



NPP SDS - LaRC Face 2 Face Meeting

Science Data Segment (SDS) An Introduction

**February 28, 2008
Langley Research Center**

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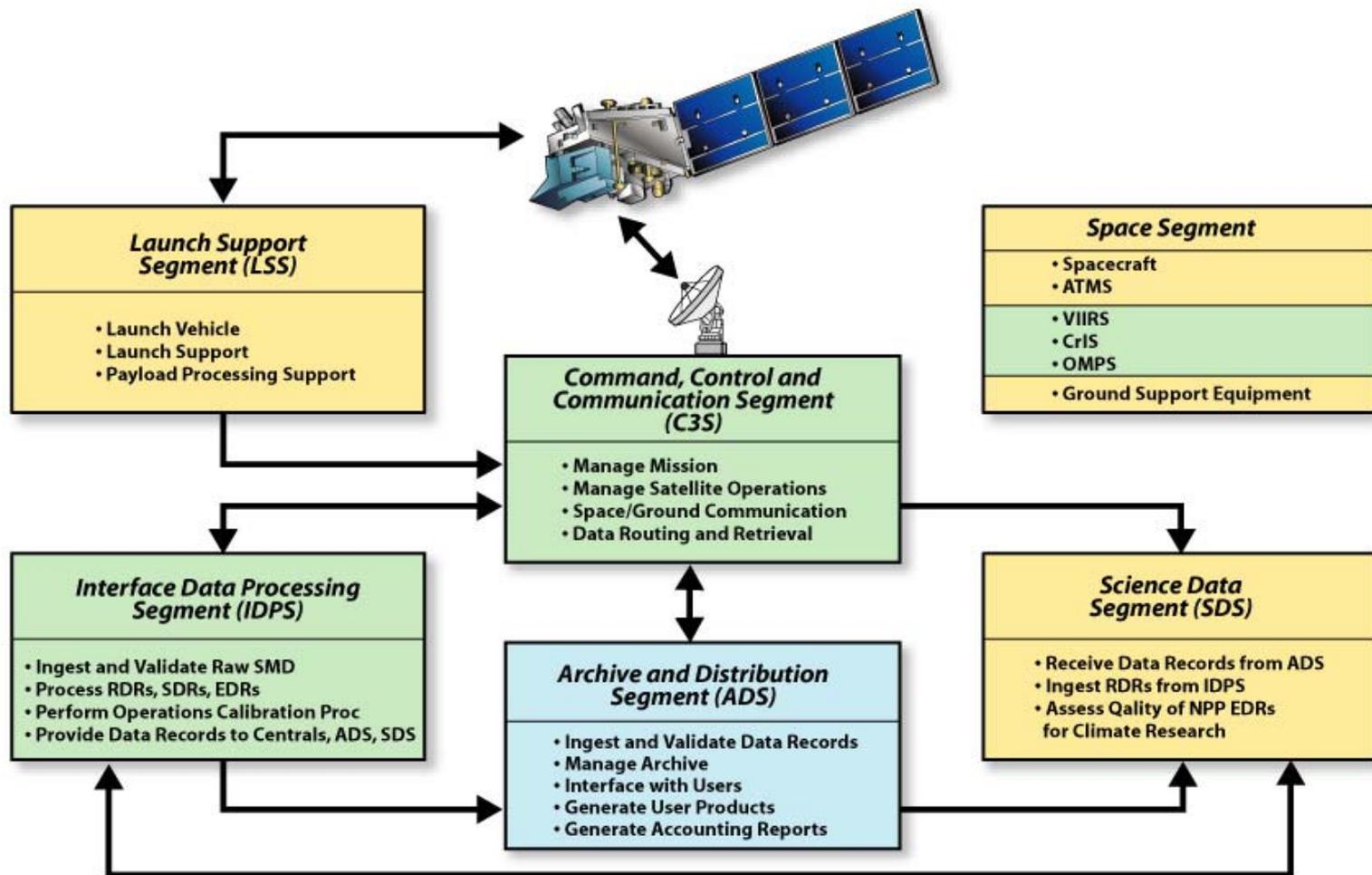
Science Data Segment (SDS) Objective



- **The primary objective of the SDS is to test the NPP operational products for their ability to support climate research**
 - **Operational products are assumed to be “climate quality”, i.e., No Reprocessing**
 - **In cases where Operational products are not of “climate quality”, the SDS can provide and demonstrate software algorithm improvements / enhancements**
- **SDS is designed as a prototype for NASA’s distributed Earth Science Data System**
 - **Built on a set of existing distributed, measurement-based, investigator-led data systems**
 - **SDS is a Research tool, it has no “operational” requirements**
 - **The SDS is not a data Production System**

