

Monitoring and Understanding Our Environment Through Satellite Remote Sensing

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Observing and Understanding Our Environment: The Ocean, Atmosphere and Land



- **Time**
 - Short (weather) and long (climate) time scales
- **Location**
 - Regional (local) and global

Satellite Remote Sensing Supports NOAA's Mission

NOAA's Mission Overview

NOAA is a science-based services agency engaged with the entire Earth system science enterprise.

NOAA's Top Four Priorities:

- To provide information and services to make communities more resilient
- To evolve the National Weather Service
- To invest in observational infrastructure
- To achieve organizational excellence



Environmental Information:

Observations → Monitoring → Assessment → Modeling → Tools & Services 2



NOAA Organization

The National Oceanic and Atmospheric Administration (NOAA) is a science-based federal agency within the Department of Commerce with regulatory, operational, and information service responsibilities.




NOAA Satellite Systems

- DSCOVR
- JASON-3
- COSMIC-2
- GOES-R
- JPSS

National Ocean Service



National Environmental Satellite, Data, & Information Service



Oceanic & Atmospheric Research



National Marine Fisheries Service



National Weather Service



Office of Marine and Aviation Operations




Geostationary Operational Environmental Satellites GOES to GOES-R

3X MORE CHANNELS



Improves every product from current GOES Imager and will offer new products for severe weather forecasting, fire and smoke monitoring, volcanic ash advisories, and more.

4X BETTER RESOLUTION



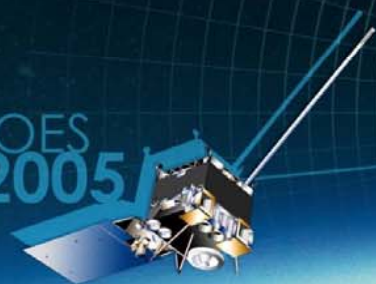
The GOES-R series of satellites will offer images with greater clarity and 4x better resolution than earlier GOES satellites.

5X FASTER SCANS



Faster scans every 30 seconds of severe weather events and can scan the entire full disk of the Earth 5x faster than before.

