BLENDED PRODUCTS WORKSHOP – INTRODUCTION AND LOGISTICS

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OBJECTIVES AND OUTCOMES

- **Workshop Objectives:**
  - Determine the current status of various schemes used to blend operational products at various time and space scales
  - Determine emerging, new techniques being tested through new products from the JPSS PGRR program
  - Identify common tools and their potential use in NESDIS enterprise systems

- **Expected Outcomes:**
  - A white paper on the current status of JPSS blended products and future development strategy
  - Identify synergies with ongoing NESDIS Enterprise products

AGENDA

Monday | Tuesday | Wednesday | Thursday

Auditorium: Blended Products Workshop

Time	Presentations / Topics	Speaker	Affiliation
0845 - 0920	***Session 1 - Introduction***	CHAIR - Ralph Ferraro, Lihang Zhou	NESDIS/STAR
845 - 855	*Introduction and Logistics*	Ralph Ferraro	STAR
855 - 905	*Objectives and Goals*	Mitch Goldberg	JPSS
905 - 920	*Current Operational NESDIS Blended Products and emerging PGRR Products*	Limin Zhao	OSPO
0920 - 1000	***Session 2 - Blending Tools***	CHAIR - Ingrid Guch, Tom Smith	Aerospace; NESDIS/STAR
920 - 940	*Commonly used Blending Techniques*	Tom Smith/STAR	STAR
940 - 1000	*Gap filling methods - DIN EOF*	Xiaoming Liu	STAR
1000	***Break***		
1015 - 1115	***Session 3 - Composite Products***	CHAIR - Huan Meng, John Forsythe	NESDIS/STAR; CIRA
1015 - 1035	*Blended Ozone*	Flynn/Kapoor	STAR/OSPO
1035 - 1055	*Blended Biomass Burning*	Kondragunta/Ding	STAR/OSPO
1055 - 1115	*Multi-Platform TC surface winds*	Knaff/Ma	STAR/OSPO
1115 - 1215	***Session 4 - PDF matching and OI Products***	CHAIR - Nai-Yu Wang, Sean Helfrich	
1115 - 1135	*Soil Moisture*	Zhan/Zhao	STAR/OSPO
1135 - 1155	*IMS*	Helfrich/Romanov/Woods	STAR/CUNY/OSPO
1155 - 1215	*Blended SST*	Maturi/Sapper	STAR/OSPO
1215 - 1330	***LUNCH - Possible brown bag seminar?***		
1330 - 1510	***Session 5 - Other/Advanced Techniques***	CHAIR - Limin Zhao, Tony Wimmers	OSPO/CIMSS
1330 - 1350	*Multisensor Sea Ice Motion and Concentration*	Jeff Key, Aaron Letterly	STAR, CIMSS
1350 - 1410	*MIMIC*	Tony Wimmers	CIMSS
1410 - 1430	*CMORPH*	Pingping Xie	NWS/NCEP/CPC
1430 - 1450	*Multisatellite Water Vapor and Rain Rates*	John Forsythe	CIRA
1450 - 1510	*Flooding from VIIRS and ABI*	Sanmei Li	GMU
1510 - 1530	***Break***		
1530 - 1700	***Session 6 - Topical Discussions/Common Threads***	CHAIR - Lihang Zhou, Ralph Ferraro	STAR
1530 - 1645	*Discussions*		
1645	*Action Items, next steps, etc.*		
1700	*Workshop Ends*		

8-02-2018 12:55 pm

We chose a wide array of products, but we could not include them all…

LOGISTICS

- We have coffee
- Vending
- Restrooms
- Wireless – umd network; Username: jpssws; password: rtubbacoponp (all lower case)
- Lunch on your own/Lunch Talk
- Stay for the discussion session!

Discussion Topics

- Any common methods/tools that could be used for:
  - Baseline products
  - Emerging/PGRR products
  - Ripe for the Enterprise Product System?
- What is best path forward to compare impact of various blending schemes – a testbed of sorts?
- What is the 'low hanging fruit'?
- Possible future improvements for end-users' needs
  - Data Formats
    - NetCDF, GeoTiff, etc.
  - Latency
  - Resolution
- Next steps; what would be a good platform to keep the dialogue continuing?

BACKUP

Some Attributes of Blended Products

- Considered as “L3”; use L2 products as input
  - Quality of L3 dependent on quality of L2!
- Highly desirable by NESDIS operations and end users
  - Optimizes computer resources for producer and user
  - Puts quality burden on producer and not user
- There is a “normalization” process
  - Each L2 could have different attributes
    - Native spatial resolution; Latency; Errors
    - Observation frequency of various sensors used
    - Scan geometry/biases
  - Generally, each L2 is “adjusted” to a reference
    - Highest quality L2, independent data, human eye (IMS), etc.
  - For some products, weights assigned to each L2 that factor in error attributes
  - End usage also dictates how the normalization is done
    - AWIPS/image products
    - Input to NWP or Hydrological Models
    - Global vs. Regional

NESDIS Operational Blended Products

Limin Zhao

NOAA/NESDIS/OSPO

August 30, 2018

Operational Blended Products Team

Products	OSPO/STAR Leads
bTPW - Blended Total Precipitable Water; bRR – Blended Rain Rate	Limin Zhao/Ralph Ferraro
eTRaP - Ensemble Tropical Rainfall Potential (eTRaP)	Liqun Ma/Bob Kuligowski
GHE - Global Hydro-Estimator	Limin Zhao/Bob Kuligowski
SMOPS - Soil Moisture Operational Products System	Limin Zhao/Xiwu Zhan
MTCSWA - Multiplatform Tropical Cyclone Surface Wind Analysis	Liqun Ma/John Knaff
Blended SST – Blended Sea Surface Temperature	John Sapper/Eileen Maturi
GBBEPx - Blended Global Biomass Burning Emissions Product	Hanjun Ding/Shobha Kondragunta
TOAST – Total Ozone Analysis; Enhanced TOAST – Enhanced Total Ozone Analysis	Vaishali Kapoor/ Larry Flynn
IMS – Interactive Multi-sensor Snow and Ice Mapping System	John Woods/Sean Helfrich
ADT - Advanced Dvorak Technique	Liqun Ma/Jeff Key
HMS – Hazard Mapping System	Zhaohui Cheng/Wilfrid Schroeder
GOES/POES Arctic Composites Imagery Products	Hanjun Ding/Jeff Key
Global Mosaic of Geostationary Satellite Imagery (GMGSI)	John Paquette/Ken Pryor

Outlines

- **Requirements**
- **Attributes of Blended Products**
- **Current Operational Capability**
  - Data Source for the Blended Products
  - Blending Approach
  - Products Information
  - Examples
- **Data Access**
- **Path Forward**

Requirements

- **User Requests**
  - SPSRB User Requests
  - NESDIS Internal SAB Requests
  - Undocumented Grandfather User Requests

- **JPSS Requirements**
  - *L1RDS-2260*
    - The JPSS shall support modifications to ESPC blended products.
  - *JERD-2335*
    - The NESDIS ESPC shall incorporate JPSS and GCOM-W data into the blended satellite products identified in Appendix D.

