Suomi NPP/JPSS Land Cryosphere EDR Overview

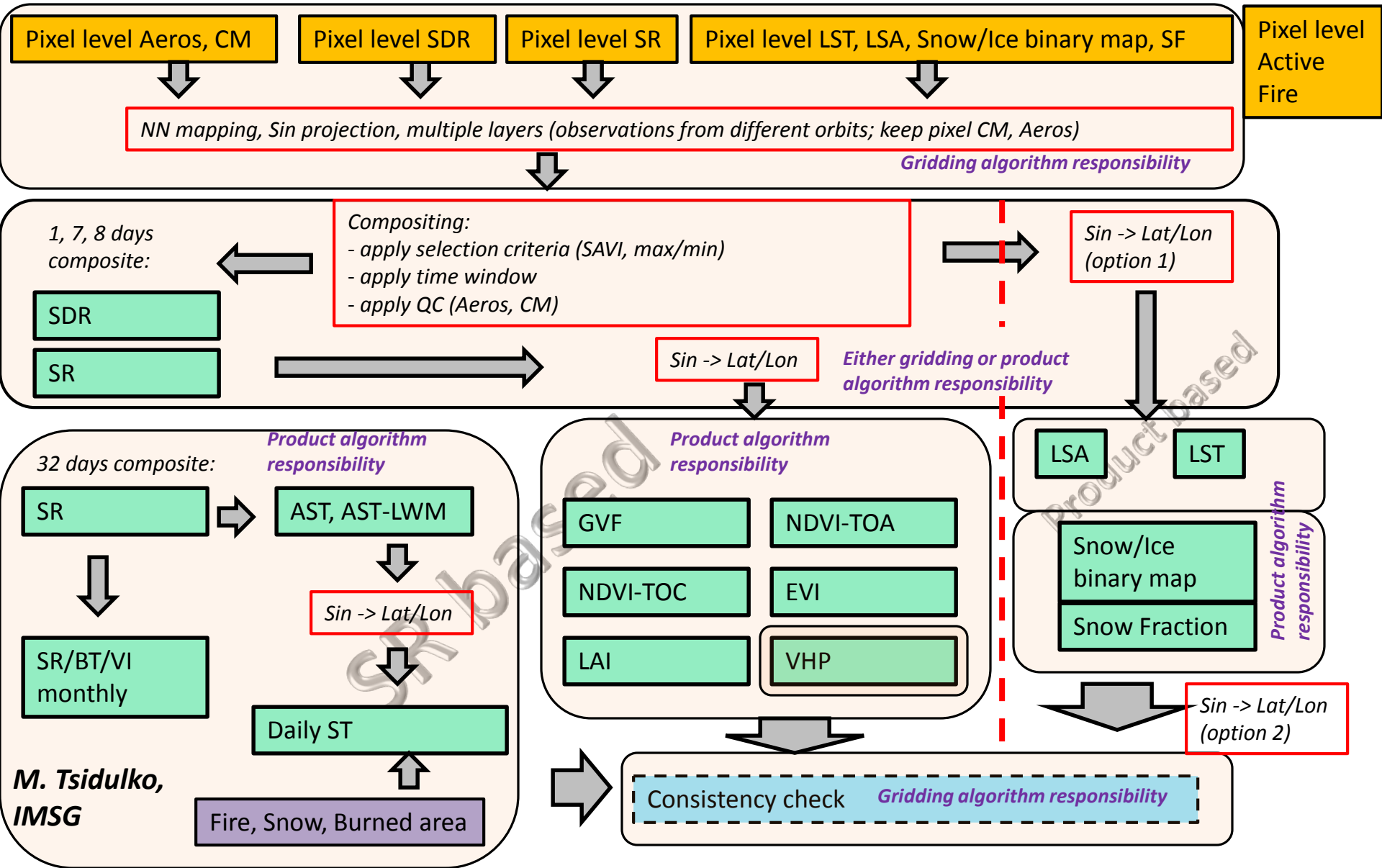
Products, Applications and J1 Readiness

Ivan Csiszar, Jeff Key

NOAA/NESDIS/STAR

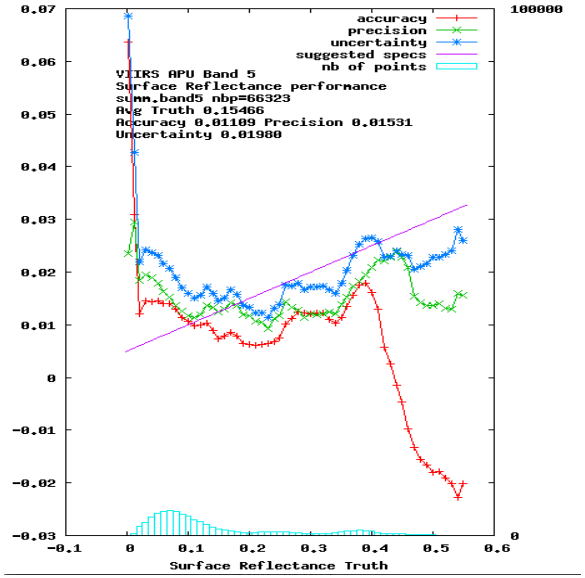
and the NOAA JPSS Land and Cryosphere Teams

