



ASSISTT – Introduction to Enterprise Approach Transition to Operations

Presented by:
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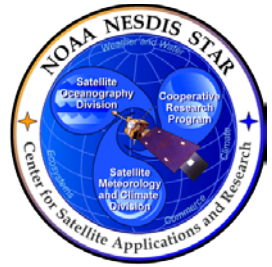
Slides from the following people were used:

Lihang Zhou, Jaime Daniels
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ASSISTT – Algorithm Scientific Software Integration and System Transition Team

Overview



- For the JPSS program, over the past few years we have been transitioning the IDPS EDR algorithms to new, advanced algorithms that have been termed Enterprise Algorithms
- These Enterprise Algorithms are transition to NDE for operational implementation
- The Enterprise Algorithms will not only be used to create S-NPP and J1 products but also products from other instrument suites from GOES, MetOP, and NOAA satellites

What is an Enterprise Algorithm?



An enterprise algorithm is an **endorsed** algorithm that uses the same scientific methodology (ie., physical basis, including assumptions) and software base to create the same classification of product from differing input data (satellite, in-situ, or ancillary)

Benefits:

- ❑ Consistent products with similar characteristics and performance can be generated for different instruments. Users benefit from this.
- ❑ Fewer algorithms and systems to be maintained.

Endorsed Algorithm

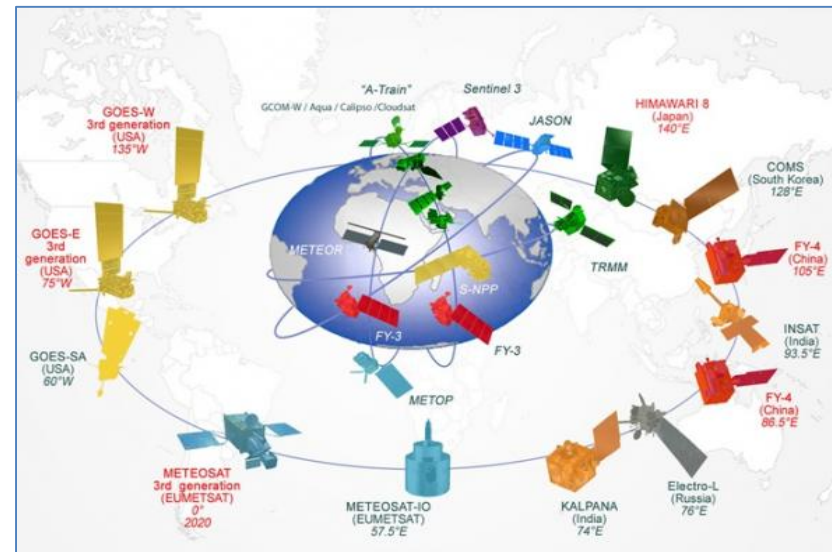
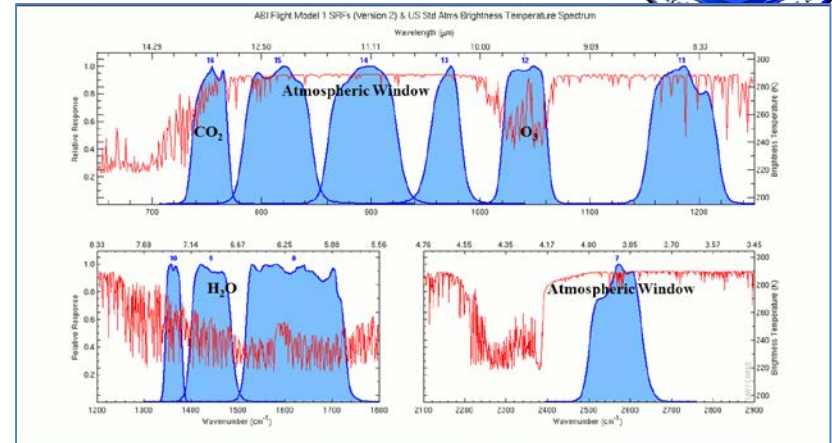


- Is well vetted and peer reviewed by independent reviewers
- Is well documented in an Algorithm Theoretical Basis Document (ATBD) and in the scientific literature
- Test and validation procedures are well established
- Performance is well demonstrated and characterized to the extent possible using available real or proxy data
- Algorithm meets the requirements