JPSS Supported Blended Products

Blended Products	Priority	OPS Status
Blended Sea Surface Temperature (with VIIRS)	Critical	S-NPP
Blended Sea Surface Temperature (with AMSR2)	Critical	
Blended Biomass Burning (with VIIRS)	Supplemental High	S-NPP
Blended Snow Cover (with VIIRS)	Supplemental High	S-NPP
Blended Snow Cover (with AMSR2)	Supplemental High	
Blended Rainfall Rate (with ATMS)	Supplemental High	S-NPP
Blended Rainfall Rate (with AMSR2)	Supplemental High	GCOM-W1
Blended Total Precipitable Water (with ATMS)	Supplemental High	S-NPP
Blended Total Precipitable Water (with AMSR2)	Supplemental High	GCOM-W1
Blended Ozone (with OMPS NP)	Supplemental High	S-NPP
Blended Ozone (with OMPS CrIS)	Supplemental High	S-NPP
Blended Soil Moisture (with AMSR2)	Supplemental High	GCOM-W1
Blended Land Surface Temperature (with VIIRS)	Supplemental Low	
Blended Tropical Cyclone Surface Wind Analysis (with ATMS)	Supplemental High	S-NPP
Advanced Dvorak Technique (with AMSR-2)	Supplemental High	GCOM-W1

Attributes of Blended Products (1/2)

- **Unified products**
  - From multiple resources, including satellites/sensors/algorithms
  - Much better spatial and temporal resolution than any individual L2 product
  - Analyzed product from available individual L2 products

- **Value added L3 product**
  - Gridded products, either horizontal or vertical
  - With quality dependency on the L2 products used

- **Highly desirable by NESDIS operations and end users**
  - Optimizes computer resources for both producer and user
  - Puts quality burden of L2 products on producer not user

Attributes of Blended Products (2/2)

– Common Features

- Normalization/Calibration Process
  - Each L2 could have different attributes
    - » Native spatial resolution; Latency; Observation frequency; Scan geometry/biases, Algorithm biases, etc
  - Generally, each L2 is “adjusted” to a reference
    - » Highest quality L2; independent data, such as, climate data; human experience and expertise (IMS, HMS), etc.
  - End usage of the blended products could dictate how the normalization is done
    - » AWIPS/image products; Input to NWP or Hydrological Models; Global vs. Regional

- Merging Algorithm
  - Overlay
    - » Latest; closest; most accurate
  - Average/Weighted Average
  - Comprehensive Objective Analysis
    - » Error attributes; Time latency, etc.

Current Operational Capability - Overview

Applications	Satellites/Sensors	Products
bTPW - Blended Total Precipitable Water	NOAA-18, NOAA-19, Metop-A and Metop-B, GOES-W, GPS-Met, DMSP F17&F18, GCOM-W1, GPM and S-NPP	Global TPW map; Percentage of TPW normal
bRR - – Blended Rain Rate	NOAA-18, NOAA-19, Metop-A and Metop-B, DMSP F17&F18, GCOM-W1, GPM and S-NPP	Global Rain Rate map
eTRaP - Ensemble Tropical Rainfall Potential (eTRaP)	NOAA-18, NOAA-19, Metop-B, DMSP 17&18, GOES-W, Meteosat-8, Meteosat-11, Himawari-8	Ensemble forecast of 6~24-hour rainfall potential for tropical systems
SMOPS - Soil Moisture Operational Products System	Metop-A/-B, SMOS, SMAP, GCOM, GPM	Global soil moisture map
GHE - Global Hydro-Estimator	GOES-15/-16, Meteosat-8, Meteosat-11, Himawari-8	Global rainfall estimate with different temporal scale
Blended SST – Blended Sea Surface Temperature	Metop-B/AVHRR, S-NPP/VIIRS, GOES-E&-W/Imager, Meteosat-11/SEVIRI and Himawari-8/AHI	Global Sea Surface Temperature
GBBEPx - Blended Global Biomass Burning Emissions Product	GOES-W/Imager, EOS-Terra/MODIS, EOS-Aqua/MODIS, S-NPP	Daily global biomass burning emissions
MTCSWA - Multiplatform Tropical Cyclone Surface Wind Analysis	NOAA-15, NOAA-18, NOAA-19, Metop-A, S-NPP	Six-hourly estimates of tropical cyclone wind fields
TOAST – Total Ozone Analysis	NOAA-19/SBUV-2 and Metop-B/TOVS	Total ozone map
Enhanced TOAST – Enhanced Total Ozone Analysis	NOAA-19/SBUV/2 and S-NPP/CrIS	Total Ozone map
IMS – Interactive Multi-sensor Snow and Ice Mapping System	NOAA-15/-18/19, Metop-A/-B, S-NPP, F18, Aqua/TERRA, Meteosat-11, Himawari-8, GOES-W	Snow and Ice cover maps
ADT - Advanced Dvorak Technique	GOES-15/-16, Meteosat-8, Meteosat-11, Himawari-8, F15/F17/F18, GCOM, GPM	A computer-based objective algorithm to estimate tropical cyclone (TC) intensity
HMS- Hazard Mapping System	NOAA-15/-18/-19, Metop-A/-B, S-NPP, Aqua/TERRA, GOES-15/-16	A visualization and editing GUI system/tool that allows interactive human anaysis on fire and smoke from multi-sensors/satellites
GOES/POES Arctic Composites Imagery Products	NOAA-18&-19, Metop-A/-B, S-NPP, Aqua/TERRA, GOES-15, Meteosat-11, Himawari-8	Hourly GOES/POES composite image over arctic
Global Mosaic of Geostationary Satellite Imagery (GMGSI)	GOES-15/-16, Meteosat-11, Himawari-8	Nearly no-gap geostationary image over global