General Framework for Land Enterprise System

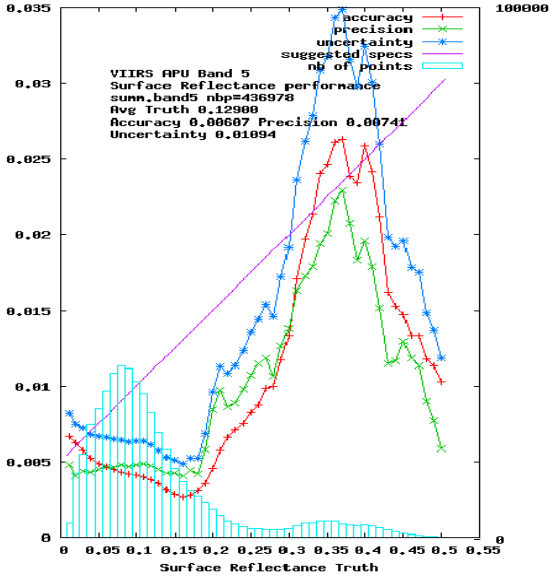


VIIRS Surface Reflectance: NDE algorithm performance

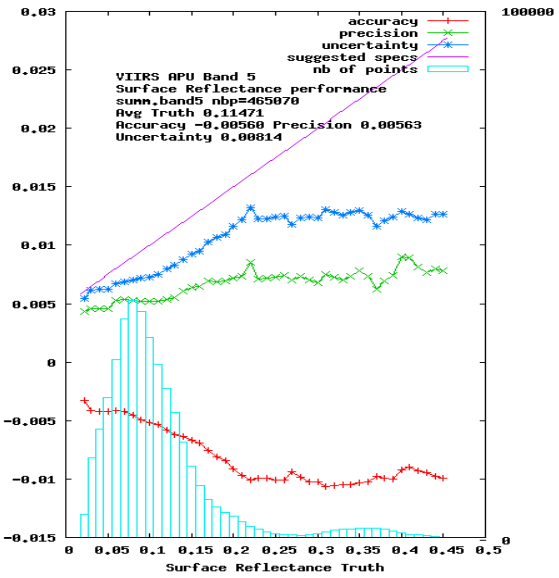
IDPS version



NASA C1.1



NDE, NASA Version 1

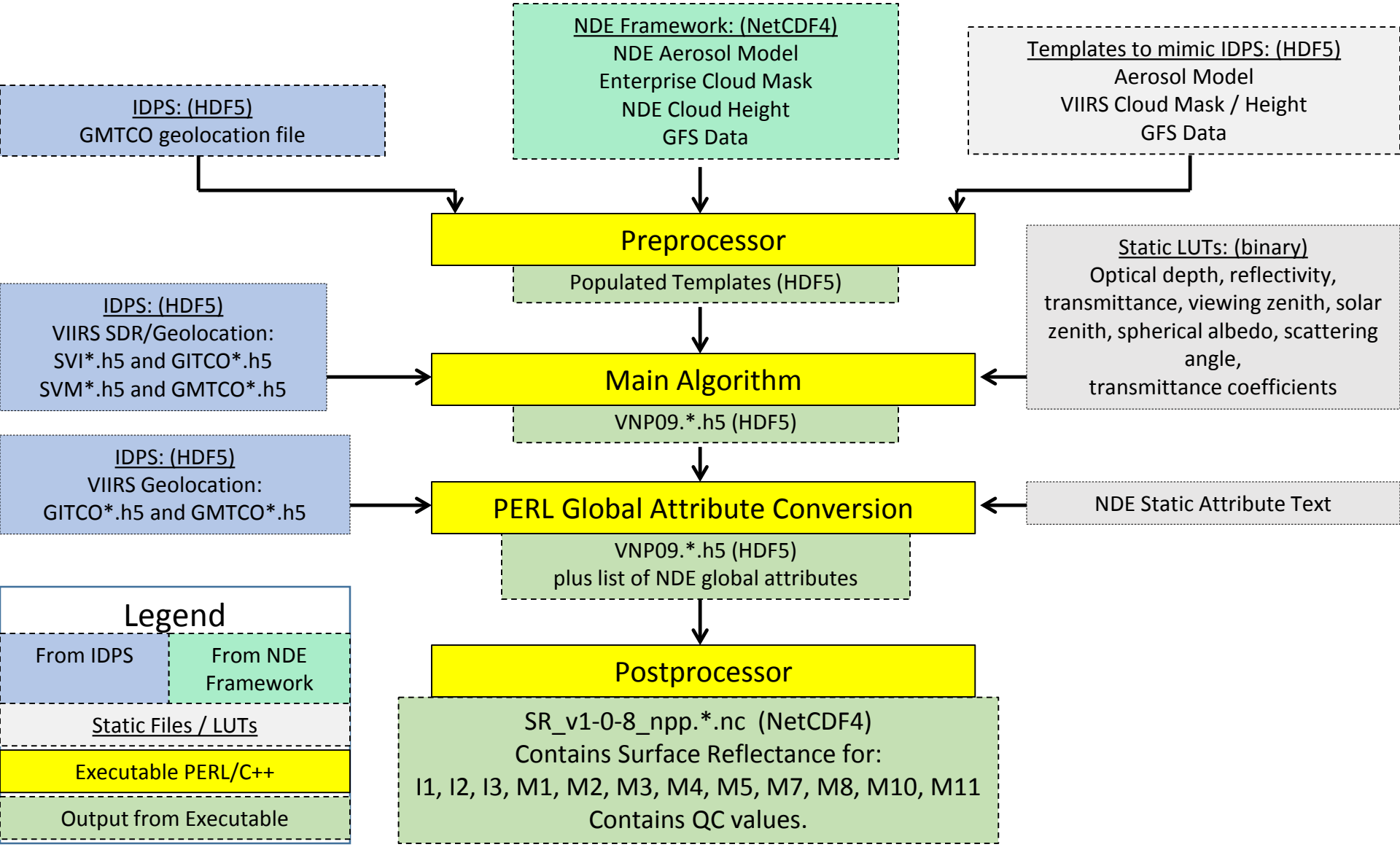


Improvement is clearly visible from IDPS to current NDE version

Algorithm in transition to operations

E. Vermote, NASA

Surface Reflectance Algorithm Overview

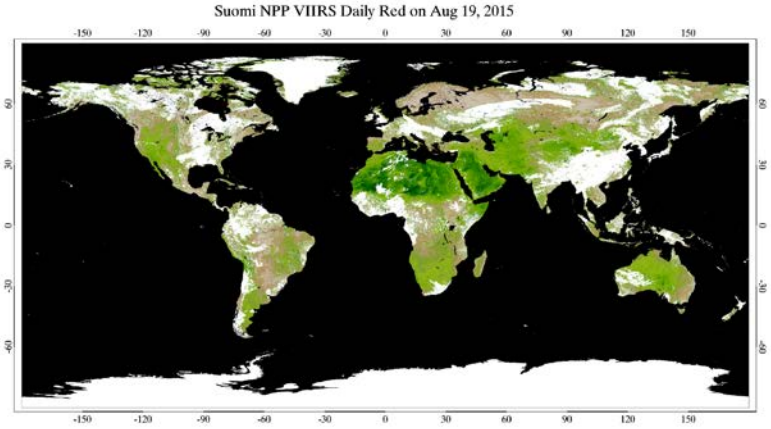


Algorithm in transition to operations

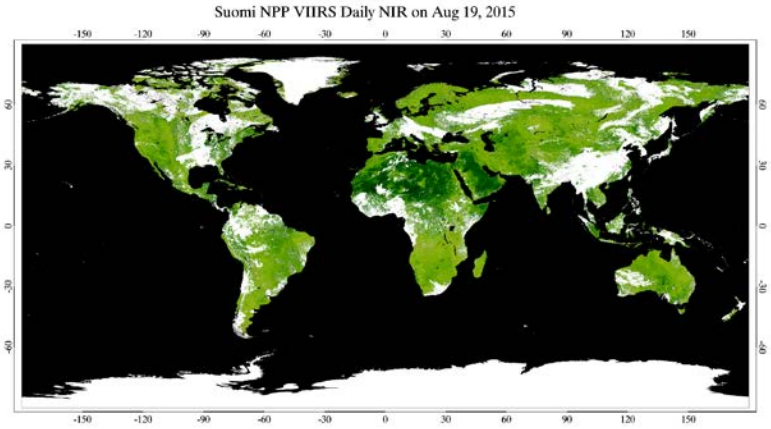
M. Wilson, STAR ASSIST

GVF System – Intermediate Files generated using Enterprise Surface Reflectance input granule data in NetCDF4 (2015-08-19)

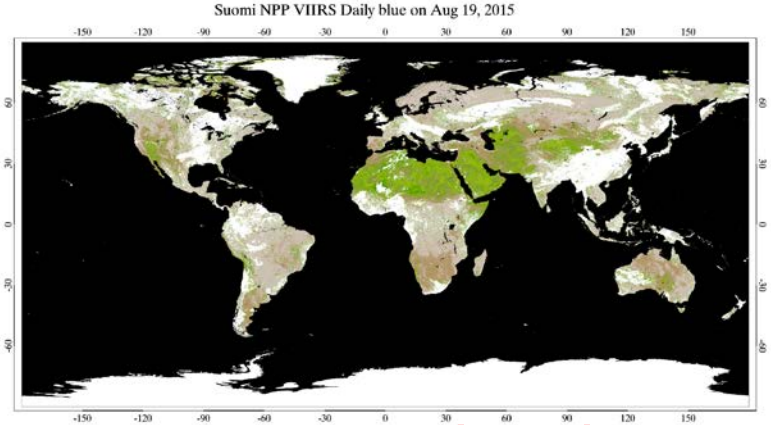
Daily VIIRS I1 ESR (Aug 19, 2015)



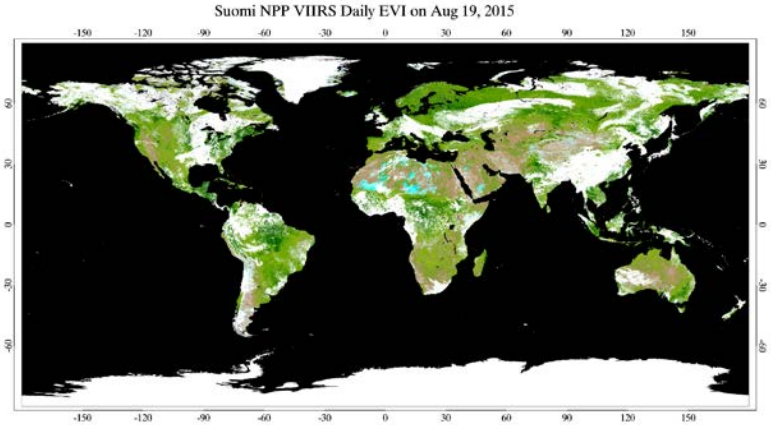
Daily VIIRS I2 ESR (Aug 19, 2015)



Daily VIIRS M3 ESR (Aug 19, 2015)



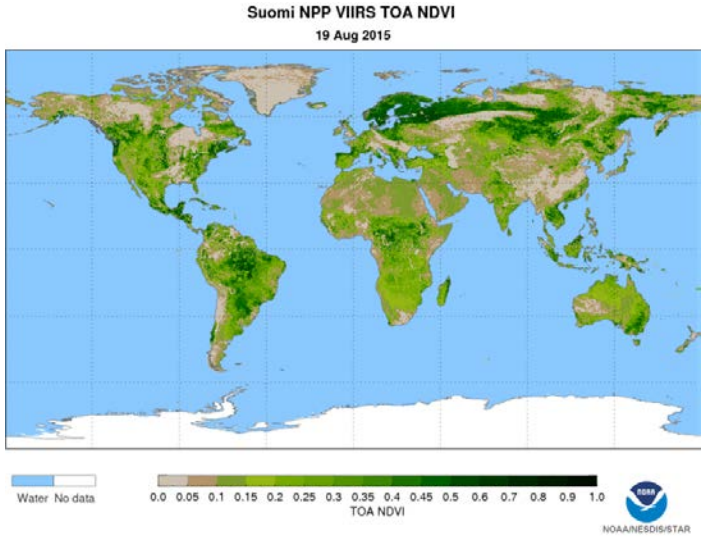
Daily EVI (Aug 19, 2015)

