SSM/I Hydrological Products (ARC)

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Outline

- Brief Project Overview
- Approach (1-2 slides)
- Results/Accomplishments (1-3 slides)
- Validation Strategy/Results (1-2 slides)
- Algorithm/Product Maturity
- Issues/Risks & Work-Off Plans
- Schedule
- Research-to-Operations or Delivery Plan
- Resources

Overview

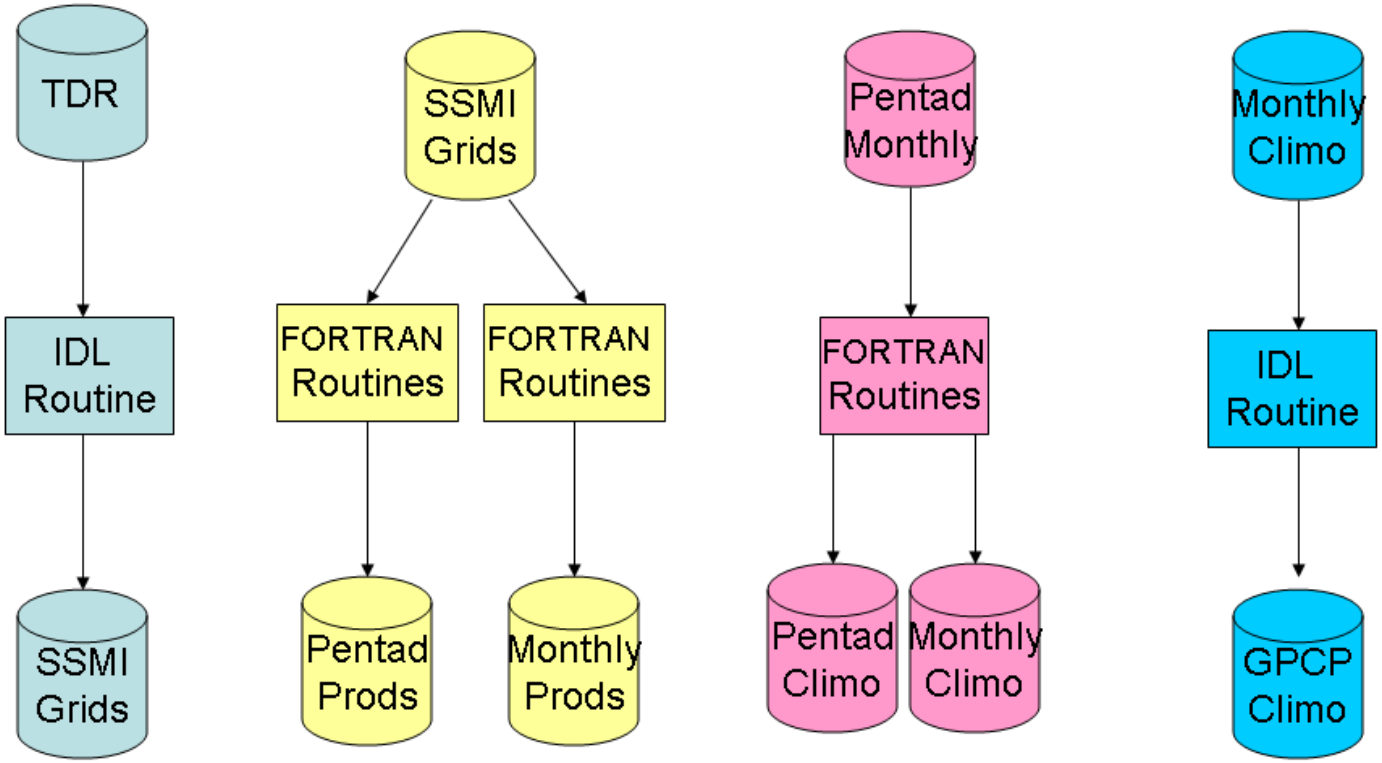
- Goal(s):
  - Maintain/enhance climatology of hydrological parameters
  - Deliver estimates to GEWEX/GPCP
- Source Data
  - DMSP SSM/I (1987 – present)
- Deliverables
  - Monthly, global 1 & 2.5 degree products (Rainfall & frequency of occurrence; CLW & frequency of occurrence; TPW; Snow Cover; Sea-Ice Concentration & frequency of occurrence)
- ECVs addressed
  - Rainfall, TPW, CLW, Snow, Sea-Ice
- Current/expected user communities
  - Climate Community (GEWEX, NOAA, JMA)
  - Some requests from selected groups – communications sector and insurance industry (mainly rainfall intensity)