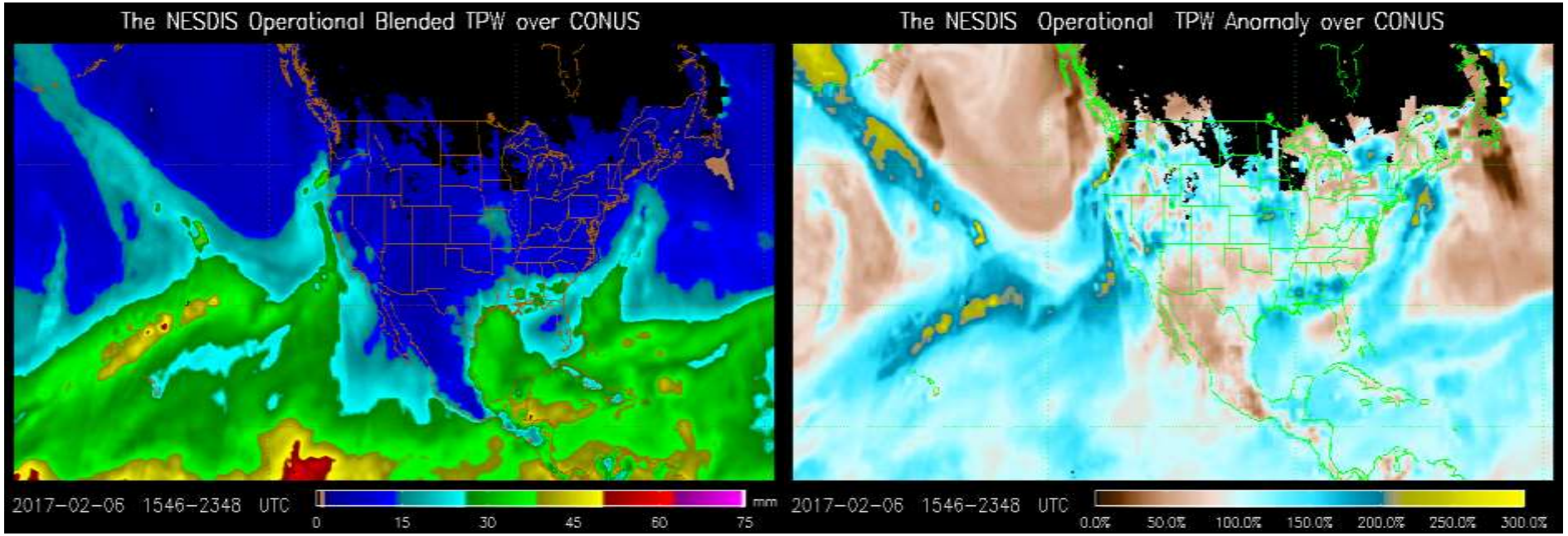
More details https://drive.google.com/drive/folders/1qiHXNrKY0JgnvyQhoUWOZ7qG9R6q1VUn?ogsrc=32

Blended TPW Products

- **Overview**
  - Unified, meteorologically significant TPW global maps, which merge the TPW retrievals from various satellites/algorithms.
  - PDF matching; Latest retrievals (overlay)
- **Data Source**
  - **Over Ocean**
    - MiRS TPW from NOAA -18/-19 and Metop-A/-B, F17, F18, S-NPP, GPM
    - GAASP TPW from GCOM-W1
  - **Over Land**
    - GPS-Met over CONUS, Alaska and Hawaii – primary data source over CONUS
    - MIRS TPW from NOAA-18/-19 and Metop-A/-B, F17, F18, S-NPP, GPM over CONUS when GPS is not available, and also over other Landmass
    - GOES-W over CONUS used to fill the hole when no GPS and MIRS TPW are available
- **Products:** *TPW, Percentage of Normal TPW; 16x16km; Hourly*
- **Formats:** HDF-EOS, McIDAS area and AWIPS; netCDF4 available in near future
- **Data Access:** PDA, ADDE and AWIPS
- **The imagery products are also available on the Internet through:** http://www.ospo.noaa.gov/Products/bTPW/index.html
  - **Animation** – Near-real time loops of blended TPW and PCT available over 16 AOI regions for zoom in details with time interval of 1 hour, 3, 6, 12 and 24 hours
- **POCs**: Limin Zhao and Ralph Ferraro

Example of Blended TPWs

The blended TPW has been used, together with the percentage of normal TPW, by satellite analysts and forecasters to improve analysis and prediction of heavy precipitation and flash flood, and also monitoring the “atmospheric rivers” (ARs). Here shows the animation of bTPW and PCT for a heavy rain event during Feb 6~9, 2017, when an atmospheric river event brought a prolonged period of moderate to heavy rain to portions of northern California on Feb 6. That rain, combined with snowmelt in some areas, brought flooding and several mudslides to parts of California and Nevada.



