Global Precipitation Measurement (GPM) mission

1st NOAA GPM Users Workshop

GPM Data Products and Data System Status

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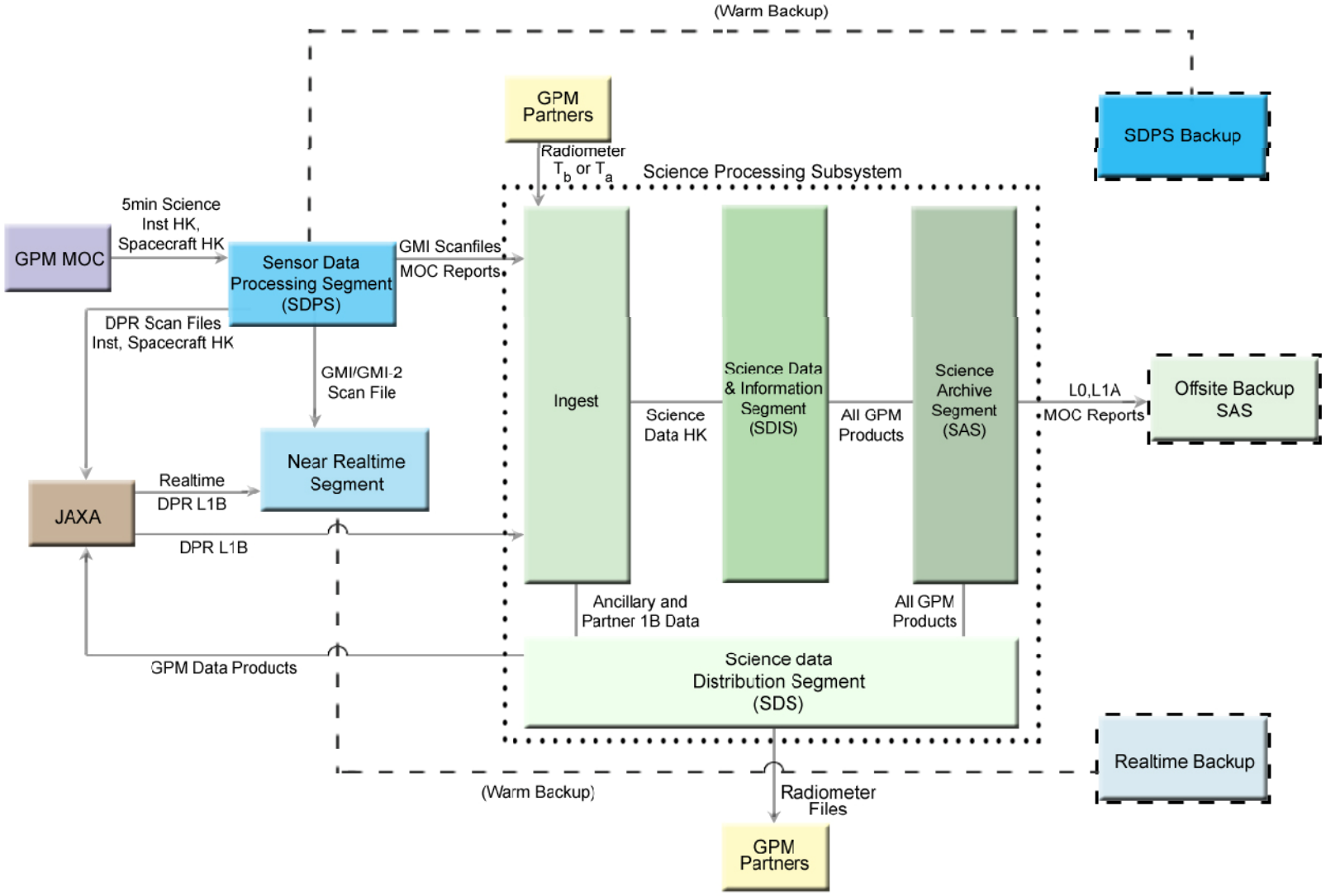
August 18, 2010

PPS Architecture

Top Level PPS Architecture



GPM Algorithms and Levels

Programs that take satellite data and perform the precipitation retrievals generate products at the following levels:

- ***Level-1A****:* Packet data repackaged into orbits or NRT granules.
- ***Level-1B/1C****:* Calibrated instrument measurements, instantaneous field of view (ifov) in geolocated swaths.
- ***Level-2****:* Precipitation retrievals, at ifov, instrument swath geometry.
- ***Level-3****:* Time-Space averages/accumulations (gridded).
- ***Level-4****:* Addition of modeling data to satellite retrievals.