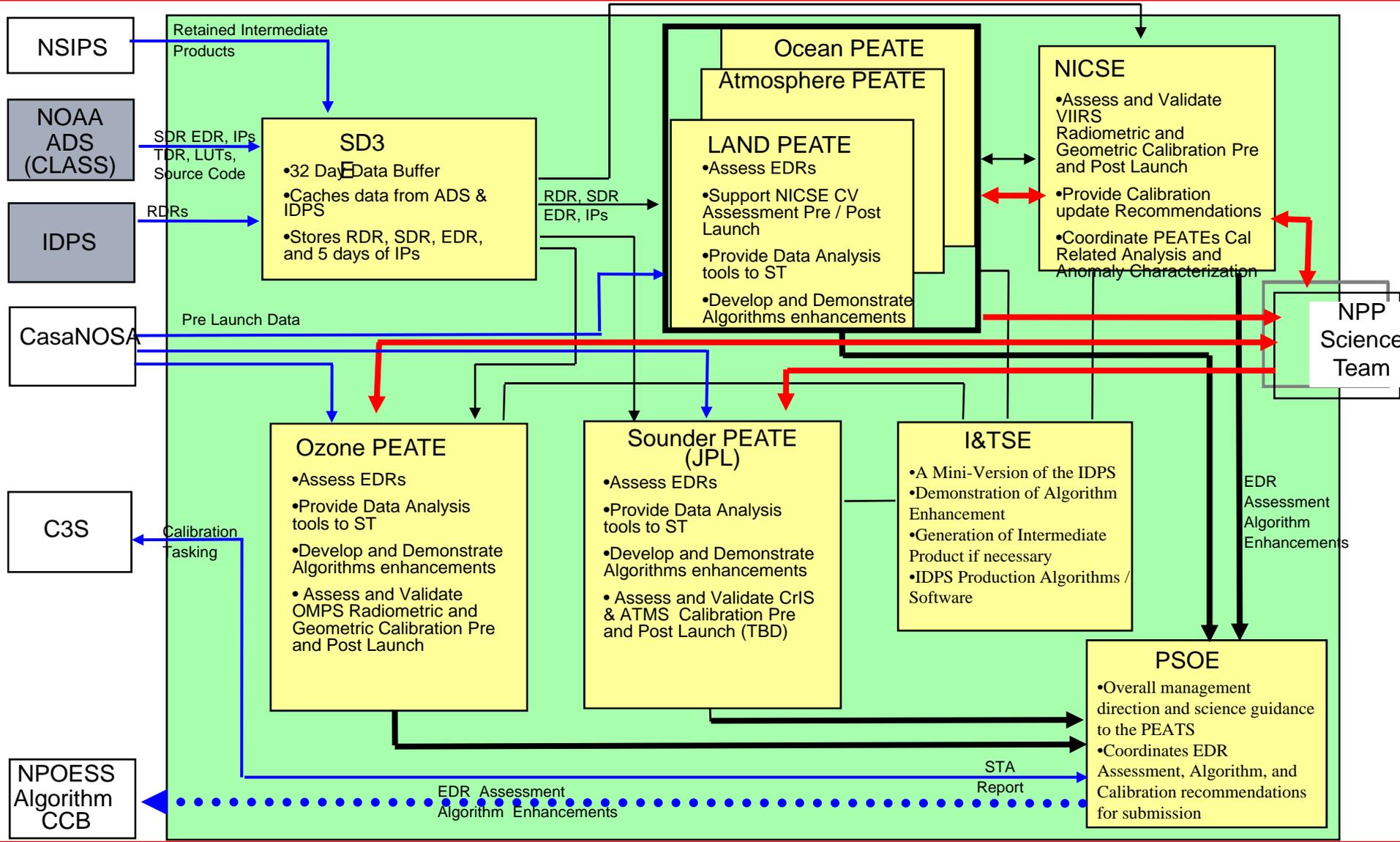


NPP Mission Segments





Simplified SDS Block Diagram





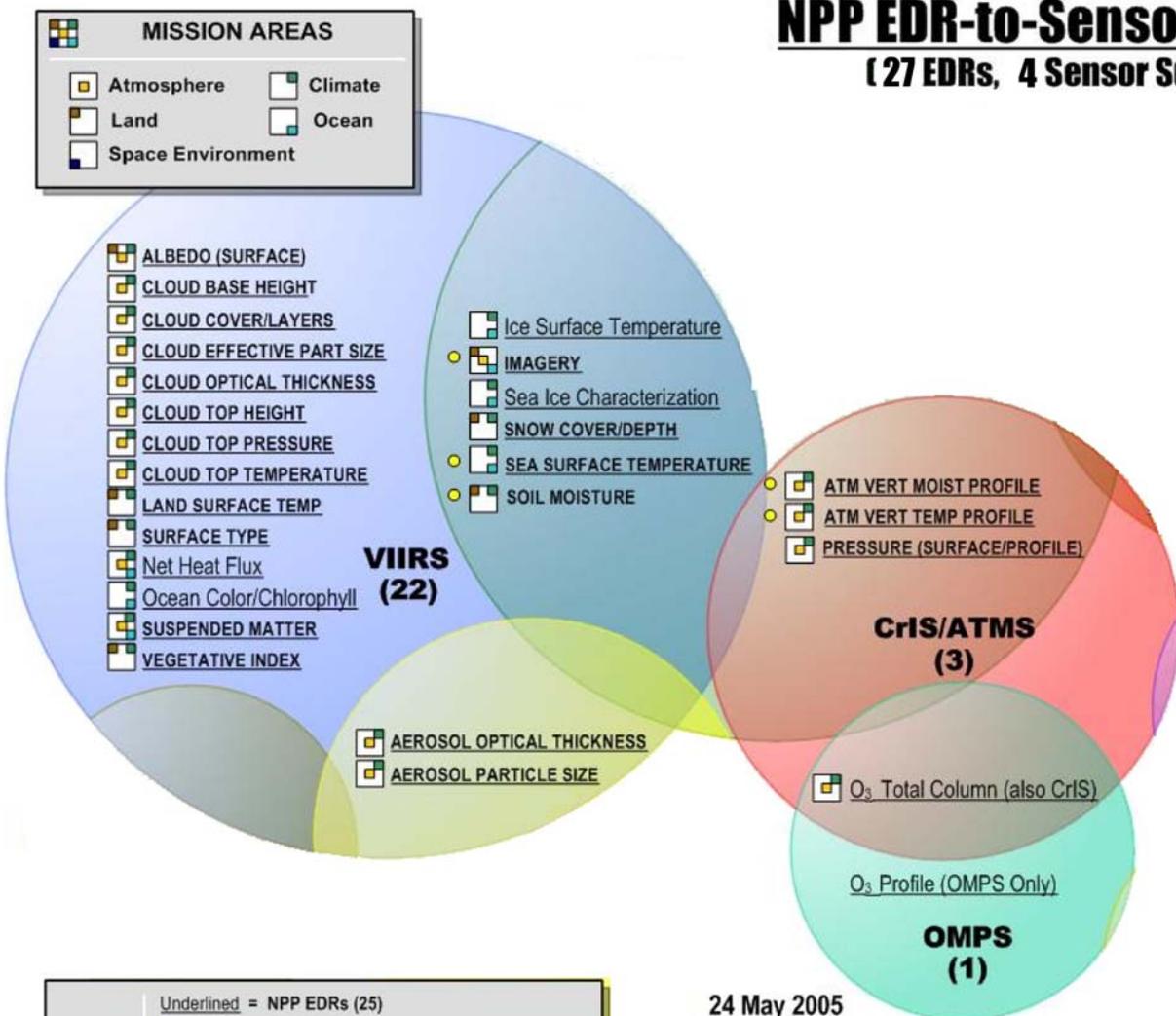
SDS Elements

- **SD3E – SDS Data Delivery & Depository Element**
 - Acquires data from NOAA/CLASS and NESDIS/IDPS
 - Provides ~32 days “rolling storage” for pick-up by PEATEs and the NICSE
- **PEATEs – 5 Product Evaluation and Algorithm Test Elements**
 - Performs EDR Evaluation / Characterization and algorithm improvements coordinated with External Science Investigators
 - Ocean (VIIRS) leveraged off Ocean Data Processing System (ODPS)
 - Land (VIIRS) leveraged off MODIS Adaptive Processing System (MODAPS)
 - Atmosphere (VIIRS) leveraged off University of Wisconsin-Madison’s LEOCAT
 - Ozone (OMPS) leveraged off OMI Data Processing System (OMIDAPS)
 - Sounder (CrIS & ATMS) leveraged off JPL Atmospheric Infrared Sounder (AIRS) Project’s Team Leader Science Computing Facility
- **NICSE - NPP Instrument Calibration Support Element**
 - VIIRS radiometric and geometric calibration and Instrument characterization support
- **I&TSE – Integration and Test System Element**
 - Mini-IDPS for demonstrating algorithm enhancements and / or calibration improvements
- **PSOE - Project Science Office Element**
 - Submits algorithm and calibration recommendations to NPP/NPOESS Algorithm CCB



NPP EDR-to-Sensor Mapping

NPP EDR-to-Sensor Mapping (27 EDRs, 4 Sensor Suites)



KEY

Underlined = NPP EDRs (25)

● = NPOESS Key Performance Parameters

BOLD CAPS = LRD Environmental Data Records

* = not yet on contract

** = Includes AURORA

*** = Deletion pending approval ECP-6RP

24 May 2005
 DOC, NOAA, NESDIS,
 Integrated Program Office
 D. Pierce, M. Haas, S. Mango,
 J. Schaeffer, J. Whitcomb
 Northrop Grumman
 L. Wait



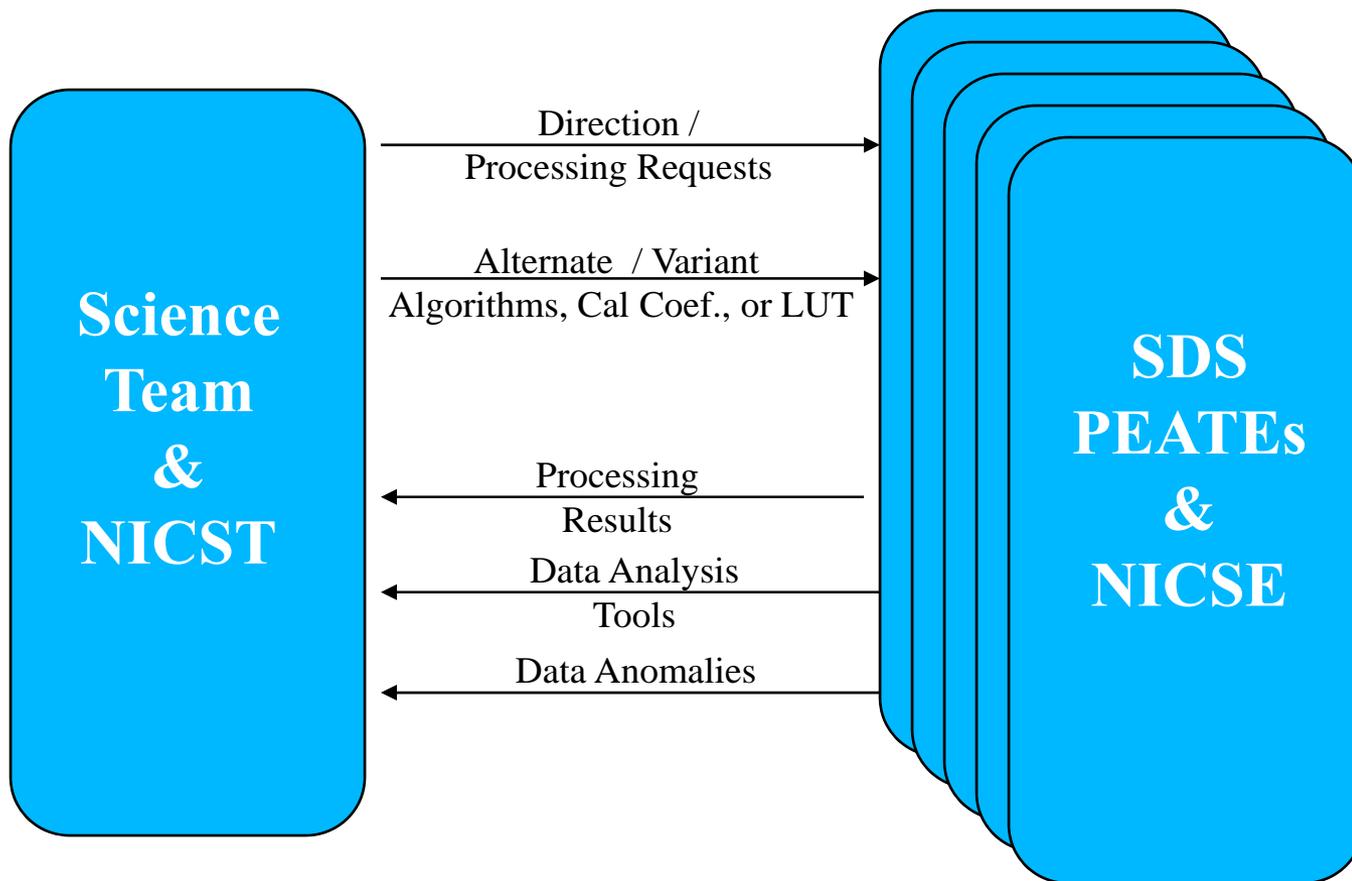
EDR-to-PEATEs Mapping



- **Land PEATE**
 - 1. Land Surface Temperature
 - 2. Vegetation Index
 - 3. Snow Cover and Depth
 - 4. Surface Type
 - 5. Active Fires
 - 6. Ice Surface Temp.
 - 7. Albedo (Surface)
 - 8. Aerosol Optical Thickness
 - 9. Aerosol Particle Size
- **Ocean PEATE**
 - 10. Ocean Color
 - 11. Sea Surface Temperature
- **Ozone PEATE**
 - 12. Ozone Total Column/Profile, & **Limb Profile**
- **Atmosphere PEATE**
 - 13. Suspended Matter
 - 14. Cloud Cover/Layers
 - 15. Cloud Effective Particle Size
 - 16. Cloud Top Height
 - 17. Cloud Top Pressure
 - 18. Cloud Top Temperature
 - 19. Cloud Base Height
 - 20. Cloud Optical Thickness
- **Sounder PEATE**
 - 21. Atmospheric Vertical Moisture
 - 22. Atmospheric Vertical Temperature Profile
 - 23. Atmospheric Vertical Pressure Profile



