NOAA/NESDIS Update: ScatSat-1 and CYGNSS Missions

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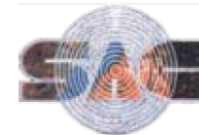
May 2, 2017

ScatSat-1

- Launched September 26, 2016
- 5 year mission design life
- Currently undergoing cal/val (ISRO-NOAA-JPL-KNMI joint activity)
  - Characterizing L1b (sigma0) and addressing corrections as necessary
  - This was a critically important activity with OSCAT to get products that were of sufficient quality and consistency to support real-time decision making
- Swath coverage will be comparable to QuikSCAT

Mission Specifications

Spacecraft Altitude	720 Km (Nominal)
Inclination	98°
Orbit	Injection at 9:20 am into Polar Non Sun-Synchronous orbit; Will be allowed to drift @8sec/day; Planned to arrest at 8:45am LT after ~1year
Frequency	13.515625 GHz
Polarization	HH for inner and VV for Outer beams
Swath	1400 Km (both HH and VV beams available) 1400-1800 km (only VV beam available)
Wind Speed Range	3-30ms/s
Wind Direction Range	0° to 360°
Wind Speed Accuracy	1.8 m/s rms or 10% whichever is higher
Wind Direction Accuracy	20^0 rms
Wind Vector Cell (grid) Size	25 Km x 25 Km Grid

STAR Full Suite of Scatterometry Products – Planned for ScatSat

- **Low and high resolution global**
  - Scatterometer wind vectors
  - Wind vector ambiguities
- **NAWIPS and AWIPS ready** wind vector products for NWS operations
- **BUFR ready** wind vector products for Data Assimilation
- **Ultra high resolutions NRCS imagery** for
  - TC positioning
  - Oil spill detections
- **Ultra high resolution TC** wind vector product
- Scatterometer derived sea **surface pressure fields**
- **Ice products**
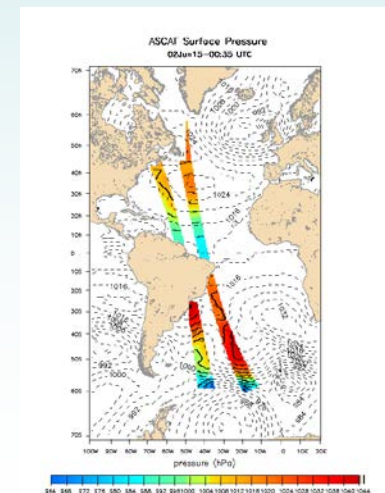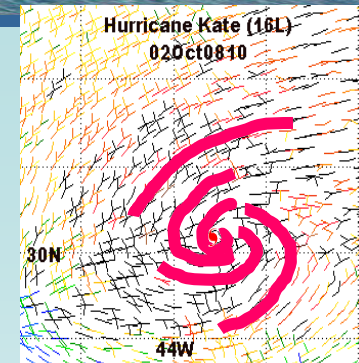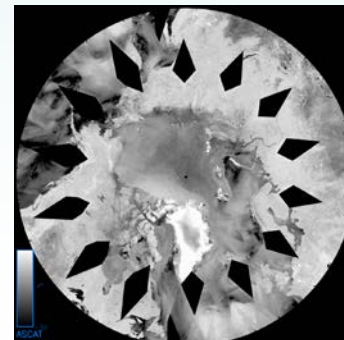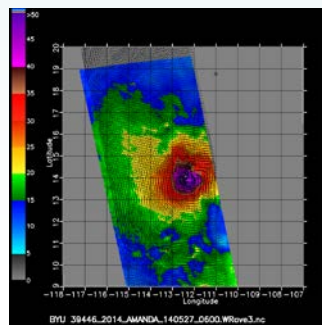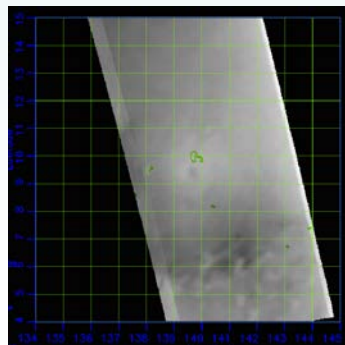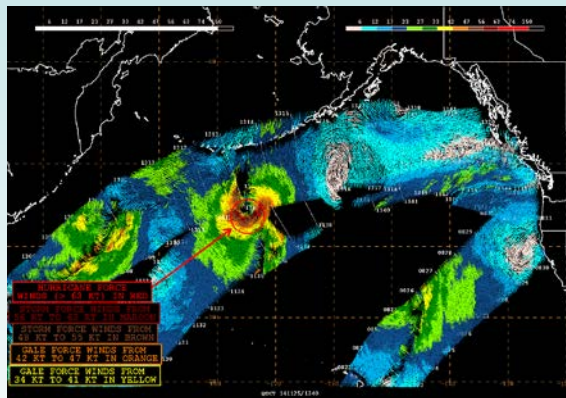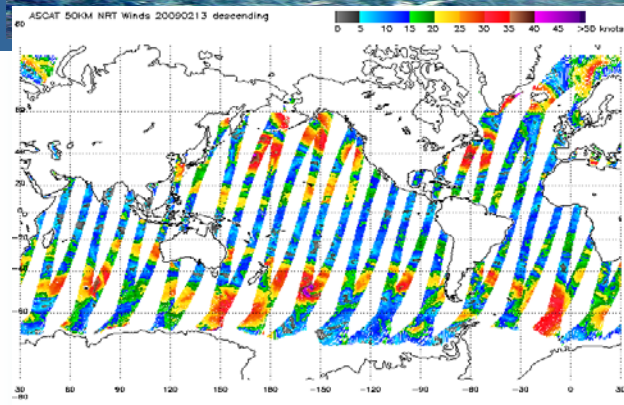
Potential Issues

