Advancing Climate Prediction: The Climate Test Bed

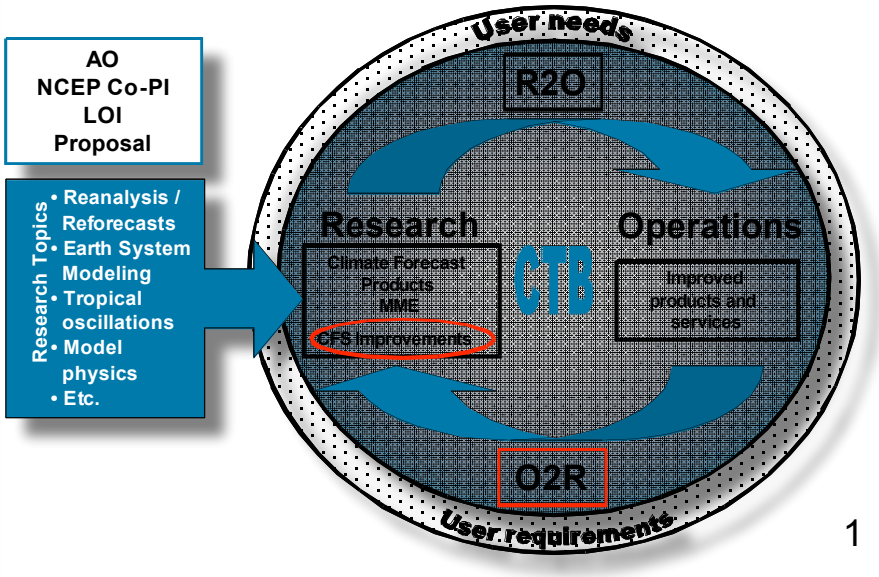
- Jointly established in 2004 by NCEP and NOAA Climate Program Office
- Serves as conduit between the operational, academic and research communities

Mission

- *To accelerate the transition of scientific advances from the climate research community to improved NOAA climate forecast products and services*

R2O and O2R

- Focus Areas
  - *CFS Improvements*
  - *MME*
  - *Climate Forecast Products*
- Competitive Grants Program
- CTB Seminar Series
- CPC-RISA-Partners Program
- Distinguished Visiting Scientist Program (FY09)



CTB Structure

Present

- Oversight Board
- Science Advisory Board
- Announcement of Opportunity (AO)
- NCEP Co-PI identified in advance
- LOI
- Proposals
- Links to NIDIS

Future (new charter under development)

Steering Committee (SC)

- Science teams to work with PIs
- Visiting scientists and post-docs
- AO/LOI with CTB, SC involvement
- Proposals evaluated with criteria from CTB, SC
- NCEP Co-PI tbd
- Project relevance to society in general

Climate Test Bed
Currently Funded Projects

- **10 ongoing projects**
  - **1 transitioned in FY08**
  - **1 in the "funnel" FY08 (not funded for FY09)**
  - **1 identified as unsuitable for transition FY08**
  - **3 for transition in FY09**
  - **4 for transition in FY10**
- **3 new projects funded for FY09**

CTB Focus Areas

- Climate Forecast System (CFS) Improvements
  - Dynamics
  - Physics
  - Coupled Ocean Atmosphere Land Cryosphere
- Multi Model Ensemble Prediction System
  - International
  - National
- Climate Forecast Products
  - Forecast evaluation tool (FET)
  - NIDIS Pilot Project
  - Improving NWS Products and Services in Partnership with the External Community
- Push for O2R
  - CPC to stage subset of reanalysis data for community
  - March 2010: Conversion of CPC operational monitoring products from CDAS-based to CFS-Reanalysis based
  - Establish Model Test Facility

