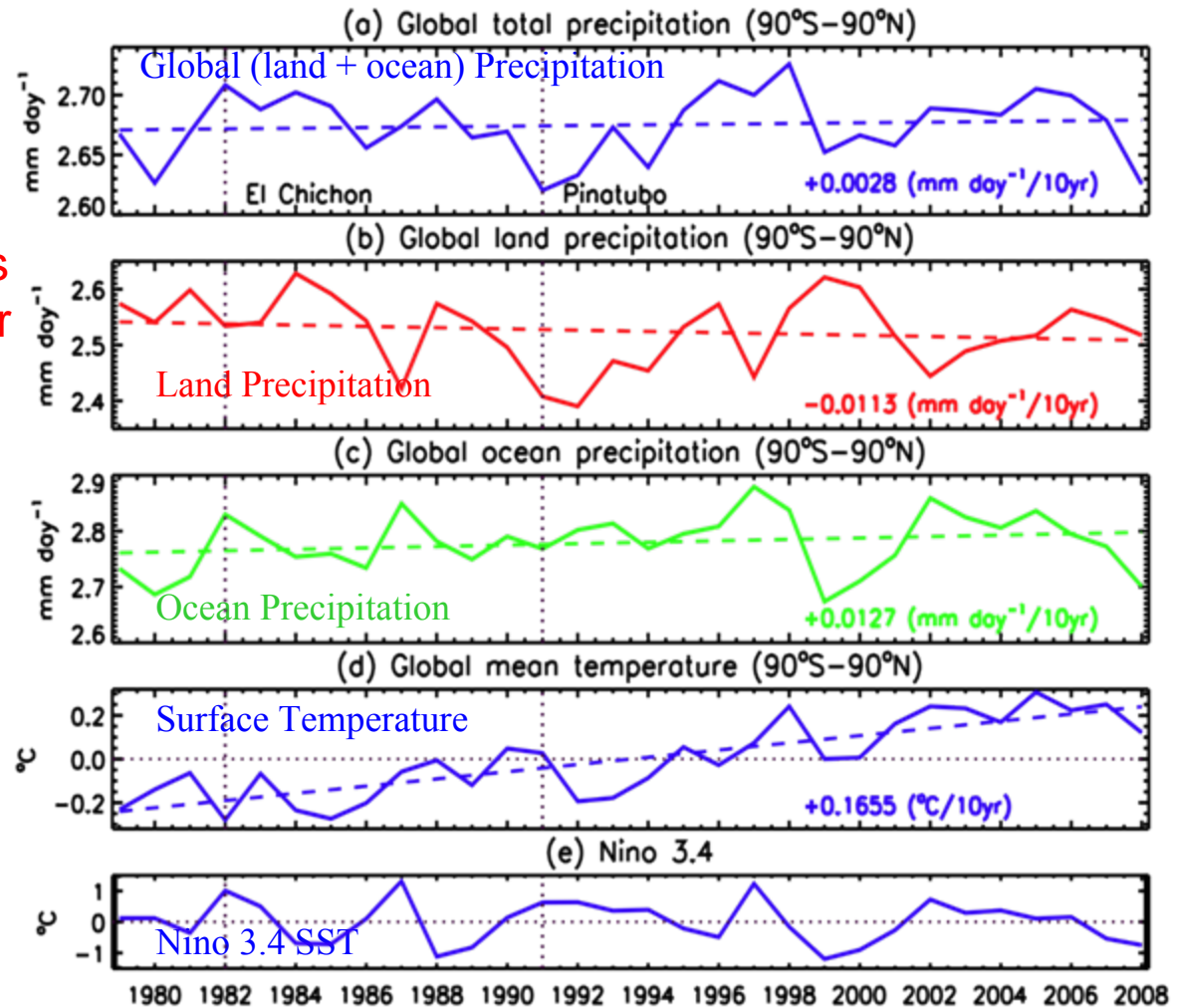
Value of such data at high latitudes for hydrology (and other) applications (CLIC)?

Bolvin, D.T., R.F. Adler, G.J. Huffman, E.J. Nelkin, J.P. Poutiainen, 2009: Comparison of GPCP Monthly and Daily Precipitation Estimates with High-Latitude Gauge Observations. *J. Appl. Meteor. Climatol.*, 48, 1843-1857.

