STAR GCOM-W1/AMSR2 Product Development and Validation Project

AMSR2 Level 1 and Level 2 products

STAR GCOM-W1 Project Team

Presented by Ralph Ferraro

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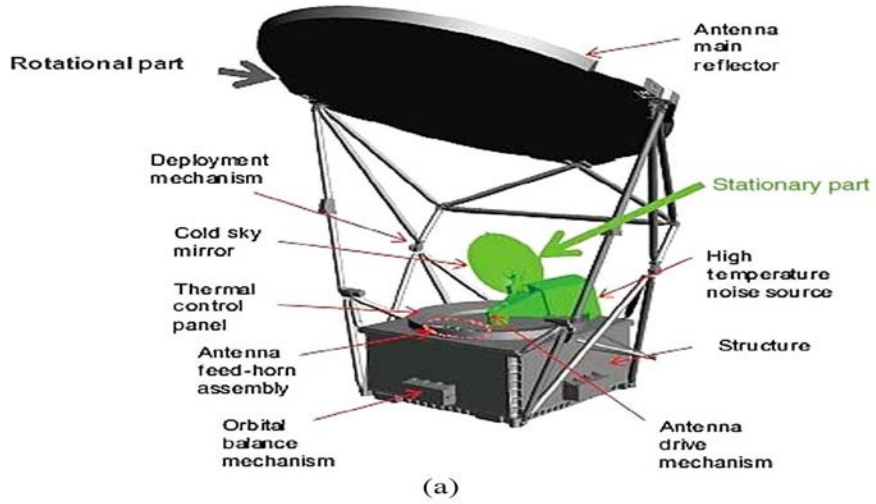
August 25, 2015

Outline

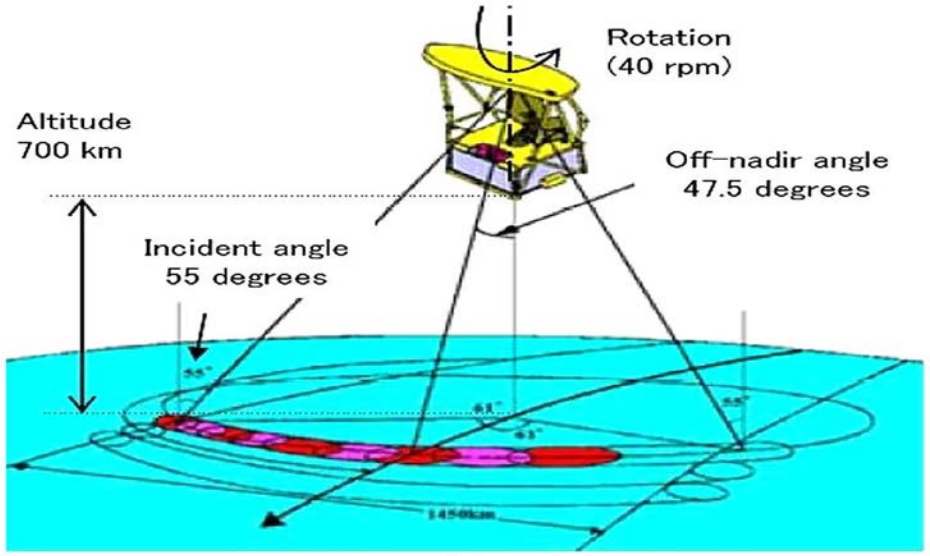
- GCOM-W1/AMSR2 Instrument Overview
- Project Structure and Schedule
- Product Status, Overview and Examples
- Summary and Path Forward

AMSR2 Instrument Overview

- General Information
  - Launched: JAXA, 05/2012
  - Swath: 1450 km
  - EIA: 55°
  - Rate: 40 rpm



Center freq. (GHz)	Band width (MHz)	Beam width (3 dB, deg.)	Ground IFOV (km)	Sampling interval (km)
6.925/7.3	350	1.8	35 x 62	10
10.65	100	1.2	24 x 42	
18.7	200	0.65	14 x 22	
23.8	400	0.75	15 x 26	
36.5	1000	0.35	7 x 12	
89.0	3000	0.15	3 x 5	5



NOAA GCOM-W1 Project Responsibilities

The NOAA JPSS Office (NJO) is providing funding to OSD, STAR, and OSPO to operationally generate and make available AMSR2 SDR and EDR products to support NOAA's user needs.

OSD has developed a system called the GCOM-W1 Processing and Distribution System (GPDS) to perform the following tasks.

- Ingest AMSR2 RDRs and ancillary data; Run the JAXA RDR-to-SDR software; Run the STAR GCOM-W1 AMSR2 Algorithm Software Processor (GAASP); Transfer products for distribution; Interact with OSPO monitoring and control systems.

STAR:

- Developed a software package, called the GCOM-W1 AMSR2 Algorithm Software Processor (GAASP), to generate the AMSR2 EDRs and perform product reformatting to netCDF4.
- Developed operational documentation for the GAASP package and the EDR algorithms following existing SPSRB templates.
- Delivered the GAASP and documentation to the OSD contractor for integration into their GPDS.

OSPO:

- Received the GPDS (with JAXA and GAASP packages integrated into it) from the OSD contractor.
- Operationally run and maintain the GPDS for the lifecycle of the project.

Project Schedule Overview

- Key Milestones – Day 1 Products:
  - Preliminary Design Review – Nov 8, 2012
  - Critical Design Review – May 1, 2013
  - Software Code Review – Sept 18, 2013
  - Algorithm Readiness Review – Dec 19, 2014
  - ***Operational Readiness Review – Aug 21, 2015***
  - ***SPSRB Decision Briefing – Sept 23, 2015***
  - Operations Commence – Pending for the NDE build 1.0.8 release schedule, targeted on late of Oct 2015

- Since June 2013: Products available in near real-time to users (NHC, JTWC, NRL, etc.) via the GAASP on the STAR GCOM-W1/AMSR2 product development and validation system

- Discontinuities were found the level 1 files that were introduced by the IDPS granules. This necessitated moving to full orbit contacts through IDPS which is currently an ongoing effort.

STAR GAASP Development

Delivery 1:

Day 1 GAASP Product Capability

- Microwave Brightness Temperature (MBT)
- Cloud Liquid Water (CLW)
- Sea Surface Temperature (SST)
- Total Precipitable Water (TPW)
- Precipitation Type/Rate (PT/R)
- Sea Surface Wind Speed (SSW)

GAASP netCDF4 Reformatting Capability

SPSRB documentation ***(See backup slides for Day 1 data flow)***

Delivery 2:

Day 2 GAASP Product Capability

- Soil Moisture (SM)
- Snow Cover/Depth (SC/D)
- Sea Ice Characterization (SIC)
- Snow Water Equivalent (SWE)

Updated GAASP netCDF4 Reformatting Capability

Updated SPSRB Documentation

Deliveries 3,4,…

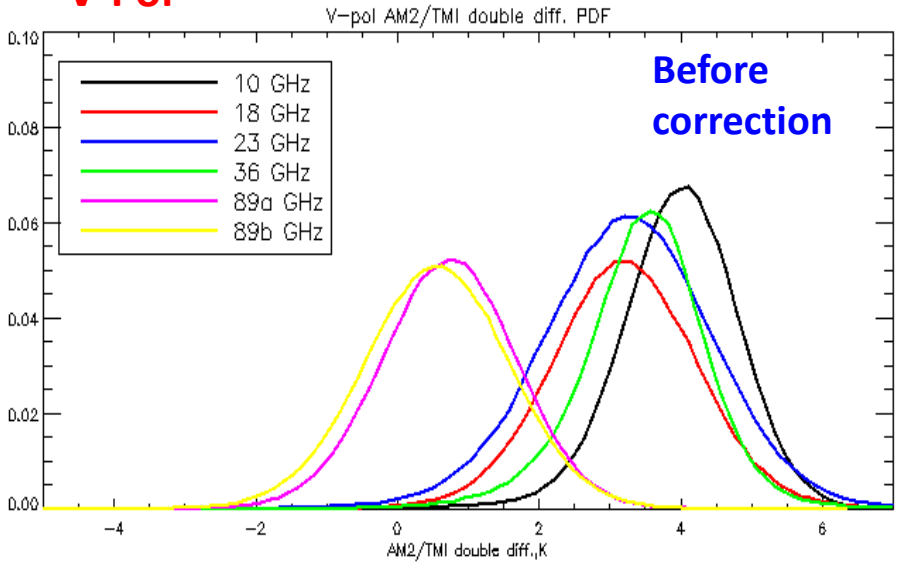
Updates and enhancements to existing EDRs