Science Team Interface to PEATEs





Pre-Launch Activities



- **Integrate Mini-IDPS and Develop SD3E**
 - Forge necessary associated external interfaces
- **Acquire, adapt and integrate Science and Operational SDR and EDR software into existing processing Systems**
 - Perform functional testing of operational code (as feasible)
- **Plan for and adapt existing PEATE Systems**
- **Acquire and manage various preflight instrument characterization data sets provided to the Science Team**
- **Support NPP Interface Confidence Tests, Functional Thread Tests, and NPP Compatibility Tests**
- **Support generation of proxy or synthetic test data for software and algorithm testing**
- **Support (as needed) Data Format Reviews, Various Design preparations, and ECR/CCR change process (as feasible)**



Post Launch Activities

- **Nominally, acquire all RDRs, selected SDRs, EDRs and associated ancillary data**
- **Process RDRs to SDRs and EDRs**
 - using adapted or wrapped operational software
 - using alternative calibration LUTS
- **Process SDRs to EDRs using revised or alternative algorithms, as directed by ST**
- **Share locally generated SDR/EDR with ST**
- **Perform match-ups and evaluation of EDRs with other Mission and In Situ Data, e.g., MODIS, SeaBASS**
- **Support SDR Evaluation for Long-term stability**



Documentation Landscape



- **From Various Sources (VOAT, O3OAT etc)**
 - ATBD Documents
- **From IPO/NGST et al**
 - *EDR-IR, EDR-PR, OAD,*
- **From IPO/NGST**
 - NPOESS to SDS ICD
 - NPOESS to NOAA ICD
 - NPOESS CDFCB Volume 1 Overview
 - NPOESS CDFCB Volume 2 RDR Format
 - NPOESS CDFCB Volume 3 SDR & TDR Format
 - NPOESS CDFCB Volume 4 (Parts 1- 4) EDR Format
 - NPOESS CDFCB Volume 5 Metadata
 - NPOESS CDFCB Volume 6 Ancillary Data Messages, & Reports
 - NPOESS CDFCB Volume 7 Data formats for the NPOESS application packets
 - NPOESS Common Interfaces and Services ICD
 - NPOESS Internal DFCB Volume III – Retained Intermediate Product Formats
- **From NOAA**
 - *NOAA CLASS to User Community IRD*
- **From NPP Project Office**
 - Mission Data Format Control Book
 - NPP System Integration and Test Plan
 - NPP Mission Operations Management Plan
 - NPP Mission Requirements Specification



Top 5 Challenges, Issues, Concerns



- **Early Interface testing is needed**
 - **Background:** Only limited Interface testing has occurred between SDS and the major Data providers thus far. Early interface testing is needed to flesh out interface issues between the SD3E and the IPDS, CLASS, and NSIPS
- **Documentation Synchronization**
 - **Background:** Documentation is at varying stages of development. Often not sure which document takes precedence for discrepancies. Schedule for final document versions needed.
- **Maintaining SDS Schedule**
 - **Background:** The NPP SDS PEATEs schedules are depending on the IDPS Algorithms Drops. IDPS 1.5, IDPS 1.5.x.1 [sic.] and, IDPS 1.5.x.2 [sic.] delivery schedules don't leave much time for SDS PEATES to understand, evaluate, and test algorithms. When will all ITAR Restrictions be resolved?
- **CLASS moved to Asheville, NC, and Boulder, CO.**
 - **Background:** The NOAA Class Facility has moved to Asheville (NCDC) and Boulder (NGDC) leaving the SDS to interface with a Point of Presence at NSOF, Suitland, MD. Total impacts of network limitations and issues TBD.
- **Emerging NPP Cal/Val System of Systems**
 - **Background:** SDS working to identify fit with Emerging Cal/Val System(s). Recent Design Status Review very informative.



Conclusion

- **The SDS is a research tool for NPP EDR evaluation**
 - Supports the NPP Science Team members
 - Enables discipline-based processing for continuing science quality data records
 - Prototype of NASA's future Earth science data system
 - Key system elements are science investigator-led and leverage off of existing investigator data systems
 - Goal is science-led evaluation of NPP data products leading to product improvement over time
- **The NPP SDS is on track for a system Critical Design Review, Oct 31- Nov 1, 2007**
- **NPP SDS will be ready to support the mission launch now scheduled for September 2009**



SDS Level 1 Requirements

NPP L1 Requirements Section 2.1.2

The NPP Science Data Segment (SDS) is a prototype element for the future ESE distributed science data system. In this case, the SDS is intended to be a research tool and as such had no operational requirements. Operational requirements are met by the other two elements of the NPOESS/NPP data system the IDPS and the Archive & Distribution Segment (ADS). The SDS is dependent on the NOAA is to [sic.] produce climate quality EDRs. The role of the NPP SDS is limited to assess the quality of the NPP EDRs for accomplishing climate research.

NPP L1 Requirements Section 2.1.2.1

The SDS shall be designed with the assumption that the operational IPO IDPS generated NPP EDRs do not require reprocessing or recomputation in order to support climate research needs. Consequently, the SDS will not be designed to routinely generate climate data products which require long-term archival in the ADS.

NPP L1 Requirements 2.1.2.2

The NOAA ADS will provide the active and long-term data archive for NPP mission data. The SDS Shall acquire RDRs, SDRs, and EDRs from the ADS.

NPP L1 Requirements 2.1.2.3

In developing the SDS, the Project shall assume that EDRs produced by the IDPS are climate quality and put in place the capability to test that hypothesis in order to contribute to improving the quality of future EDRs. The SDS shall provide suggested algorithm improvements to the IDPS.

NPP L1 Requirements 2.1.2.4

The SDS shall use a fully distributed interoperable architecture, with 5 (nominally) functionally independent elements (Climate Analysis Research System or CARS), organized around key EDRs (atmospheric sounding products, ocean products, land products, ozone products and atmospheric composition) in support of the ESE Science Focus Areas (Atmospheric Composition, Climate Change, Carbon/Ecosystems, Solid Earth, Weather, Water/Energy Cycle). The CARS Shall leverage the existing resources (e.g., the Science Investigator-led Processing Systems, the Earth Science Information Partners, the REASON CAN participants, EOSDIS, other national and international labs) to the maximum extent possible. The CARS will have government oversight and may be physically located anywhere. The NPP Science Team and other appropriate science measurement teams shall assist in addressing the roles and functionality of the SDS.

NPP L1 Requirements 2.2.2

At launch, the NPP SDS shall be capable of processing selected data subsets in order to conduct independent analysis in support of the IPO NPP Calibration/Validation activities.



Excerpts from IRT Review Level 1

September 17-18, 2007



Proposed Level 1 Requirement Changes



- ***NPP path to launch***
 - From: 2.2.1 – NPP observatory launch readiness date shall be no later than October 31, 2006.
 - To: 2.2.1 – NPP observatory launch readiness date shall be no later than **October 30, 2009**.
- ***Transition to afternoon orbit***
 - From: 2.1.1.6.3 – Nominal descending equatorial crossing time of 10:30 AM + / - 10 minutes
 - To: 2.1.1.6.3 – Nominal **ascending** equatorial crossing time of **1:30 PM** + / - 10 minutes
- ***CERES accommodation***
 - From: 2.1.1.1 – The NPP spacecraft shall be designed for a 5-year lifetime with a probability of success of 0.85, and shall accommodate the VIIRS, CrIS, ATMS and OMPS sensors.
 - To: 2.1.1.1 – The NPP spacecraft shall be designed for a 5-year lifetime with a probability of success of 0.85, and shall accommodate the VIIRS, CrIS, ATMS, OMPS **and CERES** sensors.
 - From: 2.1.1.3 – The NPP spacecraft shall support concurrent operation for all 4 sensors, and be capable of downlinking all observed data each orbit to the mission ground system.
 - To: 2.1.1.3 – The NPP spacecraft shall support concurrent operation for all **5** sensors, and be capable of downlinking all observed data each orbit to the mission ground system.