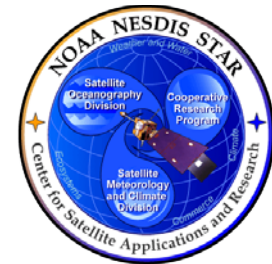
Synergies Among Instruments



- Instrument channels are carefully chosen (ie., central frequency, bandwidth) to measure/observe specific environmental (atmospheric or land) phenomenon (ie., aerosols, dust, smoke, vegetation, etc) being sought
- Coordination among satellite operators through the World Meteorological Organization (WMO) Coordination Group for Meteorological Satellites (CGMS) and the Committee on Earth Observation Satellites (CEOS) helps populate the Global Observing System (GOS) with similar instruments and channels.



Common Channels (1 of 2)



ABI Band	GOES-R Central Wavelength (microns)		Typical Use	GOES I-L Central Wavelength (microns)	GOES M-N Central Wavelength (microns)	GOES O-P Central Wavelength (microns)	AVHRR Central Wavelength (microns)	MODIS Central Wavelength (microns)	VIIRS Central Wavelength (microns)	SEVIRI Central Wavelength (microns)
1	0.47	Visible	Aerosol over land/Haze	-	-	-		0.469	0.488	0.45 – 1.05
2	0.64	Visible	Clouds/ Albedo	0.65	0.65	0.65	(1) .58-.68	0.645	0.64	0.64
3	0.865	Visi/NIR	Aerosol over water; Vegetation	-	-	-	(2) .725-1.0	0.858	0.865	0.81
4	1.378	NIR	Daytime Cirrus, Contrails	-	-	-		1.375	1.38	--
5	1.61	NIR	Snow, Phase	-	-	-	(3a) 1.58-1.64	1.64	1.61	1.64
6	2.25	NIR	Cloud / Aerosol Particle size	-	-	-		2.13	2.25	--
7	3.9	IR	Cloud/Fog Discrimination .; Fire	3.9	3.9	3.9	(3b) 3.55-3.93	3.96	3.75	3.92

Note the synergy of bands across sensors.
This is not by accident.

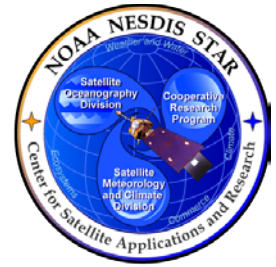
Common Channels (2 of 2)



ABI Band	GOES-R Central Wavelength (microns)		Typical Use	GOES I-L Central Wavelength (microns)	GOES M-N Central Wavelength (microns)	GOES O-P Central Wavelength (microns)	AVHRR Central Wavelength (microns)	MODIS Central Wavelength (microns)	VIIRS Central Wavelength (microns)	SEVIRI Central Wavelength (microns)
8	6.19	IR	Hi-Lev Water vapor	-	-	-		--	--	6.25
9	6.95	IR	Mid Lev Water Vapor	6.75	6.55	6.55		6.72	--	--
10	7.34	IR	Low-Lev Water Vapor	-	-	-		7.33	--	7.36
11	8.5	IR	Total Water, cloud phase	-	-	-		8.55	8.55	8.7
12	9.61	IR	Ozone	-	-	-		9.73	--	9.66
13	10.35	IR	Surface; LL WV & Cloud	-	-	-		--	--	--
14	11.2	IR	IR Window	10.7	10.7	10.7	(4) 10.8	11.03	10.76/11.45	10.8
15	12.3	IR	Dirty Window	12			(5) 11.8			
16	13.3	IR	Cloud Top Temperature		13.35	13.35				

Note the synergy of bands across sensors.
This is not by accident.