CTB Seminar Series For 2008-2009

Schedule of Speakers

#	Date	Location	Speaker	Title
1	29-Oct	NCEP	Steve Lord/Hua-Lu Pan, NCEP/EMC	CFS - Under the Hood and CFS – Where It's Going
2	12-Nov	NCEP	V. Ramaswamy, GFDL	Climate Modeling at GFDL: The Scientific Challenges
3	17-Nov	ESSIC	Ed O'Lenic, NCEP/CPC	An Interactive, Community-Based Web Tool for Evaluating the Skill of CPC Forecasts
4	24-Nov	NCEP	Zhaohua Wu, COLA	Annual cycle and predictability of interannual variability
5	3-Dec	COLA	Eugenia Kalnay, U. of MD	New ideas on Ensemble Kalman Filter
6	[illegible]-Dec	CEP/209	Kathy Pegion, COLA	Subseasonal Variability of Tropical Cyclone Activity
[illegible]				
8	4-Feb	NCEP	Emilia Jin, COLA/GMU	Factors limiting the current skill of forecasts: flaws in model and initialization
9	10-Feb	NCEP	J. Shukla, GMU/IGES	Seamless Weather and Climate Prediction
10	11-Feb	COLA	Soo-Hyun Yoo, NCEP/CPC	The relationships between Indo-Pacific SSTs and Asian summer Monsoons in the NCEP CFS
11	24-Feb	NCEP	[illegible]	The relationship of U.S. droughts with SST and soil [illegible] time scale of droughts (with
12	9-Mar	ESSIC	Viviane Silva, NCEP/CPC	[illegible] Precipitation over the Americas
13	16-Mar	NCEP	Augustin Vintzileos, NCEP/EMC	On the importance of atmospheric and oceanic initial conditions in forecasting the MJO with the NCEP-CFS
-	18-Mar	NCEP	J. Kinter, COLA	RESCHEDULED FOR MAY 4
14	9-Apr	COLA	Kingtse Mo, NCEP/CPC	Monitoring many faces of drought over the United States
15	22-Apr	NCEP/209	E. Schneider, COLA	Amazon deforestation in CFS
16	[illegible]	[illegible]	[illegible]	[illegible]
17	[illegible]	[illegible]	[illegible]	[illegible]
18	6-May	NCEP	Jiangfeng Wei, COLA	Investigation of land-and-atmosphere interaction with multi-forcing and multi-model coupling methods
19	11-May	ESSIC	Huug van den Dool, NCEP/CPC	Methods of Multi-Model Consolidation, with Emphasis on the Recommended Cross Validation Approach
20	27-May	NCEP	Vladimir Krasnopolsky, NCEP and ESSIC	Development of neural network emulations of model radiation for improving the computational performance of the NCEP seasonal climate forecasts
21	3-Jun	NCEP	Alexander (Sandy) MacDonald	TBD
22	10-Jun	COLA	Jim Carton, U. of MD	Ocean reanalyses: prospects for climate studies
23	24-Jun	NCEP	Sumant Nigam, U. of MD	TBD

Schedule and past presentations available at www.cpc.ncep.noaa.gov/products/ctb

High-Resolution Global Precipitation Analyses Based on Multiple Satellite Observations and In situ Measurements

Pingping Xie
NOAA's Climate Prediction Center

2009.04.28.

Objective:

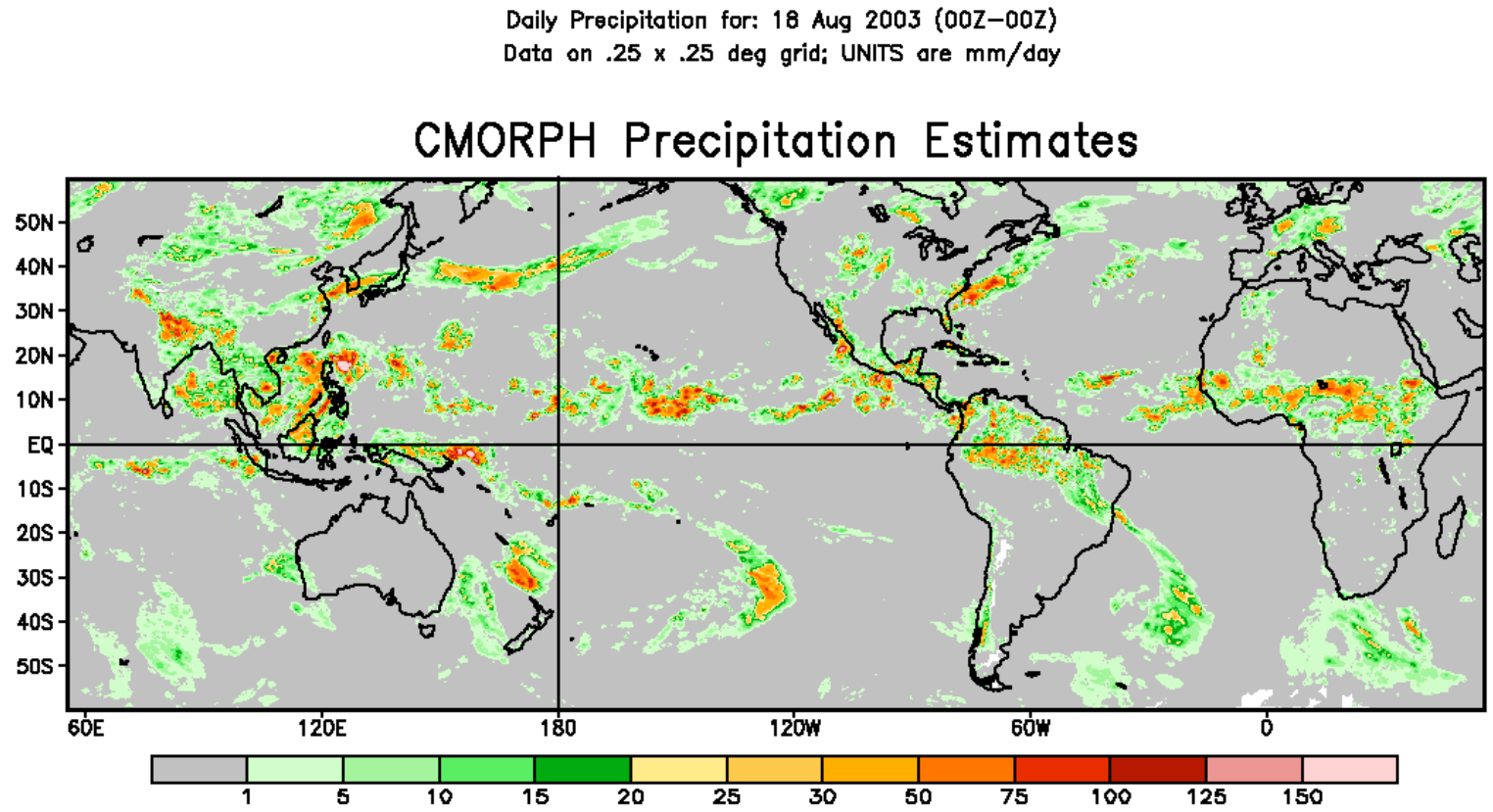
- To create an analysis system of high-resolution precipitation over the globe using all estimates available from GPM and other satellites as well as other sources of information

CMORPH

- CPC Morphing technique
  - Create hi-resolution precipitation estimates by combined use of MW-based precip estimates from polar orbiting satellites and IR data from geostationary satellites
  - Compute the advection vectors of cloud/precipitation systems using consecutive IR images from geostationary satellites;
  - Define precipitation estimates through propagating the instantaneous MW-based precipitation estimates from individual polar orbiting satellites
- Features
  - 8kmx8km resolution / Quasi-global coverage (60^{o}S-60^{o}N);
  - 30-min interval / from December 2002 / Real-time
- Performance
  - Best performance among similar products in most situations
  - Bias and random error
  - Relatively short records (from Dec.2002)

Example of CMORPH Estimates

Example CMORPH Precipitation for Aug.18, 2003



Strategy

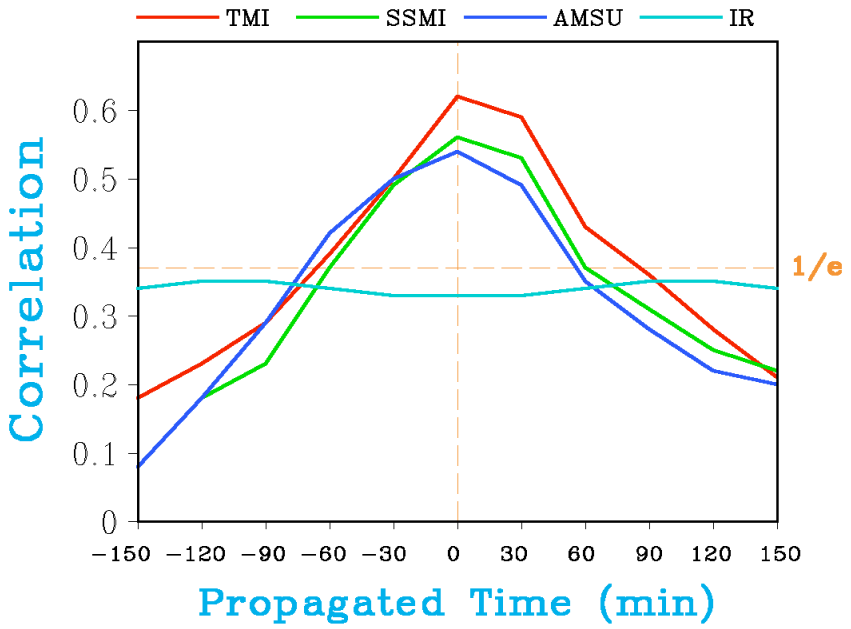
- Improving CMORPH satellite-based high-resolution precipitation estimates through adopting Kalman Filter technique