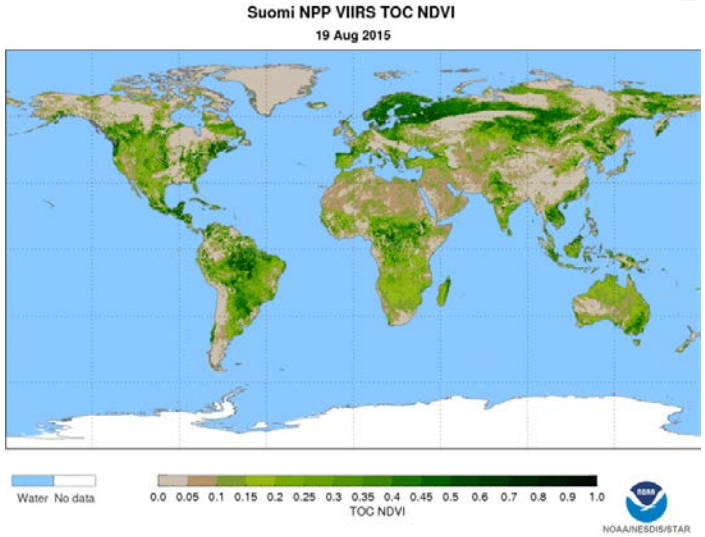


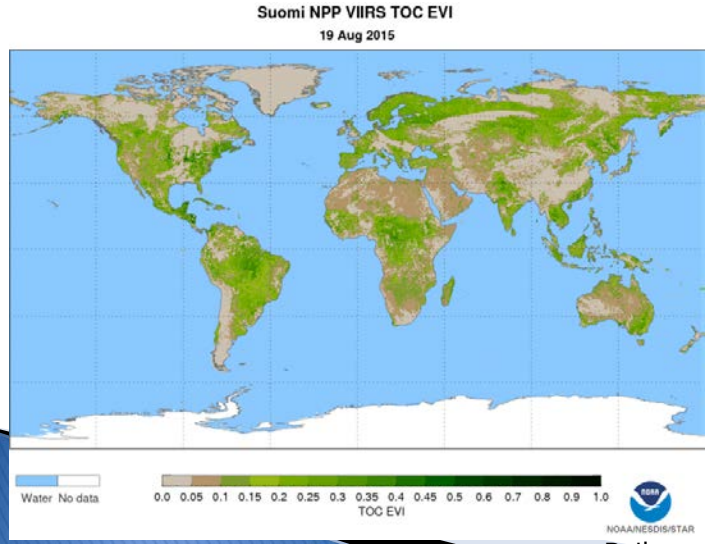
Algorithm in transition to operations

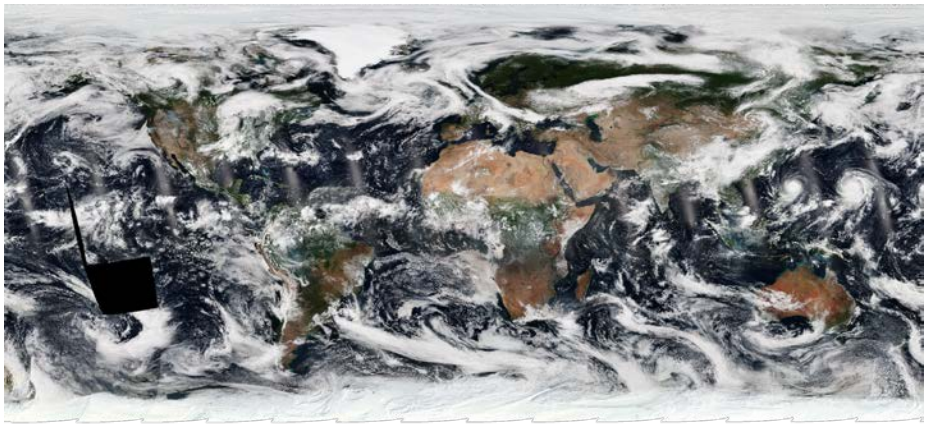
Intermediate files within the VIIRS GVF processing system

Vegetation Index Daily Global Products (4 km res)







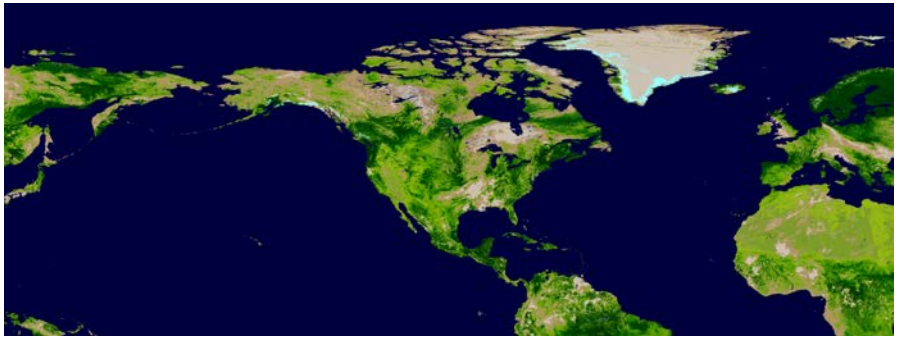


Algorithm in transition to operations

Daily products generated with the **Enterprise Surface Reflectance** granule data in NetCDF format

Vegetation Index Daily Regional Products (1km res)

REGIONAL TOA NDVI 2015/08/19



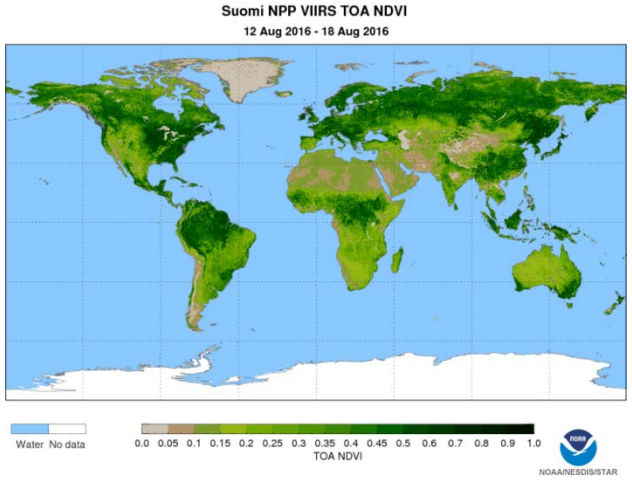
REGIONAL TOC NDVI 2015/08/19

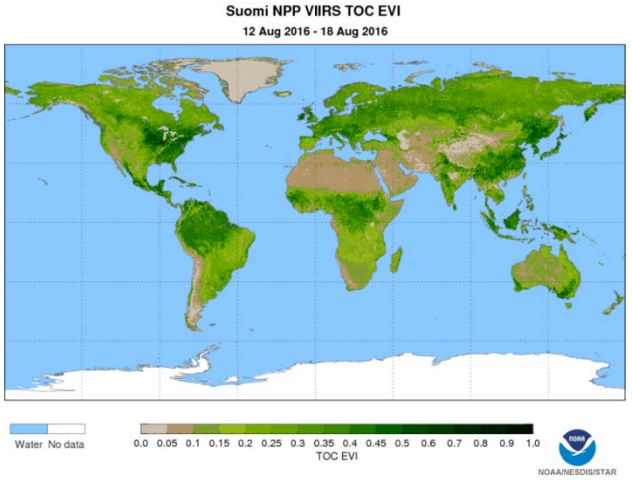
REGIONAL TOC EVI 2015/08/19

Some issues with upstream products and associated QA

Algorithm in transition to operations

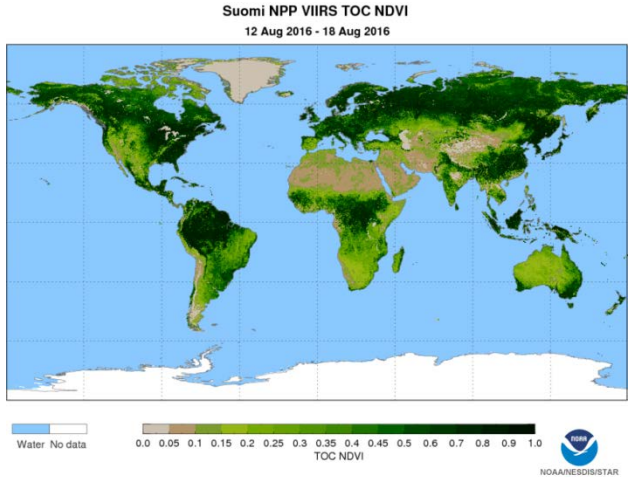
Vegetation Index Weekly Global Products





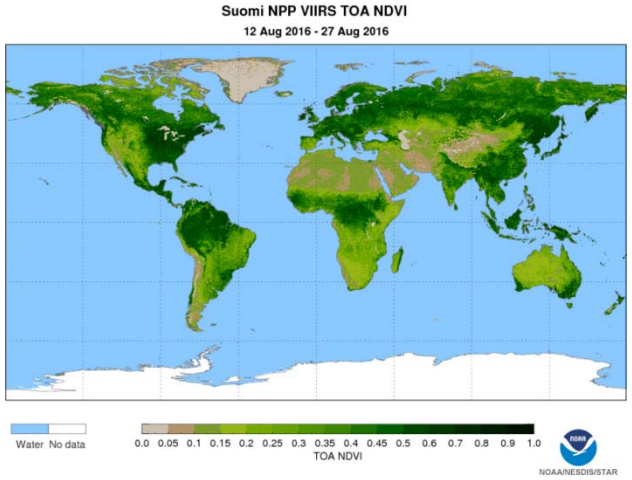
Global weekly products generated from Surface Reflectance granule Data in HDF5 format (from the IDPS)

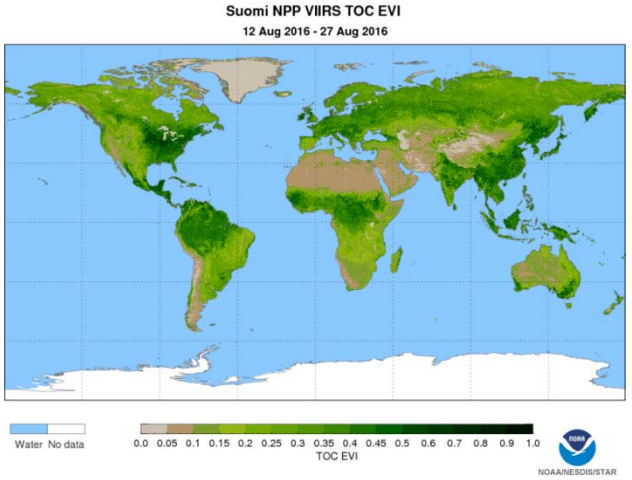
Some issues with upstream products and associated QA

