NOAA Update and Key Issues

Dr. Stephen Volz, Assistant Administrator for Satellite and Information Services

Space Studies Board Meeting

April 28, 2016

Outline

- NOAA Overview
- NOAA's observing systems
- Space-based observations of the future
- Service-Driven Science and Applications
- NOAA-relevant NAS activity
- Challenges

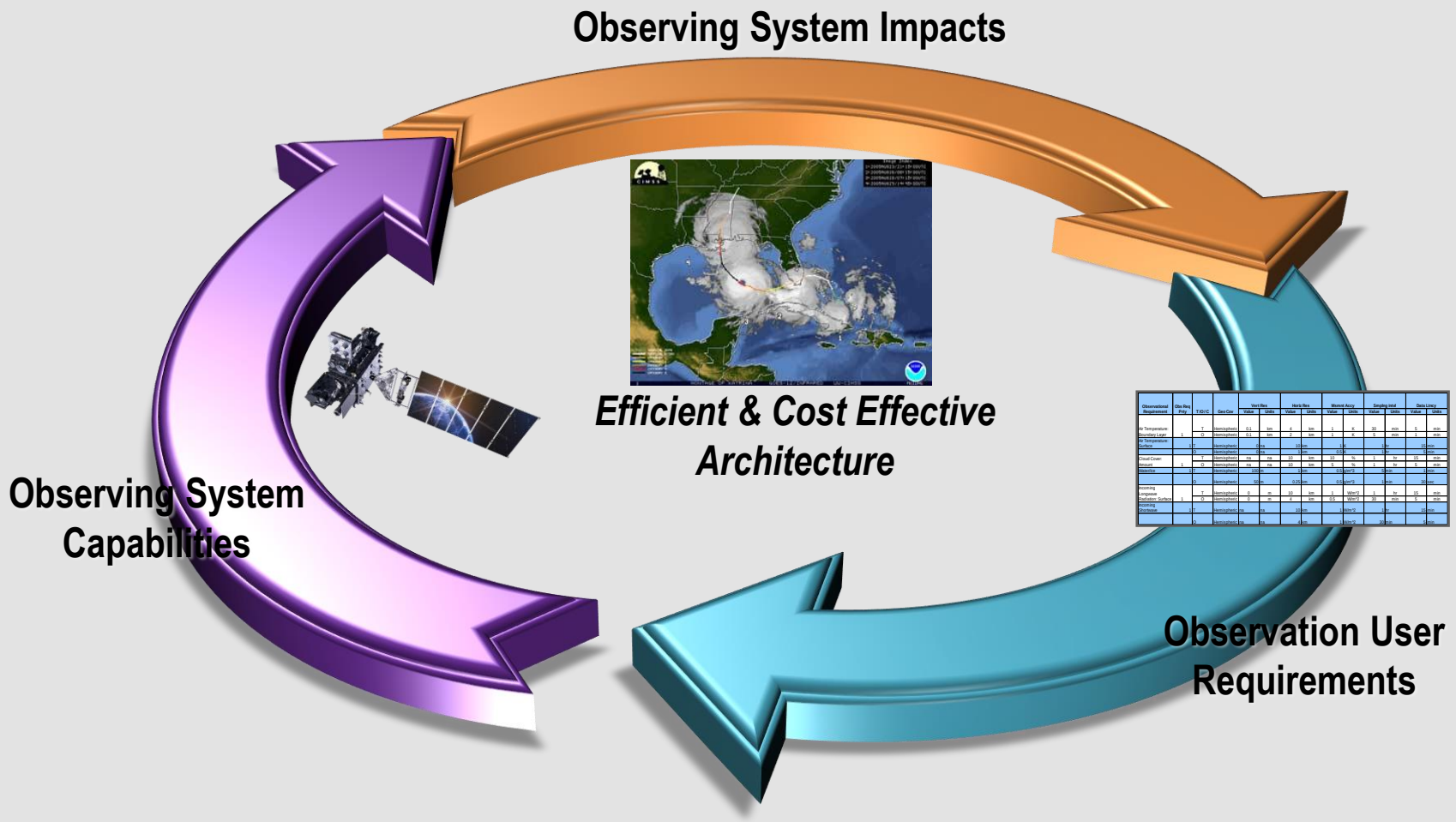
2 days with NASA, 30 minutes with NOAA

NOAA Strategic Priorities

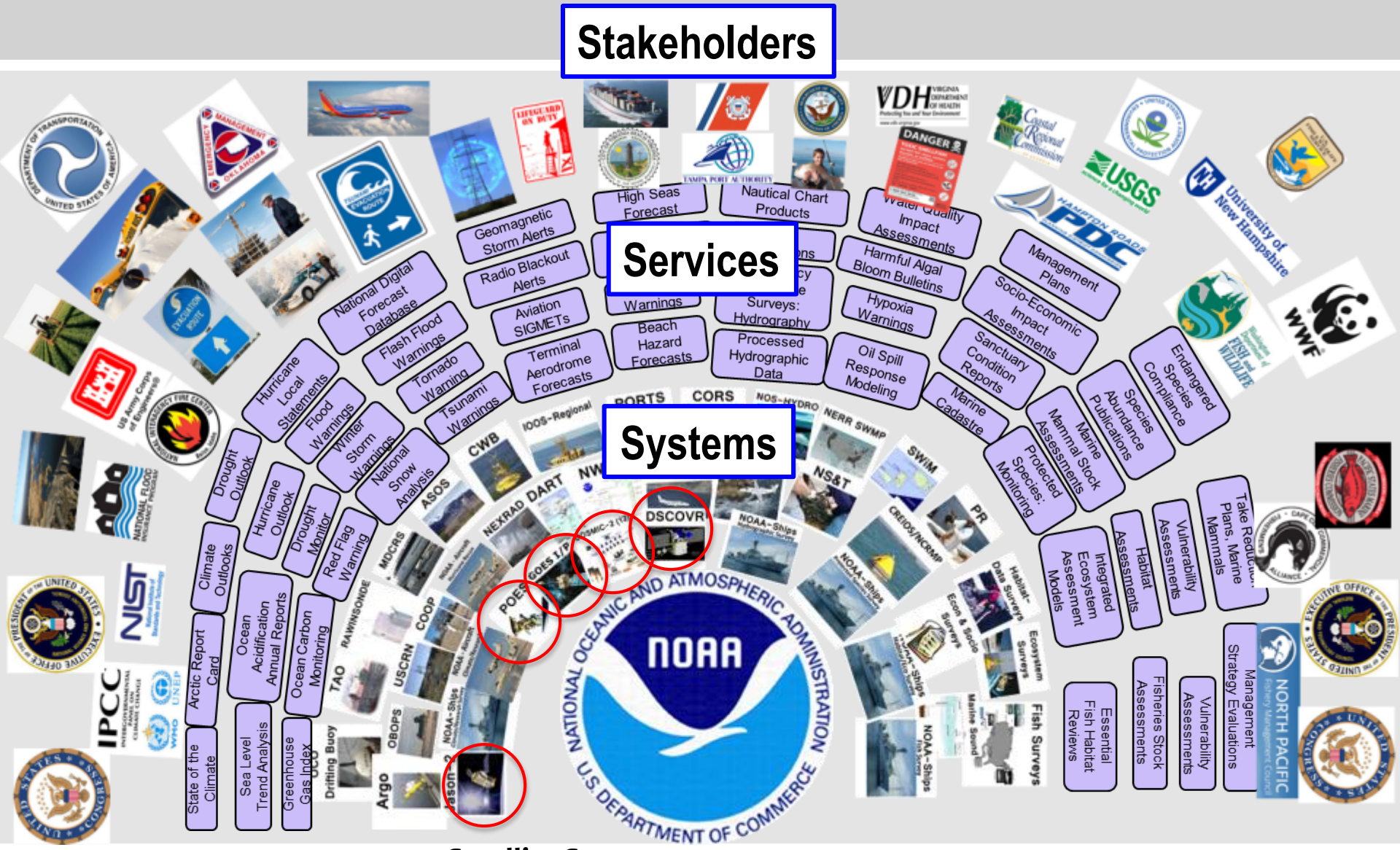
NOAA's Top Priorities

1. Provide Information & Services to Make Communities More Resilient
2. Evolve the National Weather Service
3. *Invest in Observational Infrastructure*
   - ***Observations account for $2.7B of NOAA's $5.45B budget***
4. Achieve Organizational Excellence

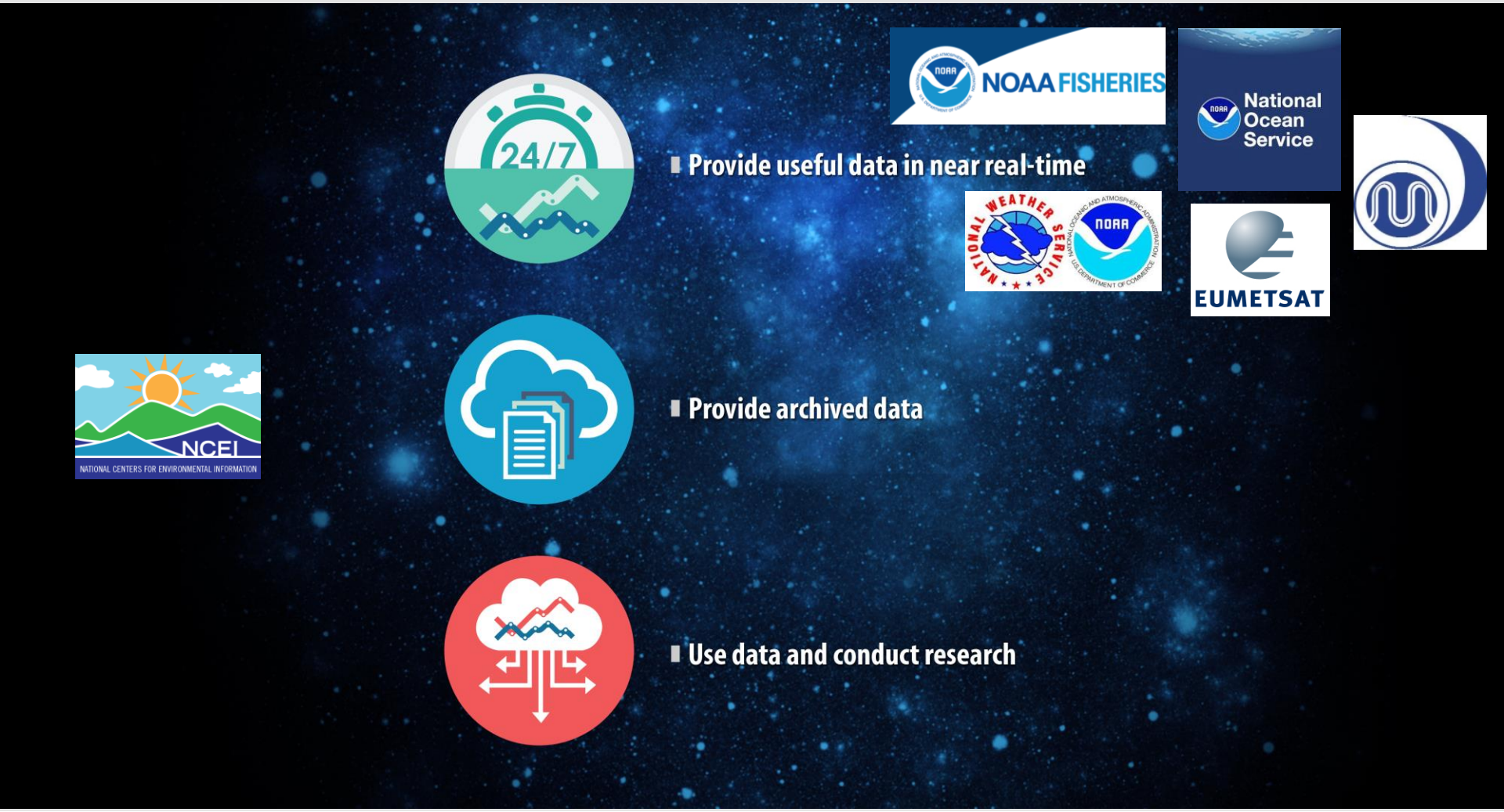
NOAA Observing System Council (NOSC) Portfolio Management