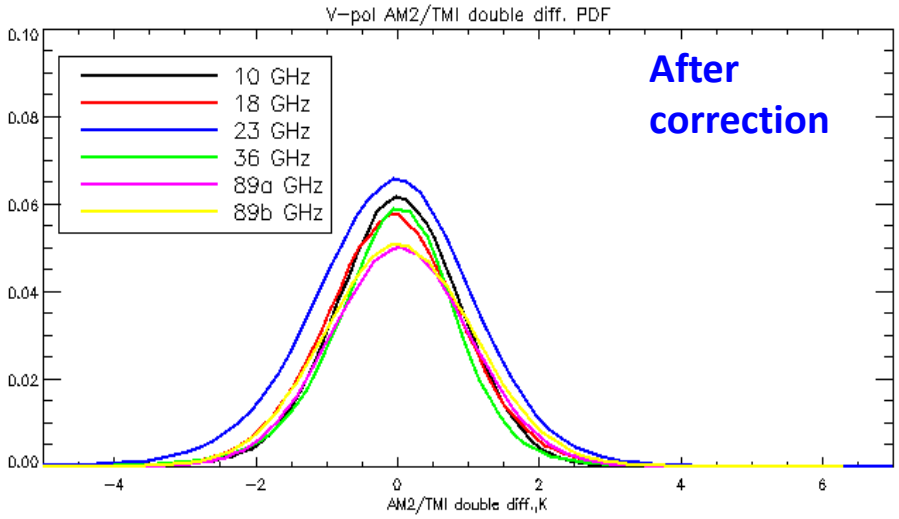
AMSR-2 On Orbit Calibration

- Accounting for residual calibration errors in AMSR-2 TB's received from JAXA significantly improves the performance & accuracy of geophysical retrieval algorithms
  - Double difference analyses were utilized to characterize the residual calibration biases
    - TMI 1B11 V7 calibrated Tbs were used as a reference radiometer data

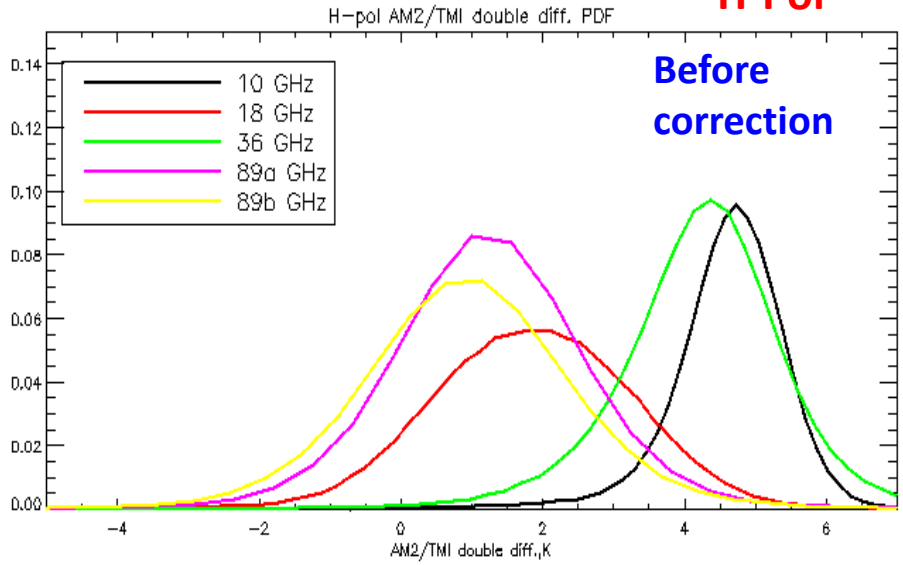
Double Difference PDFs

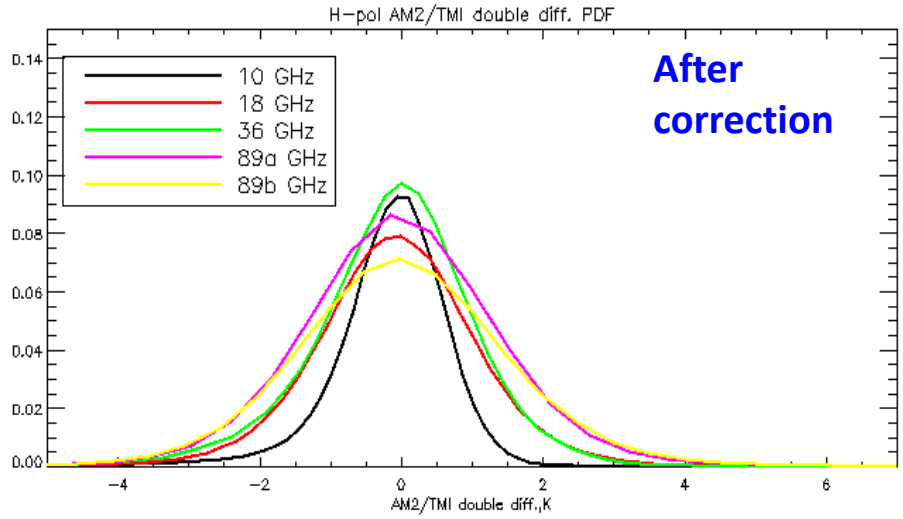
V-Pol





H-Pol





JAXA-NOAA Technical Exchange Meeting – November 21-22, 2014; Tokyo, Japan



Day-1 Ocean EDR Improvements

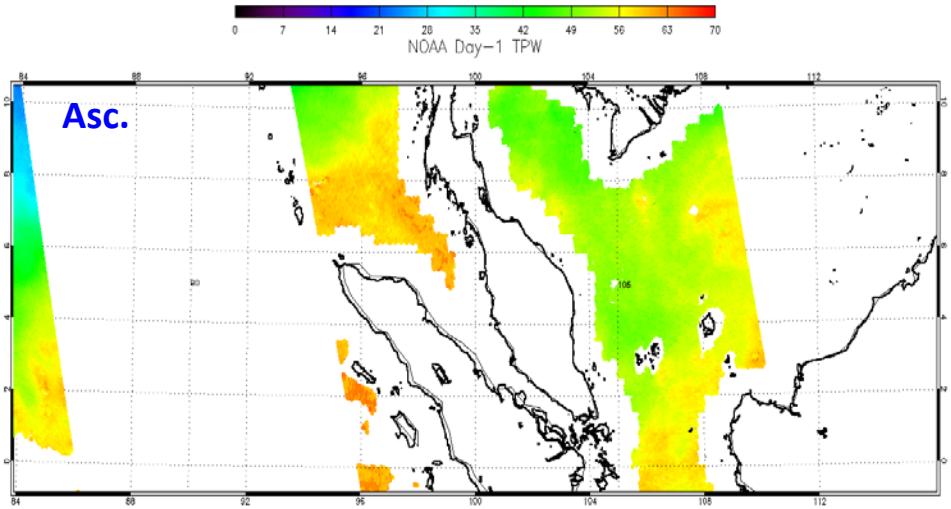
- Some issues found in the initial Day-1 ocean products are being addressed
  - Retrieved SST values match models in daytime (ascending AMSR2 passes)
    - Models tend to underestimate SST by ~ 2 K at low winds
  - Small dependence on earth incidence angle (EIA)
    - Apply EIA correction
  - Occasional horizontal lines (artifacts) appear in some Day-1 products
    - Latitude stepwise regressions were not used

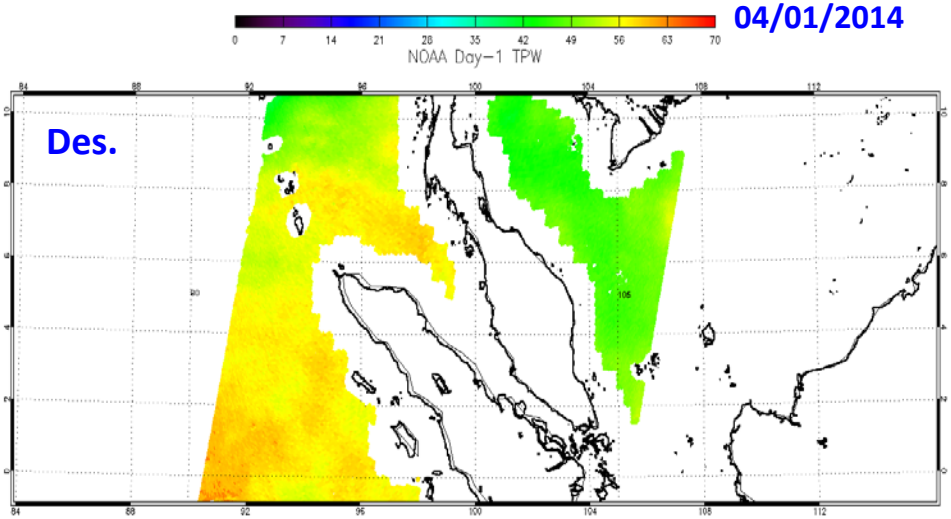
Day-1 Ocean EDR Improvements (cont.)