Proposed Level 1 Requirement Changes



- ***CERES Accommodation (continued)***
 - **From: 2.1.2.4 – The SDS shall use a fully distributed interoperable architecture, with 5 (nominally) functionally independent elements (Climate Analysis Research System or CARS), organized around key EDRs (atmospheric sounding products, ocean products, land products, ozone products and atmospheric composition) in support of the ESE Science Focus Areas (Atmospheric Composition, Climate Change, Carbon/Ecosystems, Solid Earth, Weather, Water/Energy Cycle)...**
 - **To: 2.1.2.4 – The SDS shall use a fully distributed interoperable architecture, with 6 (nominally) functionally independent elements (Climate Analysis Research System or CARS), organized around key EDRs (atmospheric sounding products, ocean products, land products, ozone products, atmospheric composition and Earth radiation budget) in support of the ESE Science Focus Areas (Atmospheric Composition, Climate Change, Carbon/Ecosystems, Solid Earth, Weather, Water/Energy Cycle)...**



Proposed Level 1 Requirement Changes



- ***CERES Accommodation (continued) and OMPS limb re-manifest***
 - **From: 2.1.2.3 – In developing the SDS, the Project shall assume that EDRs produced by the IDPS are climate quality and put in place the capability to test that hypothesis in order to contribute to improving the quality of future EDRs. The SDS shall provide suggested algorithm improvements to the IDPS.**
 - **To: 2.1.2.3 – In developing the SDS, the Project shall assume that EDRs produced by the IDPS are climate quality.**
 - > **2.1.2.3.1 – The SDS shall have the capability to test the assumption in order to contribute to improving the quality of future EDRs.**
 - > **2.1.2.3.2 – The SDS shall provide suggested algorithm improvements to the IDPS.**
 - > **2.1.2.3.3 – The SDS shall provide the capability to generate, store and disseminate climate quality data products for CERES and OMPS limb (note: these products are not produced by the IDPS)**



QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.



CERES Accommodation on NPP Phase 2 Preliminary Readouts (Ground)

NPP Science Data Segment (SDS) Summary of Impacts

September 5, 2007

Aurora, Colorado

Robert.J.Schweiss@nasa.gov



Agenda



- **SDS Background Brief Review**
- **SDS CERES Accommodations Requirements**
- **SDS Data Flow / Design Impacts / Plans**
- **Operational Responsibilities, Activities, and Interfaces**
- **Concerns, Open Areas etc.**
- **Status of Cost Preparation and Identification of Cost Drivers**



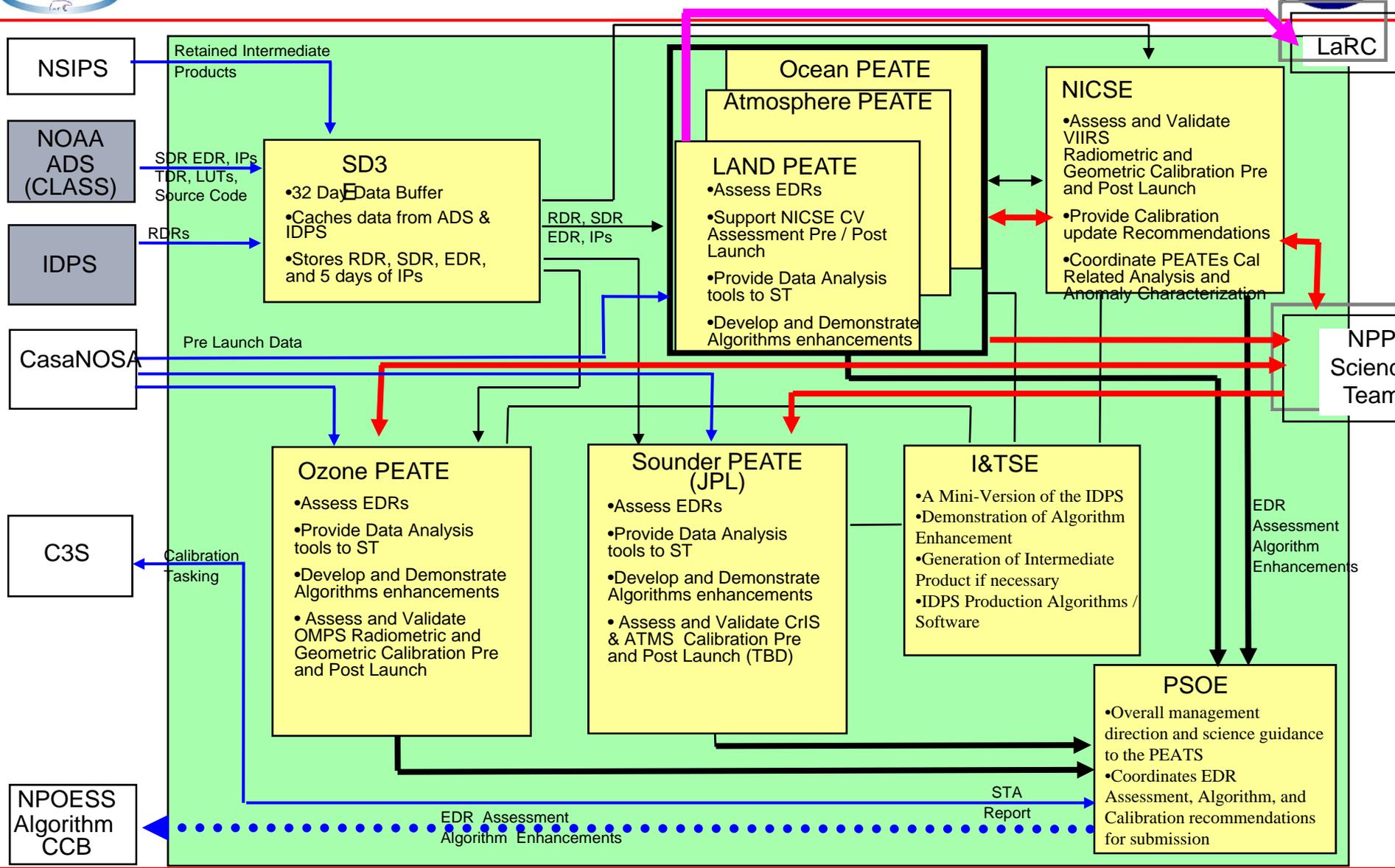
CERES Accommodation on NPP – Phase 2 Readout Agenda - Ground



- **Brief SDS Background**
- **Summarize Key CERES System Requirements / Capabilities and Interfaces**
- **Summarize Design & Associated Implementation Plan**
 - > **Hardware, software, documentation changes**
 - > **Implementation Plan**
 - > **Schedule Drivers & Dependencies**
- **Summary of Results from Operational Responsibilities, Activities and Interfaces**
 - > **Pre-launch Support, Instrument Ops, LEO&A Support**
 - > **Factory Support for Life of Mission**
 - > **Schedule, Drivers, and Dependencies**
- **Concerns or Open Areas, if any**
- **Status of Cost Preparation and Identification of Cost Drivers**



SDS Block Diagram





SDS Elements

- **SD3E – SDS Data Delivery & Depository Element**
 - Acquires data from NOAA/CLASS and NESDIS/IDPS (Now to handle CERES RDRs)
 - Provides ~32 days “rolling storage” for pick-up by PEATEs and the NICSE
- **PEATEs – 5 Product Evaluation and Algorithm Test Elements**
 - Performs EDR Evaluation / Characterization and algorithm improvements coordinated with External Science Investigators
 - Ocean (VIIRS) leveraged off Ocean Data Processing System (ODPS)
 - Land (VIIRS) leveraged off MODIS Adaptive Processing System (MODAPS)
 - > Re-sample and forward selected VIIRS Bands. Forwards CERES RDRS and other products.
 - Atmosphere (VIIRS) leveraged off University of Wisconsin-Madison’s LEOCAT
 - Ozone (OMPS) leveraged off OMI Data Processing System (OMIDAPS)
 - Sounder (CrIS & ATMS) leveraged off JPL Atmospheric Infrared Sounder (AIRS) Project’s Team Leader Science Computing Facility
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Key CERES System Requirements / Capabilities and Interfaces



CERES System Requirements / Capabilities and Interfaces



CERES System Requirements (1 of 3)



- **SDS shall store and forward CERES RDRs**
 - **Rational:** SDS has a NRT Feed from the NESDIS IDPS. It can easily acquire the CERES RDRs and forward them via Land PEATE to LaRC.
 - **Comments:**
 - > **SDS Already has the following requirements:**
 - > The SD3E shall be capable of requesting and accepting **all** RDRs generated by the IDPS.
 - > **RMA only open issue here as thus far SDS has been a research tool.**
- **SDS [& Land PEATE] shall store, process, & forward, all CERES data within 24 hours after receipt**
 - **Rationale:** An obvious performance goal.
 - **Comment:** The first latency or performance requirement on the SDS. Will not apply to multi-day gridded products for MODIS comparisons.