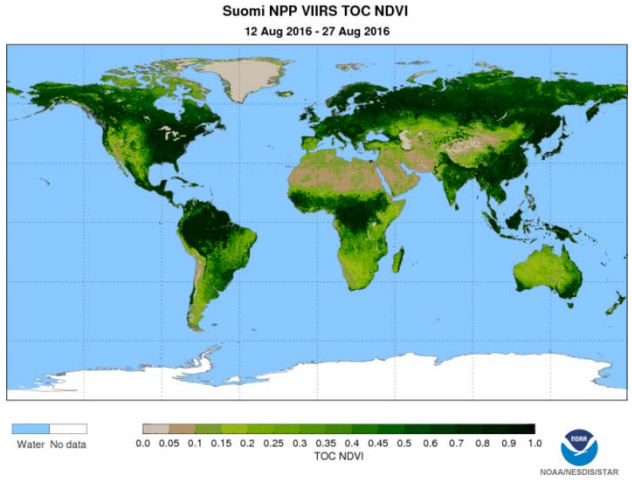


Algorithm in transition to operations

Vegetation Index Bi-Weekly Global Products







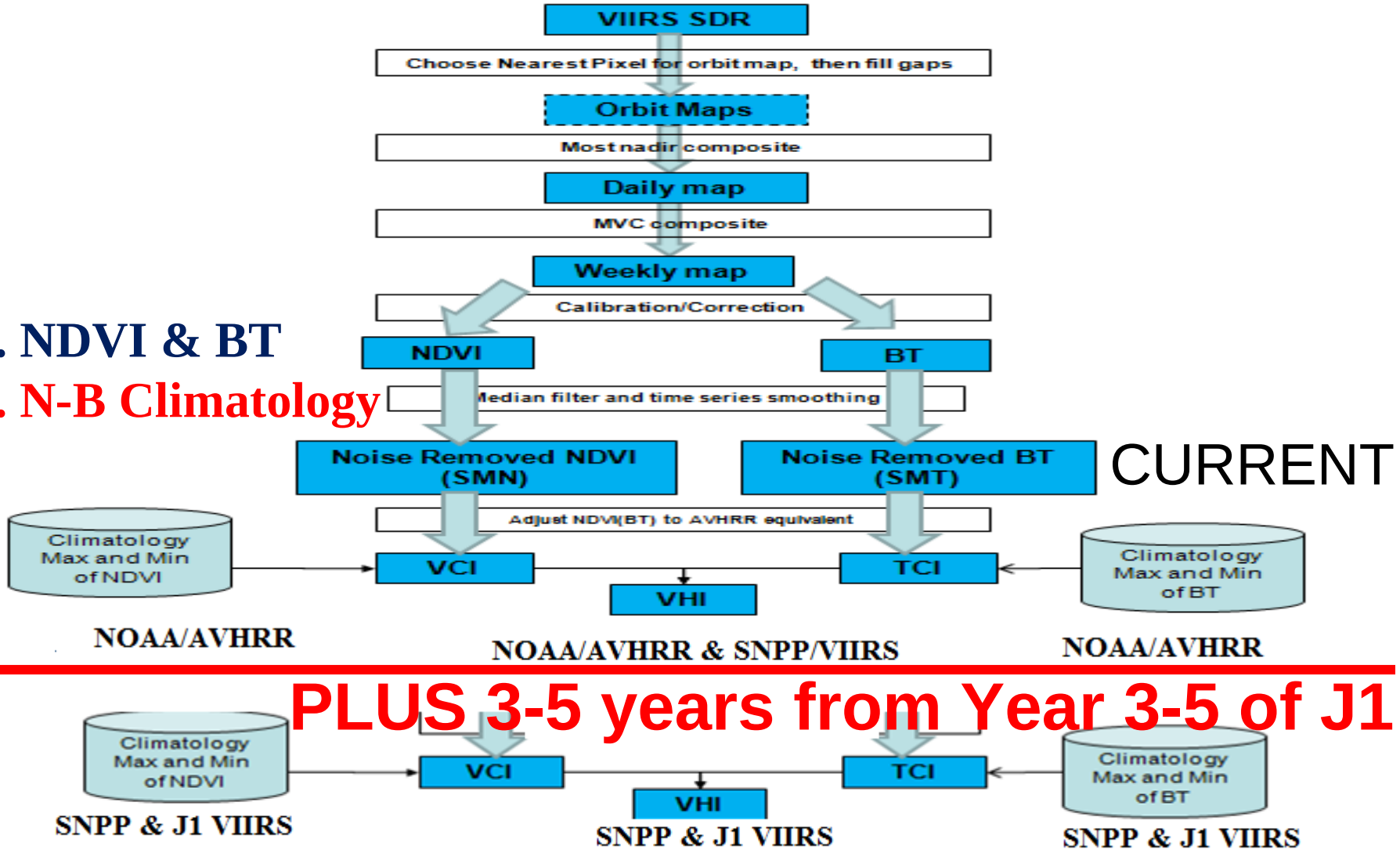
Global Bi-weekly products generated from Surface Reflectance granule Data in HDF5 format (from the IDPS)

Some issues with upstream products and associated QA

Algorithm in transition to operations

Vegetation Health

1. NDVI & BT
2. N-B Climatology

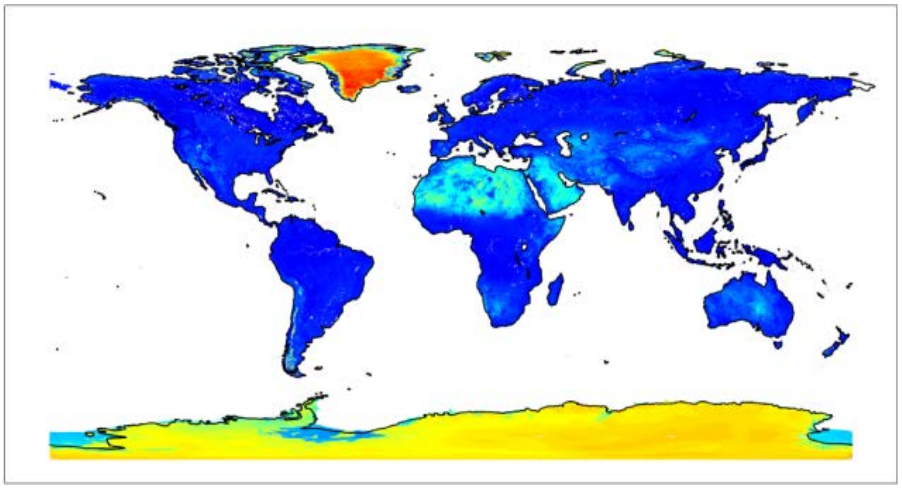


Algorithm reaching readiness for operational transition

F. Kogan, STAR

Enterprise land surface albedo

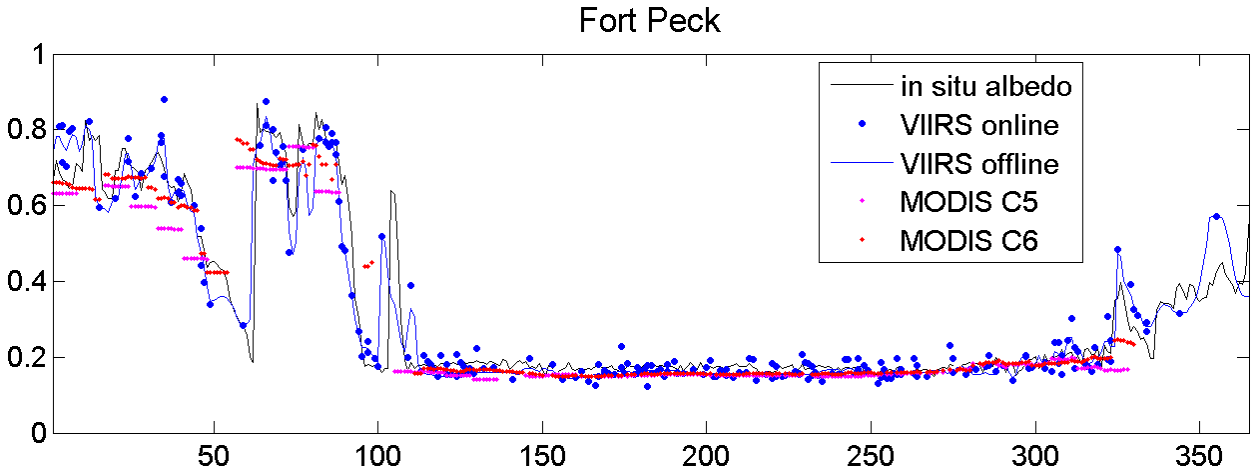
Gap-filled, noise-reduced, gridded LSA



Example of global map of gap-filled and noise-reduced VIIRS gridded albedo on Jul 17th, 2015

- New gridded VIIRS LSA product
  - All gaps are filled.
  - Noises are reduced.
- Validation suggested higher accuracy than original VIIRS product and other existing products