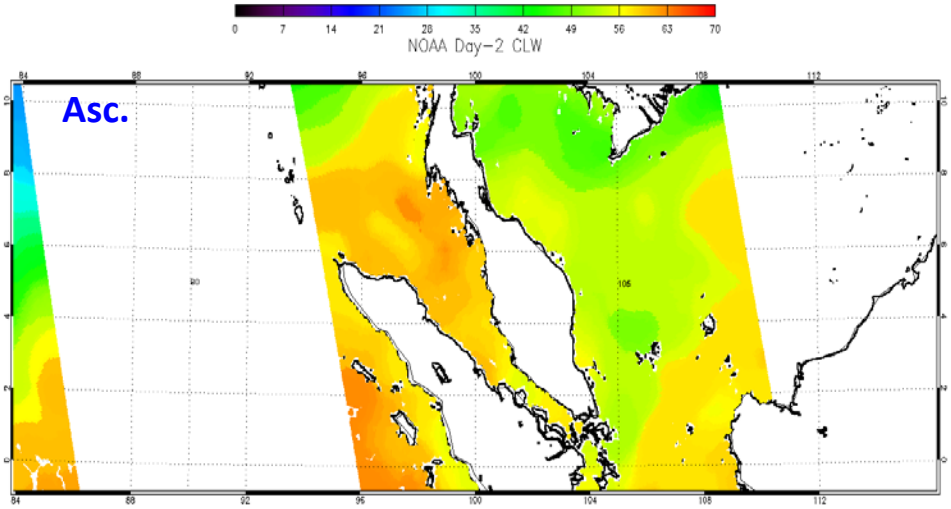
- Initial CLW & TPW retrievals utilized all AMSR-2 channels including the 6 & 7 GHz channels
  - Affected by sun glint
  - Not able to get close to coast line due to bigger IFOV of low frequency channels
- Enhanced Day-1 TPW & CLW use 23 & 36 GHz channels
  - No sun glint issues
  - Can get much closer to the coast line
    - ➢ Better utilization by NWS in certain regions with complex coastlines