- Removing the Bias in the CMORPH satellite estimates through combination with gauge analysis

Improving CMORPH [1]

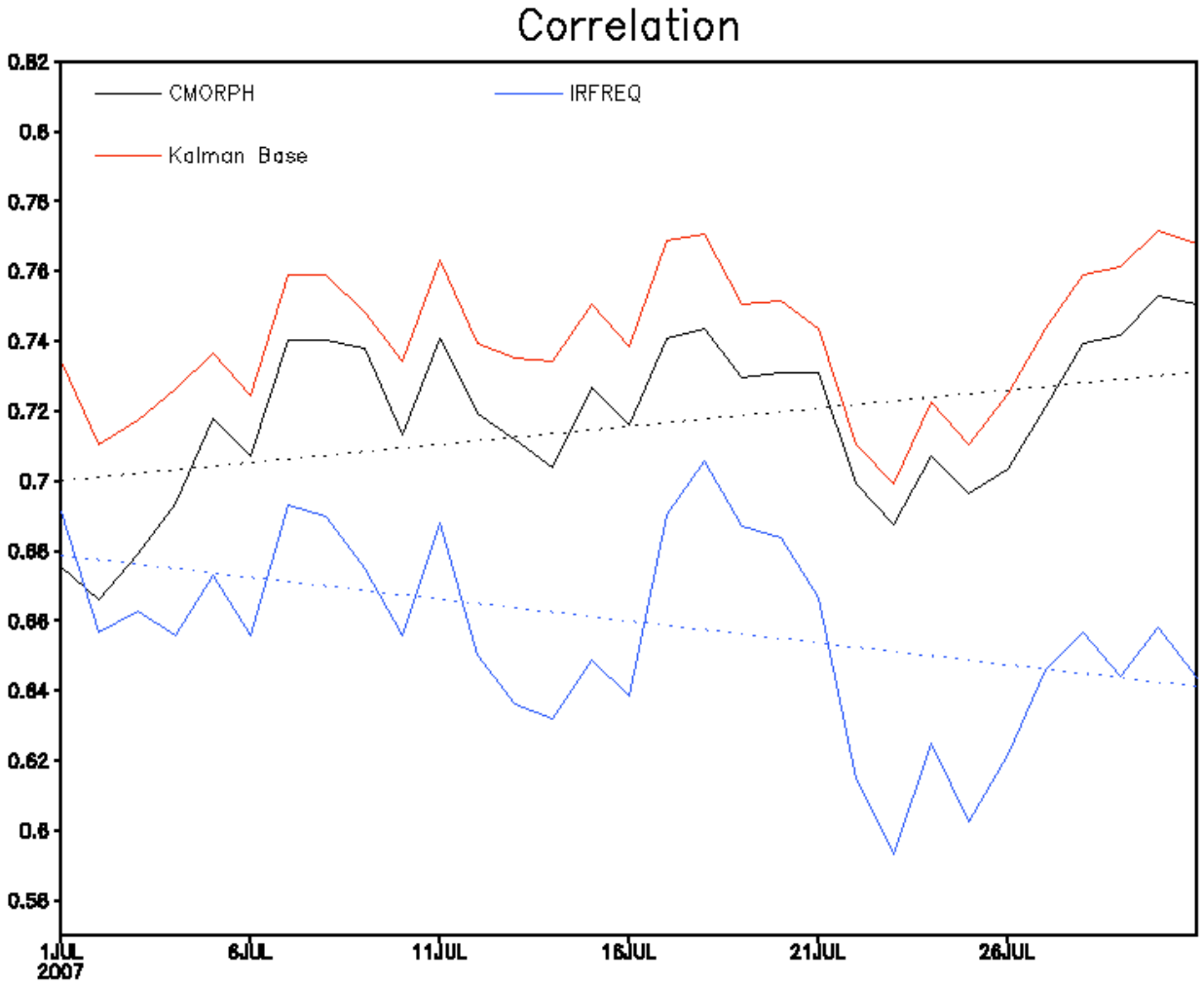
Methodology

- **Taking inputs from more satellites**
  - Microwave estimates from all available satellites
  - IR-based precipitation estimates to fill gaps of MW observations
- **Combining satellite estimates through Kalman Filter**
  - Weights inversely proportional to the error variance of each satellite estimates
  - Error variance of each satellite estimates as a function of advection time from its observed time