NOAA Stakeholders, Services, and Systems



Expanding Understanding of Our Dynamic Planet

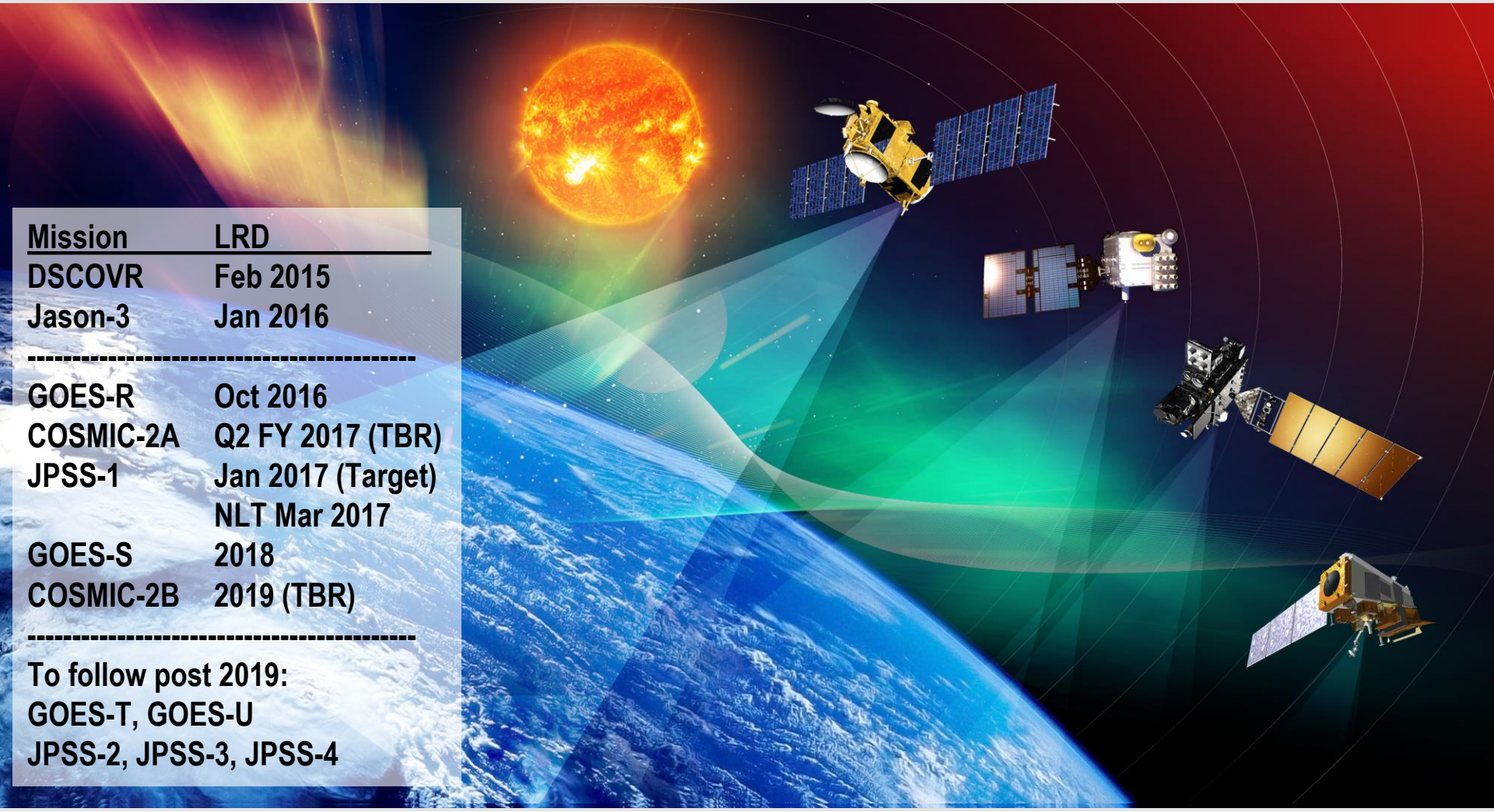


Partners in the Global Space-Based Observing System

Signed in the last six months:

- US-EC Agreement on free & open data exchange
- NOAA-Eumetsat Joint Polar System Agreement on polar observations

Recent and Upcoming Launches



Mission	LRD
DSCOVR	Feb 2015
Jason-3	Jan 2016
GOES-R	Oct 2016
COSMIC-2A	Q2 FY 2017 (TBR)
JPSS-1	Jan 2017 (Target) NLT Mar 2017
GOES-S	2018
COSMIC-2B	2019 (TBR)

To follow post 2019:
GOES-T, GOES-U
JPSS-2, JPSS-3, JPSS-4

Entering the New Era with JPSS and GOES-R