GOES
2005



GOES-R
2016



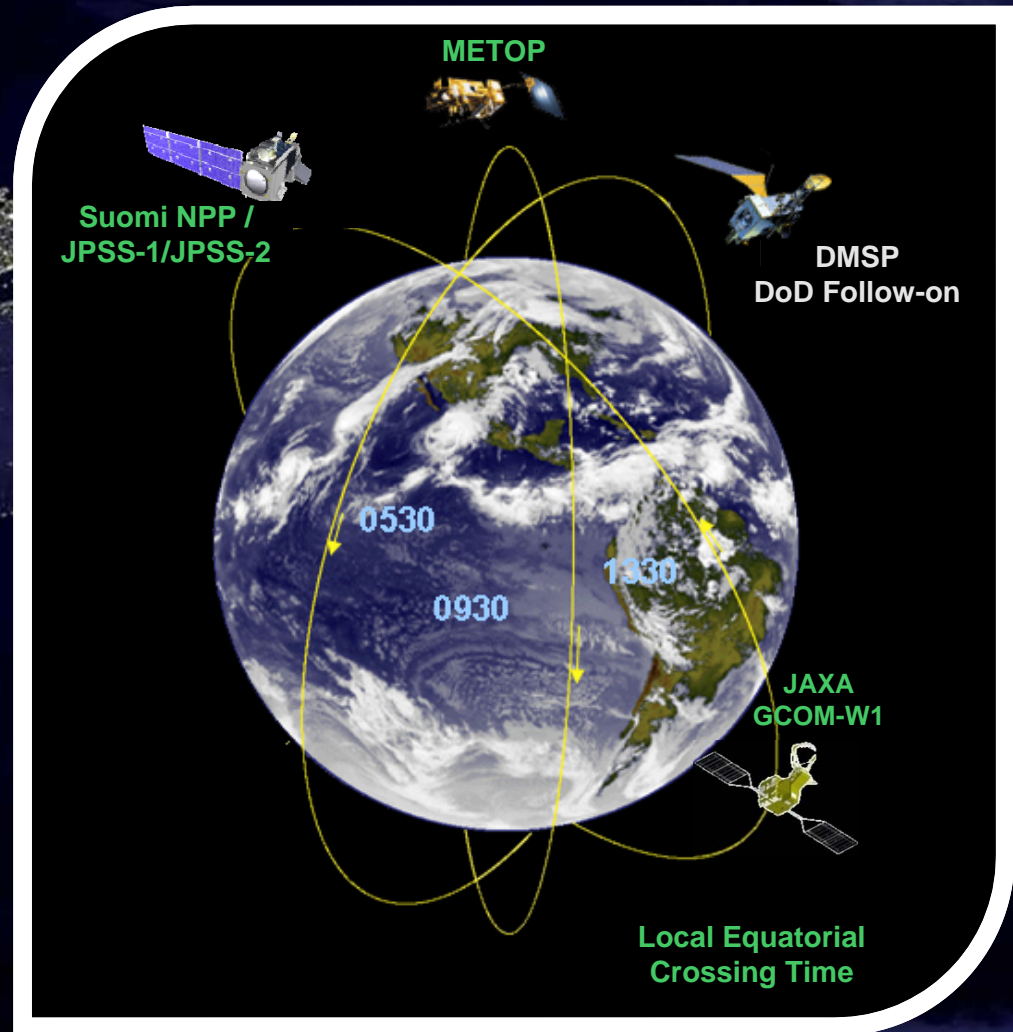


JPSS: Integral to 3-Orbit Global Polar Coverage



- JPSS implements U.S. Space Policy and international agreements to ensure global coverage.
- NOAA's polar satellite covers the afternoon orbit, EUMETSAT's satellite covers the mid-morning orbit and DoD covers the early morning orbit.
- The data from these three orbits are fundamental to the 3-7 day forecast to provide advanced warning of severe weather, as well as environmental monitoring .
- JAXA provides microwave imagery used for a variety of applications; most importantly of precipitation in areas not covered by land based radar.

JPSS provides observational continuity for the afternoon orbit



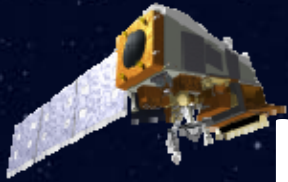


GCOM-W1/AMSR2: Part of the Afternoon Polar Constellation



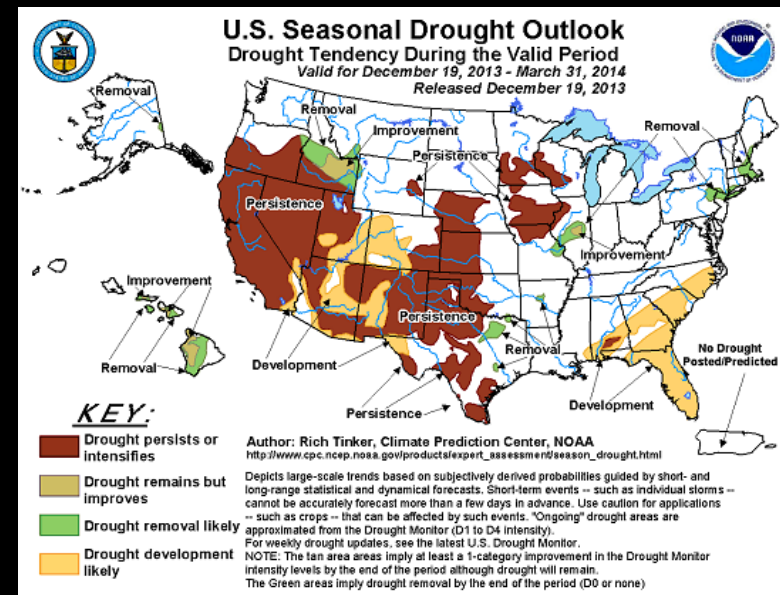
GCOM-W1 complements Suomi-NPP in the afternoon orbit

