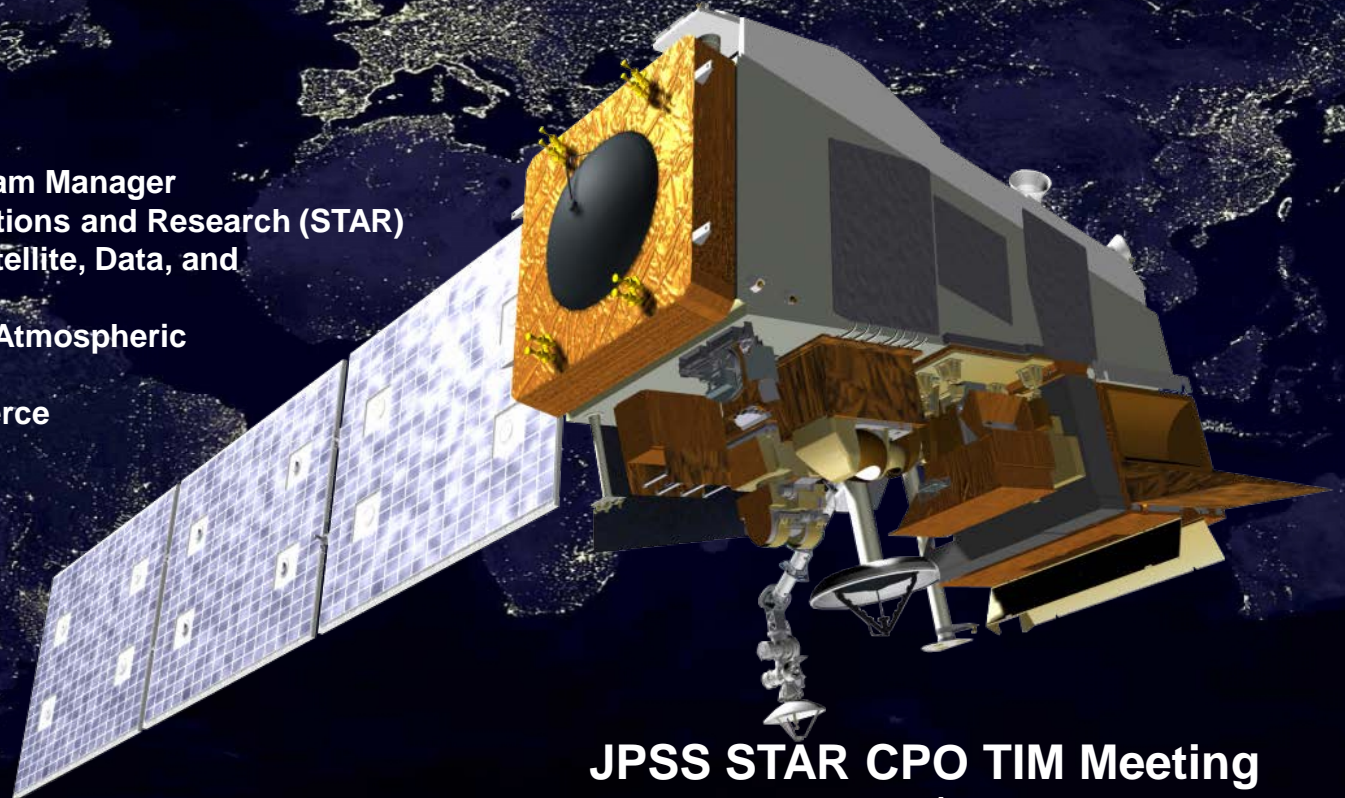


Joint Polar Satellite System (JPSS)