JPSS

- Over 2000 channels
- Spectral resolution in IR/mw
- Hi-Res visible (Arctic, fire, …)
- Night time imagery for Polar viewing

GOES-R

- Advanced Baseline Imager w/16 channels
- More rapid coverage of global and focused areas
- Geostationary Lightning Mapper

Increasing ability to blend all of this data with other data sources in real time in AWIPS2 for situational awareness & in data assimilation for numerical forecast models

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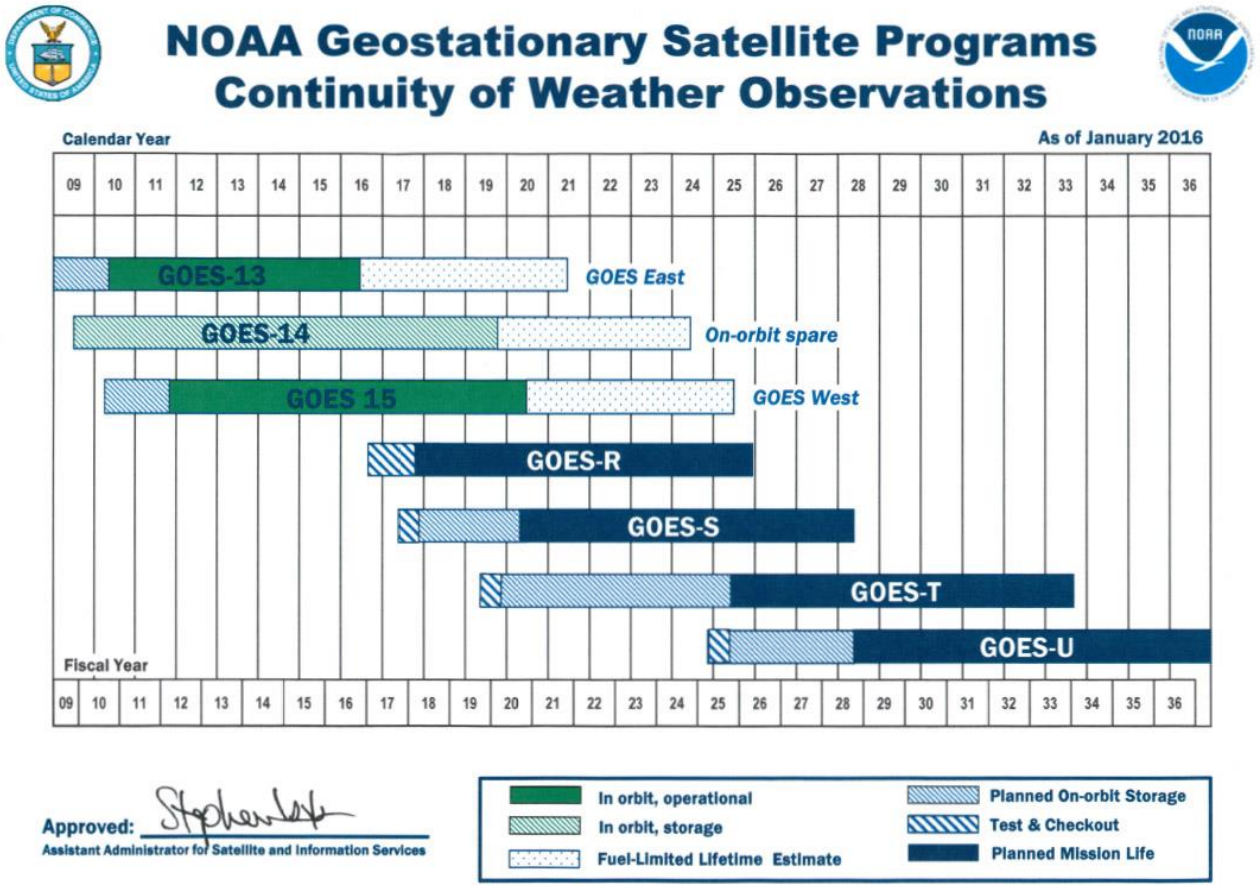
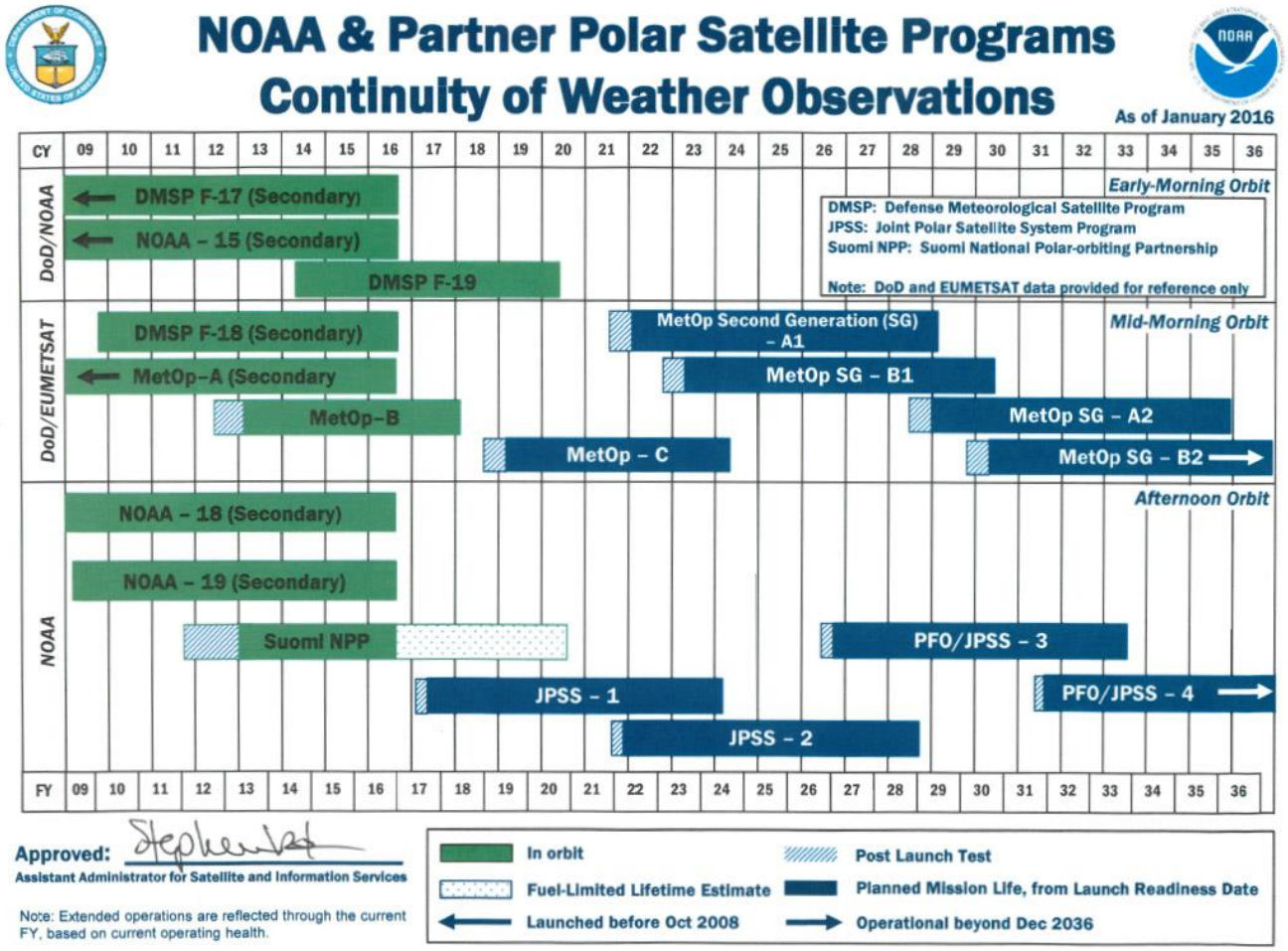
GOES Flyout Chart