- Directly supports the JPSS Program observational requirements
- **Tropical Cyclones** - Helps accurately determine storm center location, structure and track intensity - critical to accurate predictions to protect life and property
- **Heavy rain/flash flooding potential**- High spatial resolution precipitation and total precipitable water products important for predicting heavy rainfall events, floods, etc. – provides much improvement over soundings for very difficult to predict parameters
- **Sea ice** – Sees through clouds to distinguish sea ice from ocean, Available day and night in often data sparse regions (Arctic) – critical for navigation along with SAR and visible imagery
- **Marine warnings and forecasts** –surface (SST and wind) information over data sparse oceans
- **Global soil moisture information for numerical weather models** – Beyond AMSR2, there is limited satellite coverage for this observational parameter today.
- **All weather sea surface temperature products** – Provides ocean surface information through clouds, Important since the average cloud cover over oceans is 69%, and even higher in the eastern Pacific



Information drives decisions

- A bad environmental decision can impact lives, property and segments of the economy for years.
- What if there were no weather warnings or forecasts, tsunami and flood alerts, fire and drought reports and predictions, ice monitoring or harmful algal bloom assessments?
- Better information is usually tied to better observations, user training modeling and computer resources.
- Decision support tools are essential and information must be easy to comprehend.





Speeding Data to Decisions



Support transportation & commerce



Facilitate sustainable agriculture, fisheries, & aquaculture

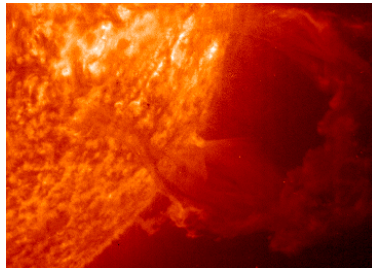


Protect life & property & create business opportunities

Assist communities & provide recreational opportunities



Safeguard communication & electric infrastructure



Inform renewable energy business decisions

From Satellites to Agricultural Decisions

Satellite Products that Support Agricultural Decisions

- Vegetation health products
- Soil moisture, land surface temperature
- Snow cover and snow water equivalent
 - water resources
- Precipitation diagnosis
 - especially important for areas without radar

Drought affects Global Food Security by reducing agricultural production below consumption. Since 2000, this occurred 8 years out of 13.

Drought Assessments and Predictions

Farmers

- When and what to plant
- Irrigation timing and amount
- Pesticides and fertilization
- Expected yield and harvesting decisions
- Impacts on livestock