CERES System Requirements (2 of 3)



- **SDS [Land PEATE] shall subsample VIIRS SDRs to 2km resolution**
 - Rationale: LaRC doesn't need the full Resolution SDRs and the reduced data volume reduces disk space and network bandwidth requirements.
 - Comments: **This requires subsetter software to be adapted from MODIS.**
- **SDS [Land PEATE] shall reformat VIIRS resampled SDRs & EDRs to HDF-EOS**
 - Rationale: Backward compatibility with MODIS products
 - Comments: Existing capability. No new software.
- **SDS [Land PEATE] shall remap EDRs to Sinusoidal Grid**
 - Rationale: TBD.
 - Comments: Existing capability. No new software



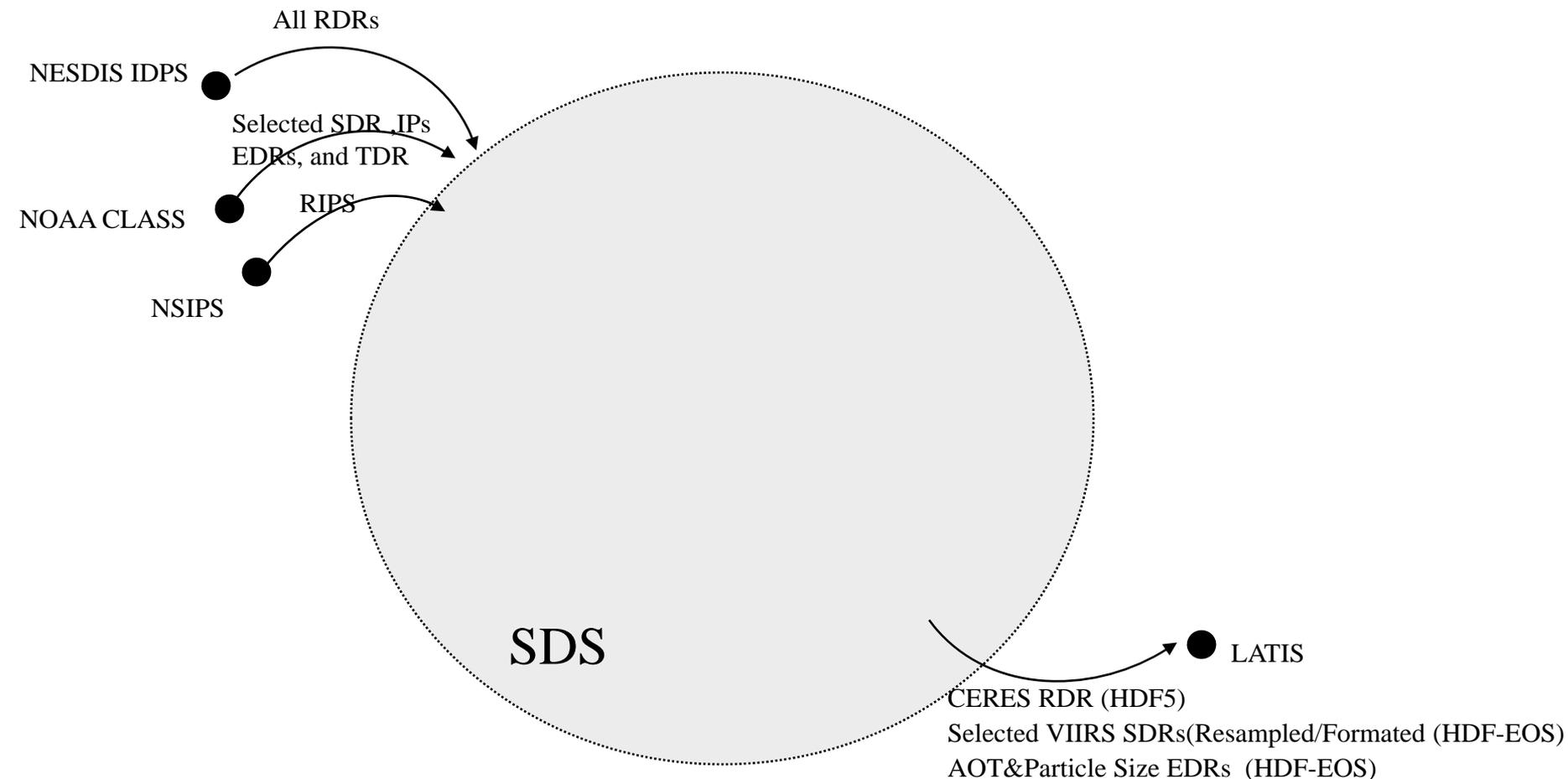
CERES System Requirements (3 of 3)



- **SDS [Land PEATE] shall aggregate respective SDRs, EDRs, Cloud Mask IP, and Active Fires ARP, to 5 minute granules**
 - **Rationale: MODIS Heritage Granule Size**
 - **Comments: NPPDAPS already planning to re-aggregate data for its heritage systems / processing. No new software.**
- **SDS [Land PEATE] shall interface to LaRC CERES processing system**
 - **Rationale: Necessary interface for CERES data.**
 - **Comments: Existing capability for LaTIS. Likely some ICD updates and a MOU here and there. Expect improvements in storage for LaTIS. Network connectivity To-Be-Determined. No major changes expected during transition from LaTIS to ANGe.**