JPSS-CPO TIM :Enterprise Algorithms and Reprocessing

Lihang Zhou

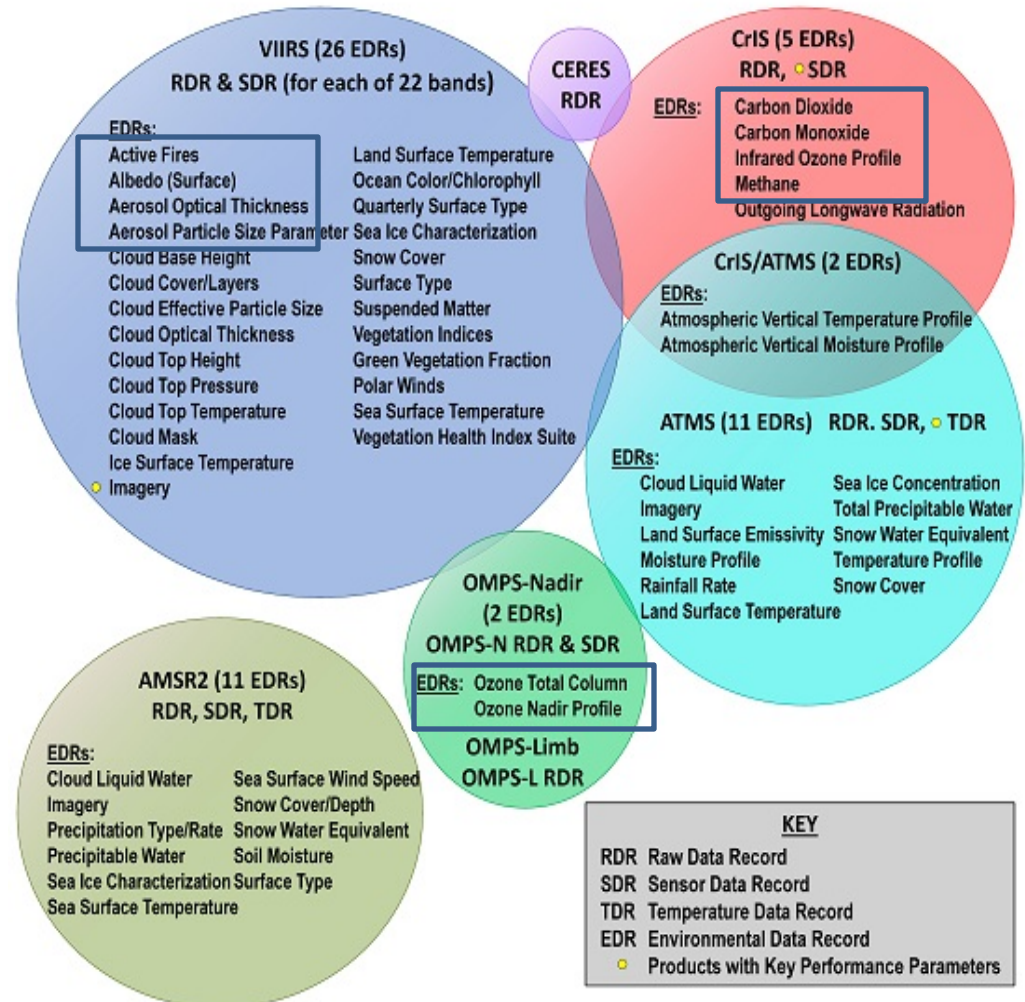
JPSS STAR (JSTAR) Program Manager
Center for Satellite Applications and Research (STAR)
National Environmental Satellite, Data, and
Information Service
U.S. National Oceanic and Atmospheric
Administration
U.S. Department of Commerce



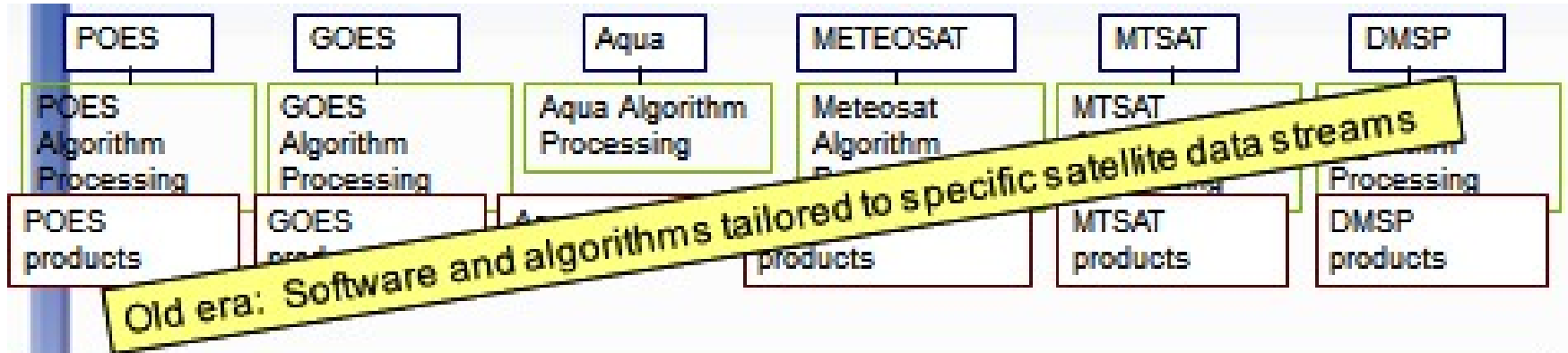
JPSS STAR CPO TIM Meeting
Nov. 18th 2016