- NESDIS is funding level 1 calibration/validation efforts but has not yet made a decision about level 2 products.
  - Level 2 products won't be available until FY18 assuming resources are made available

CEOS Ocean Vector Surface Winds Virtual Constellation (OSVW-VC) Current status and outlook – NRT data access
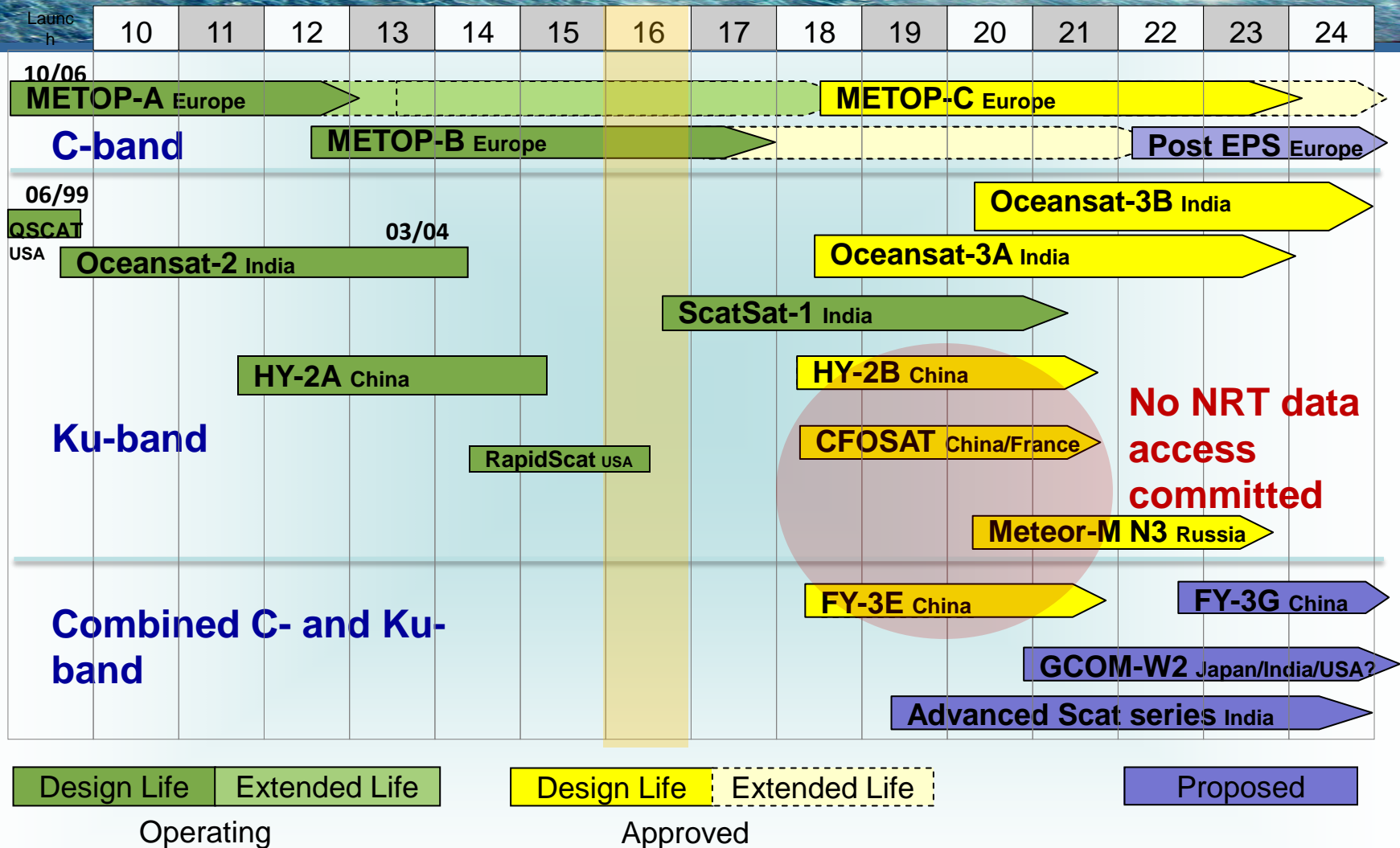
Source: WMO OSCAR database and direct interactions with agencies

The Cyclone Global Navigation Satellite System (CYGNSS) Mission

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NOAA Ocean Winds Science Team
Co-Investigators CYGNSS

July 27, 2016

- NASA Earth Ventures Mission
  - CYGNSS is the NASA Earth Venture 2 Mission (selected in June 2012)
  - Launched December 15, 2016
  - First Light – January 4, 2017
  - Science Operations Phase - March 23, 2017
- CYGNSS Objectives
  - Measure ocean surface wind speed in all precipitating conditions, including those experienced in the tropical cyclone (TC) eyewall
  - Measure ocean surface wind speed in the TC inner core with sufficient frequency to resolve genesis and rapid intensification
- CYGNSS Mission Design
  - Eight satellites in low earth orbit at 35° inclination, each carrying a four-channel modified GPS receiver capable of bi-static radar measurements of GPS signals reflected by the ocean surface

CYGNSS Earth Coverage

- 90 min (one orbit) coverage showing all specular reflection contacts by each of 8 s/c

- 24 hr coverage provides nearly gap free spatial sampling within +/- 35 deg orbit inclination

- Time lapse simulation comparing CYGNSS and ASCAT coverage of Hurricane Frances just before landfall