Buyers

- Anticipate productivity

Humanitarians

- Anticipated drought regions
- Impact on communities
- Planning relief efforts



Helping Forecast Rapid Intensification



TROPICAL STORM AMANDA DISCUSSION NUMBER 6

NWS NATIONAL HURRICANE CENTER MIAMI
FL EP012014

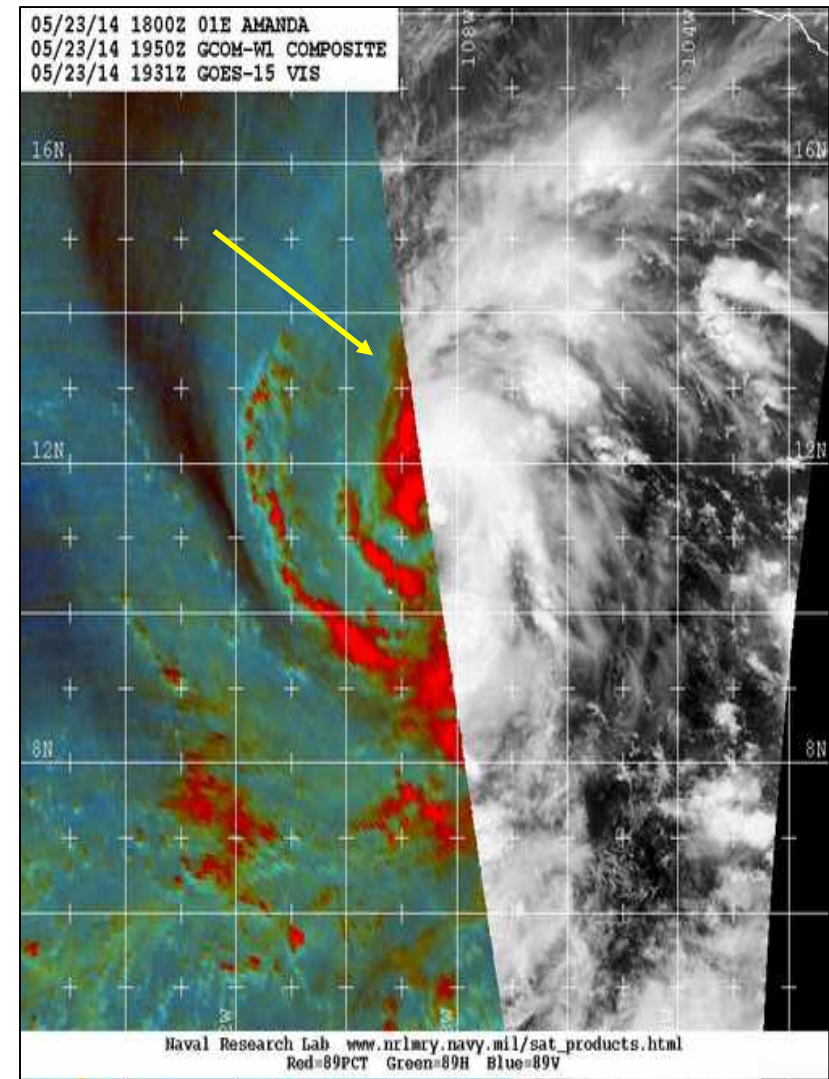
800 PM PDT FRI MAY 23 2014

Amanda has organized quickly over the past few hours. Deep

convection now wraps more than halfway around the estimated center position, and **an AMSR-2 microwave pass a few hours ago showed the development of a mid-level eye feature.** Based on the latest ADT estimate from UW-CIMSS the initial intensity has been increased to 50 kt.

Now that Amanda is developing inner-core structure, it seems likely that the cyclone will be able to take advantage of the favorable environment and intensify, possibly rapidly, during the next day or so.

24 h later Amanda was a 100-kt hurricane





Tropical Storm Blanca

2 June 2015



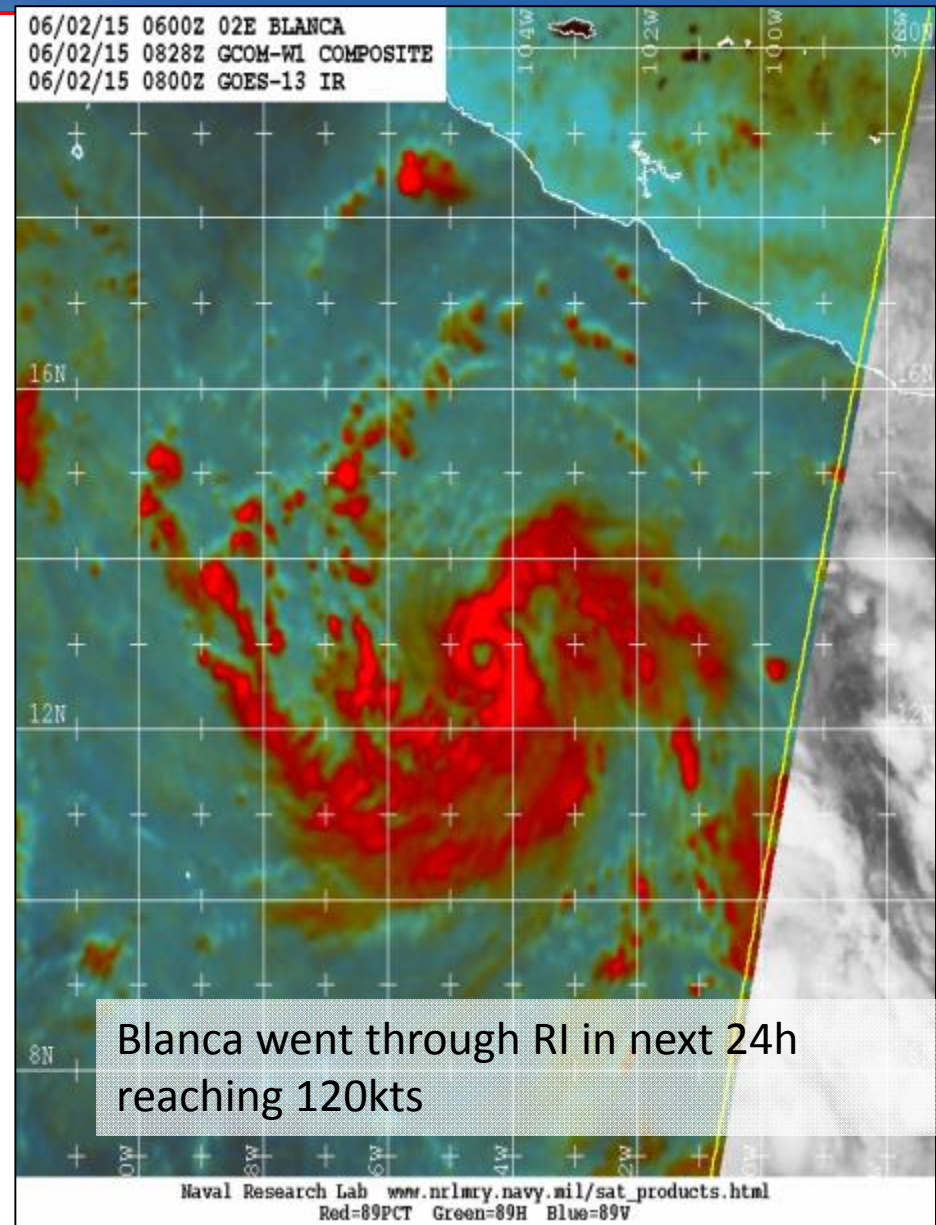
TROPICAL STORM BLANCA DISCUSSION NUMBER 8