Polar Flyout Chart



FY 2017 NESDIS Overview

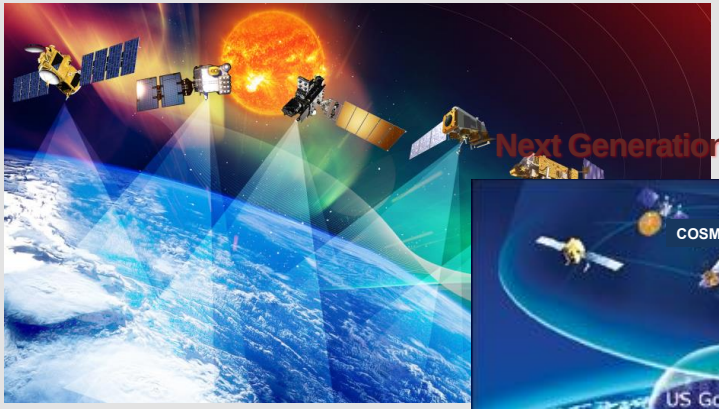
- FY 2017 Budget Request provides **$2,303.6 million total for NESDIS;** a $45.7 million decrease (~2%) from the FY 2016 Enacted, including a $49M reduction due to planned program changes (from planned roll off of GOES-R and JPSS)
- This request supports the priorities of the Administration, Department of Commerce and NOAA. In meeting these priorities, in FY 2017 NESDIS will:
  - Launch GOES-R, and continue building S, T, and U to ensure continuous Geostationary coverage of the western hemisphere
  - Launch JPSS-1, continue to build JPSS-2, and plan for PFO to ensure availability of data for weather prediction models
  - Launch COSMIC-2A constellation of six satellites, together with the USAF and Taiwan, providing critical tropical Radio Occultation measurements
  - Conduct essential architecture development for next generation weather and space weather
  - Assess viability of Commercial Data through pilot purchases
  - Maintain 24x7 satellite operations, product development, processing and distribution, and maintain the critical national environmental data archive

Architecting the Future Observing System

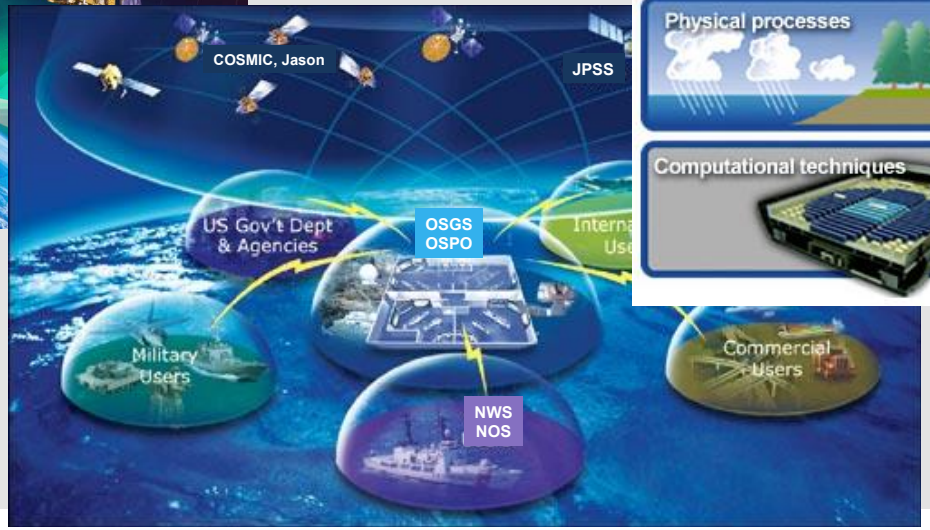
Develop a space-based observing enterprise that is flexible, responsive to evolving technologies, and economically sustainable.

