Enterprise land / cryosphere production system status (discussion)
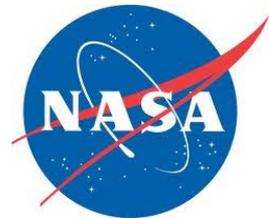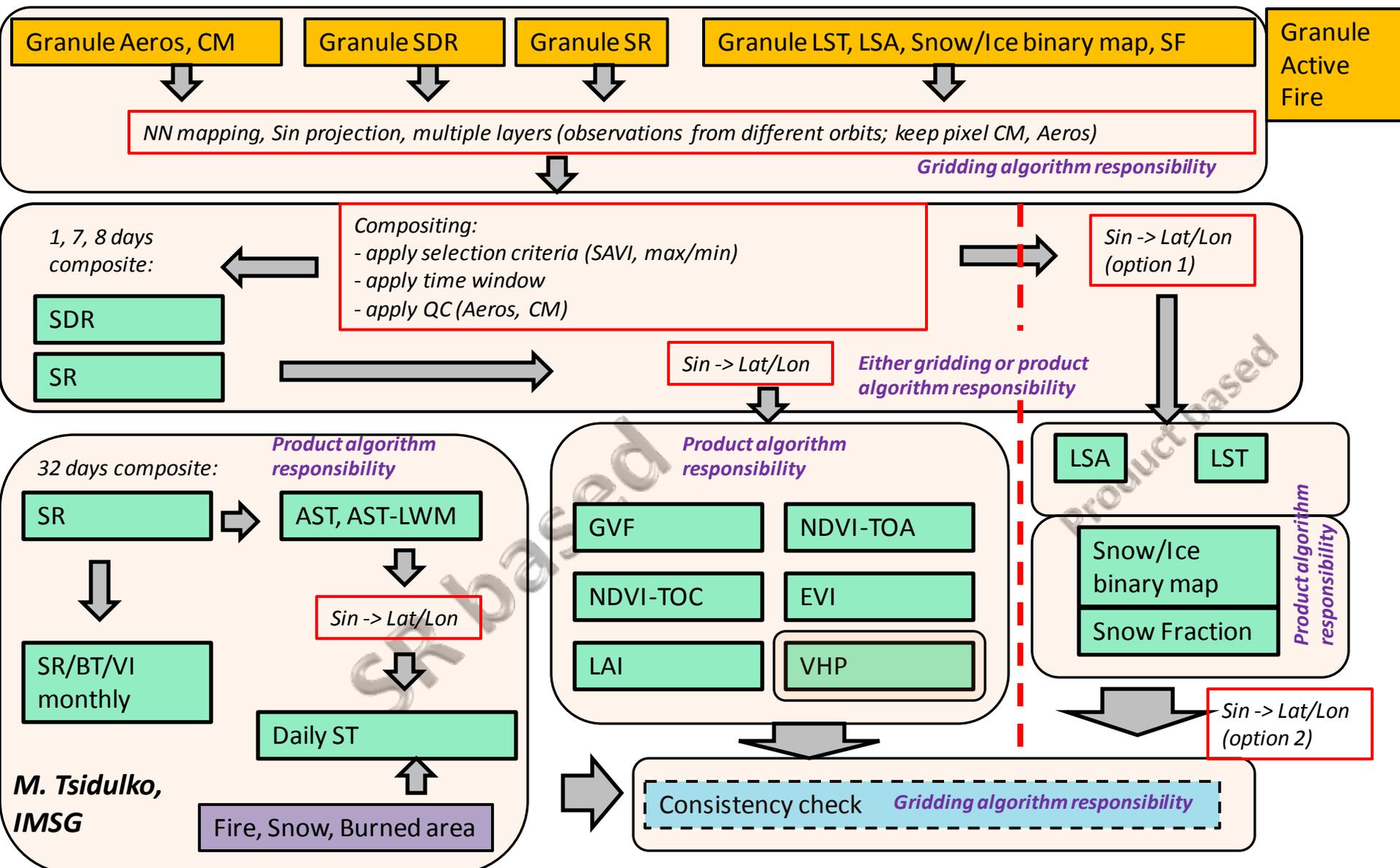
Schematic view of proposed Land Enterprise System

Granule Aeros, CM | Granule SDR | Granule SR | Granule LST, LSA, Snow/Ice binary map, SF

Granule Active Fire

NN mapping, Sin projection, multiple layers (observations from different orbits; keep pixel CM, Aeros)

Gridding algorithm responsibility

1, 7, 8 days composite:

Compositing:
- *apply selection criteria (SAVI, max/min)*
- *apply time window*
- *apply QC (Aeros, CM)*

Sin -> Lat/Lon (option 1)