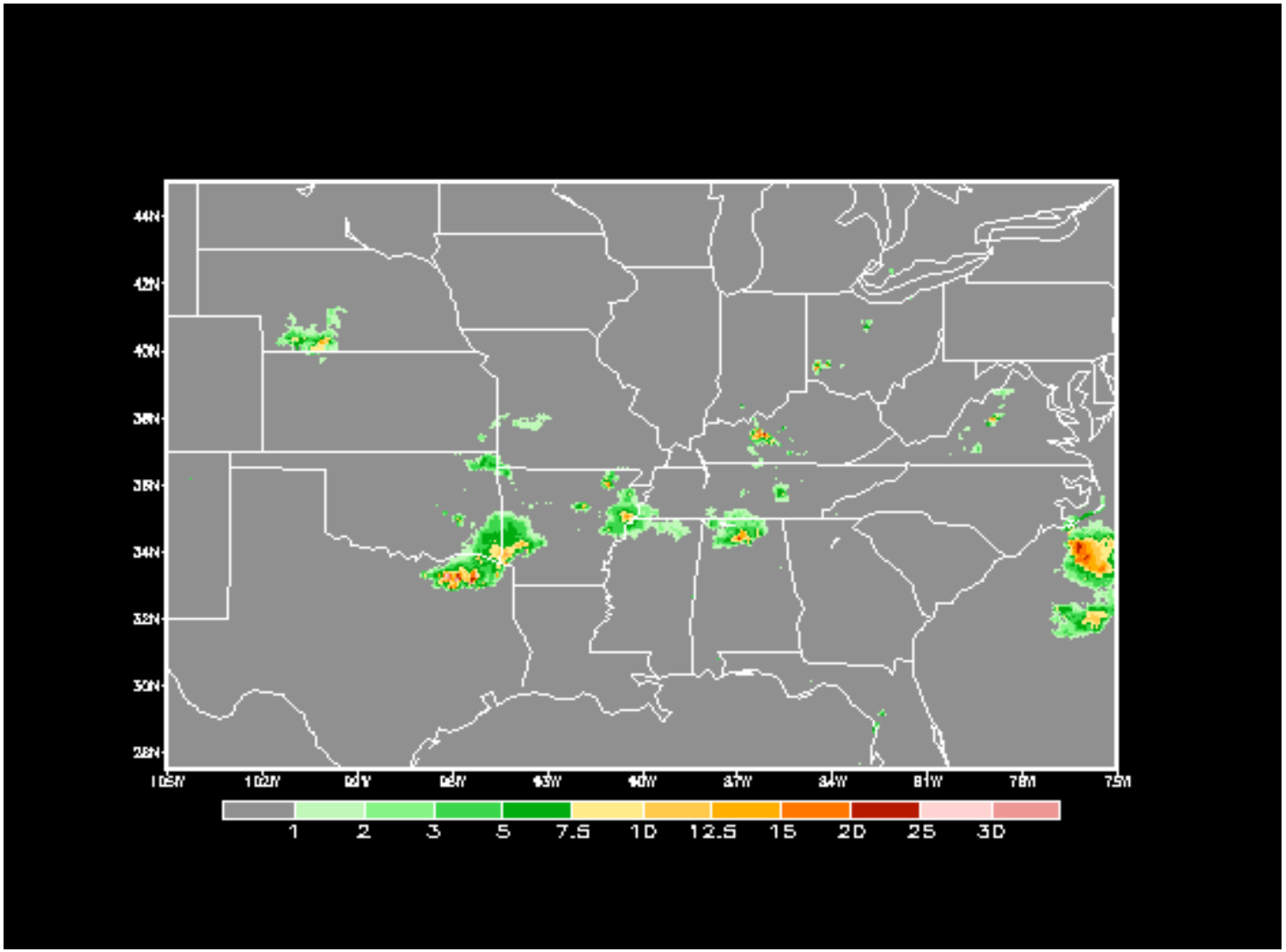
Improving CMORPH [2]

Results over CONUS



Improving CMORPH [3]