JPSS Instruments	Measurements
ATMS - Advanced Technology Microwave Sounder	ATMS and CrIS together provide high vertical resolution temperature and water vapor information needed to maintain and improve forecast skill out to 5 to 7 days in advance for extreme weather events, including hurricanes and severe weather outbreaks
CrIS - Cross-track Infrared Sounder	
VIIRS – Visible Infrared Imaging Radiometer Suite	VIIRS provides many critical imagery products including snow/ice cover, clouds, fog, aerosols, fire, smoke plumes, vegetation health, phytoplankton abundance/chlorophyll
OMPS - Ozone Mapping and Profiler Suite	Ozone spectrometers for monitoring ozone hole and recovery of stratospheric ozone and for UV index forecasts
CERES - Clouds and the Earth's Radiant Energy System	Scanning radiometer which supports studies of Earth Radiation Budget (ERB)

JPSS Program Data Products



Satellite Strategies in Transition (Enterprise Algorithm Developments)



New era: Software and algorithms work for a variety of satellite and in-situ data streams



S-NPP Data Products (EDRs Only)

Enterprise		
Active Fires (VIIRS)	Green Vegetation Fraction (VIIRS)	Sea Ice Concentration (ATMS)
Aerosol Optical Thickness (VIIRS)	Ice Surface Temperature (VIIRS)	Sea Surface Temperature (AMSR-2/3)
Aerosol Particle Size Parameter (VIIRS)	Imagery (AMSR-2/3)	Sea Surface Temperature (VIIRS)
Albedo (Surface) (VIIRS)	Imagery (ATMS)	Sea Surface Wind Speed (AMSR-2/3)
AMSR Calibrated Sensor Data (AMSR)-2/3	Infrared Ozone Profile (CrIS)	Snow Cover/Depth (AMSR-2/3)
Atmospheric Vertical Moisture Profile (CrIS/ATMS)	Land Surface Emissivity (ATMS)	Snow Cover (ATMS)
Atmospheric Vertical Temperature Profile (CrIS/ATMS)	Land Surface Temperature (VIIRS)	Snow Cover (VIIRS)
Carbon Monoxide (CO) (CrIS)	Methane (CH4) (CrIS)	Snow Water Equivalent (ATMS)
Carbon Dioxide (CO2) (CrIS)	Moisture Profile (ATMS)	Soil Moisture (AMSR-2/3)
Cloud Base Height (VIIRS)	Ocean Color/Chlorophyll (VIIRS)	Surface Type (AMSR-2/3)
Cloud Coverage/Layers (VIIRS)	Outgoing Longwave Radiation (CrIS)	Surface Type (VIIRS)
Cloud Effective Particle Size (VIIRS)	Ozone Nadir Profile (OMPS-N)	Suspended Matter (VIIRS)
Cloud Liquid Water (AMSR-2/3)	Ozone Total Column (OMPS-N)	Temperature Profile (ATMS)
Cloud Liquid Water (ATMS)	Polar Winds (VIIRS)	Total Precipitable Water (AMSR-2/3)
Cloud Mask (VIIRS)	Precipitation (Type/Rate)(AMSR-2/3)	Total Precipitable Water (ATMS)
Cloud Optical Thickness (VIIRS)	Quarterly Surface Type (VIIRS)	Vegetation Indices (VIIRS)
Cloud Top Height (VIIRS)	Rainfall Rate (ATMS)	Vegetation Health Index Suite (VIIRS)
Cloud Top Pressure (VIIRS)	Sea Ice Characterization (AMSR-2/3)	
Cloud Top Temperature (VIIRS)	Sea Ice Characterization (VIIRS)	

Already available in ESPC	Will be available when NDE 2.0 is operational	Will be available soon after NDE 2.0 is operational	Implementation in NDE is still in planning phase
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S-NPP/JPSS Cal Val Status Updates