--FY15 NOAA Annual Guidance

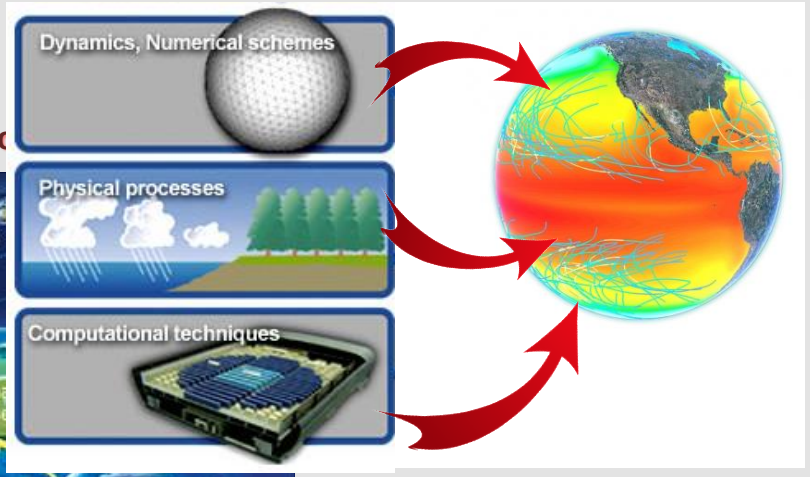
Global Earth Observing Satellite System



Next Generation Integrated & Adaptive Gro



Integrated & Assimilated Operational Data Flow



Opportunities & Challenges: Commercial Data

spire

TEMPUS GLOBAL DATA

PLANETiQ

The existence of commercial companies preparing to or actually delivering quality satellite observations is an emerging factor in our future system architecture studies

PLANET LABS

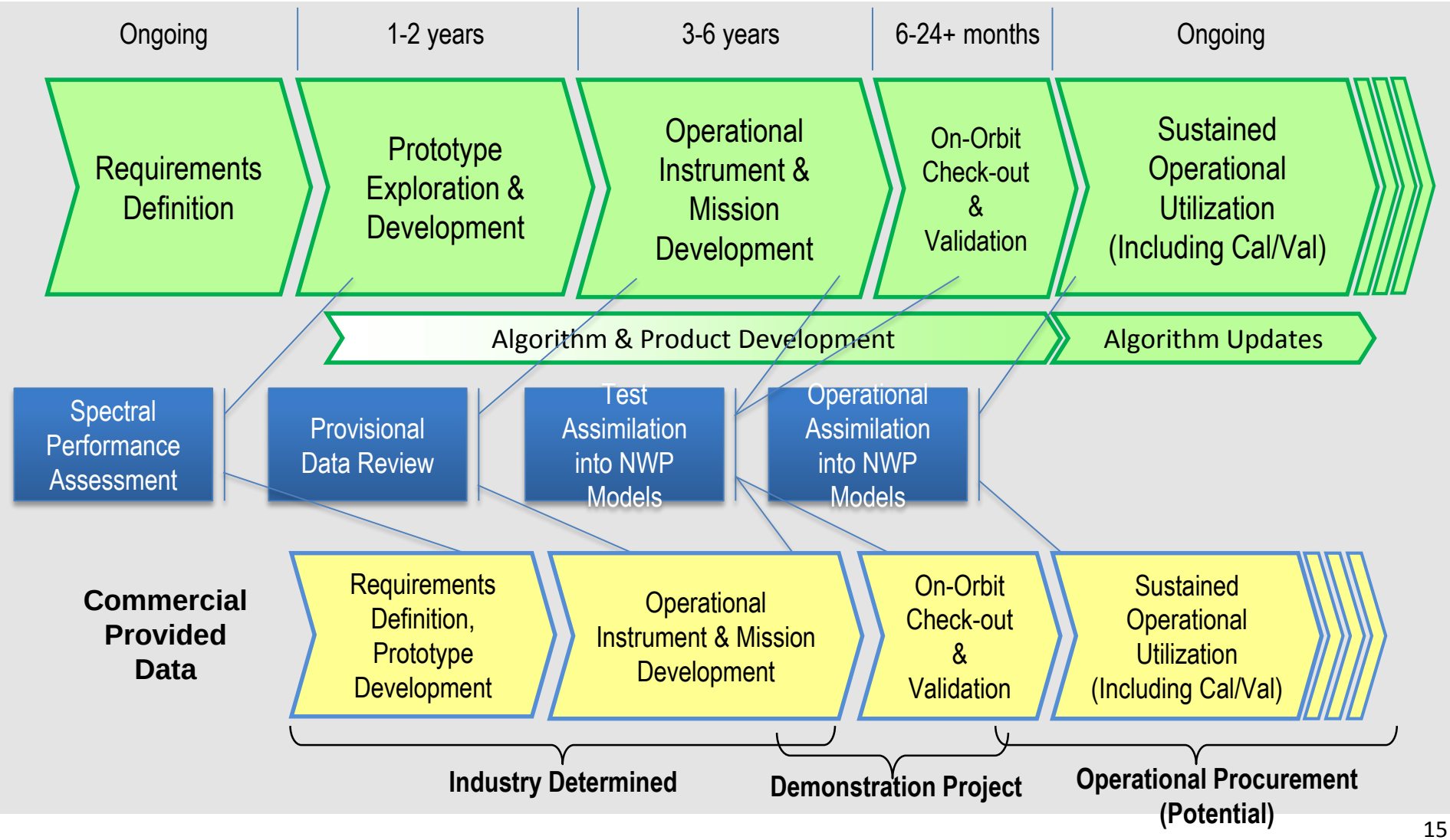
We have a number of challenges to be addressed as we add them into our assessments, including reconciling industry's development timeline with our deployment timelines

Skybox Imaging

GeoOptics

GeoMetWatch ADVANCED. AFFORDABLE WEATHER.

Opportunities & Challenges: Commercial Data



UTILIZATION OF SATELLITE DATA

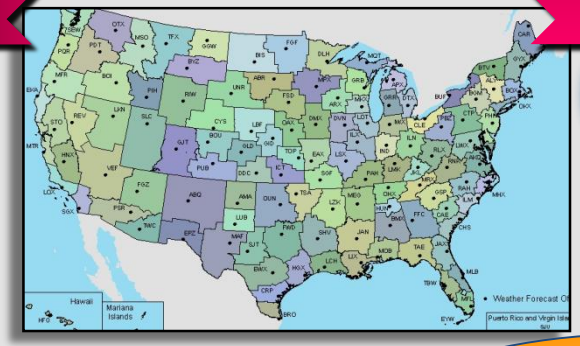
The Forecast Process

Science & Technology Integration

R2O

O2R

Observations



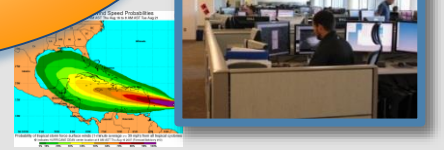
Dissemination

Central Processing

Analyze, Forecast, & Support

Central Guidance

Local Forecasts



NWS Strategic Outcome: A Weather-Ready Nation

- Becoming a Weather-Ready Nation is about building community resiliency in the face of increasing vulnerability to extreme weather, water & climate events