Approach (1/2)

- Use algorithms developed via CPO funding and published in the open literature in the 1990's
  - Ferraro et al, 1996, BAMS
  - Ferraro, 1997, JGR
  - Weng et al, 1997 JGR
    - These algorithms (or the main essence of them) are running as SSM/I EDR's at FNMOC
- We acquire orbital SSM/I and SSMIS data in near real time in TDR and SDR format
  - Complete through 8/09
    - F8- F11- F13 sequence (start 7/87- 265 months in length) [~600/1800 LST]
    - F10- F14- F15 sequence (start 1/92- 212 months in length) [~1000/2200 LST]
    - F16 ~ 5 years of products, quality acceptable on monthly scale after correction
    - 1 & 2.5 degree, pentad & monthly
  - Updated early each month; posted on FTP area and accessible through NCDC web page
- Generate 1/3 deg gridded daily files (ASC and DSC nodes)
- (Pentad) and monthly products generated 1st day each month

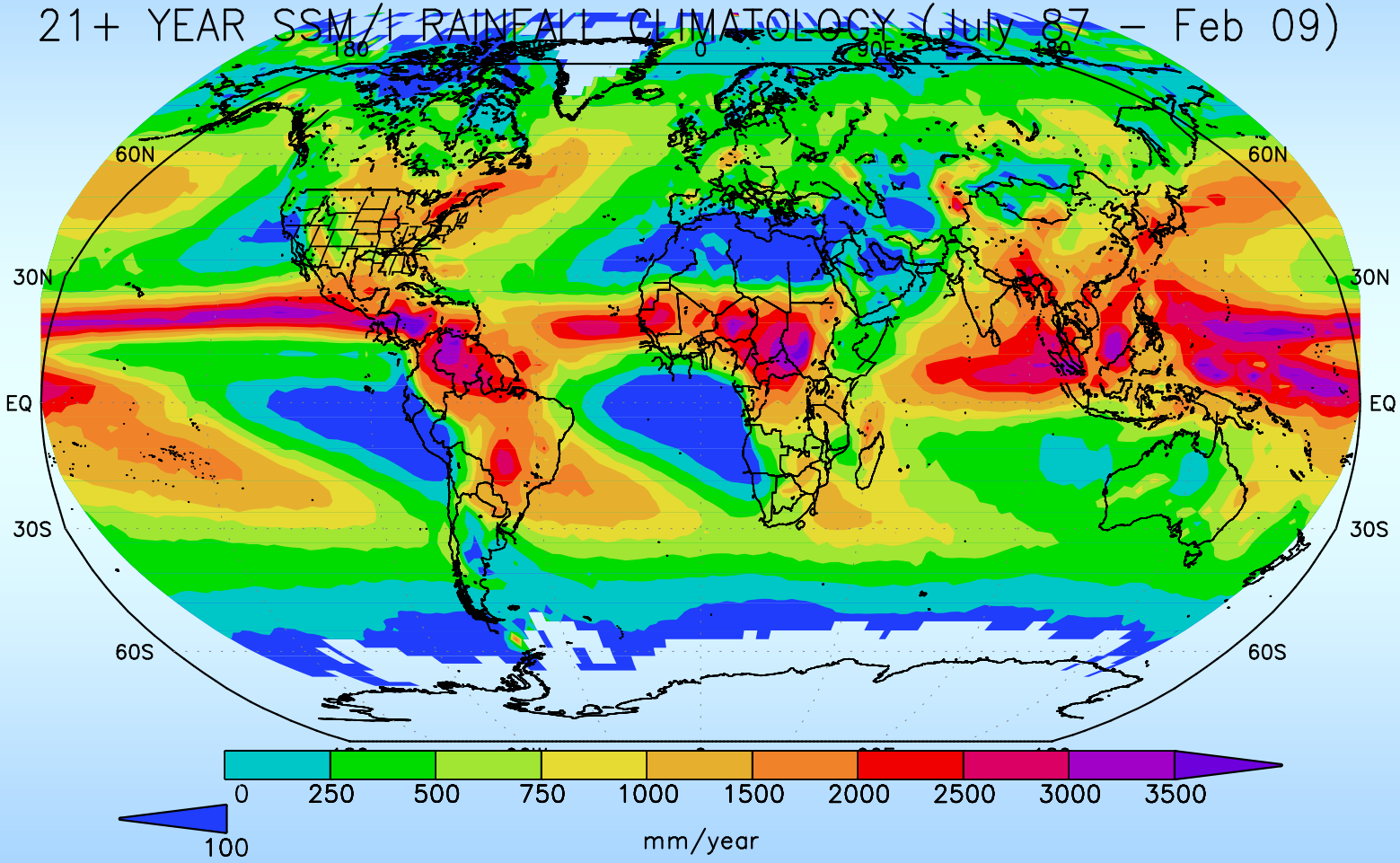
Approach (2/2)