Beta

- Early release product.
- Initial calibration applied
- Minimally validated and may still contain significant errors (rapid changes can be expected. Version changes will not be identified as errors are corrected as on-orbit baseline is not established)
- Available to allow users to gain familiarity with data formats and parameters
- Product is not appropriate as the basis for quantitative scientific publications studies and applications

Provisional

- Product quality may not be optimal
- Incremental product improvements are still occurring as calibration parameters are adjusted with sensor on-orbit characterization (versions will be tracked)
- General research community is encouraged to participate in the QA and validation of the product, but need to be aware that product validation and QA are ongoing
- Users are urged to consult the SDR product status document prior to use of the data in publications
- Ready for operational evaluation

Validated

- On-orbit sensor performance characterized and calibration parameters adjusted accordingly
- Ready for use in applications and scientific publications
- There may be later improved versions
- There will be strong versioning with documentation

Products	2012				2013				2014				2015																			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3																	
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A
SDR	ATMS	Beta				Provisional				Validated				Validated																		
	CrIS	Beta				Provisional				Validated				Validated																		
	VIIRS	Beta				Provisional				Validated				Validated																		
	OMPS	Beta				Provisional				Validated				Validated																		
EDR	Imagery (non-NCC)	Before Beta				Beta				Provisional				Validated																		
	Imagery NCC	Before Beta				Beta				Provisional				Validated																		
	VIIRS Cloud Mask	Before Beta				Beta				Provisional				Validated																		
	Cloud Properties	Before Beta				Beta				Provisional				Validated																		
	Aerosol Optical Thickness	Before Beta				Beta				Provisional				Validated																		
	Aerosol Particle Size Parameter	Before Beta				Beta				Provisional				Validated																		
	Suspended Matter	Before Beta				Beta				Provisional				Validated																		
	Active Fires	Before Beta				Beta				Provisional				Validated																		
	Land Surface Temperature	Before Beta				Beta				Provisional				Validated																		
	Surface Type	Before Beta				Beta				Provisional				Validated																		
	Surface Albedo	Before Beta				Beta				Provisional				Validated																		
	Vegetation Indices	Before Beta				Beta				Provisional				Validated																		
	Surface Reflectance IP	Before Beta				Beta				Provisional				Validated																		
	Ocean Color / Chlorophyll	Before Beta				Beta				Provisional				Validated																		
	Sea Surface Temperature	Before Beta				Beta				Provisional				Validated																		
	Ice Surface Temperature	Before Beta				Beta				Provisional				Validated																		
	Sea Ice Characterization	Before Beta				Beta				Provisional				Validated																		
	Snow Cover - Binary Mask	Before Beta				Beta				Provisional				Validated																		
	Snow Cover - Fraction	Before Beta				Beta				Provisional				Validated																		
	Sounding (NUCAPS)	Before Beta				Beta				Provisional				Validated																		
OMPS Ozone EDR	Before Beta				Beta				Provisional				Validated																			

Before Beta Beta Provisional Validated

S-NPP SDR/EDR products Cal/Val Maturity Status

S-NPP Reprocessing

- Reprocessing is now part of the cal/val program to validate algorithm corrections/improvements over a large and wide range of representative conditions, with comprehensive documentation of product performance – consistent with the “FULL” (**Validated**) product performance level..
- Benefits of reprocessed dataset enables applications dependent on retrospective data. Also to fix errors – for example there were software errors in both ATMS and CrIS SDRs.
- Reprocessed data is provided to NCEI for archive and distribution