SDR

SR

Sin -> Lat/Lon

Either gridding or product algorithm responsibility

32 days composite:

Product algorithm responsibility

SR → AST, AST-LWM

Product algorithm responsibility

GVF | NDVI-TOA

LSA | LST

Sin -> Lat/Lon

SR/BT/VI monthly

NDVI-TOC | EVI

Snow/Ice binary map

Snow Fraction

Product algorithm responsibility

Daily ST

LAI | VHP

Sin -> Lat/Lon (option 2)

M. Tsidulko, IMSG

Fire, Snow, Burned area

Consistency check   **Gridding algorithm responsibility**

Enterprise algorithm status

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

Already available in ESPC	Expected to be operational in NDE 1.0 soon	Will be available when NDE 2.0 is operational	Will be available soon after NDE 2.0 is operational	Implementation in NDE planned in 2017

A. Layns JPSS; L. Zhou, STAR

Enterprise implementation schedule

Enterprise Algorithm Schedule: S-NPP Milestones

L. Zhou, STAR

Land / cryosphere enterprise implementation schedule

- Algorithm readiness
  - Surface reflectance: February 2017
  - VI, LST, LSA: August 2017
  - Active Fire – already operational
  - Surface Type – annual updates
  - Snow Cover / fraction – in transition
  - Ice Surface Temperature – in transition
  - Sea Ice (Age/Concentration) – in tranition
- Two-phased approach
  - granule-based products
  - global gridded composites
- JPSS-1 readiness in general is confirmed
  - Evaluated test datasets provided to STAR
  - Ran select algorithms in STAR environment
    - Further interaction with NDE needed for pre-launch testing

ECM Format Basics

- The primary output of the ECM is the cloud probability for each VIIRS M-band pixels (CloudProbability in the netCDF file)
- A 4-tier cloud mask with the same categories as with the VCM may be found as well (CloudMask)
- The binary cloud mask, generally not used but required as an output, is found in CloudMaskBinary
- We encourage users to employ cloud probability, as in that form the users may set whatever value they close to determine clear or cloudy conditions
- The breakdown of the individual elements is found in CloudMaskPacked
  - It is not in CloudMaskFlags, there is no use of this for VIIRS based output

T. Kopp, Aerospace; A. Heidinger, STAR

Individual ECM Outputs

- The description of the individual bits in the 8 byte CloudMaskPacked output is found in Table 4 of the ECM ATBD
  - For those who have the current version, be aware the Surface Type values given are off by one (Deep Water is 001, Shallow Water 010, etc.)
- Note the original ECM was developed for GOES-R, and hence there are embedded tests that are not applicable to VIIRS
  - BTM11
  - RTCT
  - BTD11_6.7 thermal contrast
  - BTD11_6.7 thermal covariance
  - EMISS4
  - Ref0.63STD
- Each of the other tests are used as described in the ATBD

*T. Kopp, Aerospace; A. Heidinger, STAR*

Individual ECM Outputs

- The individual cloud detection tests, contained in bytes 3 through 7, may be 00 (clear), 01 (probably clear), 10 (probably cloudy), or 11 (cloudy)

- The 6 unused cloud detection tests will always contain values of 00

- The remaining tests will contain a climatological value for conditions where they are not executed (e.g. reflective tests at night)
  - Be aware this default value is often one of the probable conditions, and it can vary with surface type
  - The internal logic of the ECM knows when a value is from climatology and when it has been determined by internal logic
  - The thin cirrus bit is a special case and will be described in an update to the ECM ATBD