Sample Kalman Filter CMORPH for July 10, 2007

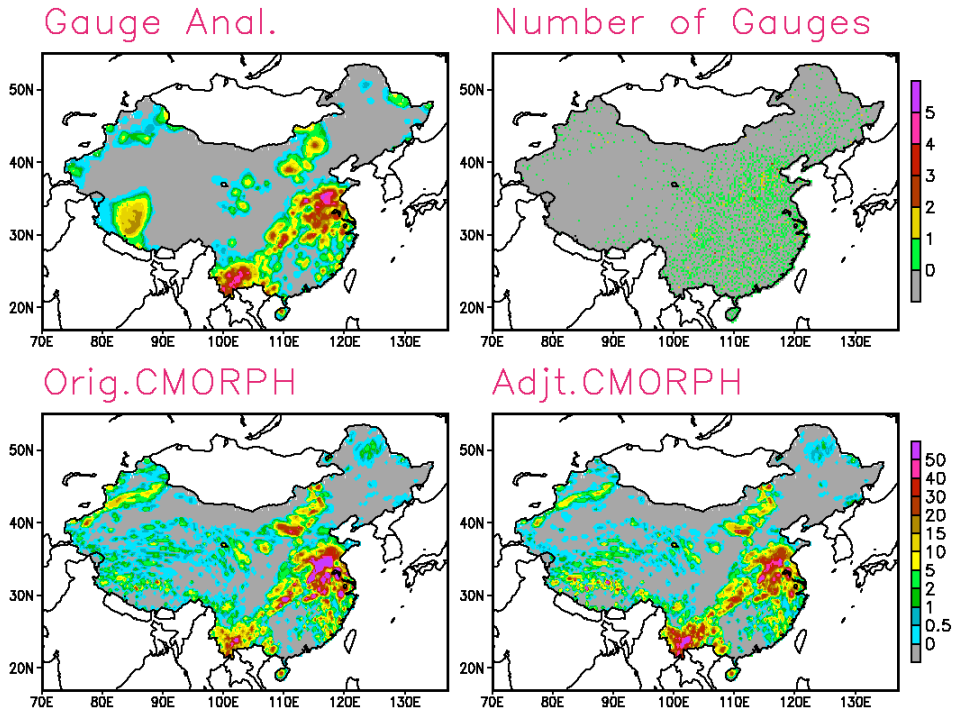


Combining with Gauge [1]

Removing Bias Through PDF Matching

- Construct PDF for CMORPH and gauge-observed daily precipitation using co-located data pairs
- Correct the bias in the CMORPH through matching the PDF of CMORPH against that of the gauge data
- Cross-Validation results over China

CMORPH	Bias (%)	Corr.
Original	-9.7%	0.706
Adjusted	-0.0%	0.785

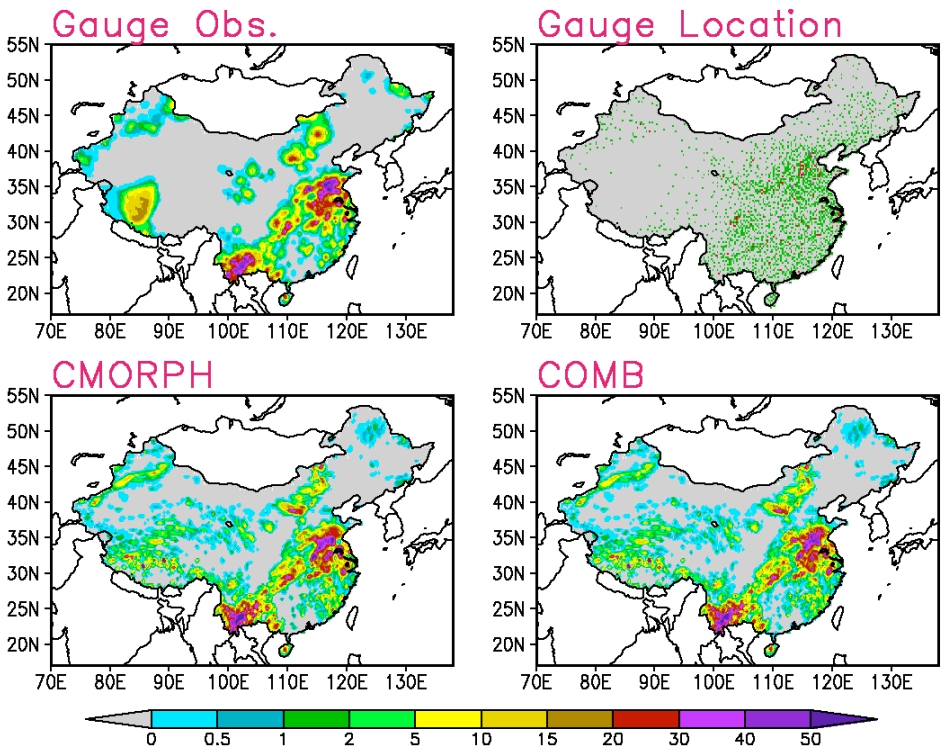


Combining with Gauge [2]