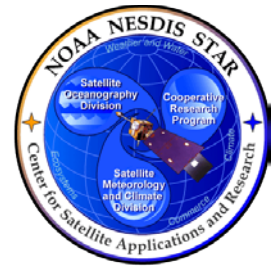
Synergies Among Instruments



Benefits:

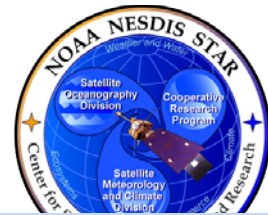
- ▶ Algorithms can be developed and applied fairly easily, with relatively minor updates, to different instruments
- ▶ Consistent products with similar characteristics and performance can be generated from different instruments
- ▶ Who benefits the most? **Our Users!**

Reduced Algorithm Development and Maintenance Costs



- Core algorithm software is reused across instruments
- Only one software base to maintain
 - Algorithm updates will be implemented across all instruments
- Same output file/format for products across instruments

Enterprise EDR Algorithm Progress



- Enterprise Clouds, Cryosphere, and Aerosol algorithms updated delivery: 04/14/17
- ACSPO SST V2.41 delivery: 03/01/17
- VIIRS Ocean Color MSL12 Operational Readiness Review (ORR) 11/9/2016
- VIIRS Polar Winds update (using ECM instead of VCM) delivery: 05/16/17
- MiRS patch deliveries:
 - Radiometric bias corrections based on ATMS full radiance SDR: 03/06/17
 - Metadata update (add orbit numbers, production_site and production_environment): 06/07/17
 - Update to fix the file creation time: 06/23/17
- GCOM patch deliveries:
 - GCOM Day-2 algorithms update: 02/17/17
 - Update to handle the compressed OISST ancillary data files: 04/18/17
 - Ocean code bug fix; pre-processing the L1B and L1R files separately to help reduce latency: 06/30/17
- Active Fires update deliveries:
 - Remove ADL dependence; update quality flags; new metadata for product monitoring: 05/11/17
 - Internal NetCDF file compression: 08/09/17

The Enterprise Processing System (EPS) products became operational in NESDIS on July 5, 2017. The products include Ice Concentration and Cover, Ice Surface Temperature, Ice Thickness/Age, Snow Cover, and Fractional Snow Cover; Aerosol Detection, Aerosol Optical Depth, Aerosol Particle Size, Volcanic Ash Mass Loading, Volcanic Ash Height; Cloud Mask, Cloud Top Phase, Cloud Type, Cloud Top Height, Cloud Top Temperature, Cloud Top Pressure, Cloud Optical Depth, Cloud Particle Size Distribution, Cloud Liquid Water, and Cloud Ice Water Path.

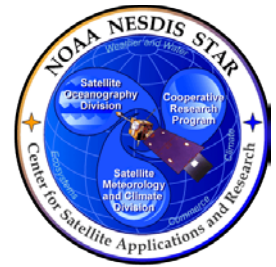
In addition to the science improvement gained by the development of the Enterprise (NOAA-unique) products, they also demonstrate NOAA's goal of enterprise solutions by employing same algorithms for POES and GOES satellite systems.

Current Status of Algorithms Yet to be Operational



- Land Surface Reflectance operational date: 09/29/2017
 - Final DAP already delivered to NDE
- Land Surface Albedo and Surface Temperature operational date: 12/20/2017
 - Final DAP to be delivered in October
- Vegetation Indices operational date: 11/30/2017
 - Final DAP to be delivered in September

Example: Enterprise Algorithms Used With Other Instruments



- **Derived Motion Winds** – GOES–R ABI, Himawari–8 AHI, S–NPP VIIRS, GOES, AVHRR, SEVIRI, MODIS
- **Cloud Products** – GOES–R ABI, Himawari–8 AHI, S–NPP VIIRS, GOES, AVHRR, SEVIRI, MODIS
- **Volcanic Ash** – GOES–R ABI, Himawari–8 AHI, S–NPP VIIRS, AVHRR
- **Cryosphere Ice Products** – GOES–R ABI, Himawari–8 AHI, S–NPP VIIRS
- **Aerosol Detection** – GOES–R ABI, Himawari–8 AHI, S–NPP VIIRS
- **Aerosol Optical Depth** – GOES–R ABI, Himawari–8 AHI, S–NPP VIIRS
- **Land Surface Temperature** – GOES–R ABI, S–NPP VIIRS

J1 Enterprise Algorithm Schedule



- The full J1 EDR enterprise algorithm schedule is shown on the following slides
- The schedule includes the CDR, Software Review, ARR, ORR and operational date for each algorithm