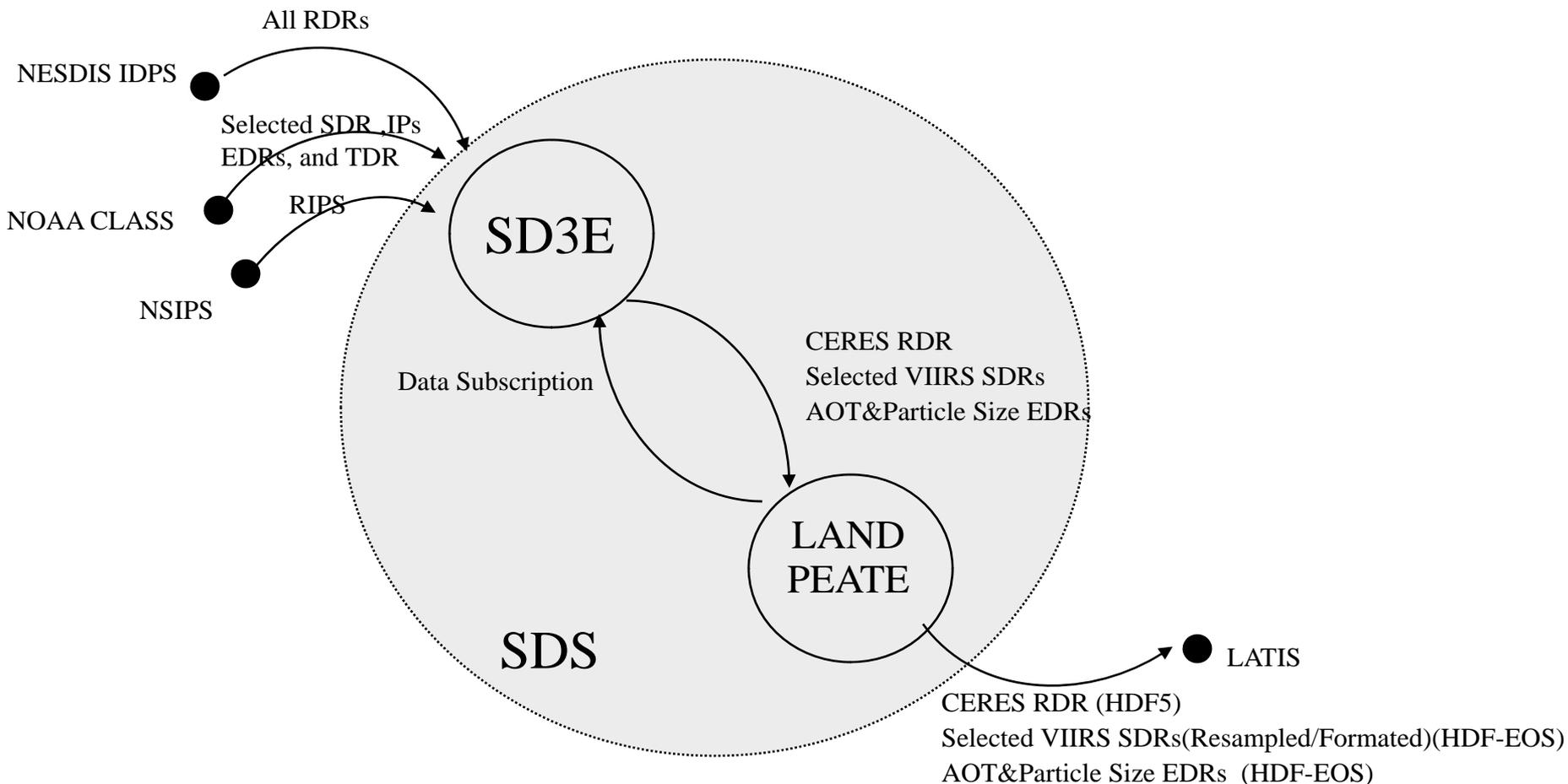


SDS Context Diagram





SDS Data Flow to LaRC

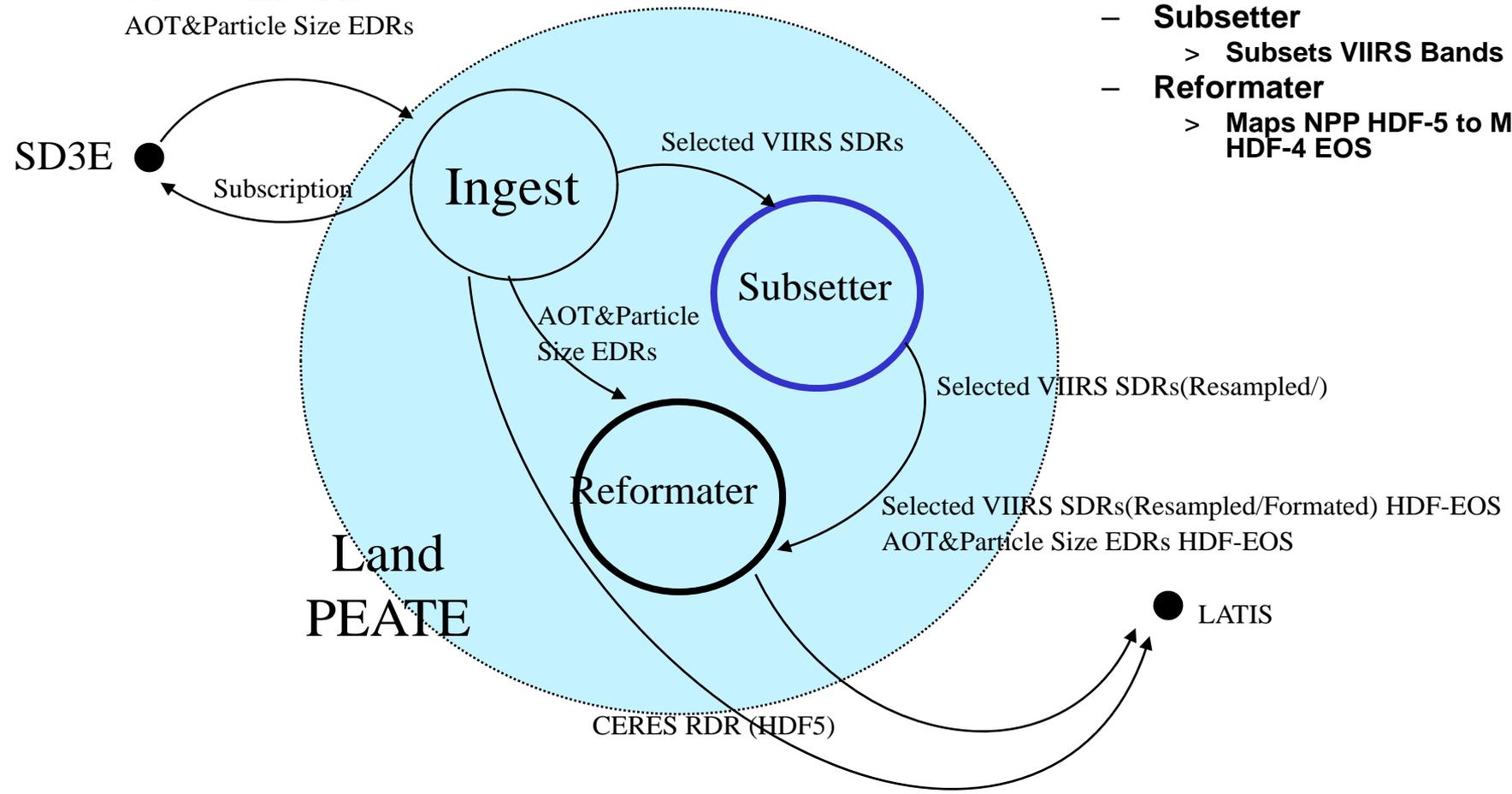




Land PEATE Data Flow

CERES RDR
Selected VIIRS SDRs
AOT&Particle Size EDRs

- **Software Modules**
 - **Subsetter**
 - > Subsets VIIRS Bands
 - **Reformer**
 - > Maps NPP HDF-5 to MODIS HDF-4 EOS





Operational Responsibilities (1 of 3)



- **Summary of Results from Operational Responsibilities, Activities and Interfaces**
 - **Pre-launch Support, Instrument Ops, LEO&A Support**
 - **Factory Support for Life of Mission**
 - **Schedule, Drivers, and Dependencies**



Operational Responsibilities (2 of 3)



- **Pre-launch Support, Instrument Ops, LEO&A Support**
 - Negligible operations impacts.
 - No additional impacts to support LE&O Activities.
 - Define, Allocate Requirements
 - Update associated documents,
 - > Test Plans, Procedures
 - Implement Requirements
 - > Augment Subsetter() software
 - Integrate and test in NPPDAPS
 - Continue SDS & Land PEATE Development ...
 - I&T Support & Participation
 - Resolve Network Connectivity



Operational Responsibilities (3 of 3)



- **Post Launch Activities**
 - **Establish & Manage Data subscriptions & data flow**
- **Factory Support for Life of Mission**
 - **SDS is planning for 5 years of O&M. Sustaining cost impacts included.**
- **Schedule, Drivers, and Dependencies**
 - **Subsetter software module to be augmented is the tallest pole for development**
 - **Network connectivity potential significant reoccurring cost impacts.**



Open Issues (1 of 3)

- **Attitude and ephemeris APID should be included in the CERES RDR**
 - **Background:** VIIRS data has attitude and ephemeris data in the VIIRS RDR
 - **Recommendation:** Watch.
- **LaRC will likely need an interface with C3S for TEU**
 - **Background:** Each SDS Element has an interface with C3S.
- **Network bandwidth between GSFC and LaRC**
 - **Background:** Estimating ~350GiB/day
 - T3/DS3 or 45 Mbps will take about ~19 hours
 - OC3 or 156 Mbps will take about ~5.5 hrs
 - OC12 or 622 Mbps will take about ~1.3 hrs.
 - **Recommendation:** Work in Progress



Open Issues (2 of 3)



- **Reliability, Maintainability, & Availability**
 - **Background:** Thus far SDS and the associated elements have only been “Research Grade”, i.e., Ao of .95. Perhaps this is sufficient.
 - **Recommendation:** Watch
- **SDS to IDPS interface robustness**
 - **Background:** Unique CERES Robustness should be added to increase probability of CERES RDRs, SDRs, etc, throughput. For Example: Current approach abandons trying to recover RDRs from IDPS after ~3hrs of down time. If CERES RDRs are not sent to CLASS the data will be lost.
 - **Recommendation:** Watch. Pick changes up during O&M as there isn’t much time.
- **Early start need**
 - **Background:** Law of the farm applicable
 - **Recommendation:** If no decision soon consider seed funding long lead items



Open Issues (3 of 3)



- **OPD (Ozone Profile Data) source and details TBD**
 - **Background From: CERES ATBD: The OPD (Ozone Profile Data) may be either an operational satellite derived product or an ozone climatology. Because the ozone concentration changes relatively slowly, we expect this data product to be updated once a month, to cover the globe at about 2.5° to 5° spatial resolution, and to have moderate vertical resolution.**



Cost Preparation and Identification of Cost Drivers



– Status of Cost Preparation and Identification of Cost Drivers

Magnatidue of effort \$K / FTEs	Oct 2007-2008	Oct 2008-2009	Oct 2009-2010 Reoccurring
	FTE	FTE	FTE
Estimate			
Software Augmentation / Test			
Subsetter (2585 SLOC)	0.5	0.5	0.1
PGE	0.1	0.1	
Hardware Impacts			
System Engineering(.2 SDS .2 Land)	0.4	0.4	0.2
Operations		0.1	0.2
CPUs & Disk Space		\$40K	
Networking	\$100K	\$100K	\$100K
Totals	1	1.1	0.5
Upper Bound			
Software Augmentation / Test			
Subsetter (2585 SLOC)	1.5	0.5	0.5
PGE	0.1	0.1	
Hardware Impacts			
System Engineering(.2 SDS .2 Land)	0.4	0.4	0.2
Operations		0.1	0.2
CPUs & Disk Space		\$80K	
Networking	\$100K	\$100K	\$100K
Totals	2	1.1	0.9



CERES/NPP VIIRS Channels



Channel	λ_c (nm)	$\Delta\lambda$ (nm)	Wavelength Type	Radiance Type	Spatial Resolution Type	Focal Plane Assembly	File Size (GB)	Daily Quantity	Total GB Daily
M5	672	20	VIS	Reflective	Moderate	VISNIR			
M7	865	39	NIR	Reflective	Moderate	VISNIR			
M9	1378	15	SWIR	Reflective	Moderate	SMWIR			
M10	1610	60	SWIR	Reflective	Moderate	SMWIR			
M11	2250	50	SWIR	Reflective	Moderate	SMWIR			
M12	3700	180	MWIR	Reflective	Moderate	SMWIR			
M13	4050	155	MWIR	Emissive	Moderate	SMWIR			
M14	8550	300	LWIR	Emissive	Moderate	LWIR			
M15	10763	1000	LWIR	Emissive	Moderate	LWIR			
M16	12013	950	LWIR	Emissive	Moderate	LWIR			



CERES/NPP Interfaces with Other Systems



Parameter	Parameter Name	Freq	CERES Source	Proposed FM5 Source	Comments
L0	L0 Data	12/hr	CERES Instrument	FM5 Instrument ✓	3 channels
Attitude	Attitude	1/hr	GSFC Flight Dyn Facility	NPP ✓	Hist: Missing data
Ephemeris	Ephemeris	1/hr	GSFC Flight Dyn Facility	NPP ✓	Hist: Missing data
APD	Aerosol (Coln) Optical thickness, type/size	1/day	MODIS	NPP-VIIRS ✓	Day and night-EDR
OPD	Ozone Profile	1/day	NCEP SMOBA	NPP ✓	Day and night
MWH	Microwave Humidity	6/day	GEOS (GMAO)	NCEP ?	Probably not needed
GAP	3-D Met Data	4/day	GMAO	GMAO ?	ECMWF Monthly delivery
GAP	Land Surface Temp	4/day	GMAO	GMAO	
GAP	Sea Surface Temp	1/day	GMAO	GMAO	
CID	Cloud Imager Data	1/day	VIRS, MODIS	VIIRS L1b Rad-SDR	2km subsamples
SURFMAP(DEM)	Surface Digital Elevation	1 time		NPP standard	
SURFMAP(SNOW)	Snow Map	1/wk	NCEP/NESDIS	NPP standard	
SURFMAP(ICE)	Ice Map	1/wk	NCEP/NESDIS	NPP standard	