Blending Bias-Corrected CMORPH with Gauge

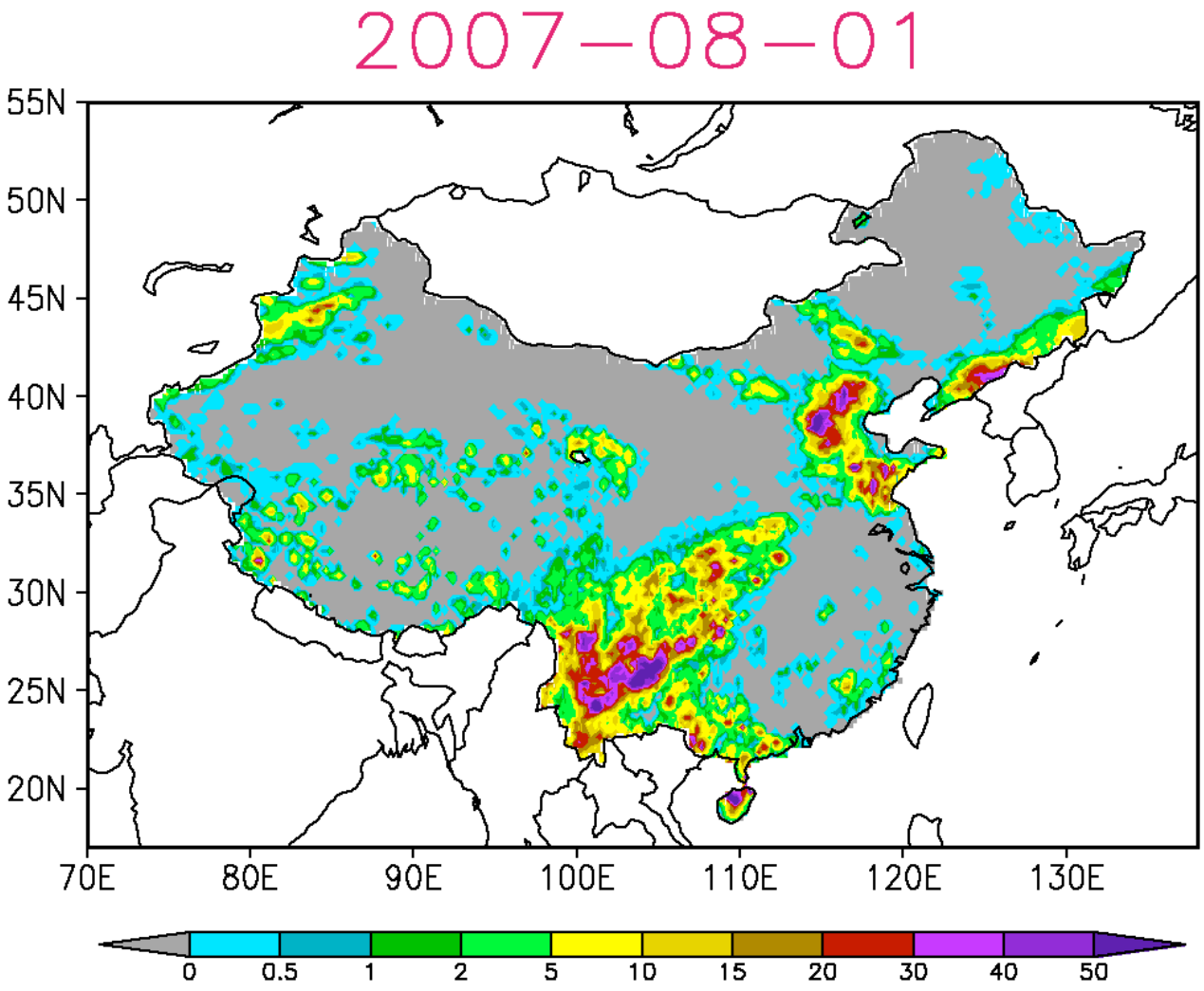
- Combine the bias-corrected CMORPH with CPC Unified gauge analysis through the OI to further improve the quality of precipitation analysis