Top-Level Schedule

J1 Polar ESPC Products		FY 17-2016				FY17-2017							
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Reformatting toolkit SDR BUFR													
Reformatting toolkit EDR BUFR and GRIB2													
NUCAPS CrIS subsetter													
NUCAPS Level 2													
CrIS OLR													
Polar Winds													
MiRS													
GVF													
ACSPO													
Ocean Color													
Active Fires													
Mircrowave Tropical Cyclone													
Veg Health													

CDR
 Prelim DAP
 SCR
 ARR/AMR
 SRR
 Final DAP
 ORR
 OPS

Top-Level Schedule

J1 Polar ESPC Products		FY 17-2016				FY17-2017							
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
V8TOz/LFSO2		△											
V8Pro		△											
Surface Reflectance		△											
Vegetation Indices		△											

△ CDR

△ Prelim DAP

△ SCR

△ ARR/AMR

△ SRR

△ Final DAP

△ ORR

△ OPS

J1 launch date

Top-Level Schedule

J1 Polar ESPC Products	FY 18- 2017			FY18-2018								
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Reformatting toolkit SDR BUFR												
Reformatting toolkit EDR BUFR and GRIB2					△	▲		▲	▲	▲		
NUCAPS CrIS Subsetter	▲											
NUCAPS Level 2												△
CrIS OLR											△	
Polar Winds									△	▲		
MiRS					△		▲					
GVF												△
ACSPO										△		▲
Ocean Color												
Active Fires											△	▲
Mircrowave Tropical Cyclone												
Veg Health									△		▲	

▲ CDR

△ Prelim DAP

▲ SCR

▲ ARR/AMR

▲ SRR

▲ Final DAP

▲ ORR

▲ OPS

J1 launch date

Top-Level Schedule

J1 Polar ESPC Products	FY 18- 2017			FY18-2018								
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
V8TOz/LFSO2					▲	▲▲	▲					
V8Pro					▲	▲▲	▲					
Surface Reflectance	▲										▲	
Vegetation Indices												▲

▲ CDR

▲ Prelim DAP

▲ SCR

▲ ARR/AMR ▲ SRR

▲ Final DAP

▲ ORR

▲ OPS

Top-Level Schedule

J1 Polar ESPC Products	FY 19- 2018			FY19-2019								
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Reformatting toolkit SDR BUFR												
Reformatting toolkit EDR BUFR and GRIB2												
NUCAPS CrIS Subsetter												
NUCAPS Level 2		▲						▲	▲▲	▲		
CrIS OLR		▲						▲	▲▲	▲		
Polar Winds		▲	▲▲	▲								
MIRS	▲▲	▲	▲									
GVF	▲			▲		▲▲	▲					
ACSPO				▲	▲	▲	▲					
Ocean Color												▲
Active Fires				▲	▲▲	▲						
Mircrowave Tropical Cyclone					▲		▲					
Veg Health				▲								

▲ CDR

▲ Prelim DAP

▲ SCR

▲ ARR/AMR

▲ SRR

▲ Final DAP

▲ ORR

▲ OPS

Top-Level Schedule

J1 Polar ESPC Products	FY 19- 2018			FY19-2019								
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
V8TOz/LFSO2												
V8Pro												
Surface Reflectance				▲	▲▲	▲						
Vegetation Indices	▲			▲		▲▲	▲					

▲ CDR

▲ Prelim DAP

▲ SCR

▲ ARR/AMR

▲ SRR

▲ Final DAP

▲ ORR

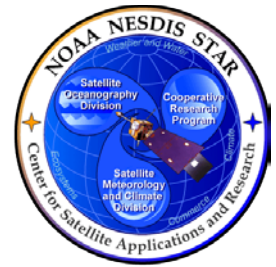
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Top-Level Schedule

J1 Polar ESPC Products	FY 20- 2019			FY20-2020								
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
MIRS												
Ocean Color			▲				▲					▲
Microwave Sounder based Tropical Cyclone	▲		▲ ▲	▲								
Veg Health						▲ ▲	▲					

J1 Polar ESPC Products	FY 21- 2020			FY21-2021								
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Ocean Color			▲	▲								

Summary



- By the end of 2017, all EDR algorithms (beside Imagery) will be updated to Enterprise Algorithms
 - Implementation of the latest science
 - Consolidation of science across satellite systems
 - Minimization of software to maintain
- These same algorithms will be used for J1
- Note that a couple of algorithms like Fires and Surface Reflectance need more work to become completely enterprise