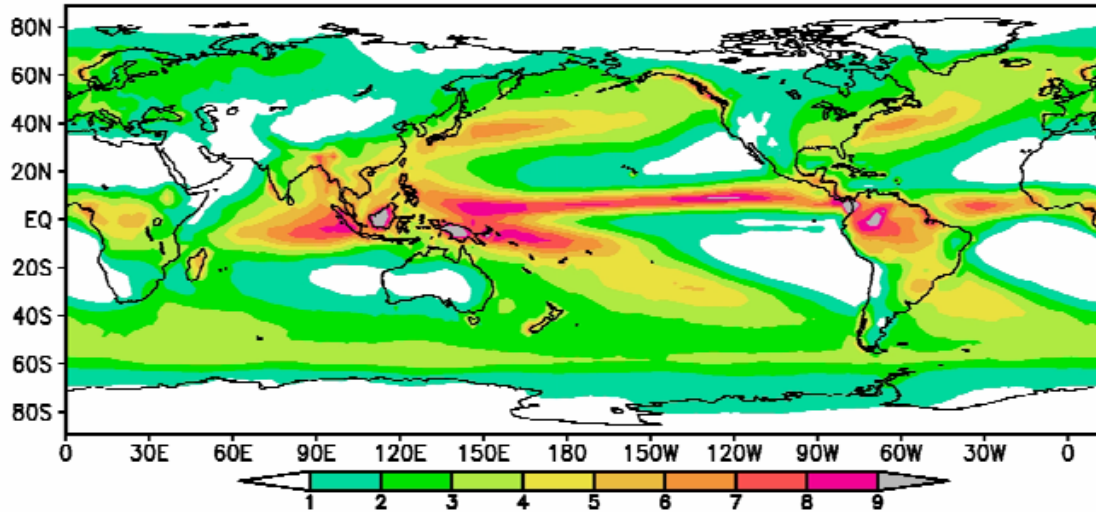
Monitoring Global Precipitation with the Global Precipitation Climatology Project (GPCP)

Year 2008 Added to GPCP Record—now 30 years

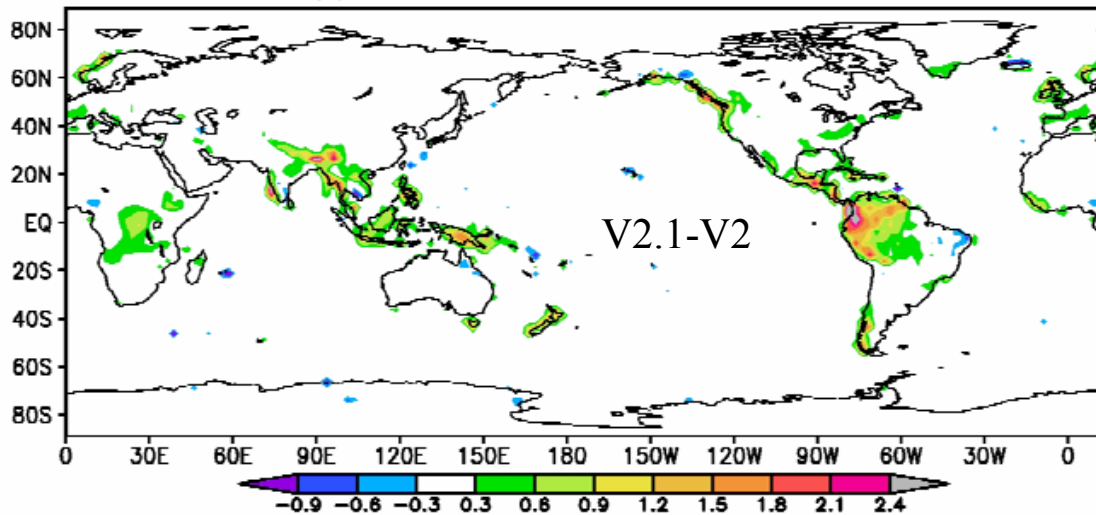
- 2008 near record low global (land + ocean) precipitation; trend very near zero, despite global warming during period.
- Near compensation of ocean and land inter-annual variations leaves slight residual of warmer and wetter years during El Ninos. 2008 was La Nina year.
- Peak temperature in 1998 associated with peak precipitation and El Nino; since '97-'98 surface temperature level and precipitation varies with ENSO.
- Temperature/precipitation relations on inter-annual and trend (climate change) scales one focus of NEWS study



(a) GPCP Climatology (v2.1; 1979–2007)



(b) Difference between GPCP v2.1 and v2



Version 2.1 of Monthly GPCP

(see Huffman et al., 2009 GRL)

Main changes over land due to improved gauge analysis by German Weather Service (GPCC) group giving improved analysis over orography and slight increase in mean values

Figures: (a) Climatology for GPCP Version 2.1 in mm/d, and (b) (Version 2.1 – Version 2) difference averaged over 1979-2007 in mm/d.

Global and Tropical Means

Table 1 Global and tropical average land, ocean and total precipitation for Versions 1 and 2 in mm/d. Percentage increase of Version 2. over Version 1 is given in parentheses. Ocean and Land Oceans are defined by 100% and <100% coverage respectively.

1979/2007	Global 90°N-90°S		Tropical 25°N-25°S	
Version	2	2.1	2	2.1
Land and C	2.62	2.68 (+2)	3.12	3.22 (+3)
Land	2.39	2.53 (+6)	3.49	3.73 (+7)
Ocean	2.78	2.78 (0)	2.88	2.88 (0)

Zonally-averaged Trends

Entire Period
1979-2007

SSM/I Era
1988-2007