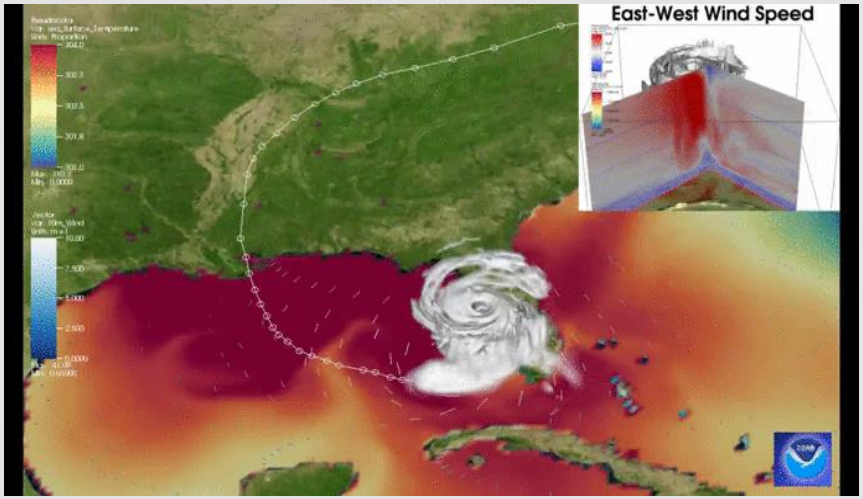
"Ready, Responsive, Resilient"

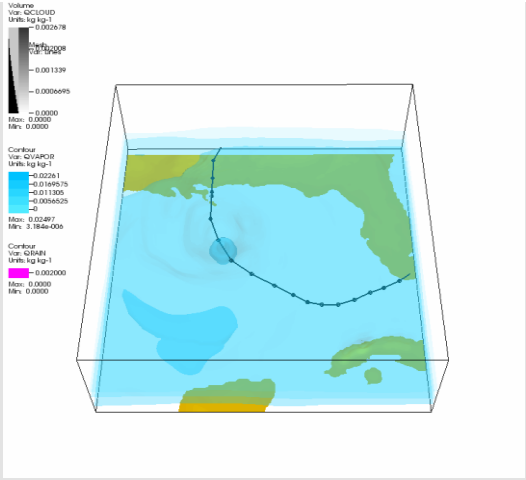
- Requires NWS to:
  - Fully integrate our field structure to produce:
    - *Better forecasts and warnings*
    - *Consistent products and services*
    - *Actionable environmental intelligence*

- Go the "last mile" to connect forecasts to critical national, state and location decisions
  - *Provide Impact-based Decision Support Services (IDSS)*
  - *Deliver through multiple and reliable dissemination pathways*
  - *Work with partners, including embedding NWS in Emergency Operations Centers and incorporating Social Sciences, to gain the public's needed response*

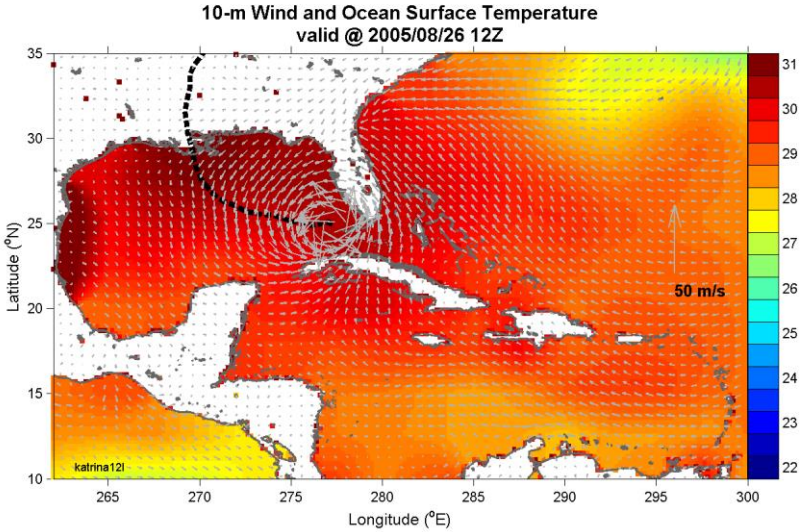
Involves entire US Weather, Water and Climate Enterprise WORKING TOGETHER to achieve far-reaching national preparedness for weather events