✓
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Conclusion



- **Total Impacts on SDS and Land PEATE are relatively small.**
- **SDS (SD3E & Land PEATE) Impact assessment is completed**
- **Go/No-Go Decision needed ASAP.**



Backup Slides



Data Volume Estimate



NPP Estimated Delivery Volume						
Item Number	Product	Orbital Total (GiB)	Daily Total (GiB)	Daily Total (TB)	GiB	Re-Sample
1	RDR	0.00	0.00	0.00		20 Guess
2	SDR	24.19	343.08	0.34	85.76968	25%
3	EDR	8.48	50.10	0.05	50.10	
4	IP	13.25	187.86	0.18	187.86	
Total Delivery		45.92	581.04	0.57	343.7283	
5	Ancillary Data	73.41	73.41	0.07		
Total w/Ancillary		119.33	654.44	0.64		
6	S/C & Sensor Telemetry	0.03	0.46	0.00		
Total w/Telemetry		119.36	654.90	0.64		

Notes: All input cells are colored Red.



MODIS products sent to CERES



Product (ESDT)	Files/day	GB/day*	Comment
MYD02SS1	288	9.7	Level 1B 1 km bands, every 2 nd pixel by every 2 nd scan
MYD03	288	7.1	Geolocation for 5 minute granules, geolocation for 1km bands
MYD04_L2	288	.18	Aerosol product, no subsetting
MYD08_D3	1	.09	Global 1° x 1° equal angle grid, statistical summaries for 80 atmosphere science parameters

* Both Aqua and Terra MODIS products are sent to LaTIS. Current volume shipped is twice the Aqua MODIS volume above. Product details at <http://modis-atmos.gsfc.nasa.gov/>



Predicted RDR Usage

Item Number	Sensor	Availability	Desired Delivery Frequency	Number of Delivery Addresses	Time Delay from Availability	Repaired Data	Orbital Total (GiB)	Daily Total (GiB)
1	ATMS	Every Granule	Not Requested	0	No Delay	Yes	0.00	0.00
2	CrIS	Every Granule					0.00	0.00
3	OMPS	Every Granule					0.00	0.00
4	VIIRS	Every Granule					0.00	0.00
RDR Subtotal							0.00	0.00
5	Spacecraft Attitude and Ephemeris Data	Delivered with each RDR					0.00	0.00
RDR Total Delivery							0.00	0.00

Notes: The size of the Spacecraft data delivered with each RDR depends upon the granule duration in seconds.



Predicted SDR Usage

Item Number	Sensor	SDR Title	Availability	Official Products			Substitute Products			Repaired Data	Orbital Total	
				Desired Delivery Frequency	Number of Delivery Addresses	Time Delay from Availability	Desired Delivery Frequency	Number of Delivery Addresses	Time Delay from Availability		(GiB)	Daily Total (GiB)
1	ATMS	SDR	Every Granule							0.00	0.00	
2	ATMS	TDR	Every Granule							0.00	0.00	
3	CrIS	Earth View SDR	Every Granule							0.00	0.00	
3	CrIMSS	ATMS Remapped to CrIS	Every Granule							0.00	0.00	
4	OMPS	Total Column Earth View	Every Granule							0.00	0.00	
5	OMPS	Total Column Calibration	Every Granule							0.00	0.00	
6	OMPS	Nadir Profile Earth View	Every Granule							0.00	0.00	
7	OMPS	Nadir Profile Calibration	Every Granule							0.00	0.00	
8	OMPS	Limb Profile Earth View								0.00	0.00	
9	VIIRS	Imagery Channel 1	Every Granule							0.00	0.00	
10	VIIRS	Imagery Channel 2	Every Granule							0.00	0.00	
11	VIIRS	Imagery Channel 3	Every Granule							0.00	0.00	
12	VIIRS	Imagery Channel 4	Every Granule							0.00	0.00	
13	VIIRS	Imagery Channel 5	Every Granule							0.00	0.00	
14	VIIRS	Moderate Band Channel 1	Every Granule							0.00	0.00	
15	VIIRS	Moderate Band Channel 2	Every Granule							0.00	0.00	
16	VIIRS	Moderate Band Channel 3	Every Granule							0.00	0.00	
17	VIIRS	Moderate Band Channel 4	Every Granule							0.00	0.00	
18	VIIRS	Moderate Band Channel 5	Every Granule	Every Granule	1	No Delay				0.76	10.80	
19	VIIRS	Moderate Band Channel 6	Every Granule	Not Requested						0.00	0.00	
20	VIIRS	Moderate Band Channel 7	Every Granule	Every Granule	1	No Delay				1.38	19.64	
21	VIIRS	Moderate Band Channel 8	Every Granule							0.00	0.00	
22	VIIRS	Moderate Band Channel 9	Every Granule	Every Granule	1	No Delay				0.54	7.72	
23	VIIRS	Moderate Band Channel 10	Every Granule	Every Granule	1	No Delay				0.99	14.03	
24	VIIRS	Moderate Band Channel 11	Every Granule	Every Granule	1	No Delay				0.54	7.72	
25	VIIRS	Moderate Band Channel 12	Every Granule	Every Granule	1	No Delay				0.99	14.03	
26	VIIRS	Moderate Band Channel 13	Every Granule	Every Granule	1	No Delay				1.78	25.24	
27	VIIRS	Moderate Band Channel 14	Every Granule	Every Granule	1	No Delay				0.99	14.03	
28	VIIRS	Moderate Band Channel 15	Every Granule	Every Granule	1	No Delay				1.38	19.64	
29	VIIRS	Moderate Band Channel 16	Every Granule	Every Granule	1	No Delay				0.99	14.03	
30	VIIRS	Day Night Band	Every Granule							0.00	0.00	
SDR Subtotal										10.36	146.86	
31	ATMS	ATMS SDR Geolocation	Every Granule							0.00	0.00	
32	CrIS	CrIS SDR Geolocation	Every Granule							0.00	0.00	
33	CrIMSS	ATMS Remapped to CrIS Geolocation	Every Granule							0.00	0.00	
34	OMPS	Total Column Geolocation	Every Granule							0.00	0.00	
35	OMPS	Total Column Calibration Geolocation	Every Granule							0.00	0.00	
36	OMPS	Nadir Profile Geolocation	Every Granule							0.00	0.00	
37	OMPS	Limb Profile Geolocation										
38	VIIRS	Fine Res - Geodetic Ellipsoid Geolocation	Every Granule							0.00	0.00	
39	VIIRS	Mod Res - Geodetic Ellipsoid Geolocation	Every Granule							13.84	196.22	
40	VIIRS	DNB Res - Geodetic Ellipsoid Geolocation	Every Granule							0.00	0.00	
SDR Total Delivery										24.19	343.08	