- Snapshots of all samples taken in 3 hour intervals

- Hurricane inner core shown as large blue dot

Time Lapse Simulations Comparing CYGNSS and ASCAT Coverage of Hurricane Frances

CYGNSS

ASCAT

Time (3 hr increments beginning at 00:00 Z on 02 Sep 2004)
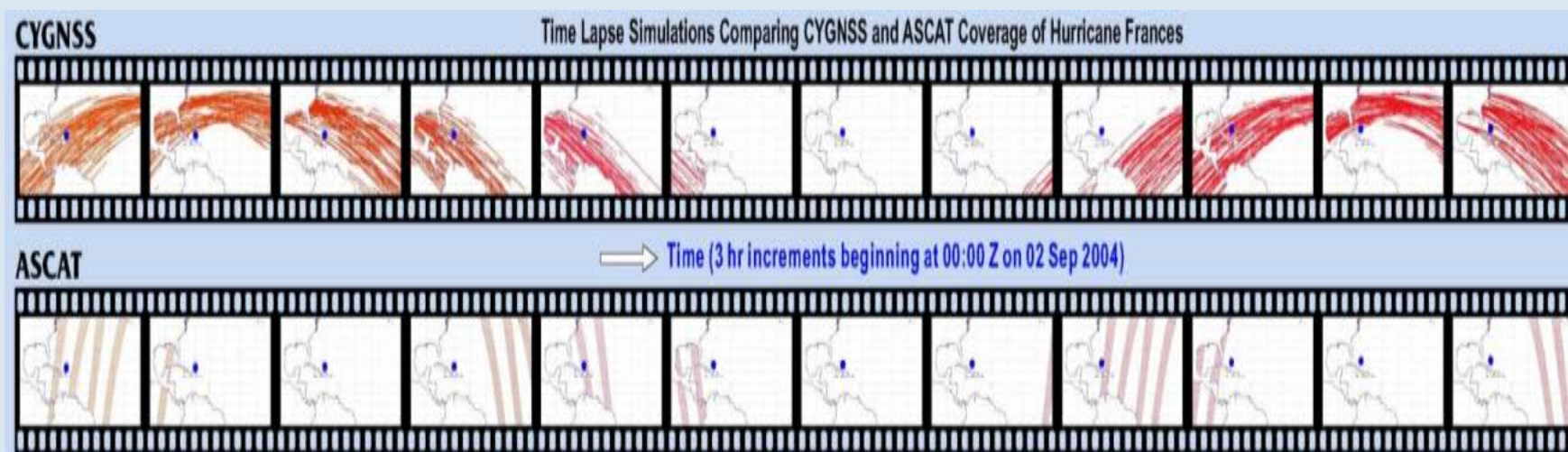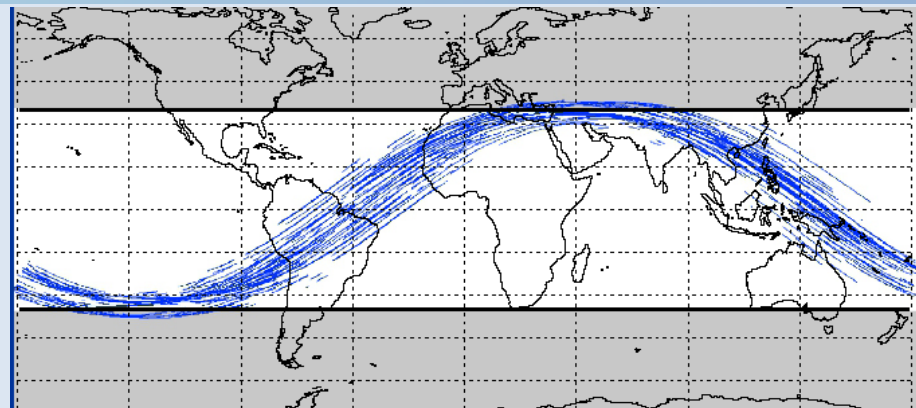
CYGNSS Update

- Currently in its cal/val phase
  - Focus now is on L1 (DDM) performance
- NESDIS is part of the core science team and responsible for cal/val and investigating utility for NOAA's weather mission (NASA funded)
- Goal is to release initial level 2 (wind speed) products to the broader science team within the next few months (end of May)
  - Freeze processing updates for hurricane season
- NRT availability is not formally part of the project deliverables (cost versus technical)
  - There will be attempts to try some NRT acquisitions over tropical cyclones
- CYGNSS is a first of its kind mission and we will be characterizing and understanding its capabilities.