Blended Rain Rate

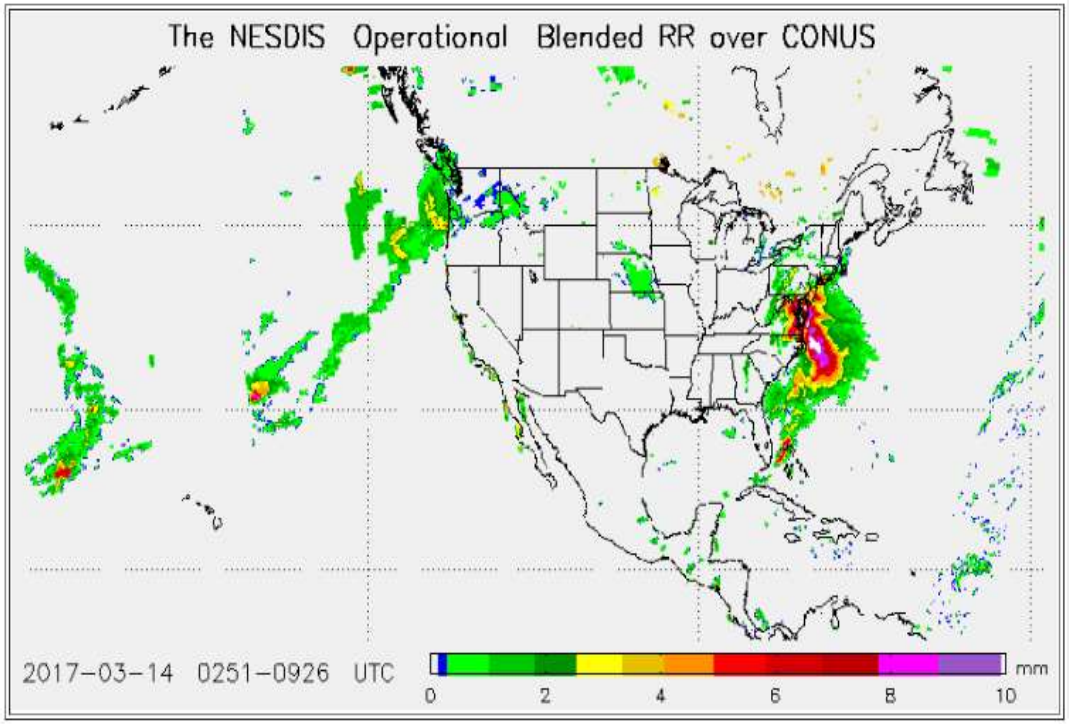
- **Product**
  - Unified global rainfall rate map generated from multi-satellites and multi–algorithms
  - PDF matching; Latest retrievals (overlay)
- **Data Sources:**
  - AMSU RR from N18, N19 and Metop-A/-B with MiRS v11.2
  - SSMIS RR from DMSP F17 and F18 with MiRS v11.2
  - ATMS RR and GMI RR from S-NPP and GPM with MiRS v11.2
  - AMSR2 RR from GCOM-W1 with GAASP/GPROF
- **Products:** Rain Rate; 16kmx16km; Hourly
- **Formats:** HDF-EOS, McIDAS and AWIPS; netCDF4 in near future
- **Data Access:** DDS/PDA, ADDE and AWIPS
- **The imagery products are also available on the Internet through:** http://www.osdpd.noaa.gov/Products/atmosphere/brr
- **POCs**: Limin Zhao and Ralph Ferraro

Blended Rain Rate

Operational Blended Rain Rate

Start | Stop | << | CONUS_RR_20170314_10Z.png | >>

Start: Mar ▾ 14 ▾ 2017 End: Mar ▾ 15 ▾ 2017 Reload



Home

Algorithm Description

Product Animation:

Blended RR:
Global | CONUS | Super National | Africa | Asia | Atlantic | East Pacific | West Pacific | Central Pacific | North Pacific | Australia | Indian Ocean | South Pacific | East Asia | South Indian Ocean | Europe

QMORPH:
Global | CONUS | Super National | Africa | Asia | Atlantic | East Pacific | North Pacific | Australia | Indian Ocean | South Pacific | East Asia | South Indian Ocean | Europe

Validation

Gauge | Radar | QMORPH

Monitoring:

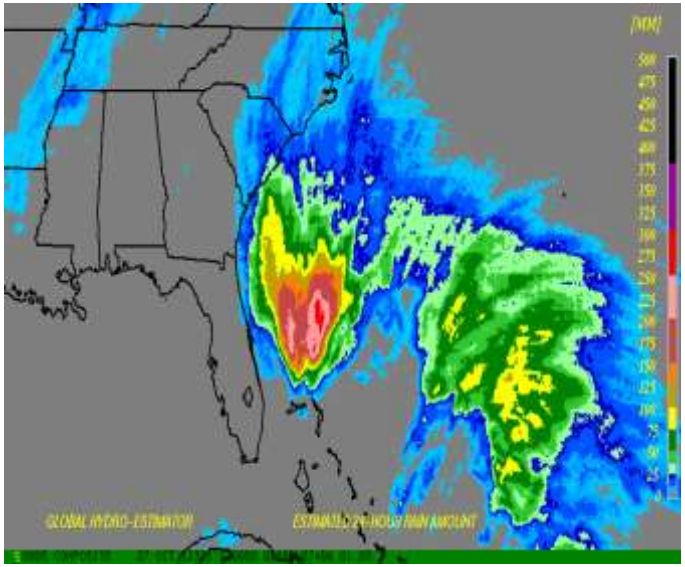
Products: Global | McIDAS | AWIPS

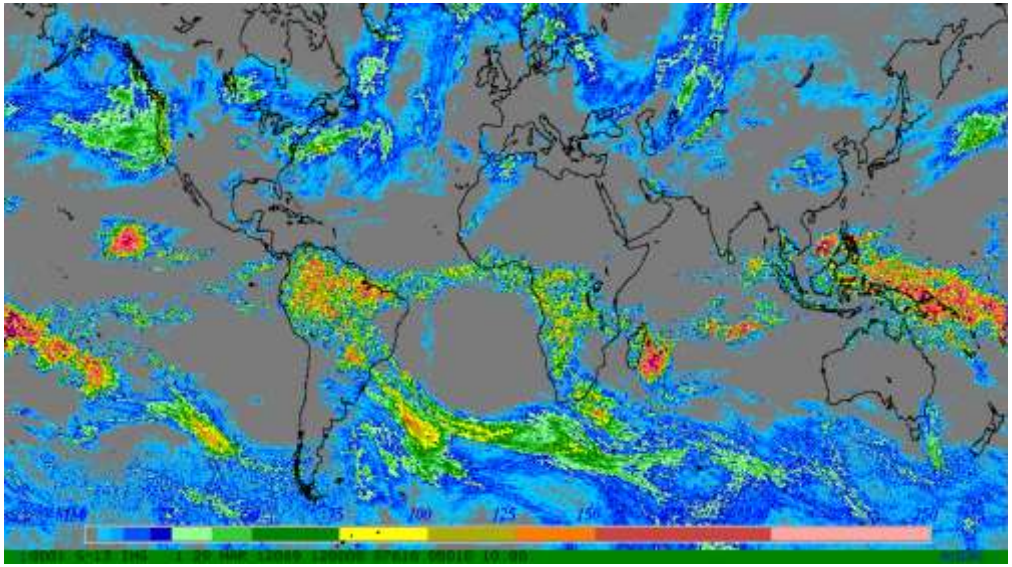
Processing | Timeliness

Test Data

GHE

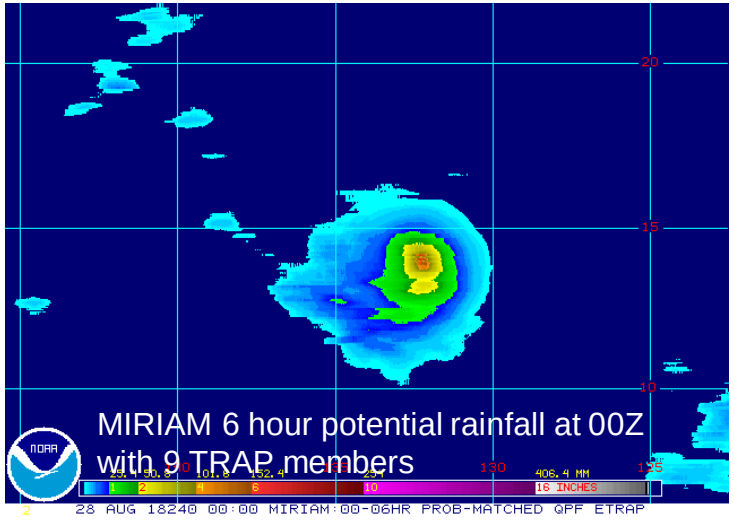
- **Overview:**
  - Global rainfall maps generated from multi-geostationary satellites
  - Parallax Correction; Average
- **Data Source:** GOES-W/-E, Meteosat-8, Meteosat-11, Himawari-8
- **Products:** *Instantaneous rain rate, 1 hour, 3 hour, 6 hour, 24 hour and also multi-day rainfall accumulation;* 4 kmx*4 km*
- **Format:** GRIB2, McIDAS area and netCDF4
- **Web Link:** http://www.ospo.noaa.gov/Products/atmosphere/ghe
- **Data Access POCs:** Limin Zhao and Bob Kuligowski

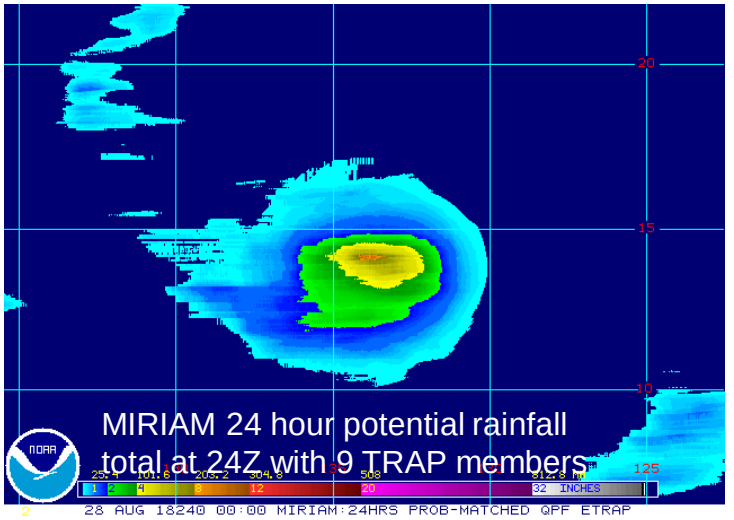




Ensemble Tropical Rainfall Potential (eTRaP)

- **Overview**
  - Ensemble forecast of 6~24-hour rainfall potential for tropical systems based on extrapolation of satellite-derived rainfall rates along predicted storm track
  - Weighted average - rain rate from each member are weighted according to assigned weights
- **Data Resource**
  - Rainfall Rate from NOAA-18/-19 and Metop-A/-B, F17, F18, S-NPP, GOES-W/GOES-E, Meteosat-8, Meteosat-11, Himawari-8
- **Products:** *Probability (PoP), Prob-Matched QPF (PMQPF) for 6 hour rainfall amount at 00Z, 06Z, 12Z, 18Z and 24 hour rainfall total*
- **Format:** ASCII, McIDAS Area and gifs
- **Web Link:** http://www.ssd.noaa.gov/PS/TROP/etrap.html
- **Data Access POCs:** Liqun Ma and Bob Kuligowski





Advanced Dvorak Technique (ADT)

- **Overview**
  - A computer-based objective algorithm to estimate tropical cyclone (TC) intensity
  - PMW is used to adjust the intensity estimates derived from Geostationary satellites
- **Data Resource**
  - GOES-15/-16, Meteosat-8, Meteosat-11, Himawari-8, GCOM-W1, GPM, F15, F17, F18
- **Products:** TC intensity estimate, location and 2D surface wind field and analysis image, etc. for each storm analysis; Storm images, etc.
- **Format:** ASCII, ATCF and gif
- **Web Link**
  - *http://www.ssd.noaa.gov/PS/TROP/adt.html*
- **Data Access POCs:** Liqun Ma and Jeff Key

Global Mosaic of Geostationary Satellite Imagery (GMGSI)

- **Overview**
  - Nearly no-gap global mosaic imagery of channel brightness temperatures from multi-geostationary satellites/sensors
  - Within 3 hour window from nearest and latest retrievals
- **Data Resource**
  - GOES-15/-16, Meteosat-11, Himawari-8
- **Products:** VIS, SWIR, LWIR; 3-Hourly; 8km; ~30min
- **Format:** netCDF4, McIDAS Area
- **Web Link**
  - https://www.ospo.noaa.gov/Products/imagery/index.html
- **Data Access POCs:** John Paquette and Ken Pryor

GOES/POES Arctic Composites Imagery Products (GPACIP)

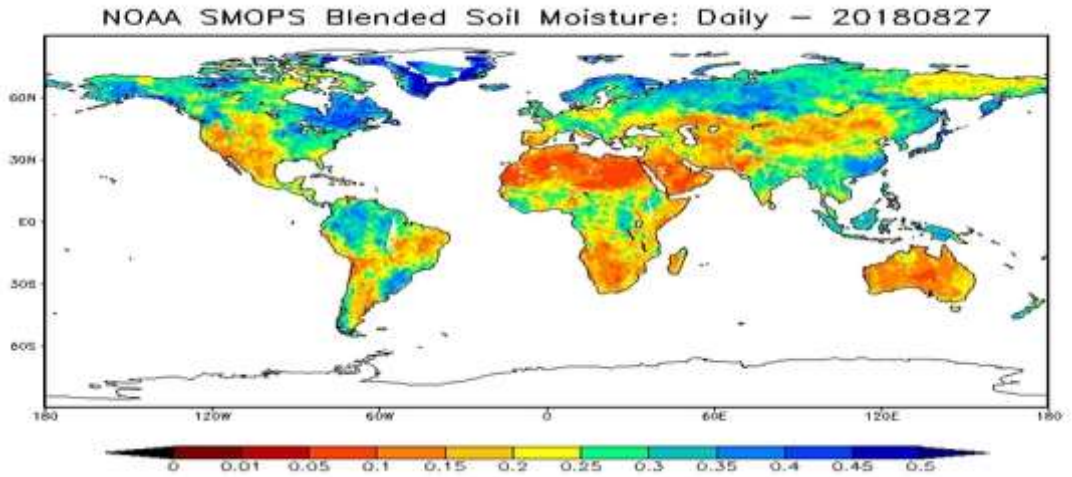
- **Overview**
  - Nearly no-gap mosaic imagery of channel brightness temperatures over arctic from multi-satellites/sensors
  - Within one hour window and nearest retrievals
- **Data Resource**
  - NOAA-18&-19, Metop-A/-B, S-NPP, Aqua/TERRA, GOES-15, Meteosat-11, Himawari-8
- **Products:** Infrared (~11.0 µm), Shortwave Infrared (~3.8 µm), Longwave Infrared (~12.0 µm), Water Vapor (~6.7 µm), and Visible (~0.6 µm); Hourly
- **Format:** McIDAS Area and gif
- **Web Link**
  - https://www.ospo.noaa.gov/Products/imagery/arctic/
- **Data Access POCs:** Hanjun Ding and Jeff Key