3-D Visualization of Hurricane Katrina Forecasts from 2015 Operational HWRF

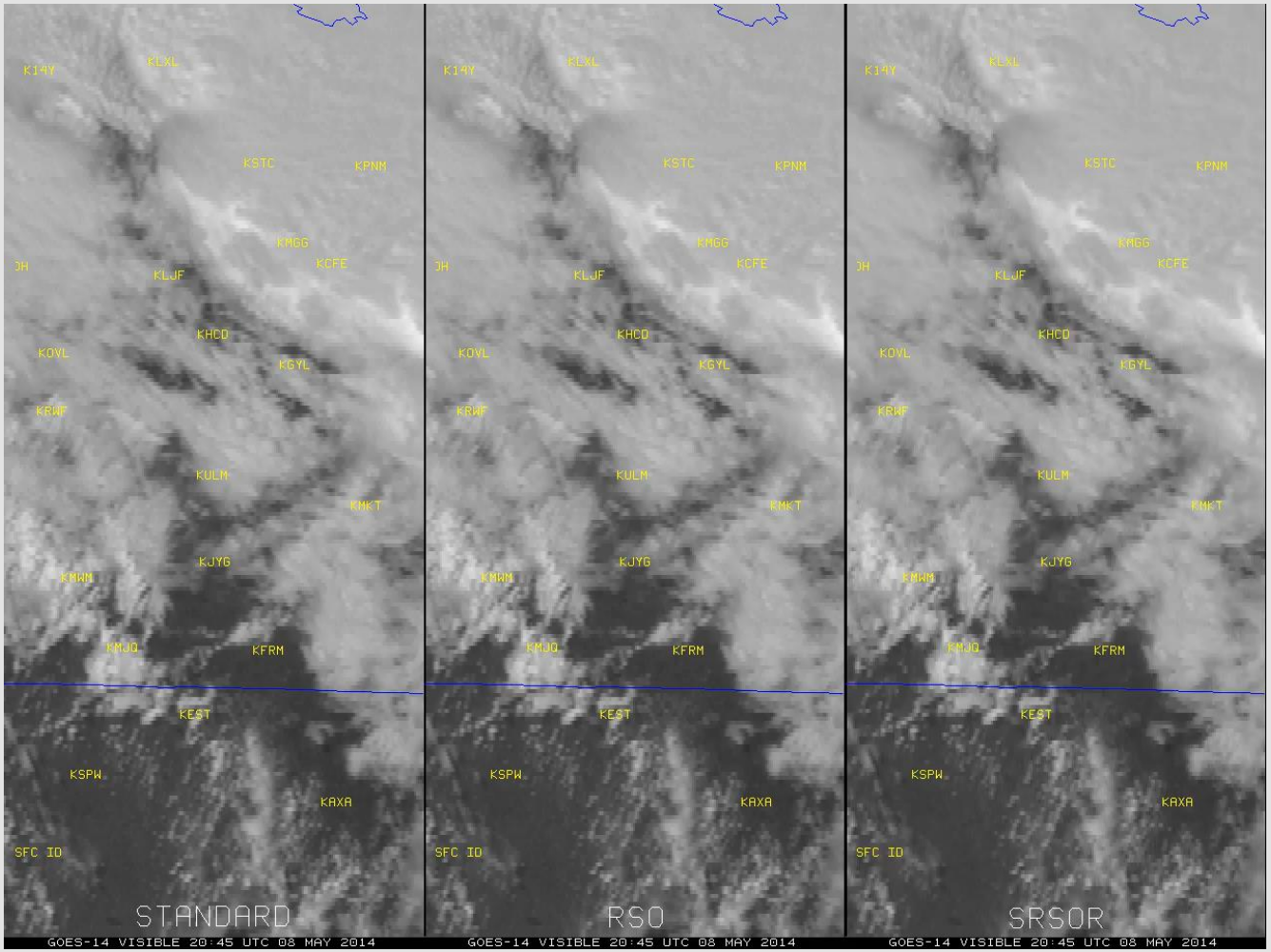




- Hurricane Katrina reminds us of critical and complex interactions between atmosphere, ocean, waves and land – all need to be accurately represented in numerical models for improving the forecast guidance
- NCEP Operational HWRF has demonstrated significant progress in improving the forecasts for high-impact events like Katrina

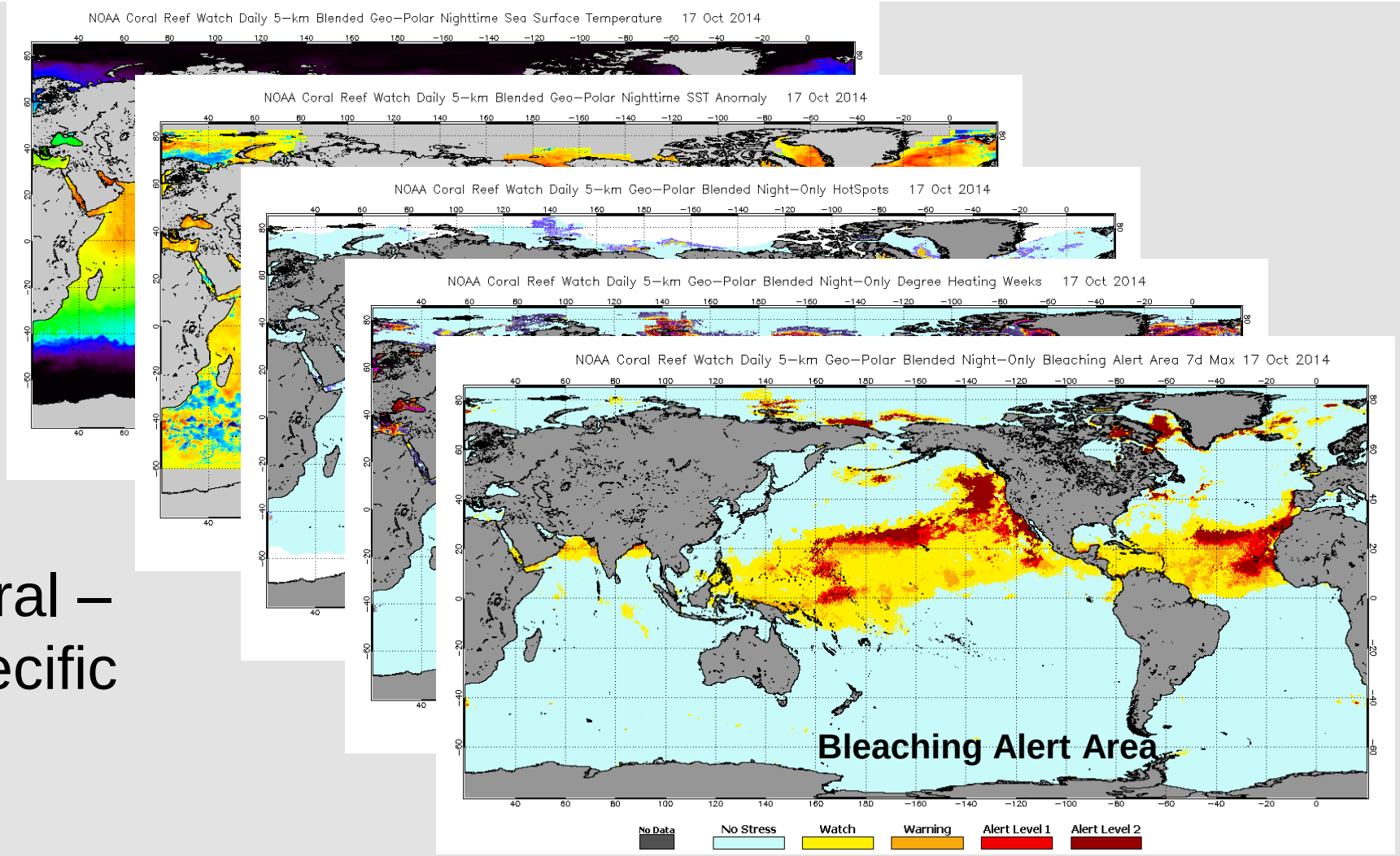


GOES-R Capabilities: Now and in the Future



Credit: Cooperative Institute for Meteorological Satellite Studies

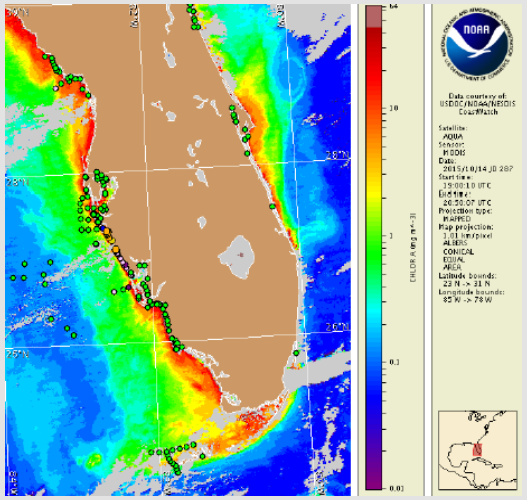
Coral Reef Watch
5-km Satellite-Based Products



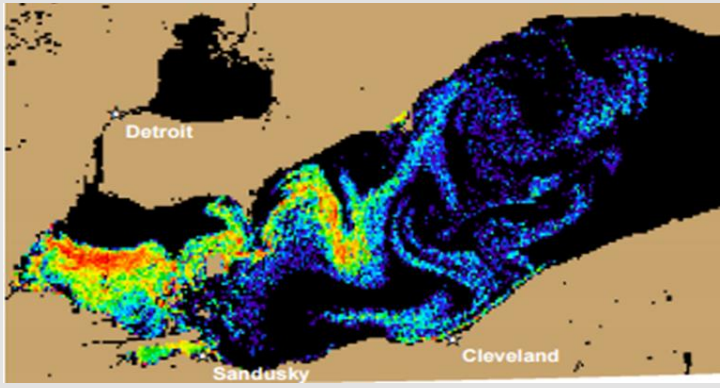
Coral – specific

One NOAA Collaboration for Ecological Forecasting

- NOS models run on NOAA/NWS operational supercomputer
- HAB, Hypoxia, Vibrio prediction in Gulf of Mexico led by NOS
- HAB – Real-time prediction in Great Lakes by NOS/OAR-GLERL:
- **The 5th NWS Strategic Goal " Enable environmental forecast services supporting healthy communities & ecosystem":**
  - Gulf of Mexico (status: operational)
    - NWS: WFOs Tampa and new in 2015, Miami and Key West, issue Beach Hazard Statements for high respiratory irritation from HAB
  - Lake Erie (status: experimental)
    - NWS (new in 2015): WFO Detroit provides decision support dashboard to NOS HAB analysts; WFO Cleveland hosts Lake Erie HAB web page



Source: NESDIS; 10/15/15



Source: NESDIS;9/8/15

NOAA Lake Erie HAB Bulletin (MERIS 2009-2011, now MODIS, soon Sentinel-3/OLCI!)