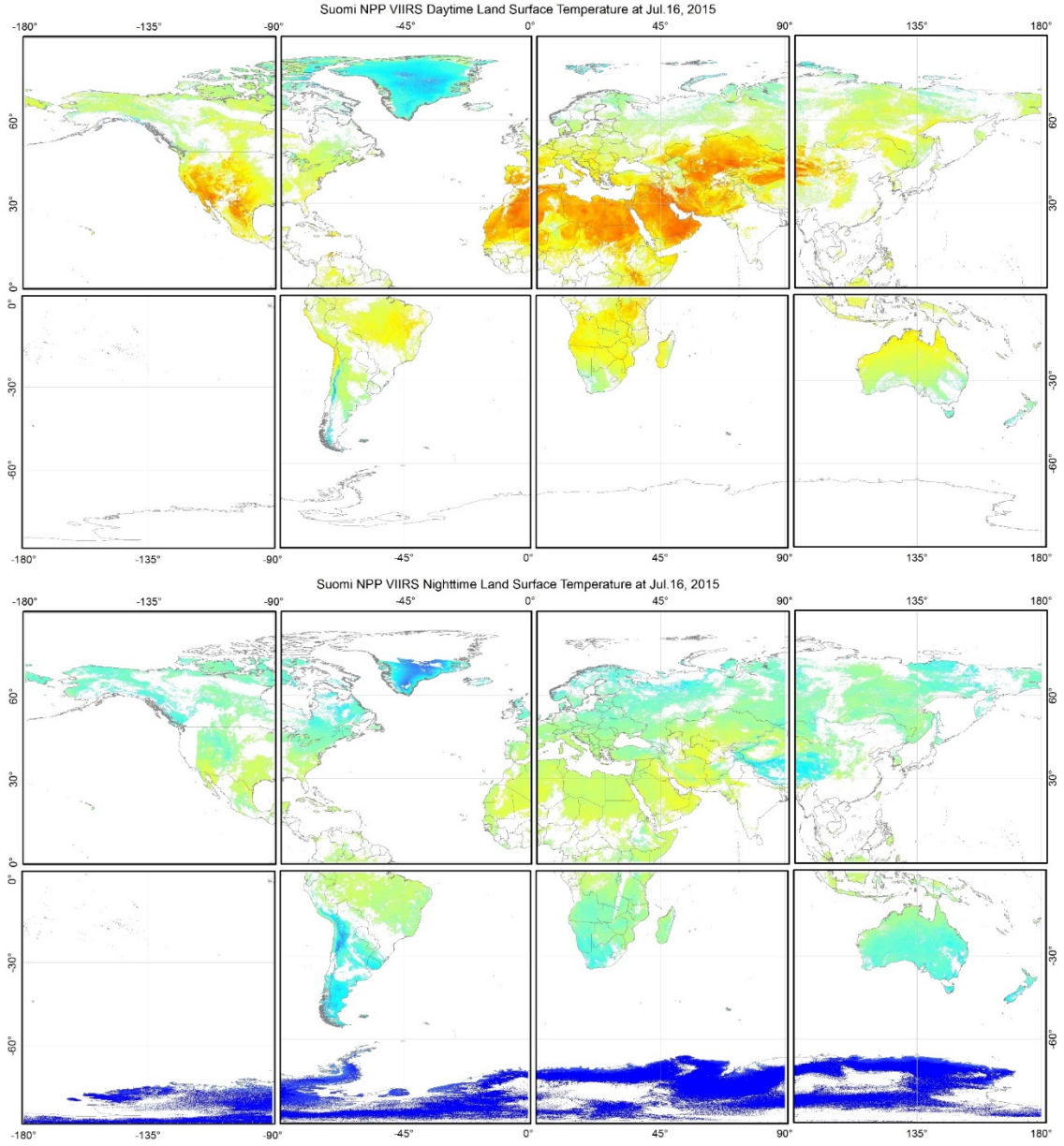
Granule-based algorithm in transition to operations



Example of time series of one year VIIRS albedo at Fort Peck

Y. Yu, STAR

Enterprise Land Surface Temperature



Gridded LST Product Development

1km Gridded VIIRS Land Surface Temperature for daytime (top) and nighttime(bottom)

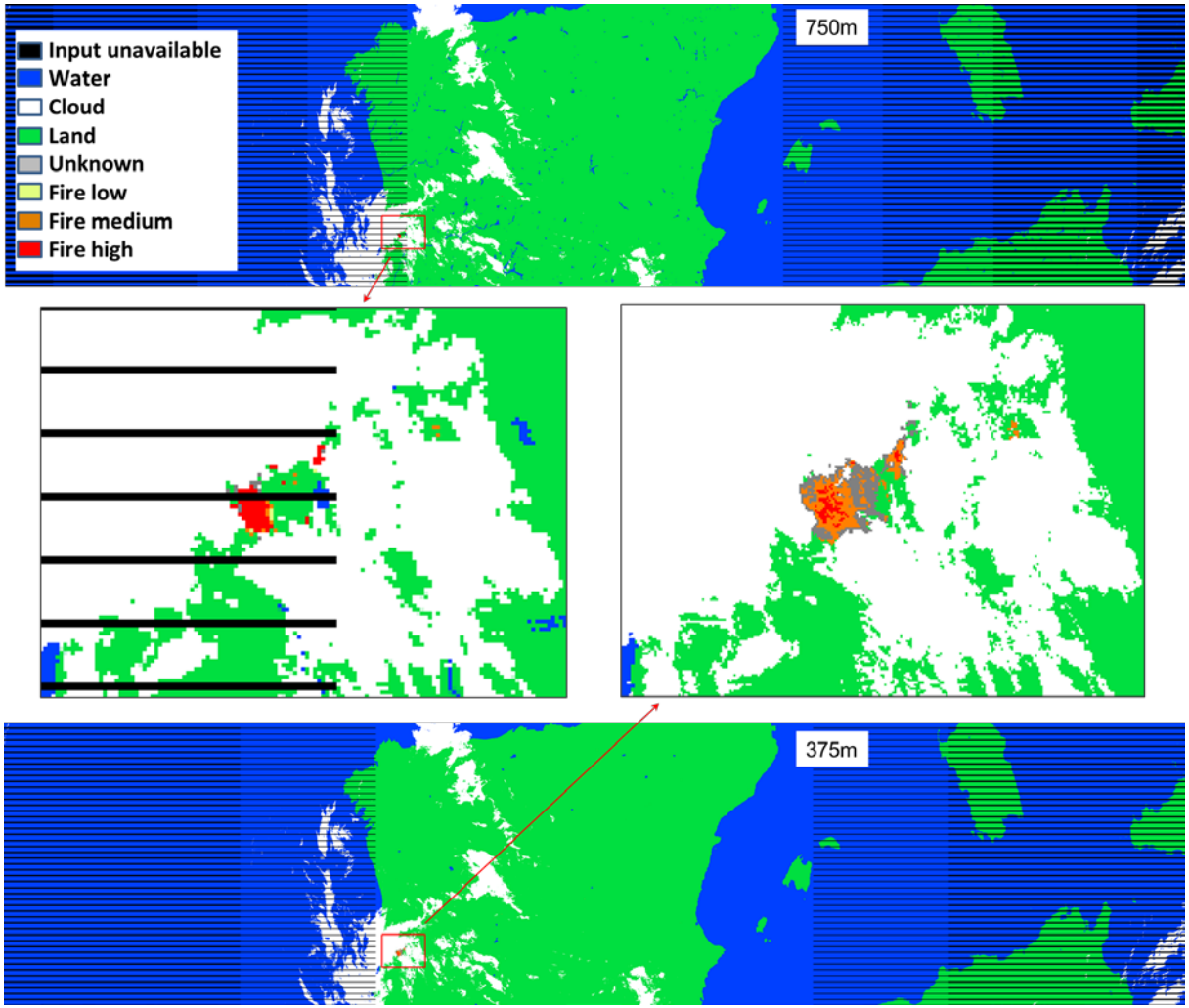
4 × 2 tiles for globe

Granule-based algorithm in transition to operations

Y. Yu, STAR

VIIRS Active Fire

- The JPSS VIIRS active fire products provide high quality information
  - 750m M-band product in operations since March 15, 2016
  - 375m I-band algorithm evaluated for operational implementation
  - both products deliver fire mask and fire radiative power (FRP)
  - FRP used in air quality, and smoke analysis and prediction systems
  - FRP is incorporated into AWIPS-II