ARC SSM/I Processing Steps

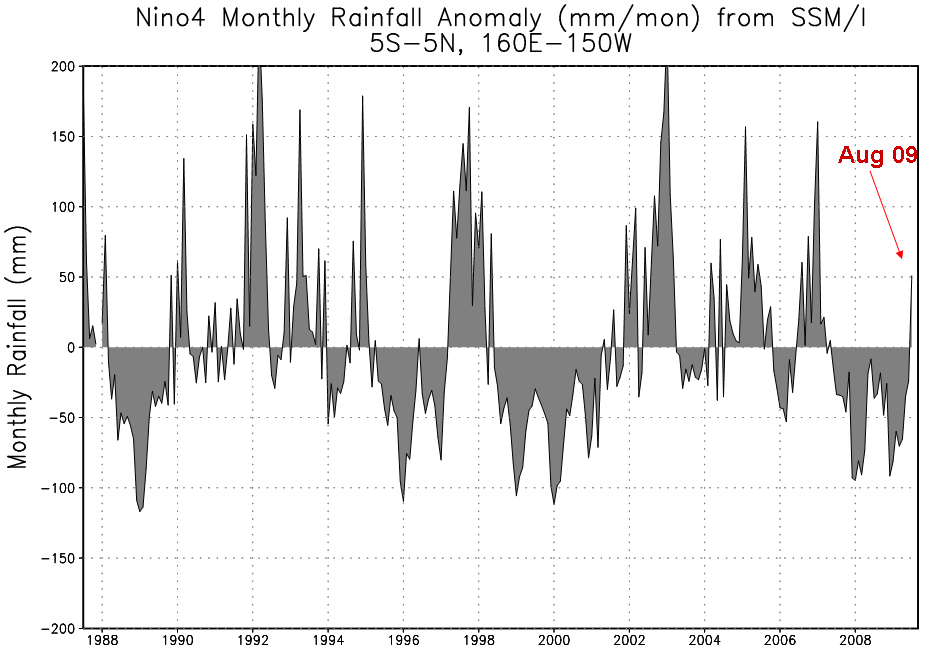


Notes:
(1) SSMI grids created for each satellite
(2a) Pentad and monthly products created at both 1 deg and 2.5 deg
(2b) Products include TPW, CLW, CFR, PRE, PFR, SNW, ICE, OWS, SSA
(3) Time series – 1987 to present (both for 6 am and 10 am satellites
(4) GPCP products – single and dual satellites