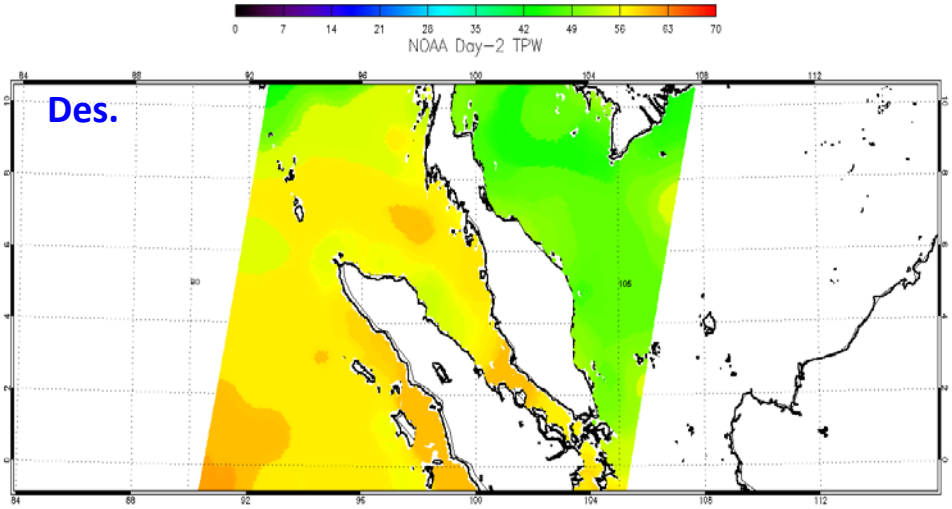
TPW Retrievals Available Closer Coast

04/01/2014

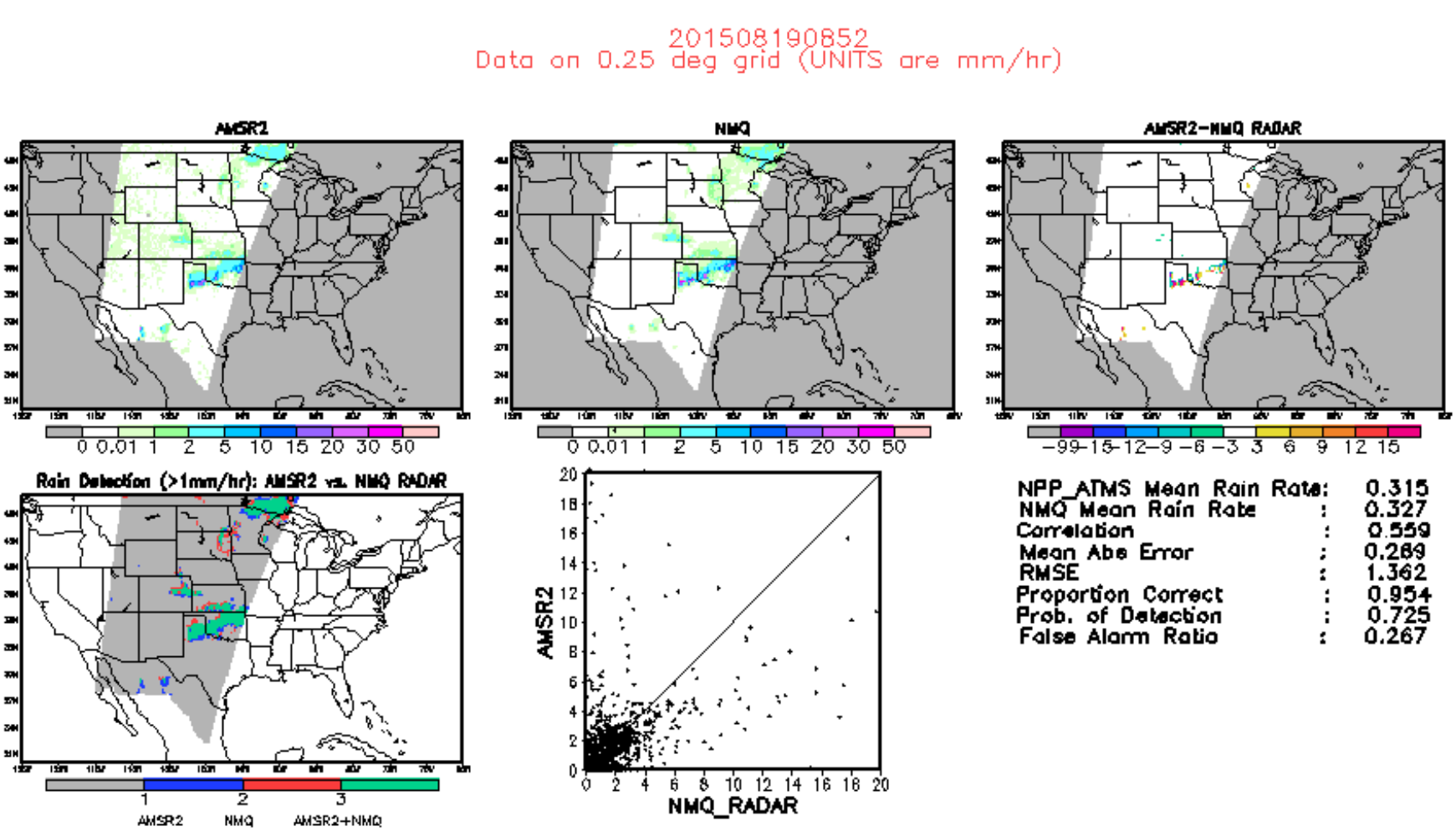




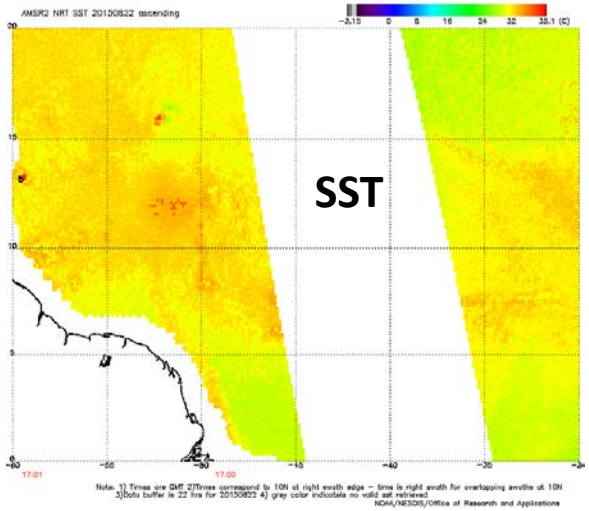


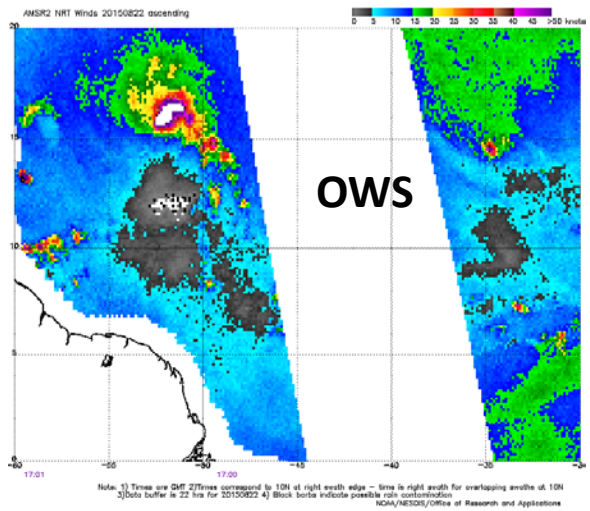


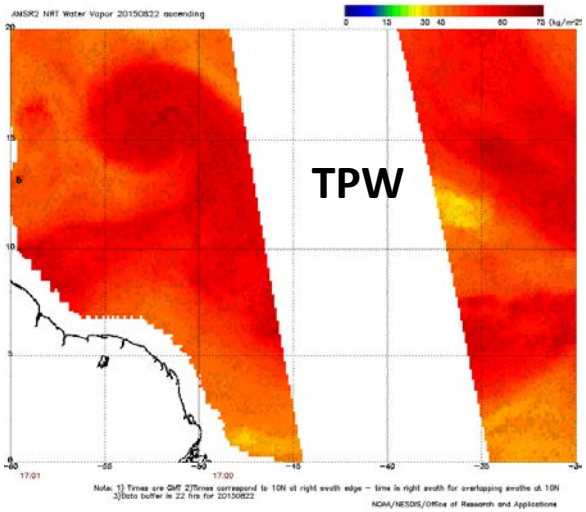
Rainfall/Monitoring over CONUS

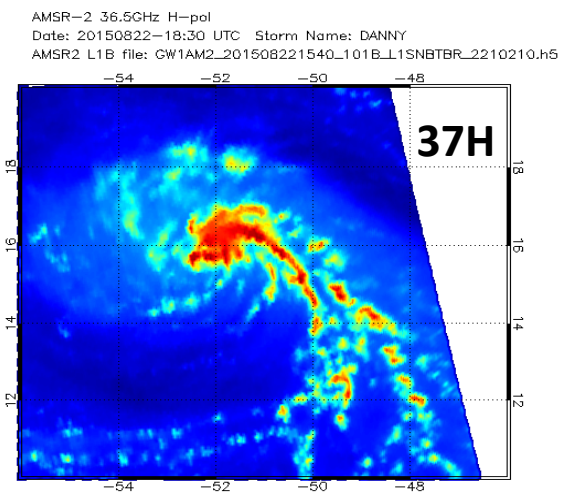


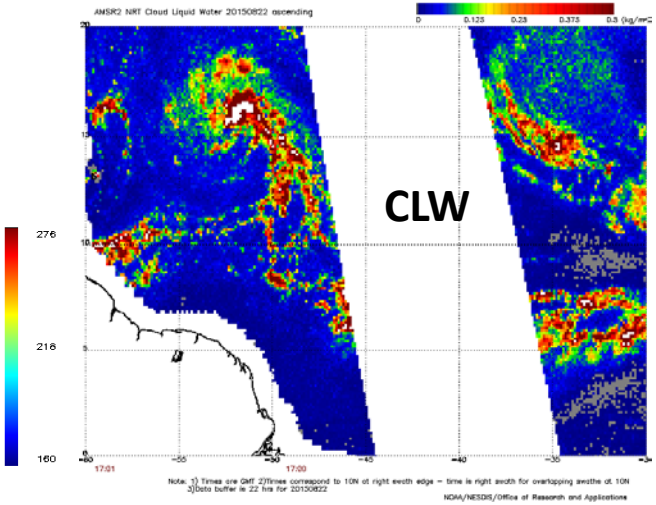
Hurricane Danny Examples (8/22/15)