GPM NRT Products

Product Level	High Level Description	Coverage
Level 1B GMI, GMI-2 Level 1C GMI, GMI-2 Level 1C Partner radiometers	Geolocated Brightness Temperature and intercalibrated brightness temperature	Swath, instrument field of view(IFOV), 5 min NRT granules, Partner as delivered GMI-no later than 1 hour after data collection 90% of time (based on 20min granule)
Level 2 GMI, GMI2 Level 2 Partner radiometers	Radar enhanced precipitation retrievals	Swath, IFOV,5min granules, Partner as delivered
Level 2 DPR	Reflectivities, Sigma Zero, Characterization, DSD, Precipitation with vertical structure	Swath, IFOV (Ku, Ka, combined Ku/Ka), size dependent upon TDRSS contact
Level 2 Combined (GMI/DPR)	Precipitation retrievals	Swath, IFOV, size dependent upon DPR L1B size Within 3 hours of collection 90% of the time
Level 3 Merged Radiometer/IR	Merged global product containing global precipitation merging retrievals from all radiometers (and IR as necessary)	0.1x 0.1 1 hour grid

GPM Research Products

Product Level	High Level Description	Coverage
Level 1B GMI, GMI-2 Level 1C GMI, GMI-2 Level 1C Partner radiometers	Geolocated Brightness Temperature and intercalibrated brightness temperature	Swath, instrument field of view(IFOV)
Level 2 GMI, GMI2 Level 2 Partner radiometers	Radar enhanced precipitation retrievals	Swath, IFOV
Level 2 DPR	Reflectivities, Sigma Zero, Characterization, DSD, Precipitation with vertical structure	Swath, IFOV (Ku, Ka, combined Ku/Ka)
Level 2 combined GMI/DPR	Precipitation	Swath, IFOV (initially at DPR Ku swath and then at GMI swath)
Level 3 Latent Heating (GMI, DPR, Combined)	Latent Heating and associated related parameters	0.1 x 0.1 monthly grid
Level 3 Instrument Accumulations	GMI, GMI-2 ,partner, combined and DPR precipitation and related parameters	0.1 x .0.1 monthly grid 0.1 x 0.1 daily grid
Level 3 Merged Radiometer/IR	Merged global product containing global precipitation merging retrievals from all radiometers (and IR as necessary)	0.1x 0.1 1 hour grid
Level3 Gridded Text products	Surface rain from GMI,DPR, and Combined	0.1 x 0.1 hourly (packaged by day)

GPM Science Algorithm Deliveries

Version 1 Nov. 2010

- *A detailed Algorithm Theoretical Basis Document* (ATBD) that will allow estimation of processing needs, storage sizing and network capacity.
- Information on all ancillary data required (e.g., *atmospheric state information*).
- Includes all temporary and/or static file usage.
- Some developers may include prototype code that can be used to test requirements, like parallel processing, etc.
- No ability to do system testing.

Version 2 Nov. 2011

- *Running code* containing the bulk of the science retrieval but anticipation is that changes may be still be made.
- Use of PPS toolkit for input and output using GPM formats.
- Output products contain all parameters although some may not be filled.
- All routines included, although some might be stubs.
- Useful for input/output testing, format verification, flow testing and even limited end to end testing in PPS.

GPM Science Algorithm Deliveries, cont.

Version 3 Nov. 2012

- *Full algorithms with all science code*, reading/writing GPM product formats and utilizing all ancillary data.
- Used for end to end testing, mission simulations, and performance testing.