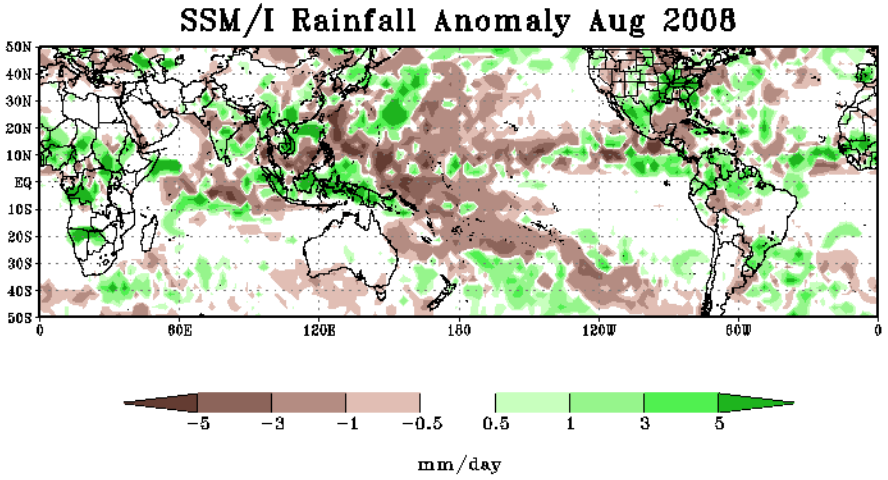
Results/Accomplishments (1/3)



Results Accomplishments (2/3)

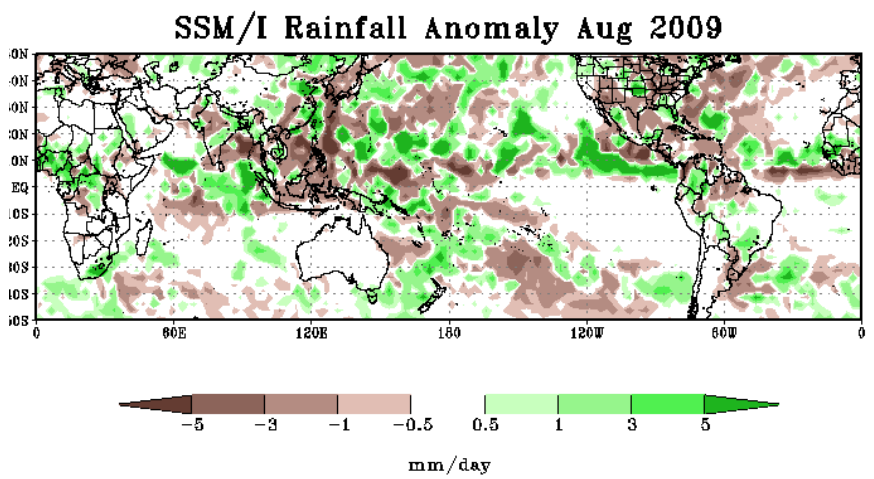


Monthly Rainfall Anomaly
based on departure from 1987–07 base period



16 Sep 2008 NOAA/NESDIS/ORA/SCSB-CICS

Monthly Rainfall Anomaly
based on departure from 1987–08 base period



2 Sep 2009 NOAA/NESDIS/ORA/SCSB-CICS

Results/Accomplishments (3/3)

d Products - Mozilla Firefox

narks Tools Help

http://lwf.ncdc.noaa.gov/oa/satellite/ssmi/ssmiproducts.html

Latest Headlines

NOAA Satellite and Information Service
National Environmental Satellite, Data, and Information Service (NESDIS)

National Climatic Data Center
U.S. Department of Commerce

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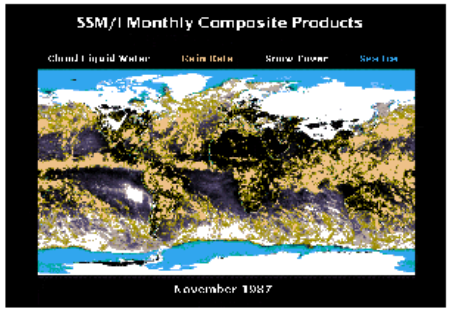
Special Sensor Microwave/Imager (SSM/I)