- Bias-corrected CMORPH as first guess, gauge data as observations to correct the first guess over regions with coverage



Combining With gauge [3]

Merged Analysis for August 1 – 10, 2007



Final Goal

- **CMORPH satellite** high-resolution satellite precipitation estimates improved and constructed for a period from 1998 to the present

- **High-Resolution (0.25^{o}lat/lon) satellite-gauge merged analysis** of precipitation created over the globe by combining with CPC Unified Gauge Analysis

Summary

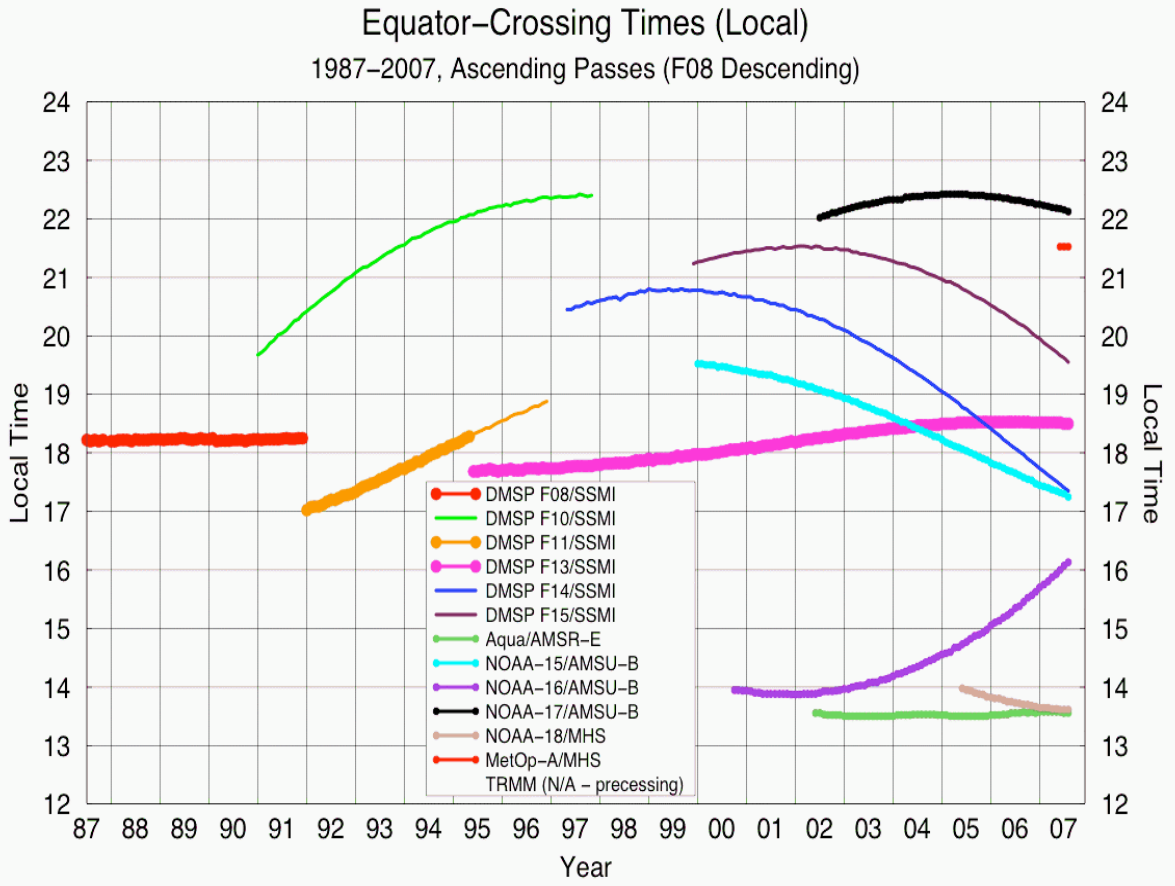
- Improving CMORPH through including observations from more satellites and applying Kalman Filter technique

- Reducing error in CMORPH through combining information from gauge observations
  - PDF matching to remove bias
  - OI blending to reduce random error

- Work underway to implement the techniques over global domain and to construct high-resolution precipitation analysis

Backup Slides

ECT of Available PMW Satellites



Thickest lines denote GPCP calibrator.

Image by Eric Nelkin (SSAI), 30 August 2007, NASA/Goddard Space Flight Center, Greenbelt, MD.

CPC Unified Daily Gauge Analysis

for July 1, 2003