Hazard Mapping System(HMS)

- **Overview**
  - An interactive multiplatform remote sensing approach to detecting fires and smoke
  - The GUI tool for analyst to make use of derived fire and smoke products from multi-satellites with ability to delete or edit any fire hot spots and smoke polygon
- **Data Resource:** NOAA-15/-18/-19, Metop-A/-B, S-NPP, Aqua/TERRA, GOES-15/-16
- **Products:** Analyst derived fire hot spots and smoke products
- **Format:** netCDF4,JPEG, Shapefile, KML and ASCII
- **Web Link**
  - *https://www.ospo.noaa.gov/Products/land/hms.html*
- **Data Access POCs:** Zhaohui Cheng and Wilfrid Schroeder

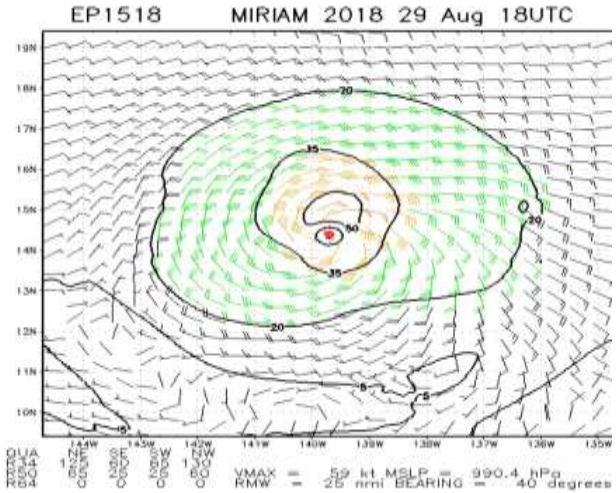
SMOPS

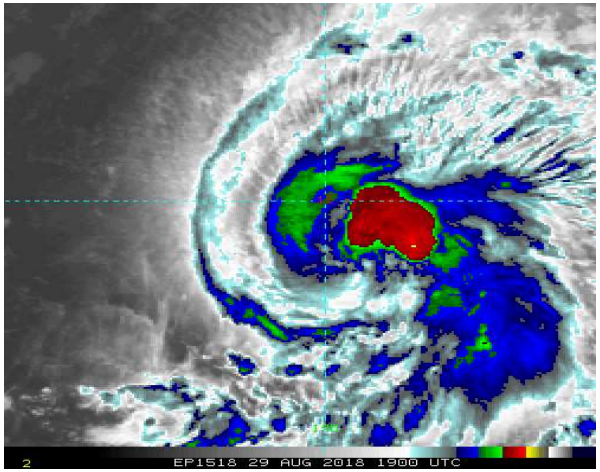
- **Overview**
  - Global soil moisture map generated from multi-satellites and/or –algorithms
  - CDF matching; Average
- **Data Resource**
  - Metop-A/-B, SMOS, SMAP, GCOM, GPM
- **Products:** 0.25x0.25 degree; 6 hourly, Daily
- **Format:** GRIB2 and netCDF4
- **Web Link**
  - http://www.ospo.noaa.gov/Products/land/smops
- **Data Access POCs:** Limin Zhao and Xiwu Zhan



Multiplatform Tropical Cyclone Surface Winds Analysis (MTCSWA)

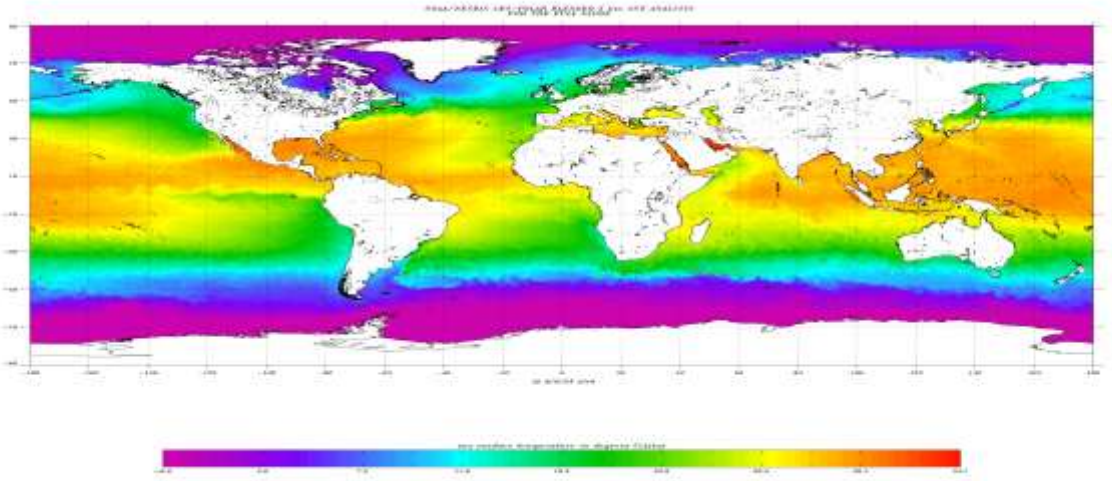
- **Overview**
  - Six-hourly estimates of tropical cyclone wind fields based on a variety of satellite-based winds and wind proxies.
  - Objective analysis based upon the model-fitting approach with smoothness constraints
- **Data Resource**
  - NOAA-15, NOAA-18, NOAA-19, Metop-A/-B, S-NPP
- **Products:** TC surface wind analysis of 34-kt, 50-kt, 64-kt and maximum wind radii at 3-hour interval; 10km
- **Format:** netCDF4, ATCF, gif
- **Web Link:** http://www.ssd.noaa.gov/PS/TROP/mtcswa.html
- **Data Access POCs:** Liqun Ma and John Knaff