NWS NATIONAL HURRICANE CENTER MIAMI FL
EP022015

1000 AM CDT TUE JUN 02 2015

Blanca is intensifying. Geostationary imagery shows a CDO and prominent banding features, and a **0828Z AMSR-2 image from GCOM-W1 showed a low- and mid-level eye feature.** The latest Dvorak estimates from TAFB and SAB are T3.5/55 kt, and the latest ADT is T4.5/77 kt. The initial intensity is set to 60 kt for this advisory. **Given that Blanca has developed the inner-core features seen in microwave imagery and the shear is now below 10 kt, the cyclone appears to be poised for a period of rapid intensification.**

The NHC forecast is near the highest guidance, showing Blanca becoming a major hurricane tomorrow, and conditions appear favorable for continued strengthening through 72 hours, when the SHIPS, LGEM and FSU Superensemble all show a peak near 120 kt. However, even this forecast could be conservative given that the SHIPS RI index shows a 95 percent chance of a 40-kt increase in the first 24 hours.



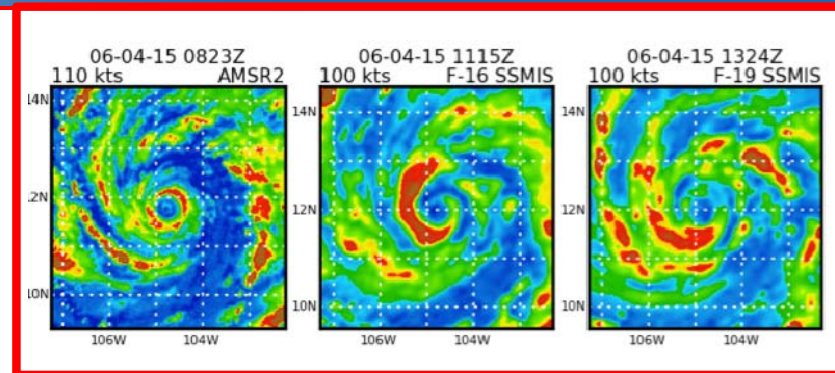
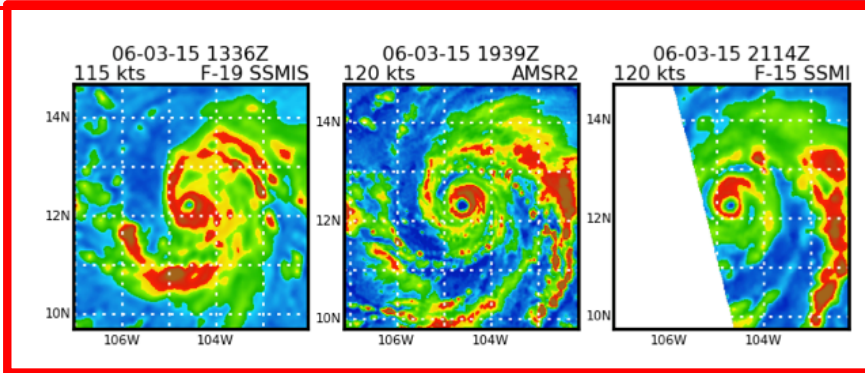