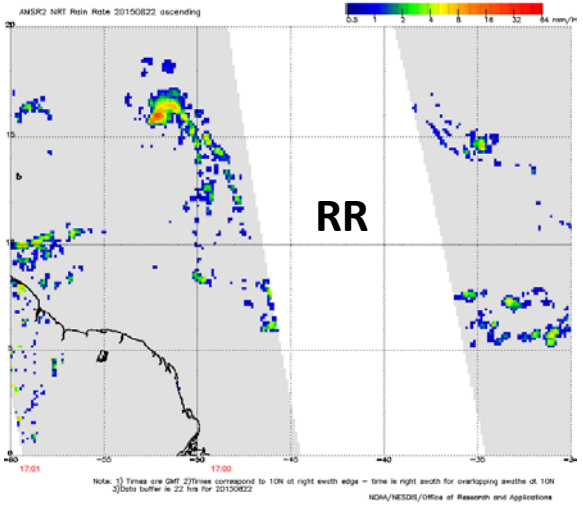




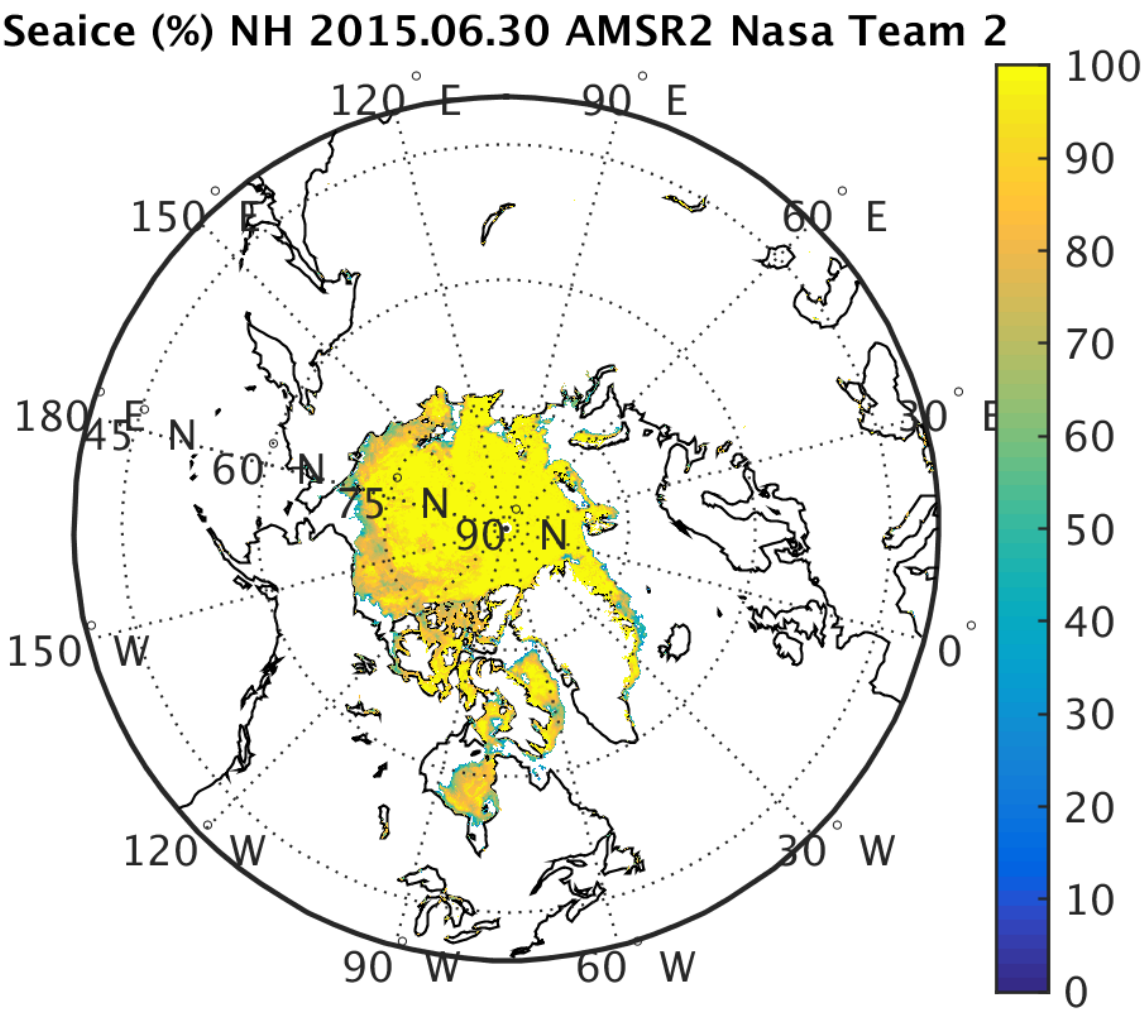




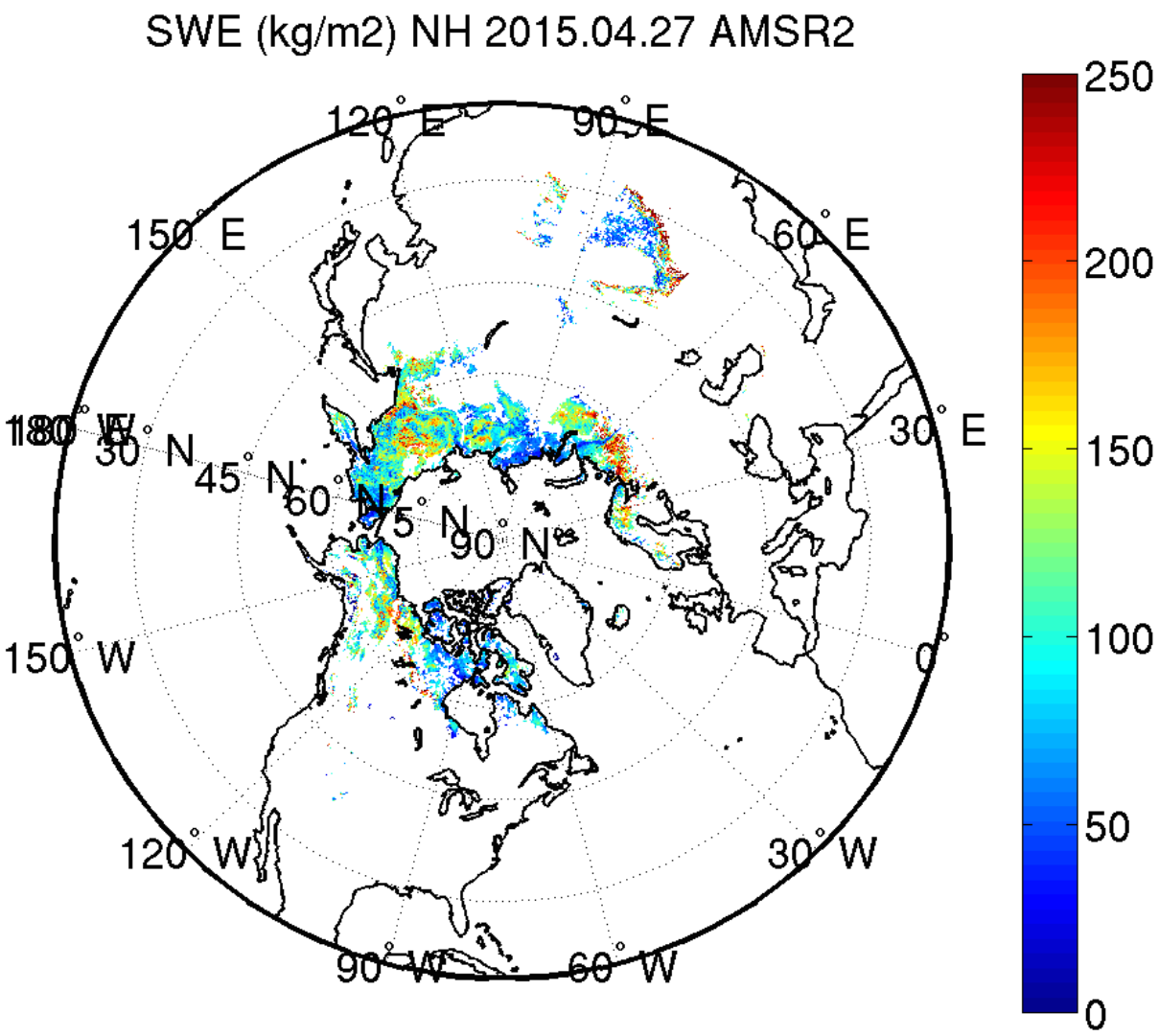




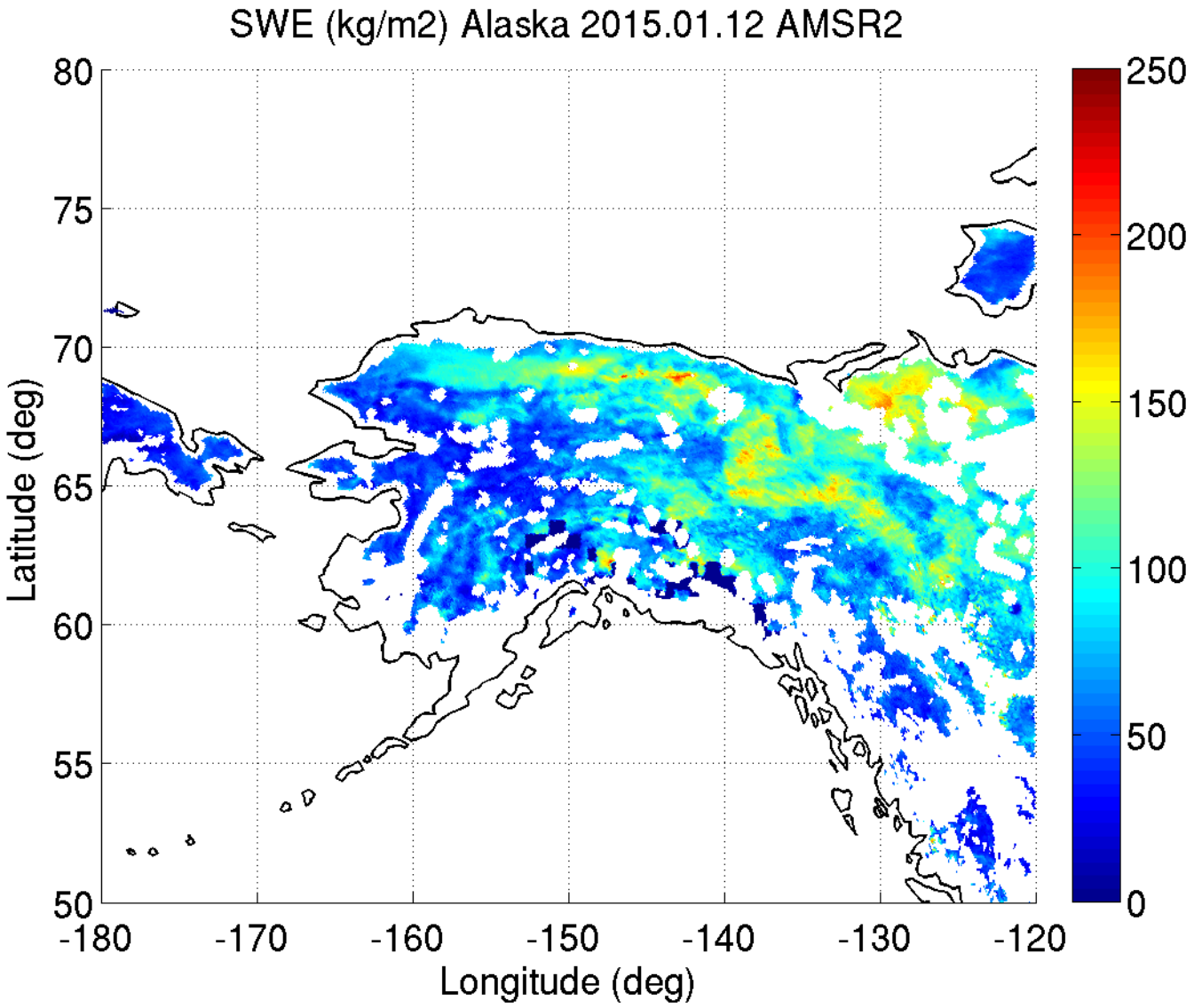
AMSR2 Sea Ice Concentration



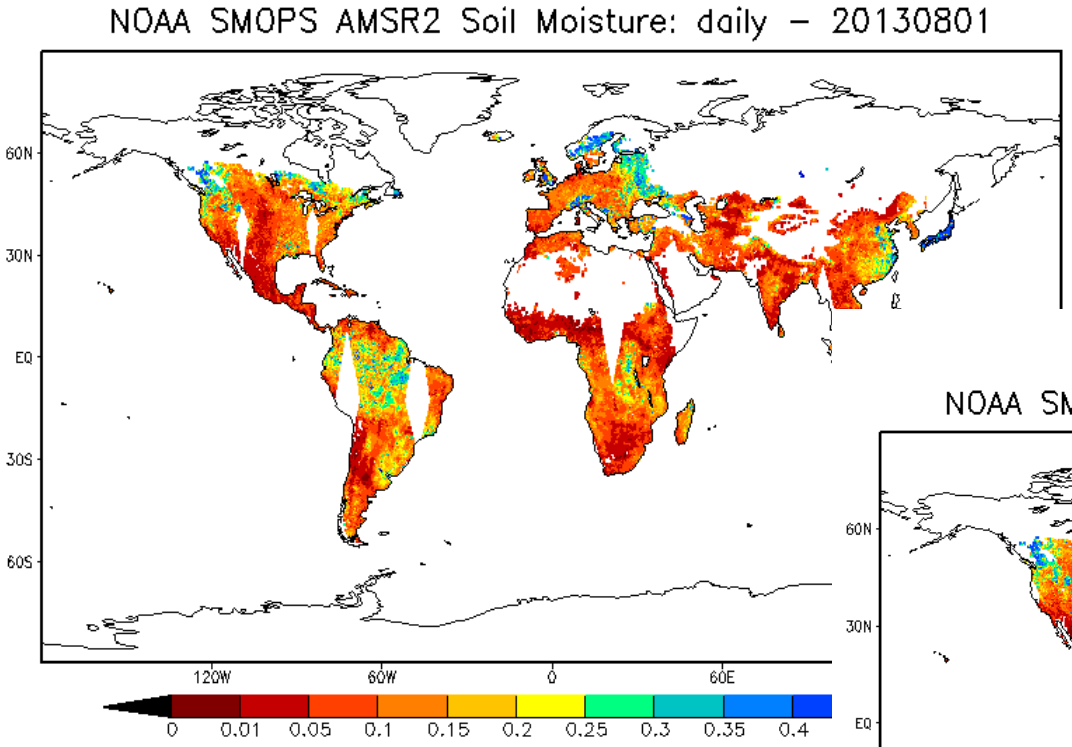
AMSR2 Snow Water Equivalent

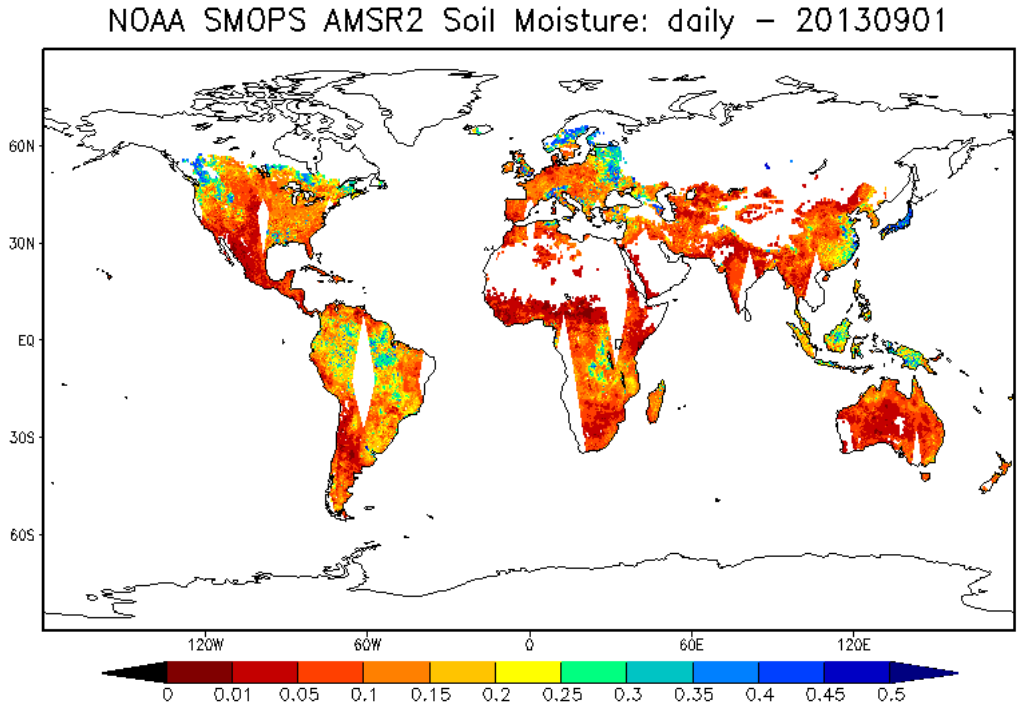


AMSR2 Snow Water Equivalent (SWE)



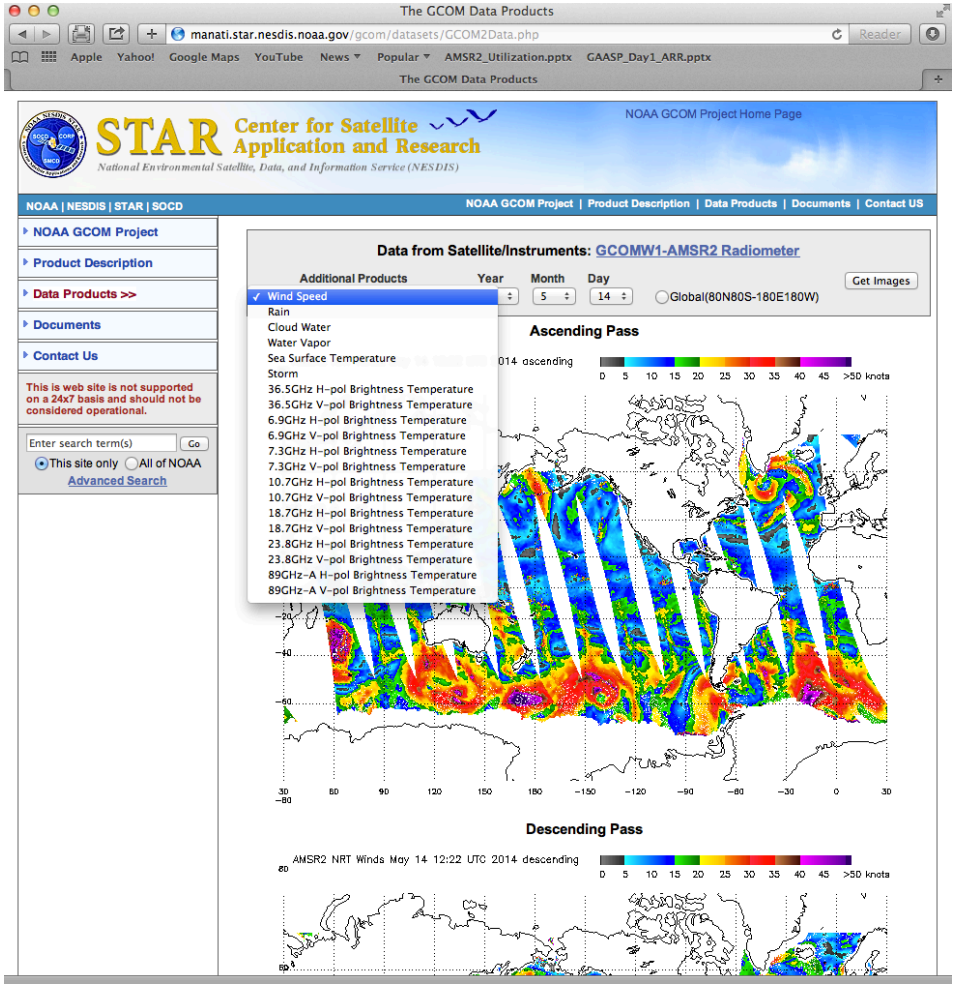
NOAA AMSR2 Soil Moisture Maps

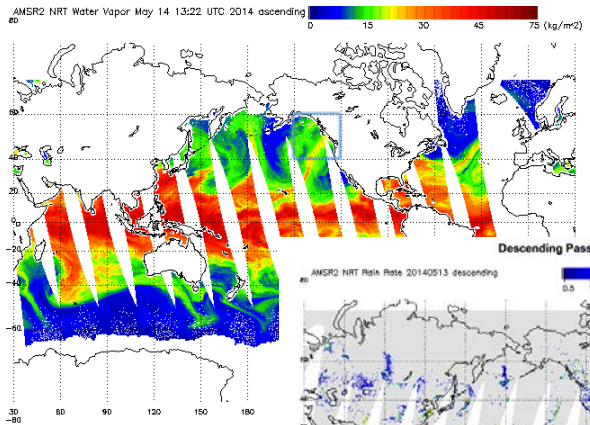


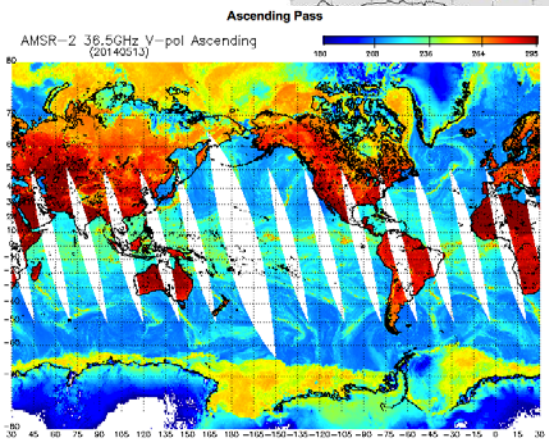


STAR GCOM-W1 AMSR2 Web Page

Near Real-Time and Retrospective AMSR2 Product Portal







http://manati.star.nesdis.noaa.gov/gcom

STAR AMSR2 Product Monitoring

http://manati.star.nesdis.noaa.gov/gcom

- NOAA GCOM Project
- Product Description
- Data Products >>
  - Data Files
- Documents
- Contact Us

This is web site is not supported on a 24x7 basis and should not be considered operational.