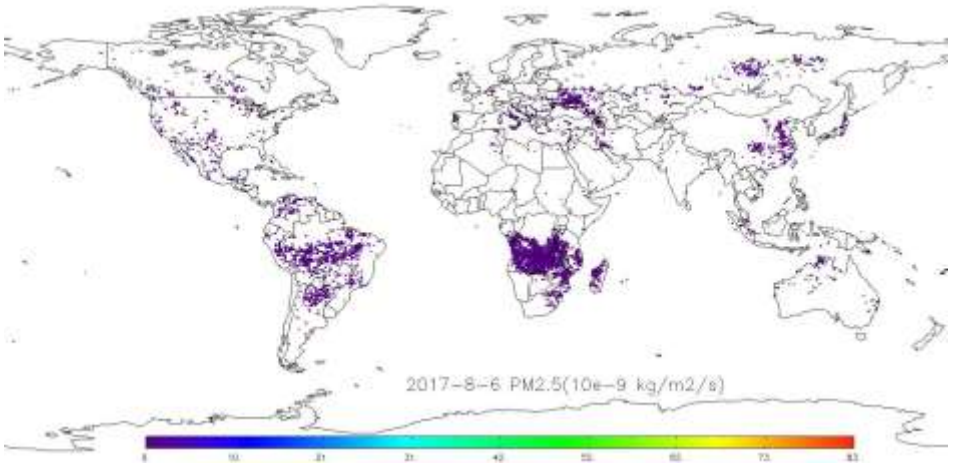
Blended SST

- **Overview**
  - Global Sea Surface Temperature daily map generated from Polar- and Geo-Satellites
  - Optimal Interpolation (OI) according to error statistics
- **Data Resource**
  - Metop-B/AVHRR, S-NPP/VIIRS, GOES-W/Imager, Meteosat-11/SEVIRI and Himawari-8/AHI
- **Products:** Global (Day/Night, Night only) and AOI regional (15) SST maps**;** 0.05°(~ 5km); Daily
- **Web Link**
  - http://www.ospo.noaa.gov/Products/ocean/sst/contour/index.html
- **Data Access POCs:** John Sapper and Eileen Maturi



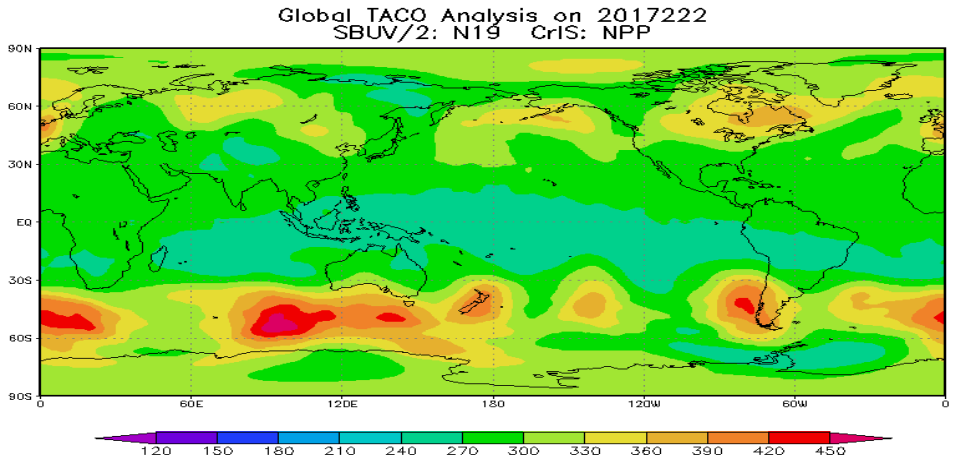
Blended Global Biomass Burning Emissions Product

- **Products:**
  - The GBBEPx produces daily global biomass burning emissions (PM2.5, BC, CO, CO2, OC, and SO2) released from wildfires using fire wildfires power retrieved from VIIRS, MODIS and Geostationary Satellites.
- **Data Resource**
  - GOES-E&-W, Meteosat-8, Meteosat-11, Himawari-8, Terra, Aqua, S-NPP
- **Products:** Daily emissions for PM2.5, CO, OC, BC, SO2, CO2, CH4, Nox, NMHC, NH3; 0.25 degreex0.325degree
- **Web Link**
  - http://www.ospo.noaa.gov/Products/land/gbbepx/
- **Data Access POCs:** Hanjun Ding and Shobha Kondragunta



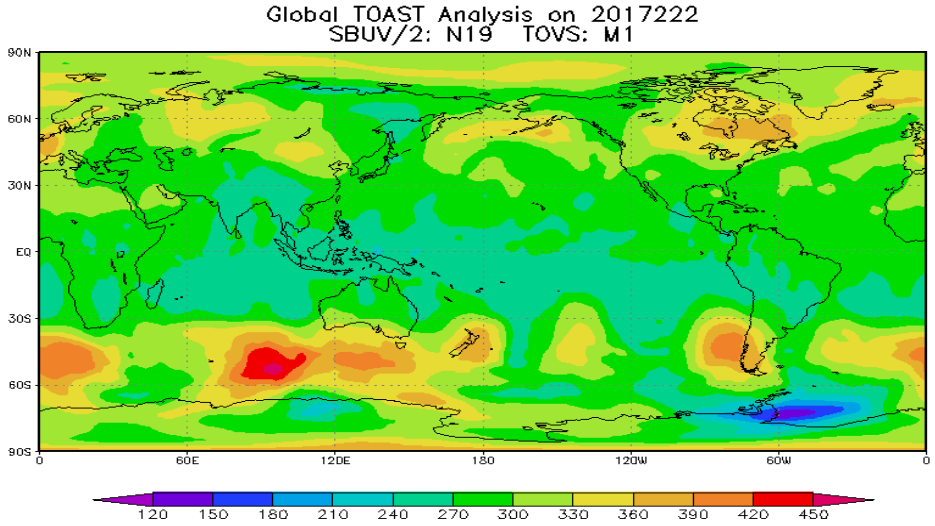
ETOAST

- **Products:**
  - Near real-time operational ozone maps generated by combining UV and IR ozone retrievals generated using Total Ozone Analysis of Cross-track Infrared Sounder- CrIS (NPP) and Solar Backscatter UltraViolet Version 2 - SBUV/2 (N19), which is an enhancement to TOAST with a new algorithm.
  - Objective Analysis
- **Data Resource**
  - NOAA-19/SBUV/2 and S-NPP/CrIS
- **Products:** Total ozone map; 1° x 1°; Daily
- **Formats:** GRIB, Binary and PNG
- **Web Link:** http://www.ospo.noaa.gov/Products/atmosphere/etoast/index.html
- **Data Access POCs**: Vaishali Kapoor and Larry Flynn