Blanca's Development through MW Imager Eyes



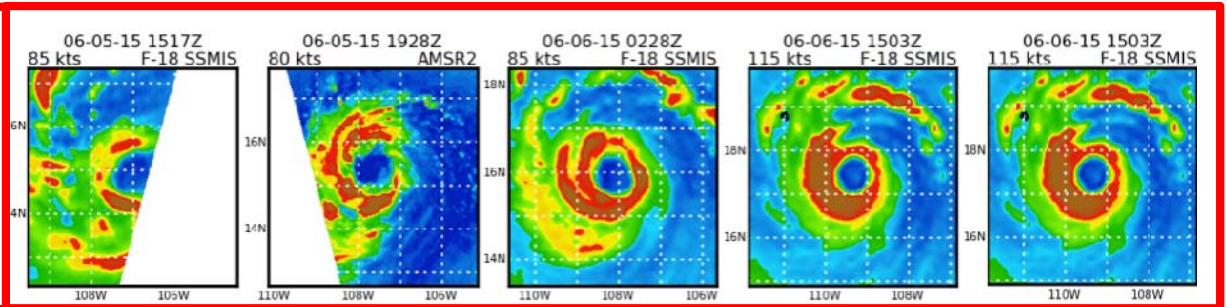
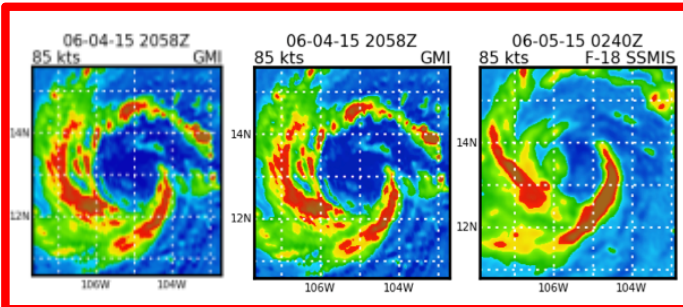
Initial Eye Development