Experimental
Lake Erie Harmful Algal Bloom Bulletin
2011-008
08 September 2011
National Ocean Service
Great Lakes Environmental Research Laboratory
Last bulletin: 22 July 2011

Bloom from MERIS

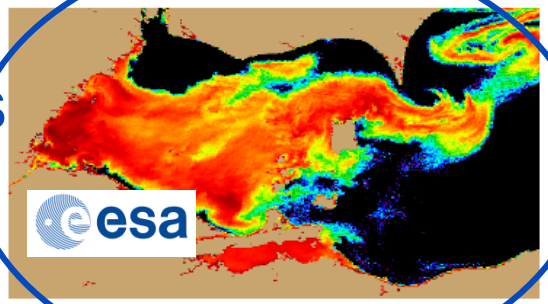


Figure 1. MERIS image from the European Space Agency. Imagery shows the spectral shape at 681 nm from September 03, where colored pixels indicate the likelihood of the last known position of the *Microcystis* spp. bloom (with red being the highest concentration). *Microcystis* spp. abundance data from shown as white squares (very high), circles (high), diamonds (medium), triangles (low) , + (very low) and X (not present).

Forecast (with Great Lakes CFS)

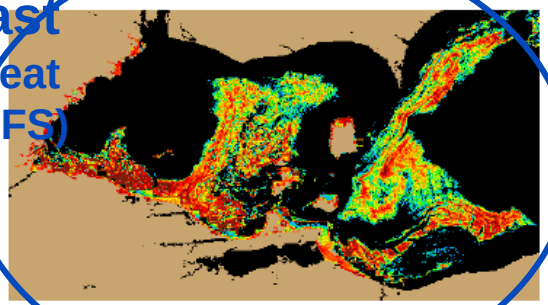
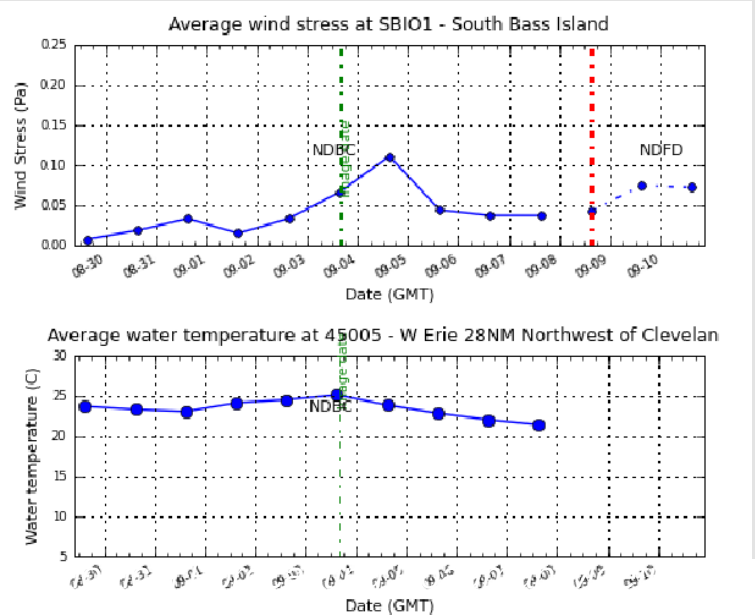


Figure 2. Nowcast position of *Microcystis* spp. bloom for September 08 using GLCFS modeled currents to move the bloom from the September 03 image.

- The value of what we bring is the ability to deliver a consistent information product with variable source observations
  - Initially a lot of work, but with enterprise ground and science work the additional investment for future missions is significantly reduced



National Water Center

University of Alabama – Tuscaloosa, AL

Initial Operating Capability: May 26, 2015

VISION: Scientific excellence and innovation driving water prediction to support decisions for a water resilient nation.

BENEFITS:

- State-of-the science modeling for global to street level predictions *(from 6,000 forecast locations to 2.7 million stream reaches)*
- Operations Center to establish common operating picture within NOAA and among water agencies; decision support for floods to droughts *(flood mapping to street level)*
- Proving ground to accelerate research to operations; partnerships with research communities *(e.g. CHUASI, National Flash Flood Interoperability Experiment)*
- Provides single place for multiple Agencies and disciplines to collaborate

Ongoing SSB Activities w/Relevance to NOAA

- ESAS 2017 Decadal Survey
  - NOAA is actively involved as a sponsor along with NASA and USGS
  - Increased effort to address operational Earth observation needs
- Achieving Science Goals with Cubesats
  - Exploring the potential for science from Cubesats
  - Understanding the difference between cubesats for demonstration and for operational use
  - Report will influence our work on operational cubesats, and our assessment of developmental maturity and operational mission risk
- NASA Science Mission Extensions
  - Processes and evaluation criteria for extensions for NASA missions may have elements in common elements with NOAA missions

Also, from the BASC:

- Advancing Social and Behavioral Science Research and Application within the Weather Enterprise

A Few Challenges

- Continue to deliver the complex and expensive systems on time and on budget
  - *Challenge: Continued commitment to maintain the pace of the GOES and JPSS satellites now under contract*
- Evolve the NESDIS and NOAA satellite utilization model to incorporate seamlessly data from multiple sources, including interagency, international, and commercial
  - *Challenge: Devise and implement operational approach to ingest data from all sources while meeting time latency, quality, validation, and IT security requirements*
- Define a new operating paradigm where the system is characterized as much by the product output as by the satellite input
  - *Challenge: Places significantly greater emphasis on the data processing and ground system hardware and data management, including increased funding*

Thank you!

NOAA's role in civilian space-based Earth Observation

"The Budget supports NOAA's broad environmental mission and redefines NASA and NOAA Earth-observing satellite responsibilities whereby NOAA will be responsible only for satellite missions which contribute directly to NOAA's ability to issue weather and space weather forecasts and warnings to protect life and property."

-FY16 President's Budget Request

NOAA is committed to meeting the observational requirements of its Line Offices – the National Weather Service (NWS), the Marine Fisheries Service (NMFS), and the Ocean Service (NOS) – with systems developed, deployed, and leveraged by NESDIS and the Office of Marine and Aviation Operations (OMAO). The NOAA Observing Systems Council (NOSC) serves as the coordinating body for trades and discussions.