Global Gridded Products

Overview Description Data Access Questions and Comments

Overview

The Defense Meteorological Satellite Program (DMSP) Special Sensor Microwave/Imager(SSM/I) became operational in July 1987 on the F-8 satellite. Subsequent SSM/I's have been flown on the F- 10 (November 1990), F-11 (December 1991), F-12 (August 1994), F-13 (March 1995), F-14 (April 1997) and most recently, F-15 (January 2000) satellites. At present, NESDIS receives data from the F-13 and F-15 satellites.



The SSM/I is a seven channel passive microwave radiometer operating at four frequencies (19,35, 22,235, 37.0, and 85.5 GHz) and dual-polarization (except at 22.235 GHz which is V-polarization only). It should be noted that the SSM/I will be replaced by an advanced sensor, the SSMIS (Special Sensor Microwave Imager Sounder) on the F-16 and F-17 satellites, which were launched in October 2003 and November 2006, respectively. SSMIS data is now available through Comprehensive Large Array-data Stewardship System (CLASS). There should be little impact on the suite of hydrological products described here, as the primary channels used are very similar between the SSM/I and SSMIS.

Scientists at the NOAA/NESDIS Center for Satellite Applicatons and Research (STAR) are actively involved in SSM/I algorithm development and validation, and the application of such algorithms for weather forecasting and analysis, and climate evaluation. Additionally, the SSM/I has been

Validation Strategy/Results

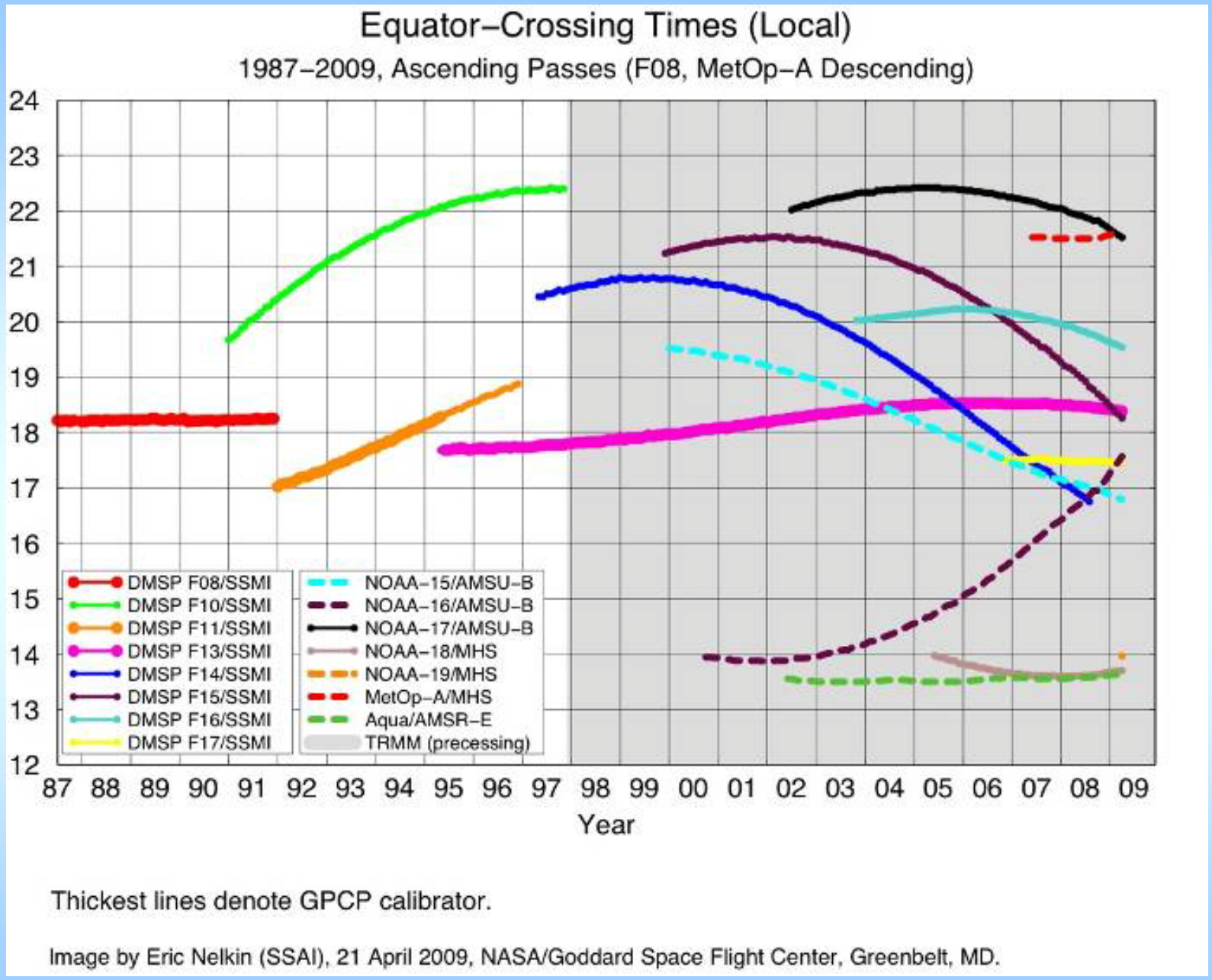
- The products/algorithms have been validated over the years and published in the open literature
  - Other satellite products
  - Surface data
  - NWP model fields
    - Uncertainties are fairly well established
- There are several areas for improvement, we keep things the same for continuity sake, but…
  - Full resolution data
  - New QC scheme
  - Improved algorithms