Eyewall Replacement Cycle

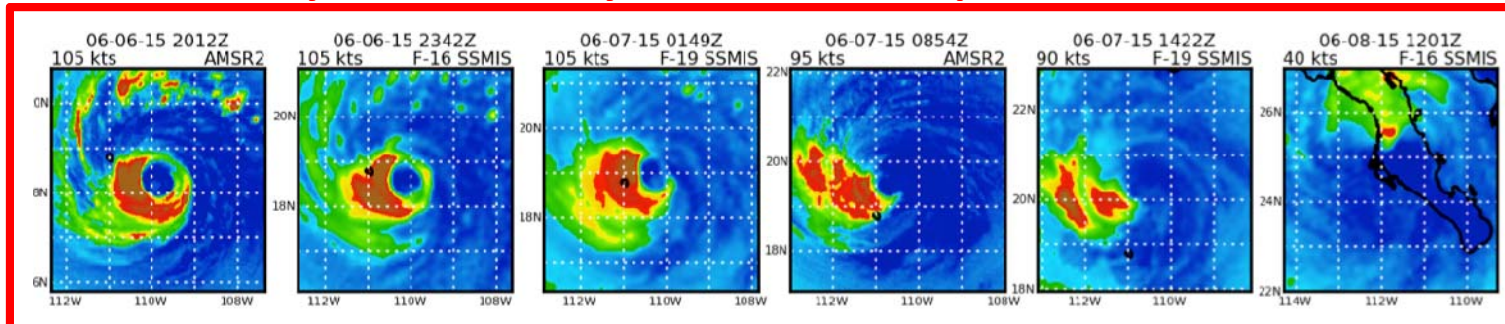


Eyewall Collapse during Rapid Decay

Second Eye Formation Cycle



Asymmetric Decay over cold water prior to Landfall

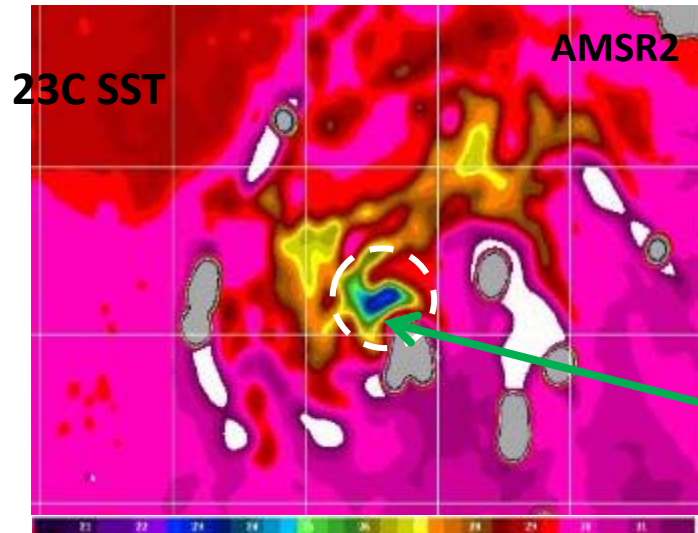




Blanca's Rapid Decay

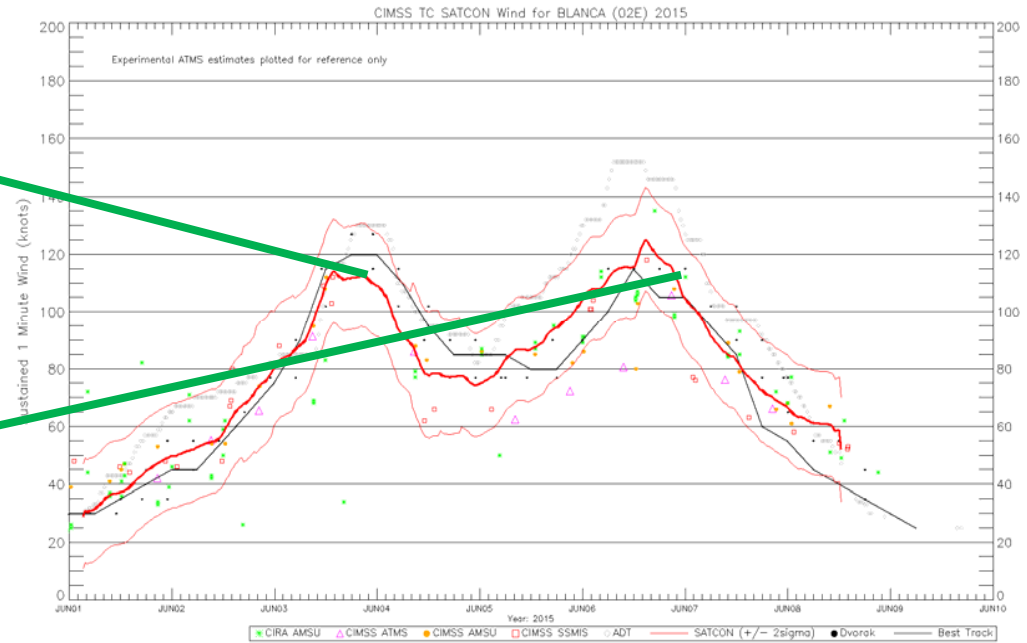
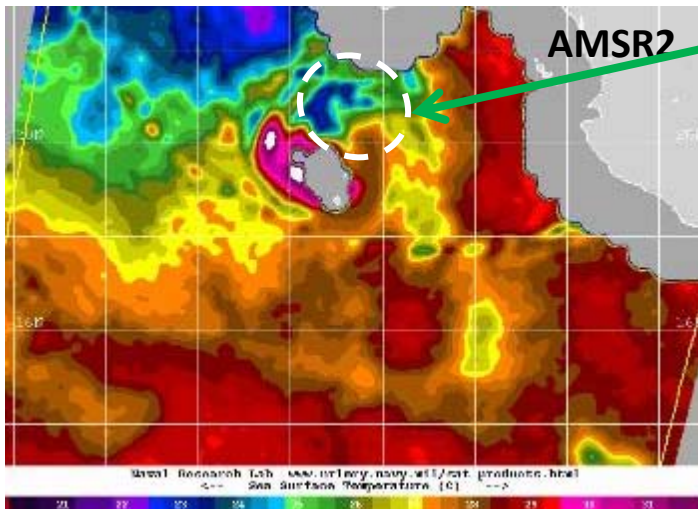