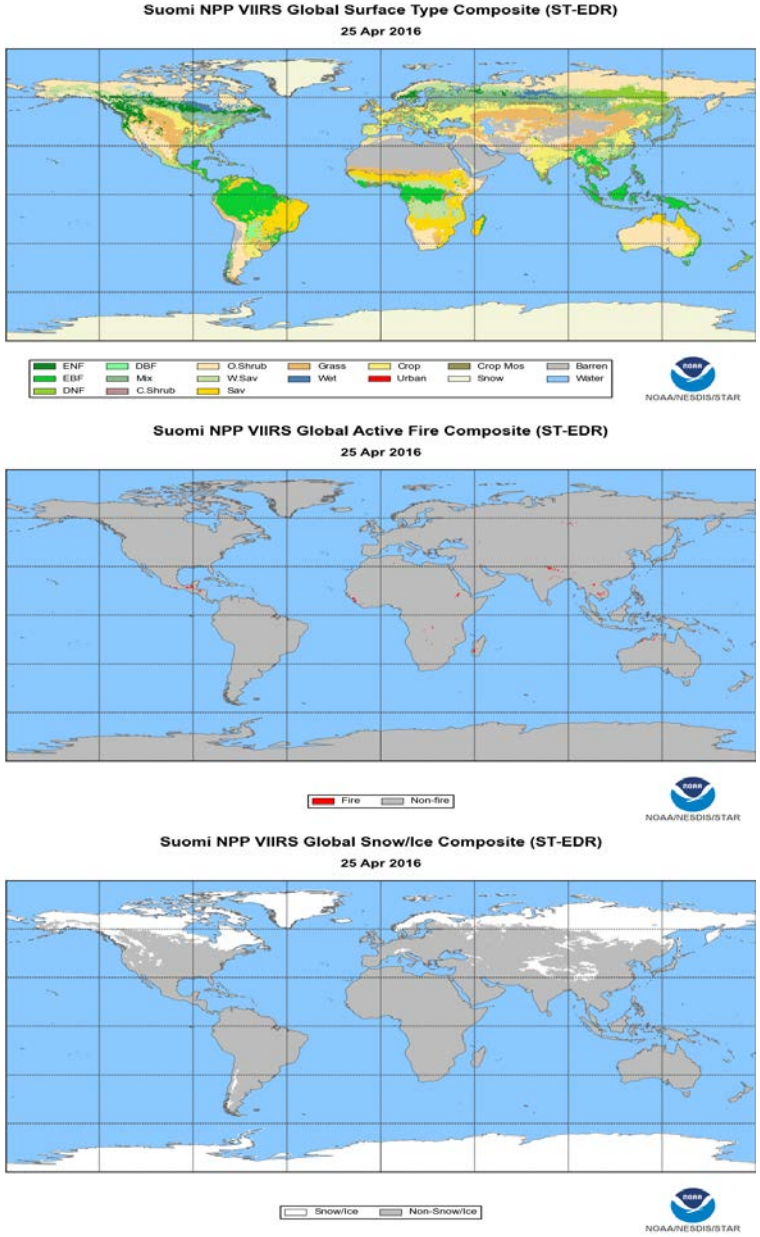


Updated M-band algorithm in delivery to NDE.

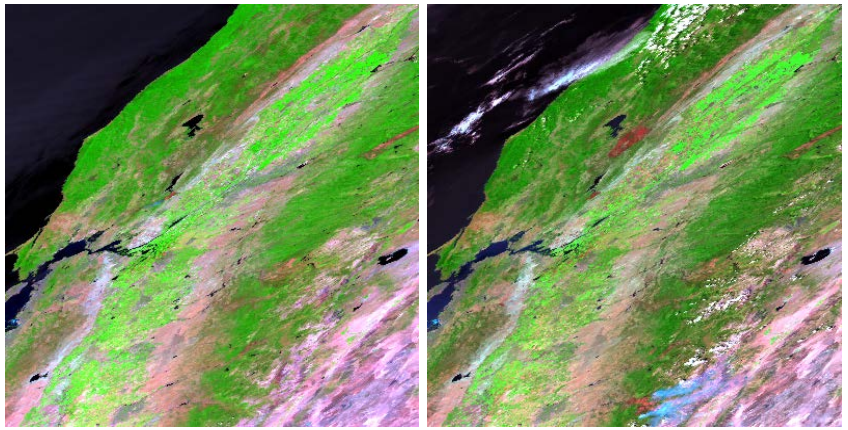
Fire masks from the M-band (top and left) and I-band (bottom and right) algorithms on 6/18/2017 02:04 UTC.

I. Csiszar, STAR; M. Tsidulko, IMSG@STAR, W. Schroeder, UMD

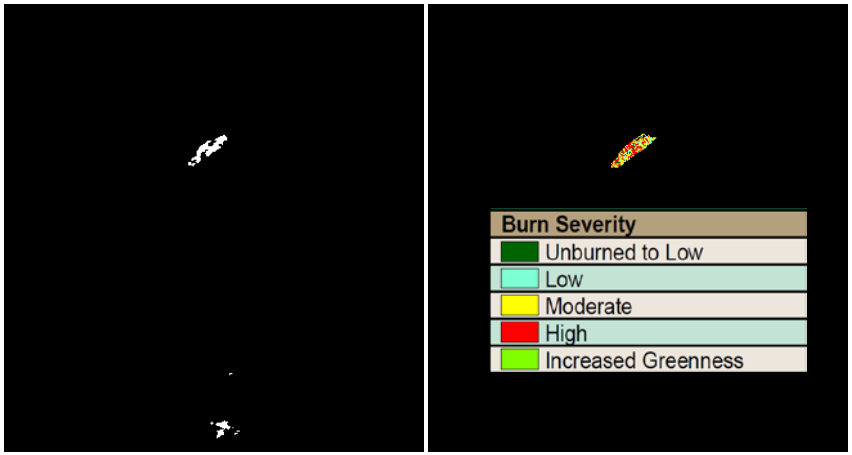
Towards a VIIRS Surface Type Change product



Surface type and change data layers in Suomi-NPP VIIRS Surface Type EDR



S-NPP VIIRS RGB images (M11-M7-M5) acquired on July 28th and August 30th, 2015



Burned areas of the Rocky Creek, CA fires in July 2015 detected with the change vector method using S-NPP VIIRS images shown above

Algorithm in testing and demonstration mode

X. Zhan, STAR; Chengquan Huang, Rui Zhang, Panshi Wang, UMD

Summary

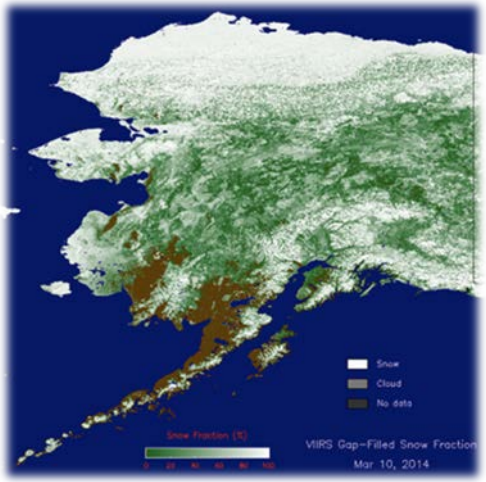
- Finalizing Enterprise algorithm development
  - Algorithms are ready and some are in the process of operational transition
  - Further refinements expected
  - Feedback on upstream Enterprise EDRs (primarily cloud mask)
  - New algorithms in testing and demonstration mode
- Reprocessing needs a coordinated effort
  - SDR is becoming available now
- Consistency between different geophysical products
  - e.g. signal from all products should indicate vegetated vs. clear land etc.
- Further progress towards interagency and international coordination
  - NOAA and NASA activities
  - CEOS WGCV and other coordination groups
  - EUMETSAT, bilateral
- Land breakout session: Thursday, August 17

SNOW, ICE, AND POLAR WINDS

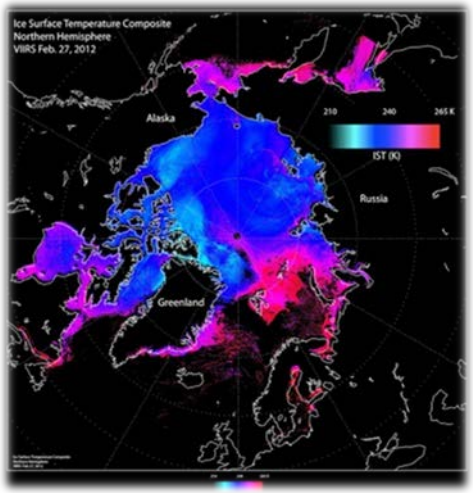
Jeff Key
NOAA/NESDIS
608-263-2605, Jeff.Key@noaa.gov

VIIRS Operational Products

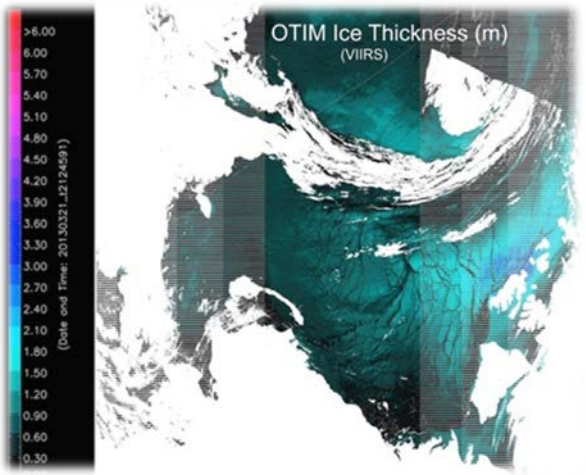
Snow Cover (binary)