Predicted EDR Usage

Item Number	Sensor	EDR Title	Availability	Official Products			Substitute Products			Repaired Data	Orbital Total (GiB)	Daily Total (GiB)
				Desired Delivery Frequency	Number of Delivery Addresses	Time Delay from Availability	Desired Delivery Frequency	Number of Delivery Addresses	Time Delay from Availability			
1	CrIMSS	CrIMSS EDR	Every Granule							0.00	0.00	
2	OMPS	Ozone Total Column	Every Granule							0.00	0.00	
3	VIIRS	Imagery: Imagery Channel 1	Every Granule							0.00	0.00	
4	VIIRS	Imagery: Imagery Channel 2	Every Granule							0.00	0.00	
5	VIIRS	Imagery: Imagery Channel 3	Every Granule							0.00	0.00	
6	VIIRS	Imagery: Imagery Channel 4	Every Granule							0.00	0.00	
7	VIIRS	Imagery: Imagery Channel 5	Every Granule							0.00	0.00	
8	VIIRS	Imagery: Moderate Channel 1	Every Granule							0.00	0.00	
9	VIIRS	Imagery: Moderate Channel 2	Every Granule							0.00	0.00	
10	VIIRS	Imagery: Moderate Channel 3	Every Granule							0.00	0.00	
11	VIIRS	Imagery: Moderate Channel 4	Every Granule							0.00	0.00	
12	VIIRS	Imagery: Moderate Channel 5	Every Granule							0.00	0.00	
13	VIIRS	Imagery: Moderate Channel 6	Every Granule							0.00	0.00	
14	VIIRS	Imagery: Moderate Channel 7	Every Granule							0.00	0.00	
15	VIIRS	Imagery: Moderate Channel 8	Every Granule							0.00	0.00	
16	VIIRS	Imagery: Moderate Channel 9	Every Granule							0.00	0.00	
17	VIIRS	Imagery: Moderate Channel 10	Every Granule							0.00	0.00	
18	VIIRS	Imagery: Moderate Channel 11	Every Granule							0.00	0.00	
19	VIIRS	Imagery: Moderate Channel 12	Every Granule							0.00	0.00	
20	VIIRS	Imagery: Moderate Channel 13	Every Granule							0.00	0.00	
21	VIIRS	Imagery: Moderate Channel 14	Every Granule							0.00	0.00	
22	VIIRS	Imagery: Moderate Channel 15	Every Granule							0.00	0.00	
23	VIIRS	Imagery: Moderate Channel 16	Every Granule							0.00	0.00	
24	VIIRS	Imagery: Day Night Band	Every Granule							0.00	0.00	
25	VIIRS	Imagery: Imagery NCC	Every Granule							0.00	0.00	
26	VIIRS	Aerosol Optical Thickness	Every Granule	Every Granule	1	No Delay				2.90	41.18	
27	VIIRS	Aerosol Particle Size	Every Granule	Every Granule	1	No Delay				0.45	6.35	
28	VIIRS	Suspended Matter	Every Granule							0.00	0.00	
29	VIIRS	Sea Surface Temperature	Every Granule							0.00	0.00	
30	VIIRS	Albedo (Surface)	Every Granule							0.00	0.00	
31	VIIRS	Land Surface Temperature	Every Granule							0.00	0.00	
32	VIIRS	Snow Cover and Depth	Every Granule							0.00	0.00	
33	VIIRS	Land Surface Type	Every Granule							0.00	0.00	
34	VIIRS	Ice Surface Temperature	Every Granule							0.00	0.00	
35	VIIRS	Ocean Color/Chlorophyll	Every Granule							0.00	0.00	
36	VIIRS	Cloud Base Height	Every Granule							0.00	0.00	
37	VIIRS	Cloud Cover/Layers	Every Granule							0.00	0.00	
38	VIIRS	Cloud Effective Particle Size	Every Granule							0.00	0.00	
39	VIIRS	Cloud Optical Thickness	Every Granule							0.00	0.00	
40	VIIRS	Cloud Top Height	Every Granule							0.00	0.00	
41	VIIRS	Cloud Top Pressure	Every Granule							0.00	0.00	
42	VIIRS	Cloud Top Temperature	Every Granule							0.00	0.00	
43	VIIRS	Vegetation Index	Every Granule							0.00	0.00	
44	VIIRS	Net Heat Flux	Every Granule							0.00	0.00	
45	VIIRS	Sea Ice Characterization	Every Granule							0.00	0.00	
EDR Subtotal											3.35	47.53
46	CrIMSS	CrIMSS EDR Geolocation	Every Granule							0.00	0.00	
47	OMPS	Total Column Geolocation	Every Granule							0.00	0.00	
48	VIIRS	Imagery Product Imagery Resolution Common Geolocation	Every Granule							0.00	0.00	
49	VIIRS	Imagery Product Moderate Resolution Common Geolocation	Every Granule							0.00	0.00	
50	VIIRS	Fine Res - Geodetic Terrain Corrected Ellipsoid Geolocation	Every Granule							0.00	0.00	
51	VIIRS	Mod Res - Geodetic Terrain Corrected Ellipsoid Geolocation	Every Granule							4.94	0.00	
52	VIIRS	Cloud Aggregated Geolocation	Every Granule							0.00	0.00	
53	VIIRS	Net Heat Flux Geolocation	Every Granule							0.00	0.00	
54	VIIRS	Imagery NCC Geolocation	Every Granule							0.00	0.00	
55	VIIRS	Aerosols Geolocation	Every Granule							0.18	2.58	
56	VIIRS	Sea Ice Characterization Geolocation	Every Granule							0.00	0.00	
EDR Total Delivery											8.48	50.10



Predicted IP Usage

Item Number	Sensor	Deliverable IP Title	Availability	Official Products			Substitute Products			Repaired Data	Orbital Total (GiB)	Daily Total (GiB)
				Desired Delivery Frequency	Number of Delivery Addresses	Time Delay from Availability	Desired Delivery Frequency	Number of Delivery Addresses	Time Delay from Availability			
1	CrIS	IR Ozone	Every Granule							0.00	0.00	
2	OMPS	Nadir Profile Ozone	Every Granule							0.00	0.00	
3	VIIRS	Active Fires ARP	Every Granule	Every Granule	1	No Delay				0.20	2.80	
4	VIIRS	Cloud Mask	Every Granule	Every Granule	1	No Delay				1.19	16.83	
5	VIIRS	Quarterly Surface Type	Quarterly									
IP Subtotal										1.38	19.64	
6	CrIS	CrIS SDR Geolocation	Every Granule							0.00	0.00	
7	OMPS	Nadir Profile Geolocation	Every Granule							0.00	0.00	
8	VIIRS	Mod Res - Geodetic Ellipsoid Geolocation	Every Granule							6.92	98.11	
9	VIIRS	Mod Res - Geodetic Terrain Corrected Ellipsoid Geolocation	Every Granule							4.94	70.11	
IP Total Delivery										13.25	187.86	



Acronyms



- **Ao** Operational Availability
- **ADS** Archive and Distribution Segment
- **ADP** Ancillary Data Providers
- **AFWA** Air Force Weather Agency
- **Anal.** Analysis
- **ANSI** American National Standards Institute
- **ATBD** Algorithm Theoretical Basis Document
- **ATMS** Advanced Technology Microwave Sounder
- **BB** Black Body
- **BRDF** Bidirectional Reflectance Distribution Function
- **BTDF** Bidirectional Transmissive Distribution Function
- **C3S** Command, Control and Communications Segment
- **CARS** Climate Analysis and Research Service
- **CCB** Configuration Control Board
- **CCS** Climate Calibration Service
- **CDMS** Climate Data Management Service
- **CDPs** Climate Data Products
- **CDRs** Climate Data Records
- **CLASS** Comprehensive Large Array-data Stewardship System
- **CM** Configuration Management
- **CMS** Climate Mission Storage
- **COTS** Commercial Off-the-Shelf
- **CrIS** Cross-Track Infrared Sounder
- **DCAVS** Distributed CDR/EDR Algorithm Validation Service
- **DDR** Data Delivery Report
- **DEM** Digital Elevation Model
- **Demo.** Demonstration
- **DFD** Data Flow Diagram
- **DN** Delivery Notification
- **DoD** Department of Defense
- **DQM** Data Quality Management
- **EDRs** Environmental Data Records
- **EDU** Engineering Development Units
- **EOS** Earth Observing System
- **EOSDIS** Earth Observing System Data and Information System
- **ESE** Earth Sciences Enterprise
- **GSFC** Goddard Space Flight Center
- **I&TSE** Integration and Test System Element
- **ICD** Interface Control Document
- **IDPS** Interface Data Processing Segment
- **Insp.** Inspection
- **IP** Intermediate Products
- **IPO** Integrated Program Office
- **IRD** Interface Requirements Document
- **ISF** Integrated Support Facility
- **IT** Information Technology
- **JPL** Jet Propulsion Laboratory
- **LEO&A** Launch, Early Orbit, and Activation
- **LRD** Launch Readiness Date



Acronyms



- **LSS** Launch Support Segment
- **LTA** Long Term Archive
- **LUT** Look-up Tables
- **MDT** Mean Down Time
- **MODIS** Moderate Resolution Imaging Spectrometer
- **MODAPS** MODIS Data Processing System
- **MRS** Mission Operations Concept
- **MTBDE** Mean Time Between Downing Events
- **N/A** Not Applicable
- **NASA** National Aeronautics and Space Administration
- **NESDIS** National Environmental Satellite, Data, and Information Service
- **NEXT** NPP EDU eXchange Toolkit
- **NGST** Northrop Grumman Space & Mission Systems Corp. Space Technology
- **NICSE** NPP Instrument Calibration and Support Element
- **No.** Number
- **NOAA** National Oceanic and Atmospheric Administration
- **NPOESS** National Polar-orbiting Operational Environmental Satellite System
- **NPP** NPOESS Preparatory Project
- **NWP** Numerical Weather Prediction
- **OMPS** Ozone Mapper/Profiler Suite
- **OSHA** Occupational Safety and Health Administration
- **PDR** Product Subscription Request
- **PEATE** Product Evaluation and Analysis Tool Element
- **POS** Performance and Operations Specification
- **POSIX** Portable Operating System Interface for Computer Environments
- **PSOE** Project Science Office Element
- **PST** Project Science Team
- **RDRs** Raw Data Records
- **RSB** Reflective Solar Band
- **RSR** Relative Spectral Response
- **RVS** Response Versus Scan Angle
- **SD** Solar Diffuser
- **SD3E** Science Data Distribution and Depository
- **SDRs** Sensor Data Records
- **SDS** Science Data Segment
- **SDSM** Solar Diffuser Stability Monitor
- **SER** Scientific, Engineering and Research
- **SI&T** System Integration and Test
- **SRD** Sensor Requirements Document
- **ST** Science Team
- **TBD** To Be Determined
- **TBR** To Be Resolved
- **TBS** To Be Supplied
- **TDR** Temperature Data Record
- **TEB** Thermal Emissive Band
- **TEUs** Telemetry in Engineering Units
- **TV** Thermal Vac
- **UTC** Universal Time Coordinate
- **VIIRS** Visible Infrared Imager Radiometer Suite
- **VDD** Version Description Document
- **xDRs** RDR, EDR, SDR, and TDR