Example of Reprocessing VIIRS SDR: Impacts on Fire Detection

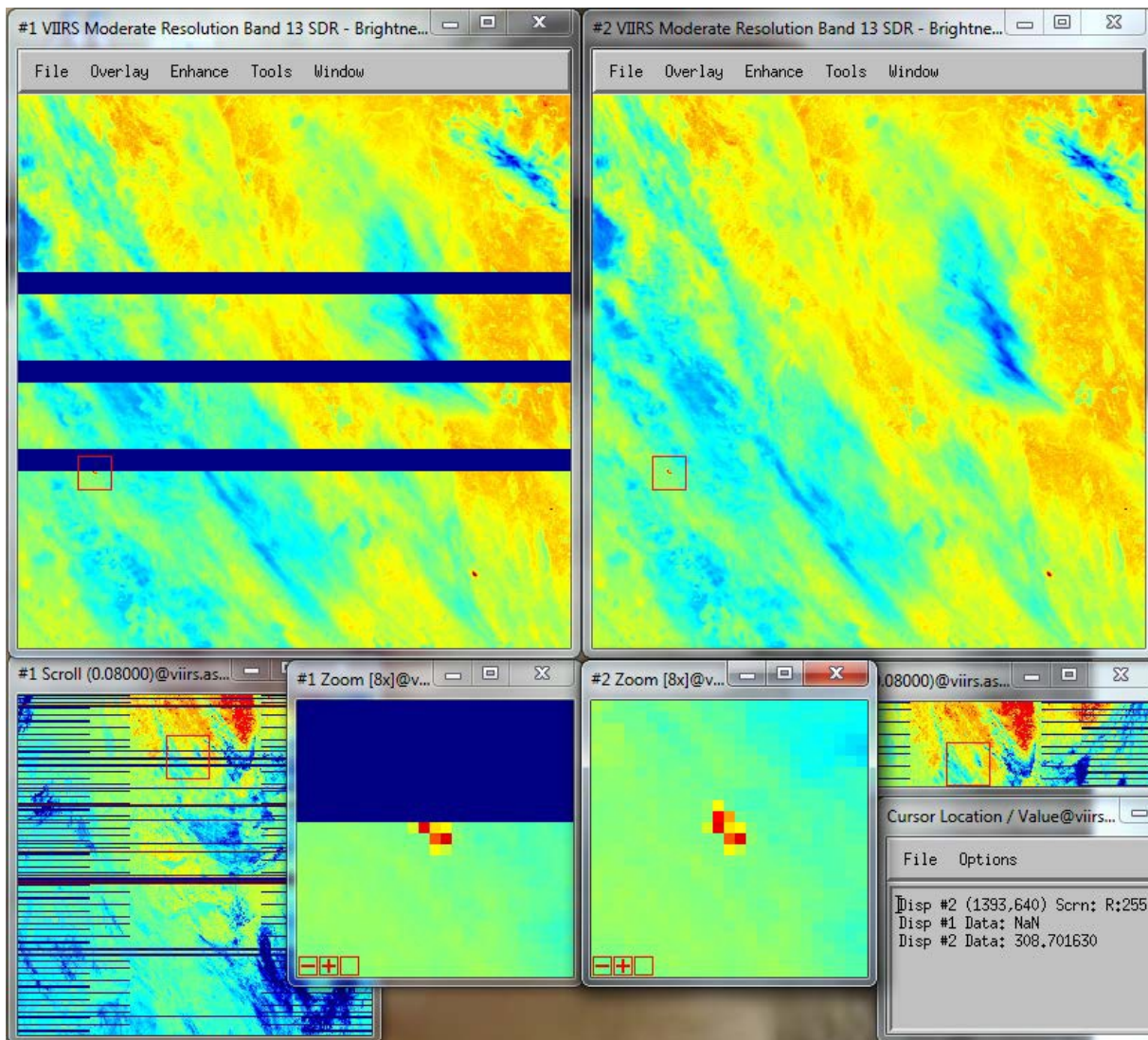
Fire spots may be missed in the original CLASS data due to:

- Missing scans
- Saturation

-Both are resolved in reprocessing:

-Missing scans are fixed with A2 RDR data as input

-Saturations are fixed with the new EBBT LUT



class_GMOD0-

SVM13_npp_d20120515_t1950411_e1956215_b02844_c2016100808 ADL4.2_SVM13_npp_d20120515_t1950411_e1952053_b02844_c2016092318 3807074331_noaa_ops.h5 1228410550_devl_dev.h5

Applications of Suomi NPP Reprocessed Data in Climate Research

- NWP reanalysis using Suomi NPP reprocessed data (e.g. NASA GMAO)
- Climate data record (40 years) of microwave sounder radiances and products from MSU/AMSU/ATMS, temperature, moisture, precip., etc
- Climate data record (40 years) of infrared sounder radiances and products from SSU/HIRS/CrIS; and hyperspectral sounders (AIRS, IASI, CrIS), atmospheric temperature, moisture, trace gases. etc
- Climate data record (40 years) of global data products from polar satellite imagers (AVHRR, MODIS, VIIRS), such as Clouds, Aerosols, Ice and Snow, SST, LST, Albedo, Surface Type, Vegetation, Ocean Color, etc
- Climate data records of global trace gases (Ozone, CO, CO₂, CH₄, etc)