Enter search term(s) Go

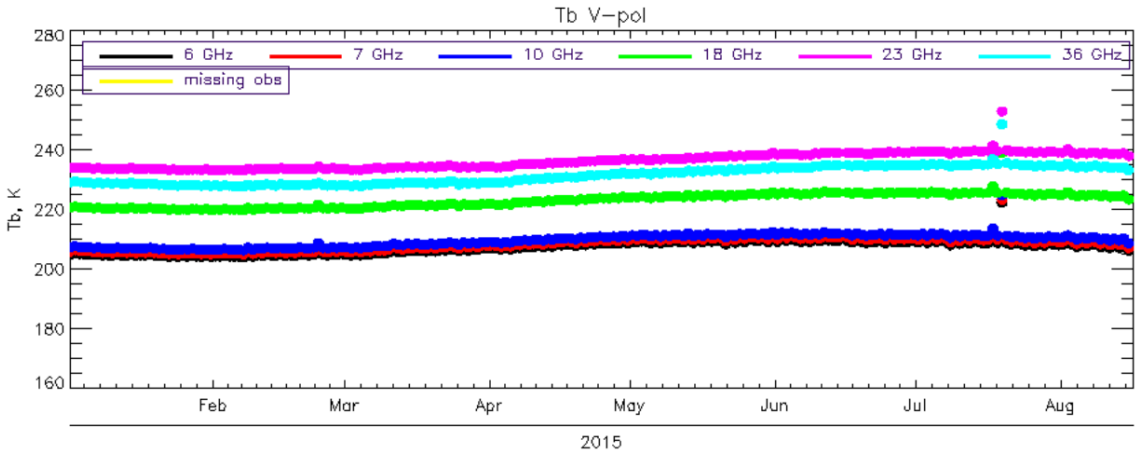
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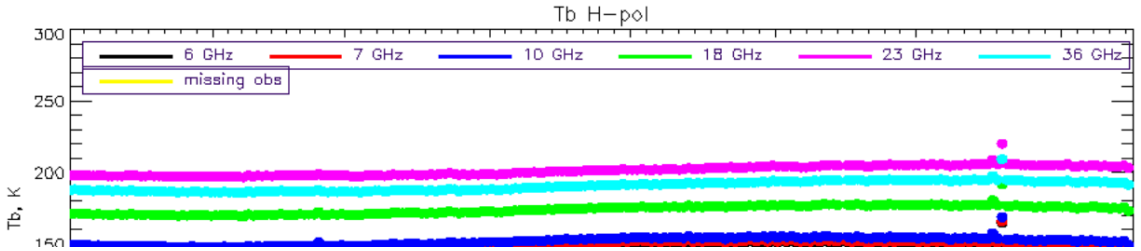
Advanced Search

Data from Satellite/Instruments: GCOMW1-AMSR2 Radiometer

Additional Products	Year	Month	Day	
Monitor	2015	8	20	Get Products

- (•) TB (daily)
- ( ) Incidence Angle (daily)
- ( ) Model-Obs diff (daily)
- ( ) Buoy-Obs diff (daily)
- ( ) Model-Obs diff (monthly)
- ( ) Buoy-Obs diff (monthly)





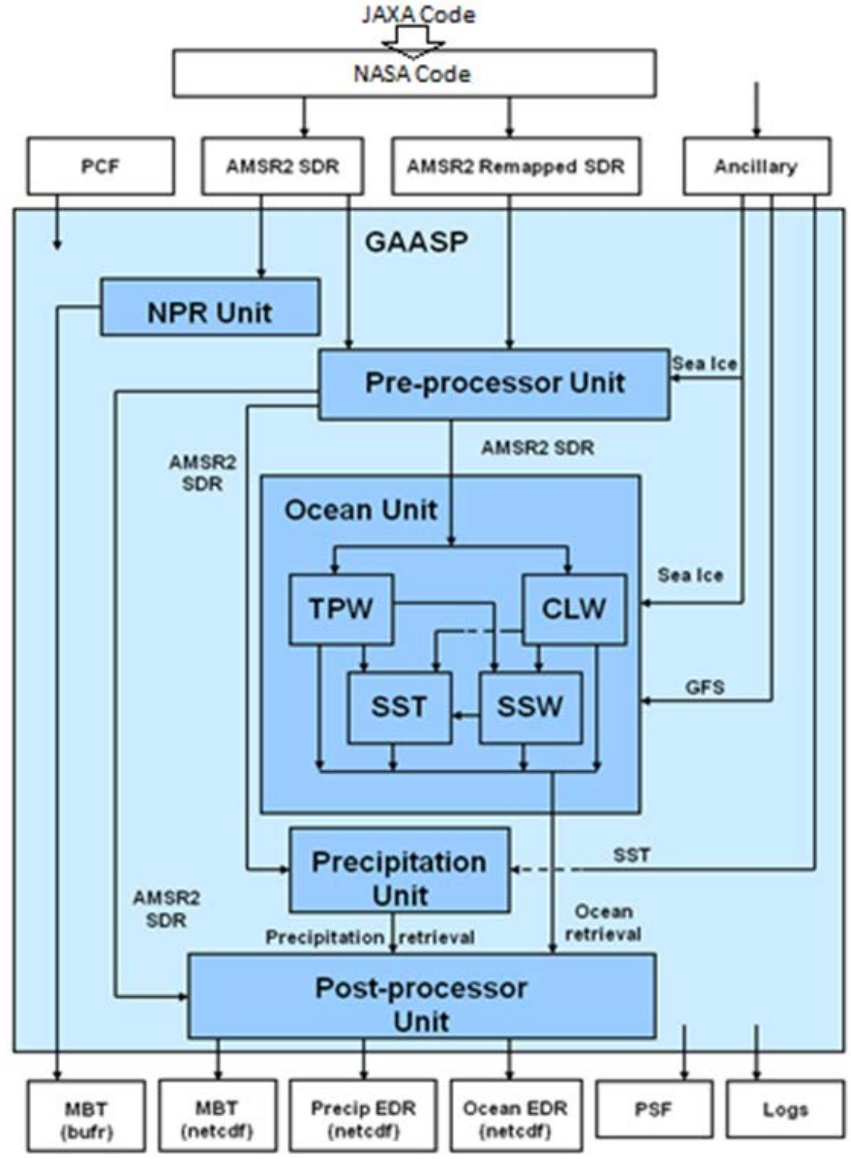
Summary & Path Forward

- Day 2 products and Day 1 product improvements being finalized in the next GAASP delivery for integration in NDE 2.0 (~October 2015)