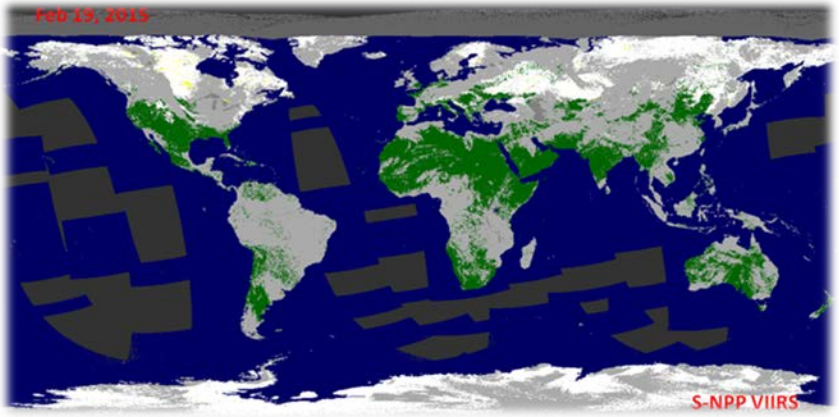
Ice Surface Temperature



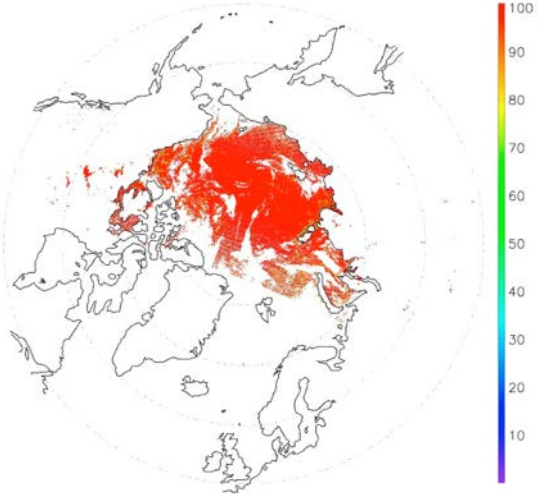
Ice Thickness/Age



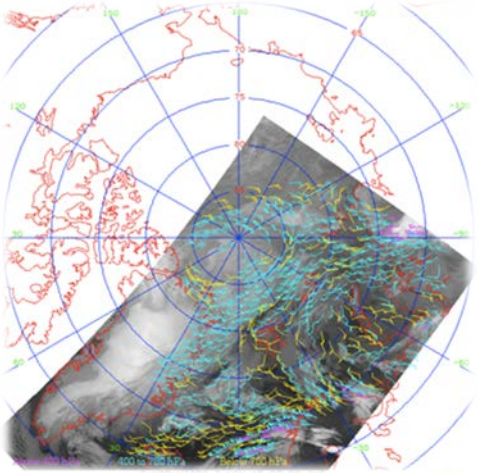
Snow Fraction



Ice Concentration

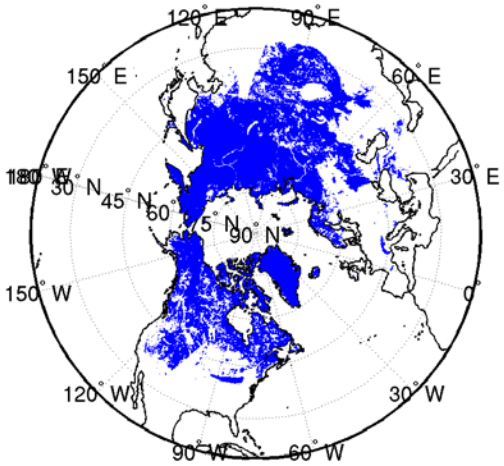


Polar Winds

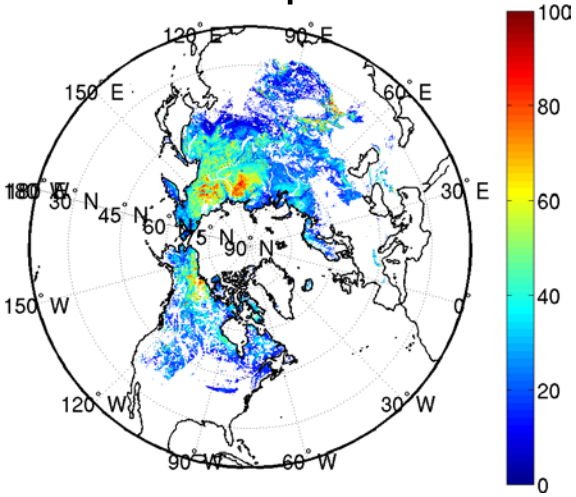


AMSR2 Operational Products

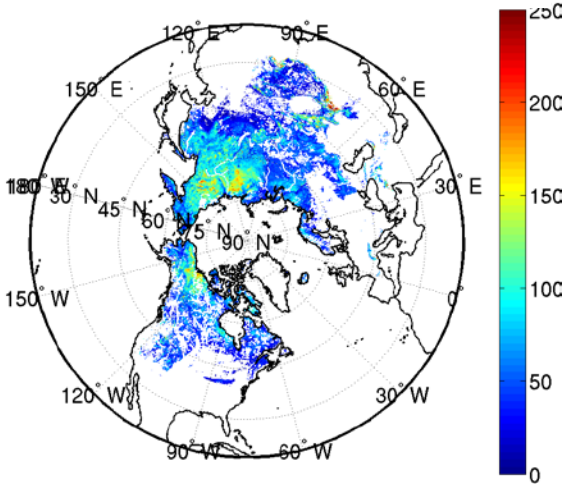
Snow Cover

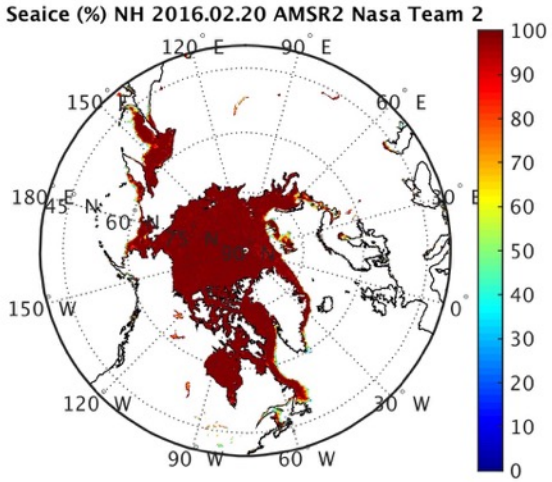


Snow Depth



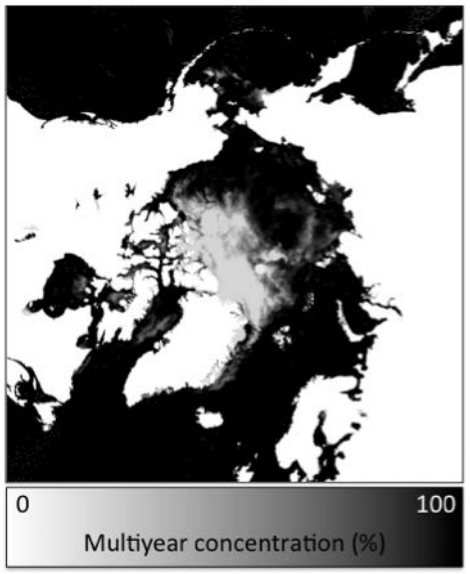
Snow Water Equivalent





Sea Ice Concentration

Sea Ice Type



Team Members - VIIRS

EDR	Name	Organization
Lead; ice and winds	Jeff Key	NESDIS/STAR
Winds	Jaime Daniels	NESDIS/STAR
Wisconsin:		
Ice conc., temp.	Yinghui Liu	CIMSS/U. Wisconsin
Ice thickness	Xuanji Wang	CIMSS/U. Wisconsin
Ice, winds	Rich Dworak	CIMSS/U. Wisconsin
Ice	Aaron Letterly	CIMSS/U. Wisconsin
Winds	Dave Santek	CIMSS/U. Wisconsin
Maryland:		
Snow cover, fraction	Peter Romanov	CREST/CCNY
Colorado:		
Ice temp., conc.	Mark Tschudi	U. Colorado
Other:		
Ice, snow	Sean Helfrich	STAR/NIC (unfunded)
Winds	Wayne Bresky	IMSG
Winds	Andy Bailey	IMSG

Team Members – AMSR2

EDR	Name	Organization
Lead; Snow, ice	Jeff Key	NESDIS/STAR
Wisconsin:		
Snow products	Yong-Keun Lee	CIMSS/U. Wisconsin
Maryland:		
Snow	Cezar Kongoli	CICS
Colorado:		
Sea ice	Walt Meier	NSIDC (formerly NASA GSFC)
Sea ice	Scott Stewart	CU Contractor
Sea ice	Florence Fetterer	NSIDC

Product Performance - VIIRS

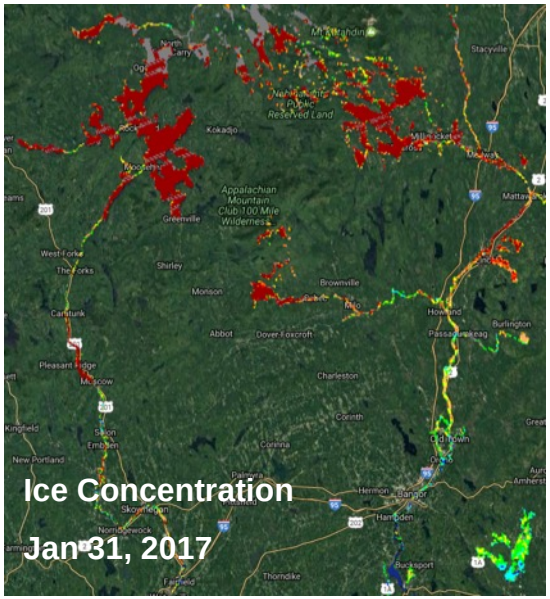
Product	L1RDS APU Thresholds	Performance	Meets Spec?
Snow cover (binary)	90% correct typing	96-99%	Y
Snow fraction	10% uncertainty	10-20%	N*
Ice surface temperature	1 K uncertainty	0.9 K	Y
Ice concentration	10% uncertainty	8.9%	Y
Ice thickness/age	70% correct typing (new/young, other ice); no thickness requirement	90% (first-year/other); 0.5 m precision for thickness	Y
VIIRS winds	7.5 m/s accuracy, 3.8 m/s precision (mean vector difference)	6.1/7.0, 3.3/2.7 accuracy, precision (NH/SH)	Y