T. Kopp, Aerospace; A. Heidinger, STAR

Thin Cirrus Addition

➢ Users asked to provide a Thin Cirrus bit in the Packed Bits Structure.
➢ Logic for Thin Cirrus in the ECM will be similar to that used in the VIIRS Cloud Mask (VCM)
➢ Thin Cirrus test development is nearly complete and will be part of the August 2016 delivery
➢ As will be shown, thin cirrus will be yes/no and not the same as the other cloud detection tests
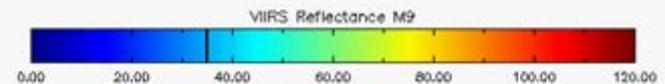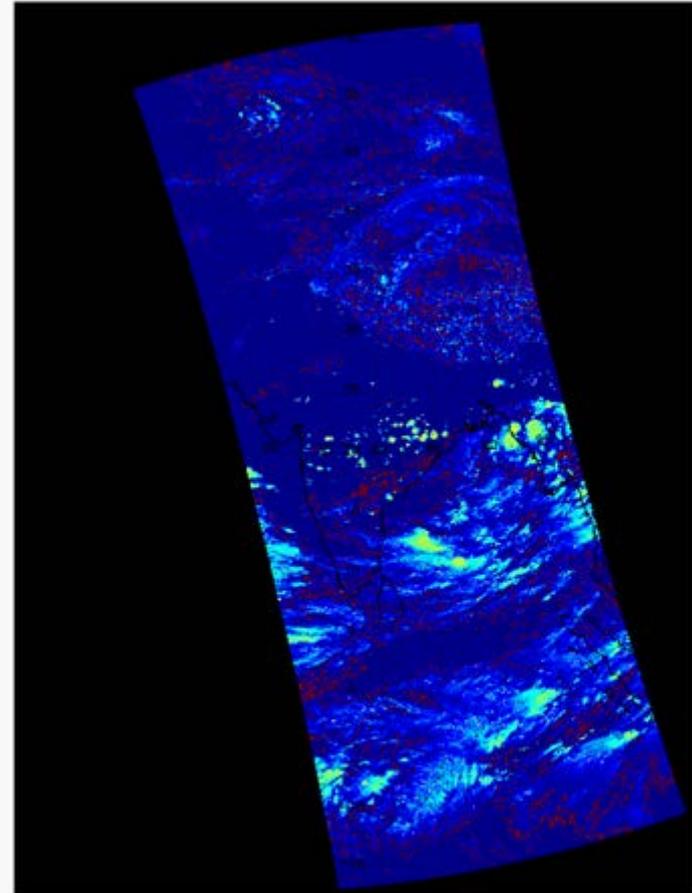
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Thin Cirrus Test

VCM

ECM

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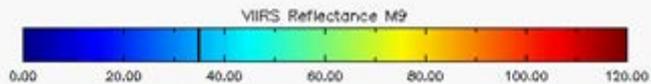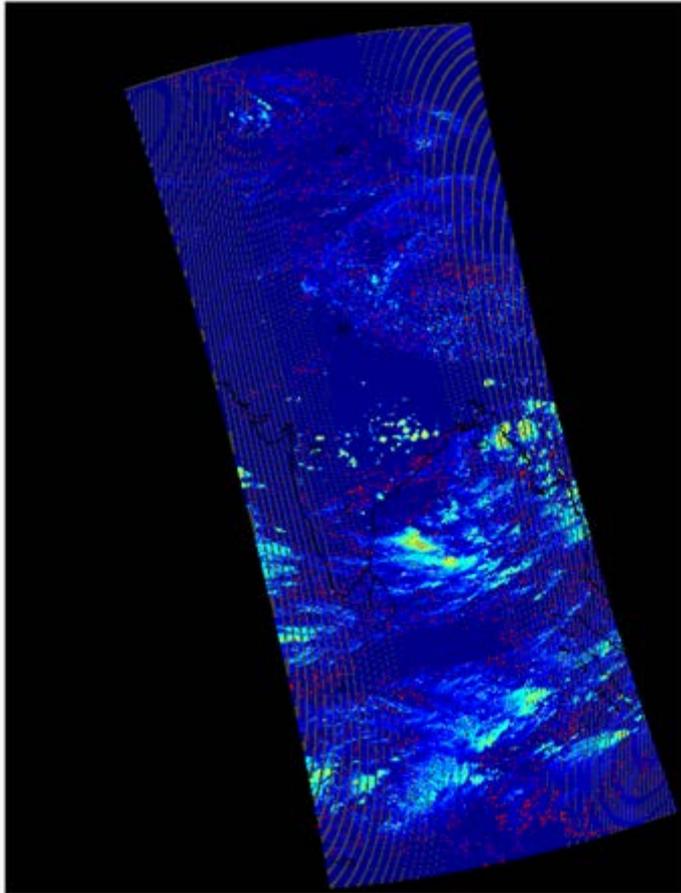
ECM Bit Structure

- Proposed Place to Ingest Thin Cirrus Test bit to ECM

Byte	Bit	Flag Description Key	Result
2	0-2	Surface Type Used for Thresholds	001 = Deep Ocean 010 = Shallow Water 011 = Land 100 = Snow 101 = Arctic 110 = Antarctic + Greenland 111 = Desert
	3	Thin Cirrus Test	0 = Clear 1 = Cloudy
	4-5	BT11 – 11 μm Thermal Test	00 = Clear 01 = Probably Clear 10 = Probably Cloudy 11 = Cloudy
	6-7	RTCT – Relative Thermal Contrast Test	00 = Clear 01 = Probably Clear 10 = Probably Cloudy 11 = Cloudy

Table 4. Cloud mask tests and flags and their descriptions.
A Naïve Bayesian Cloud Mask Delivered to NOAA Enterprise ATBD.
Version 1.1, June 3rd, 2016.

T. Kopp, Aerospace; A. Heidinger, STAR