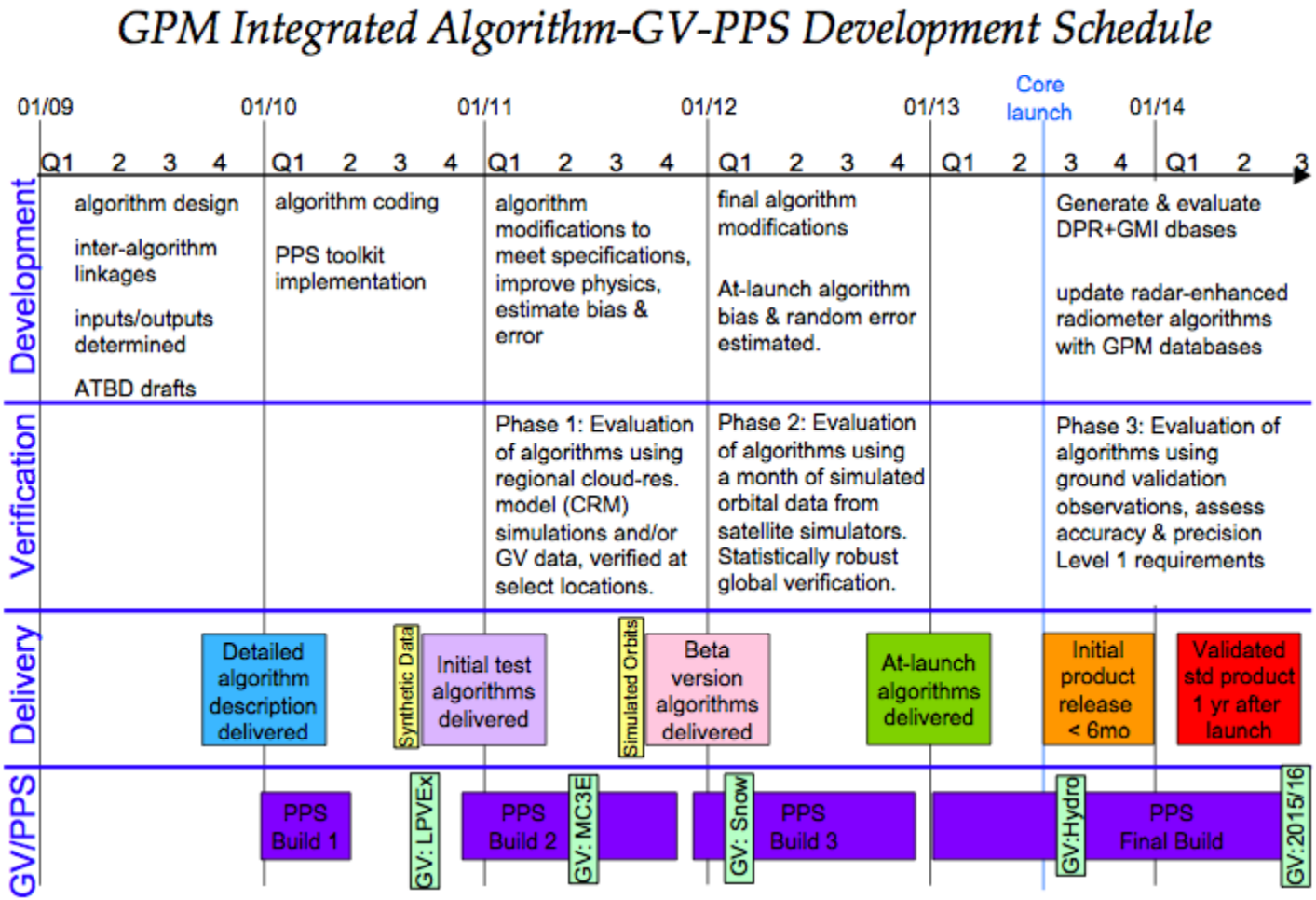
At-Launch Version Jan 2013

- Fixes in bugs found in testing of the version 3 algorithms.
- No major changes in science although there might be fixes and slight additions or corrections.
- Used in Operational Acceptance Testing which tests system and science requirements.
- Basis of Operational Readiness review.

Coordination between PPS and Algorithm Teams key for maintaining this schedule.

- PPS attends PMM science meetings and workshops.

GPM Schedule PPS/Alg/GV



Three Phase Approach for Algorithm Submission

Algorithm Submittal

- Use synthetic and real data
- Algorithm developers (AD) verify that algorithm correctly retrieves the science parameters
- PPS verify that nothing in the system is changing retrieval results

Simulated Satellite Data

- Simulated GPM data from a PMM science team satellite simulator
- Month of simulated GMI and DPR data (same orbits)
- AD and PPS validate that the retrieval data correctly matches the simulated data

Early Mission

- First real data during 90 after satellite/instrument checkout period
- Uses GPM and partner data
- AD and PPS validate that retrievals are within limits
- GV data comparisons to validate that satellite retrievals within specified GV retrievals at designated positions
- PMM algorithm test and validation working group validate retrievals within expected limits

Early Mission Phase

At GPM launch we do not have the luxury of comparing against real data like we would in a reprocessing scenario.

First 3 to 4 months of mission (after spacecraft and instrument checkout)

- PPS prepared to take multiple algorithm submissions (possible corrections).
- Data made available to AD, PMM algorithm validation WG, GV scientists for comparison at specific locations with ground based retrievals.
- PPS will reprocess all data with each algorithm submission.
- All data on hold from public until approval from Joint PMM team.

PPS will produce satellite data subsets over ground sites for validation by PMM science team.

PPS will generate all analysis products during this time.

PPS Status and Plans

- PPS - -, early version of PPS running TRMM v6 after conversion to Linux
- PPS build 1 currently being used to test the TRMM v7 algorithms for scientific validity (1st to use GPM TKIO toolkit)
- PPS build 2 currently in prototype and implementation will to used to integrate and test version 2 of the GPM algorithm code deliveries. Scheduled for December 2011
- PPS build 3 completing design scheduled for December of 2012
  - Complete data system used for mission simulations
  - Algorithms contain all required science
  - Includes full SDPS (GMI/DPR satellite data)
  - Includes full NRT
- PPS at launch – January 2013
  - Used for operational acceptance testing
  - Basically fixes to issues found in Build 3