Product Maturity

Maturity	Sensor Use	Algorithm stability	Metadata & QA	Documentation	Validation	Public Release	Science & Applications
1	Research Mission	Significant changes likely	Incomplete	Draft ATBD	Minimal	Limited data availability to develop familiarity	Little or none
2	Research Mission	Some changes expected	Research grade (extensive)	ATBD Version 1+	Uncertainty estimated for select locations/times	Data available but of unknown accuracy; caveats required for use.	Limited or ongoing
3	Research Missions	Minimal changes expected	Research grade (extensive); Meets international standards	Public ATBD; Peer-reviewed algorithm and product descriptions	Uncertainty estimated over widely distribute times/location by multiple investigators; Differences understood.	Data available but of unknown accuracy; caveats required for use.	Provisionally used in applications and assessments demonstrating positive value.
4	Operational Mission	Minimal changes expected	Stable, Allows provenance tracking and reproducibility; Meets international standards	Public ATBD; Draft Operational Algorithm Description (OAD); Peer-reviewed algorithm and product descriptions	Uncertainty estimated over widely distribute times/location by multiple investigators; Differences understood.	Data available but of unknown accuracy; caveats required for use.	Provisionally used in applications and assessments demonstrating positive value.
5	All relevant research and operational missions; unified and coherent record demonstrated across different sensors	Stable and reproducible	Stable, Allows provenance tracking and reproducibility; Meeting international standards	Public ATBD, Operational Algorithm Description (OAD) and Validation Plan; Peer-reviewed algorithm, product and validation articles	Consistent uncertainties estimated over most environmental conditions by multiple investigators	Multi-mission record is publicly available with associated uncertainty estimate	Used in various published applications and assessments by different investigators
6	All relevant research and operational missions; unified and coherent record over complete series; record is considered scientifically irrefutable following extensive scrutiny	Stable and reproducible; homogeneous and published error budget	Stable, Allows provenance tracking and reproducibility; Meeting international standards	Product, algorithm, validation, processing and metadata described in peer-reviewed literature	Observation strategy designed to reveal systematic errors through independent cross-checks, open inspection, and continuous interrogation	Multi-mission record is publicly available from Long-Term archive	Used in various published applications and assessments by different investigators