**The snow fraction requirement is inconsistent with that of other NOAA sensors. A change has been recommended.*

Product Performance – AMSR2

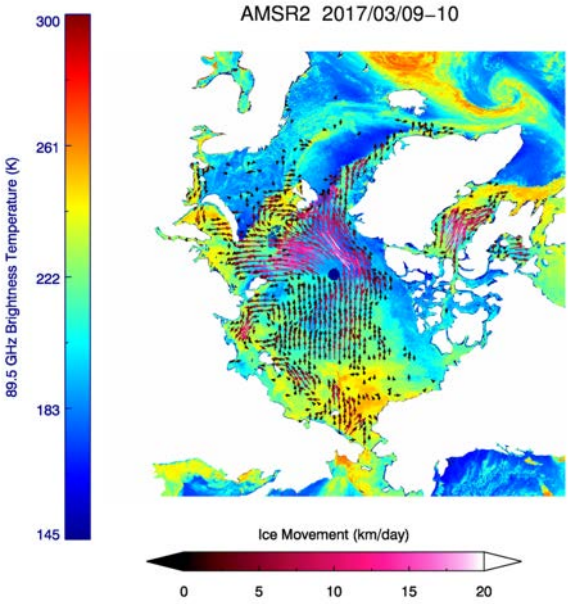
Product	L1RDS APU Thresholds	Performance	Meets Spec?
Snow cover (binary)	80% correct typing	72-97%	Y
Snow depth	20 cm uncertainty	15-22 cm	Y (marginal)
SWE	50-70% uncertainty (shallow to thick snowpacks)	~20-22%	Y
Ice concentration	10% uncertainty	3.9% NH; 4.4% SH	Y
Ice type	70% correct typing	80-90%, Arctic winter	Y

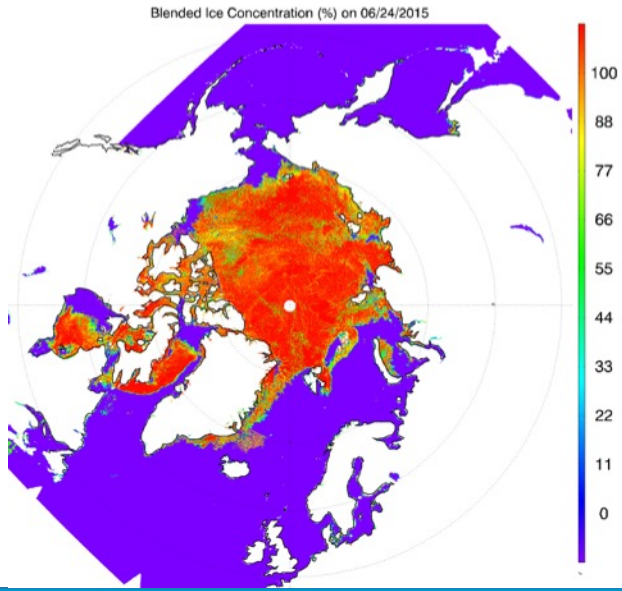
Experimental Products



River Ice

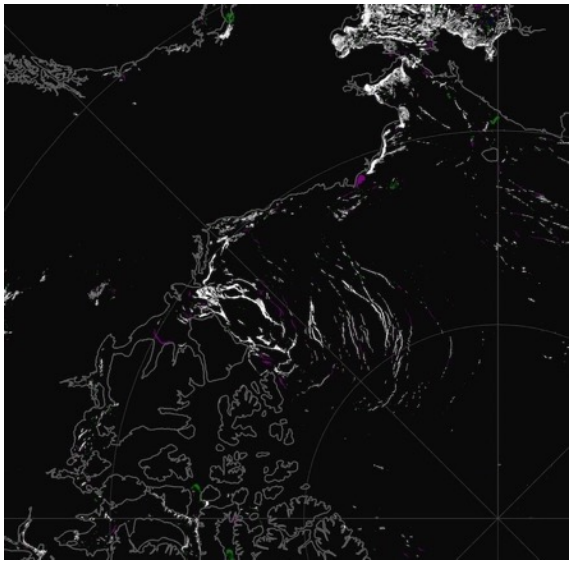
Ice Motion





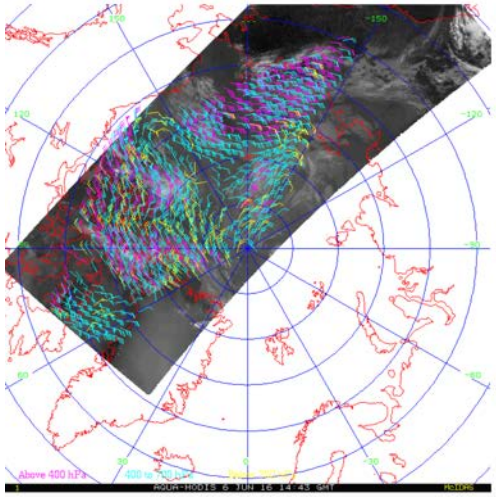
Blended Ice Concentration

Sea Ice Leads

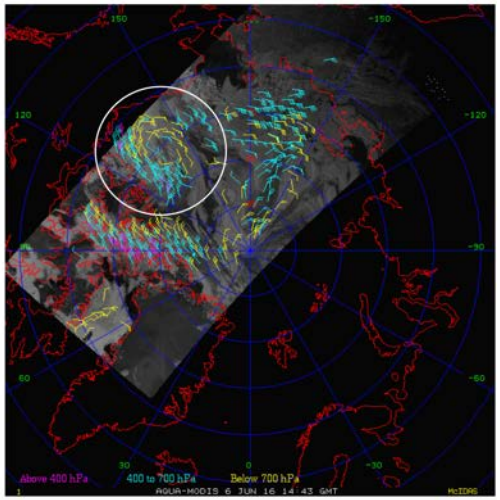


Experimental Products, cont.

WV + IR



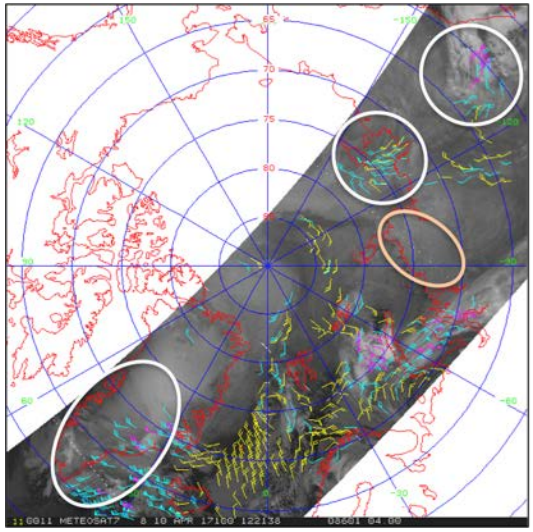
SWIR

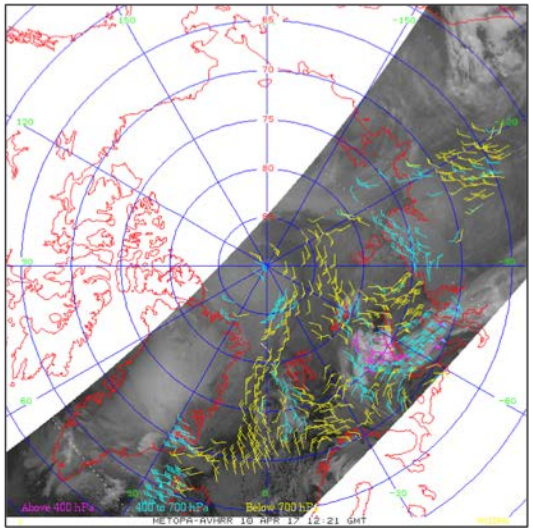


Polar winds with the SWIR band

Winds from combined S-NPP and JPSS-1

Far right: Single-satellite AVHRR winds. Right: Winds from Metop-A and –B.





Summary

- VIIRS Products:
  - Snow: Binary snow cover, snow fraction
  - Ice: Ice surface temperature, ice concentration, ice thickness/age
  - Polar winds
- AMSR2 Products:
  - Snow: Snow cover, snow depth, snow water equivalent
  - Ice: Ice concentration, ice type
- VIIRS ice products are being added to PolarWatch.
- All products meet requirements.
- All products are operational.
- Planned improvements for J1 are minor and all are ready.
- Experimental products include river ice, ice motion, blended ice concentration, sea ice leads, polar winds with new bands, winds from tandem satellites.

Global Cryosphere Watch