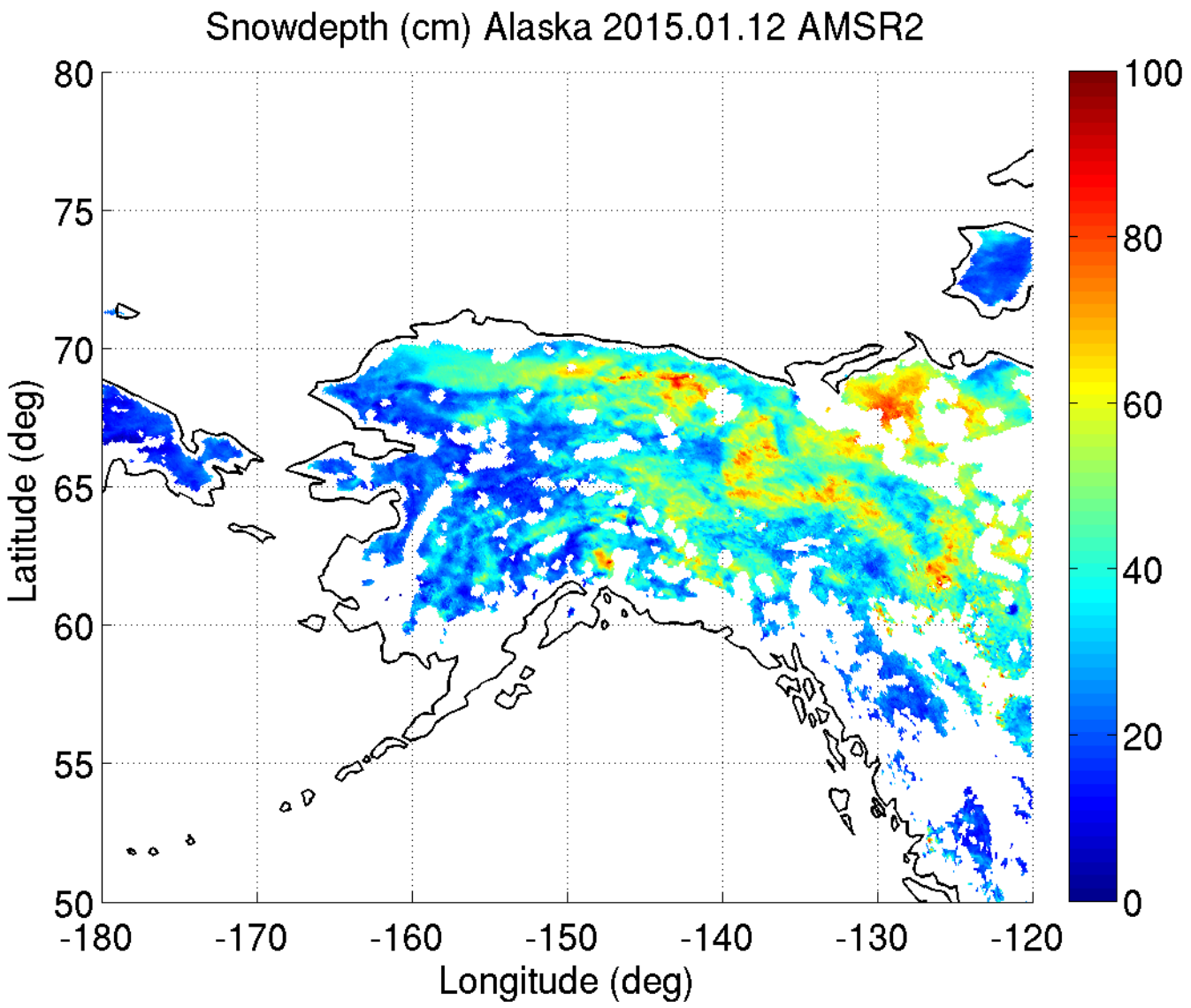
- Calibration updates, product updates and continued monitoring and quality control
  - Continue working with JAXA on Level 1 calibration improvements
  - Address JAXA updates to Level 1 processing software
  - Continue validation and product monitoring and implement product updates as needed
  - User product training and outreach

BACKUP SLIDES

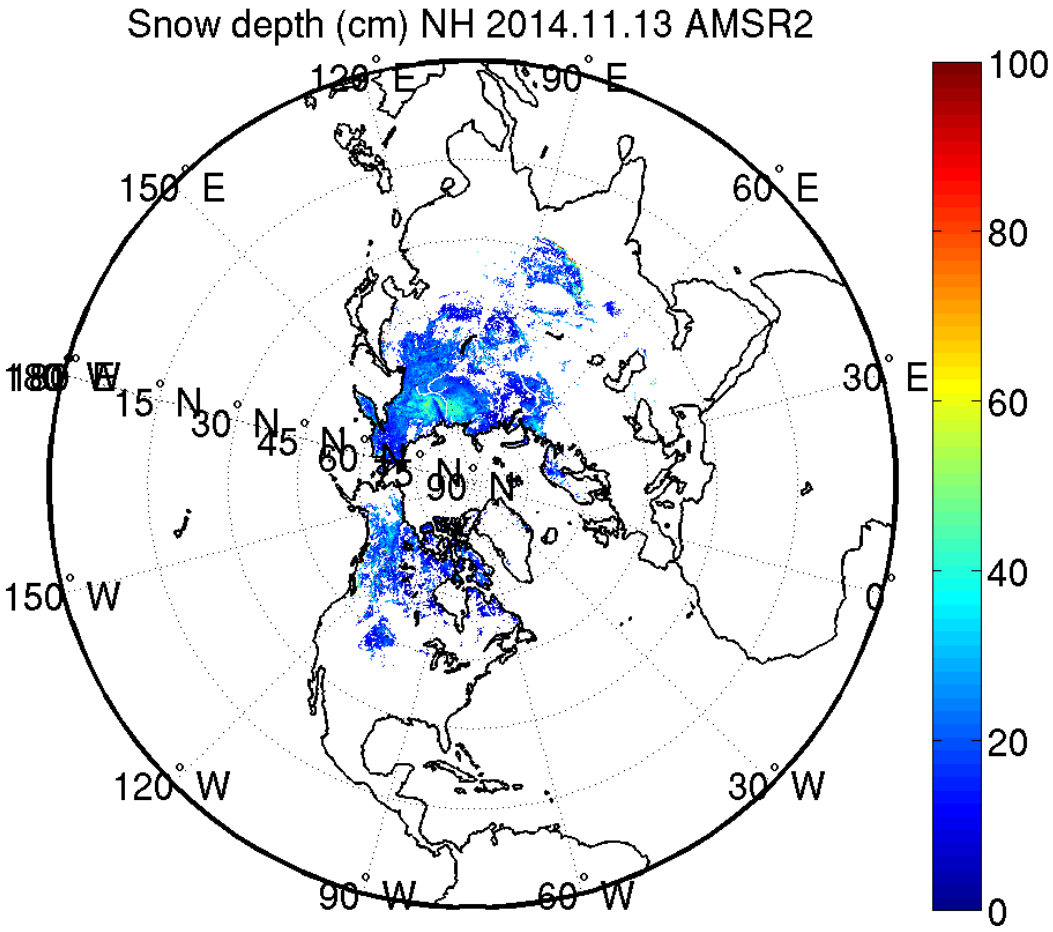
GAASP Software Day 1 Data Flow

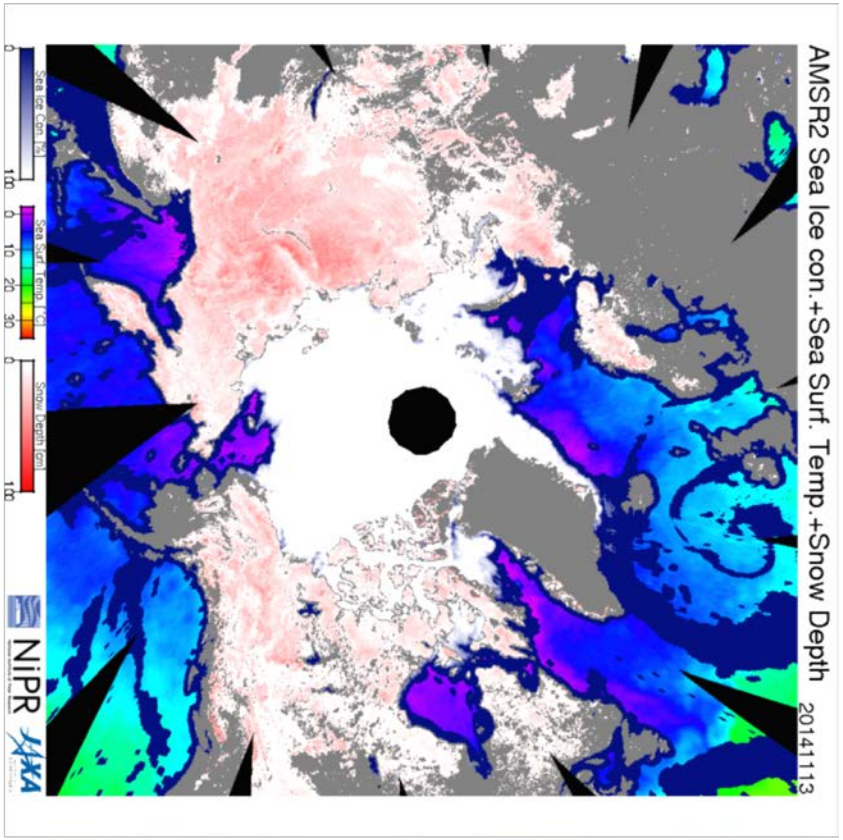


AMSR2 Snow Depth



AMSR2 Snow Depth





Enhanced Grody Algorithm Validation with AMSR2