Issues/Risks & Work- Off Plans

- SSM/I F-13 recorder failures
  - Sampling over N.A. poorer over time
    - Impact on products unknown
- SSM/I F-15 RADCAL issues
  - Does not directly affect this time series but still a user concern
- SSM/I ending; transition to SSMIS required
  - Developing methods for seamless transition
- Long term stewardship and contribution to GEWEX
  - 0.5 FTE (CI person) required to sustain product quality and deal with 'typical' issues



Thickest lines denote GPCP calibrator.

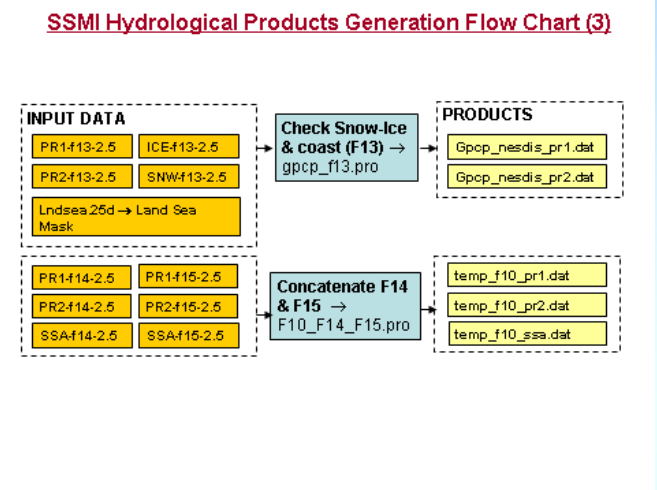
Image by Eric Nelkin (SSAI), 21 April 2009, NASA/Goddard Space Flight Center, Greenbelt, MD.

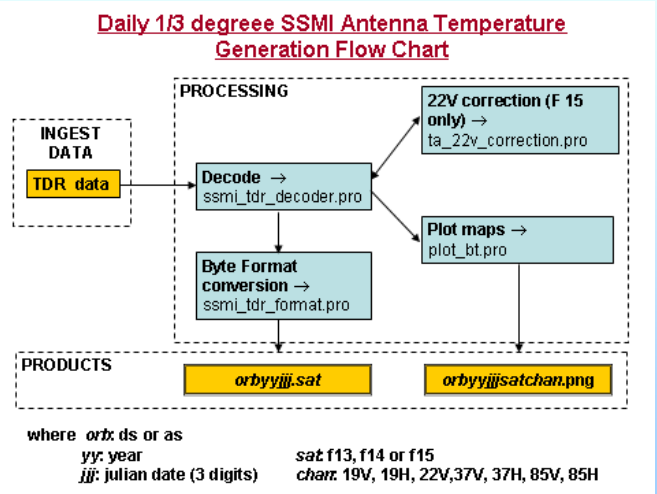
Schedule

- See next slide on transition…

Research- to- Operations or Delivery Plan

- STAR is transitioning this processing to NCDC
  - Working with Bates & Semunegus since 2008
  - Completion anticipated in 2010
    - Parallel capability established, will run for several more months
    - New QC scheme for improved products
  - May decide on a few enhancements…
  - Ferraro remains "steward" for products
    - Will try to secure STAR funding starting in FY11





Resources

- Number of personnel employed for project
  - Ferraro (0.25), Semunegus (0.25) (no cost)
  - Vila (0.5), Sudradjat (0.25) via ARC
- Key equipment or observatories used
  - Minimal computing/storage required
- Key collaborating projects or personnel
  - ARC/GPCP (Xie, CPC)
  - GEWEX/GPCP (Rossow/Kummerow/Adler)
  - New start SSM/I CDR (Kummerow, PI)
- NOAA points-of-contact or collaborators
  - (H. Semunegus, NCDC)
- Target NOAA Data Center
  - NCDC, already established