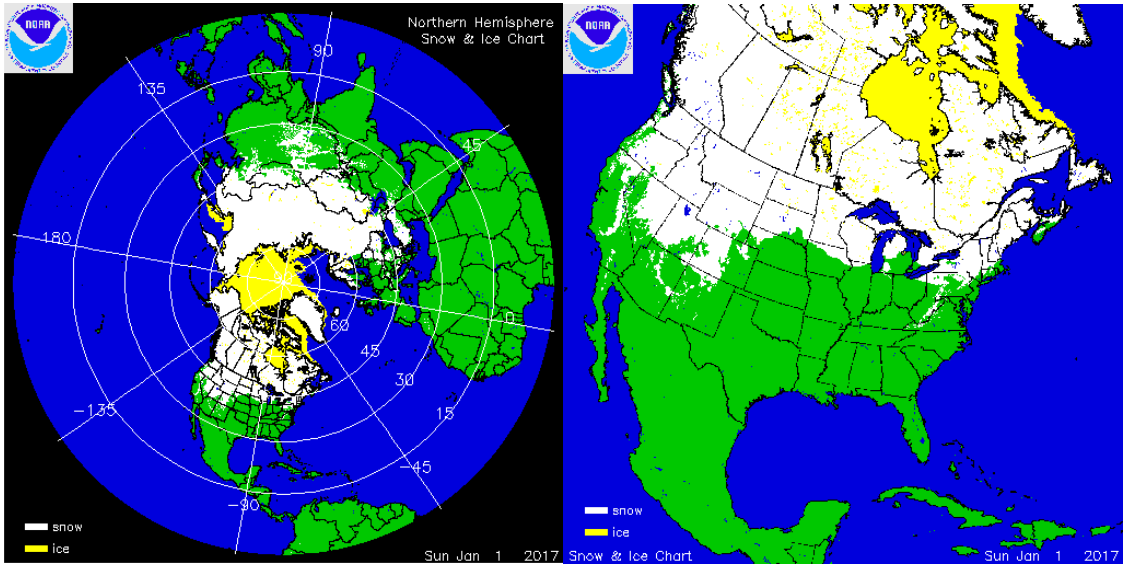
TOAST

- **Products:**
  - Near real-time operational ozone maps generated by combining TOVS (MetOp-B) tropospheric and lower stratospheric (4 to 23 km) ozone retrievals with SBUV/2 (N19) spatially smoothed mid-to-upper stratospheric (24 to 54 km) layer ozone retrievals.
  - Objective Analysis
- **Data Resource**
  - NOAA-19/SBUV-2 and Metop-B/TOVS
- **Products:** Total ozone map; 1° x 1°; Daily
- **Formats:** GRIB, Binary and PNG
- **Web Link:** http://www.ospo.noaa.gov/Products/atmosphere/toast/index.html
- **Data Access POCs**: Vaishali Kapoor and Larry Flynn



IMS

- **Overview**
  - Snow and Ice maps for the Northern Hemisphere derived from a variety of data products including imagery products from multi-satellites and in situ data.
  - Analysis GUI with products available from multi-satellites, and other resources
- **Data Resource**
  - NOAA-18&-19, Metop-A, S-NPP, Aqua/TERRA, Radarsat-2, Meteosat-11, Himawari-8, DMSP 15, GOES-W, plus other data sources, such as radar, surface obs, Buoys, Models, etc.
- **Products:** 4 & 24km Northern Hemisphere Analysis; Snow&Ice Cover; Daily
- **Format:** ASCII, BIN, GeoTiff, GRIB2
- **Web Link:** http://www.natice.noaa.gov/ims/ims_1.html
- **Data Access POC:** John Woods and Sean Helfreich



Data Access

- **Real-time data access to ESPC PDA through Data Access Request(DAR):** *http://www.ospo.noaa.gov/Organization/About/access.html*

- **Historical data access through NOAA/CLASS/NCDC**: *http://www.class.ngdc.noaa.gov/saa/products/welcome*

- **Imagery Products through Internet:**
  - *ADT – http://www.ssd.noaa.gov/PS/TROP/adt.html*
  - *Blended RR – http://www.ospo.noaa.gov/Products/atmosphere/brr*
  - *Blended SST –* http://www.ospo.noaa.gov/Products/ocean/sst/contour/index.html
  - *Blended TPW – http://www.ospo.noaa.gov/bTPW*
  - *Enhanced TOAST – http://www.ospo.noaa.gov/Products/atmosphere/etoast/index.html*
  - *eTRaP – http://www.ssd.noaa.gov/PS/TROP/etrap.html*
  - *GBBEPx –* http://www.ospo.noaa.gov/Products/land/gbbepx/
  - *GHE – http:// ://www.ospo.noaa.gov/Products/atmosphere/ghe*
  - *GMGSI – https://www.ospo.noaa.gov/Products/imagery/index.html*
  - *GPACIP – https://www.ospo.noaa.gov/Products/imagery/arctic/*
  - *HMS – https://www.ospo.noaa.gov/Products/land/hms.html*
  - *IMS – http://www.natice.noaa.gov/ims/ims_1.html*
  - *MTCSWA – http://www.ssd.noaa.gov/PS/TROP/mtcswa.html*
  - *SMOPS – http://www.ospo.noaa.gov/Products/land/smops*
  - *TOAST – http://www.ospo.noaa.gov/Products/atmosphere/toast/index.html*

- **Questions/Comments:** *Limin.Zhao@noaa.gov and related-OSPO PALs*

Path Forward

- Integrate the data from JPSS1/NOAA-20
  - A couple of products still need be updated to include GCOM-W1
- Integrate the data from GOES-17
  - A couple of products still need be updated to include GOES-16 products
- Update the merging algorithm to implement more quality controls and count the error statistics from each retrievals

Thank You