Blanca 4 June



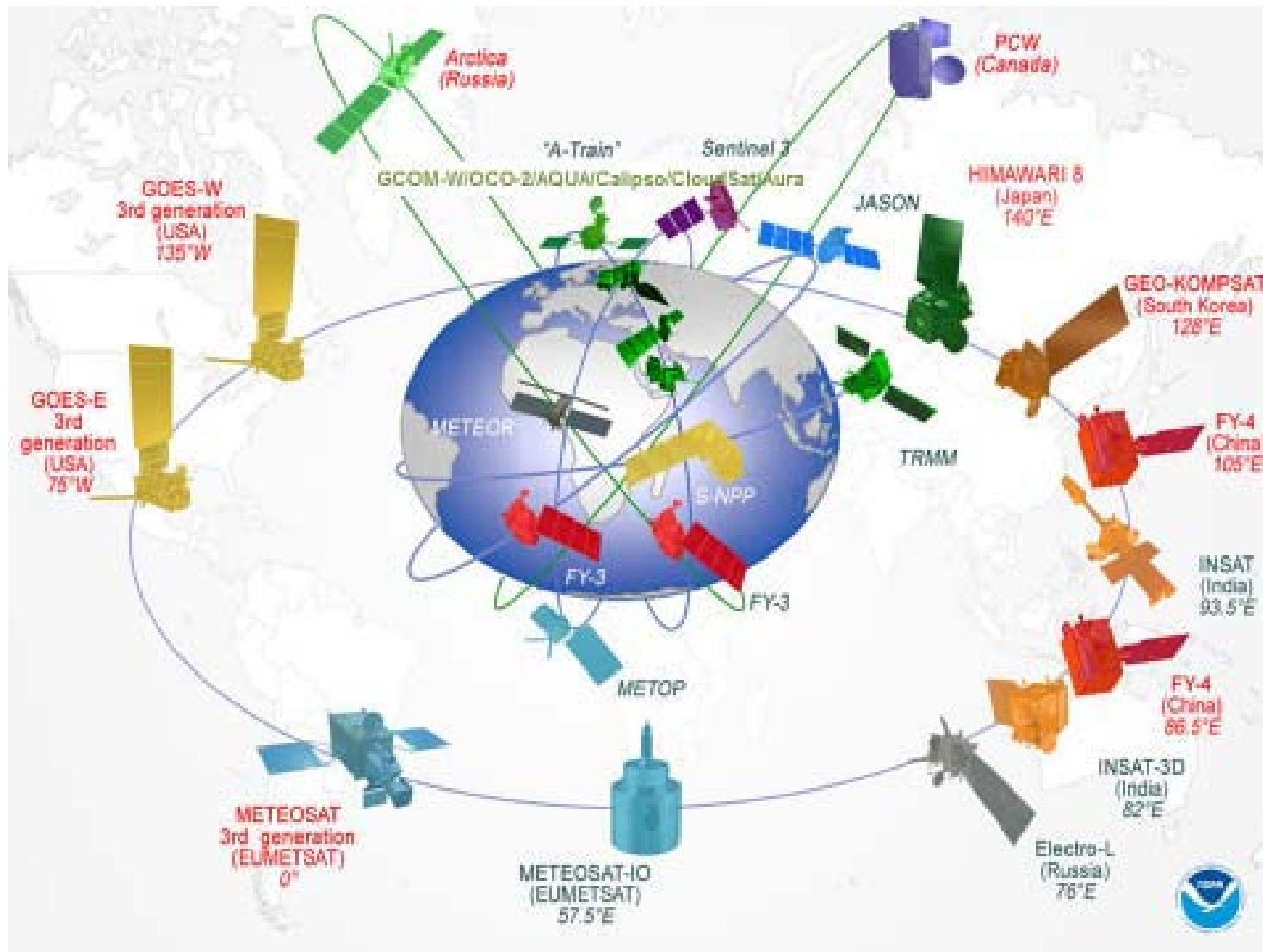
AMSR2 SST indicated that rapid decay was imminent

Blanca 7 June





The Global Observing System



We all need to contribute!