NOAA Update and Strategic Direction

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

Space Studies Board Meeting
May 3, 2017
Outline

- NOAA Mission Overview
- The Changing Paradigm
- NESDIS Strategic Plan
  - Continuity
  - Future Architectures
- Challenges
Supporting NOAA’s Mission

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

NOAA’s Top Four Priorities:
1. To provide information and services to make communities more resilient
2. To evolve the National Weather Service
3. To invest in observational infrastructure 50% of NOAA’s Budget
4. To achieve organizational excellence
NOAA Stakeholders, Services, and Systems

Stakeholders

Services

Systems

Satellite Systems
• Our historical “Flyout” charts have reflected the polar and geostationary, fixed platform program approach.
This approach has produced great returns over the years

- Significant Improvements in 3-7 day Weather forecasts

- Improved NRT severe storm warnings & alerts
  - 20% increase in hurricane track and intensity forecasts from 2010-2015

- Companion Satellite Services
  - SARSAT: >30,000 lives saved worldwide and >7,000 saved in the USA since the program start
  - Argos Data Collection Services (A-DCS): 14,000 environmental platforms, almost 50% used by NOAA
However, we are now transitioning to a new paradigm
The NESDIS Strategic Plan

COMMITMENTS
- Continuity
- Data & Information

CAPABILITIES
- Architecture
- Use-inspired Science

COMMUNITY
- Partnerships
- People
First Focus: Return on National Investment
GOES-16 Early Images

09-Feb-2017 10:02:51 UTC
GOES-16 ABI
Water Vapor

09-Feb-2017 10:00:00 UTC
GOES-13 Imager
Water Vapor

GOES-16 Early Images
GOES-16 Early Images
GOES-16 Early Images
JPSS-1: Coming in September (Series will extend through ~2038)

ATMS and CrIS together provide profiles of atmospheric temperature, moisture, and pressure

VIIRS provides daily high-resolution imagery and radiometry across the visible to long wave infrared spectrum

OMPS Spectrometer with UV bands for ozone total column measurements

CERES or RBI Scanning radiometer which supports studies of Earth Radiation Budget

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The NESDIS Strategic Plan

COMMITMENTS
- Continuity
- Data & Information

NESDIS

CAPABILITIES
- Architecture
- Use-Inspired Science

COMMUNITY
- Partnerships
- People
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
Planning for the Future Observation Architecture

- **Strategic Priorities**
  - Commercial Data Sources
- **Observation Priorities**
  - Pre-Phase A
- **Technology Opportunities**
  - Partner Sources
  - Instrument Capabilities Allocated to Orbits
  - Assurance / Replenishment / Launch policies
  - High Level Cost estimates
  - Technology and Integrated roadmaps
- **Commercial Opportunities**
  - Program(s) of Record
  - Enterprise Ground

Diagram Flow:
Addressing Needs Across NOAA

WEATHER READY NATION
1. Aviation Weather and Volcanic Ash
2. Fire Weather
3. Hydrology and Water Resources
4. Marine Weather and Coastal Events
5. Hurricane/Tropical Storms
6. Routine Weather
7. Severe Weather
8. Space Weather
9. Tsunami
10. Winter Weather
11. Environmental Modeling Prediction
12. Science, Services and Stewardship

National Weather Service

HEALTHY OCEANS
1. Ecosystem Monitoring, Assessment and Forecast
2. Fisheries Monitoring, Assessment and Forecast
3. Habitat Monitoring and Assessment
4. Protected Species Monitoring
5. Science, Services and Stewardship

National Marine Fisheries Service

RESILIENT COASTS
1. Coastal Water Quality
2. Marine Transportation
3. Planning and Management
4. Resilience to Coastal Hazards and Climate Change
5. Science, Services and Stewardship

National Ocean Service

CLIMATE
1. Assessments of Climate Changes and Its Impacts
2. Climate Mitigation and Adaptation Strategies
3. Climate Science and Improved Understanding
4. Climate Prediction and Projections

Office of Oceanic and Atmospheric Research

NOAA Mission Service Areas by Line Office
Planning for the Future Observation Architecture

Architectural Analysis

- Pre-Phase A
  - Commercial Data Sources
  - Partner Sources
  - Program(s) of Record

- Architectural Analysis
  - Instrument Capabilities Allocated to Orbits
  - Assurance / Replenishment / Launch Policies
  - High Level Cost Estimates
  - Technology and Integrated Roadmaps

Strategic Priorities

Observation Priorities

Technology Opportunities

Commercial Opportunities

Enterprise Ground
Pre-formulation: Bridging the gap between tech development and operational system acquisition

- Reduces costs thru design concept studies and tech demos
- Detailed activities will be based on Architecture Study results

<table>
<thead>
<tr>
<th>Architecture Element</th>
<th>Pre-Formulation Activity</th>
<th>Acquisition Activity</th>
<th>Potential Examples</th>
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<tbody>
<tr>
<td>Commercial Service</td>
<td>▪ Sample Data Buy for System Engineering and Quality Evaluation</td>
<td>▪ Operational Mission Data Buy</td>
<td>▪ Radio Occultation Data ▪ Communication Services</td>
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<td>New Technology insertion (e.g. Lab-developed)</td>
<td>▪ Technology transition, producibility &amp; manufacturability ▪ Concept competition</td>
<td>▪ System Procurement</td>
<td>▪ EON to mature Small Microwave Sounder to TRL 7 for operational system following NASA-funded MIRADA</td>
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<tr>
<td>Heritage Instrument</td>
<td>▪ Obsolescence Mitigation</td>
<td>▪ System Procurement</td>
<td>▪ EO Focal Planes</td>
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<td>Use-driven Data Product</td>
<td>▪ Algorithm transition/development</td>
<td>▪ Operational Data Exploitation Algorithm, End-to-End Validation</td>
<td>▪ Urgent data products (e.g. volcanic eruptions, oil spills)</td>
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Planning for the Future Observation Architecture

Strategic Priorities

Observation Priorities

Technology Opportunities

Commercial Opportunities

Architecture Analysis

Pre-Phase A

Commercial Data Sources

Partner Sources

Program(s) of Record

Enterprise Ground

Instrument Capabilities Allocated to Orbits
Assurance / Replenishment / Launch policies
High Level Cost estimates
Technology and Integrated roadmaps
Technology Insertion Candidate Examples

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<td><strong>Infrared (IR) Sounding</strong></td>
<td><strong>Visible / IR Imaging</strong></td>
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- Study/Select
- Risk Reduction
- Development
- Validation

Potential Enabling Technology: NASA investment in CubeSat based mid-wave IR sounders for the JPL CubSat Infrared Atmospheric Sounder (CIRAS) mission (Pictured)

Potential Enabling Technology: NOAA’s EON-MW concept (pictured) is based on NASA funded MIT/LL CubeSat based microwave sounder technology demonstrations MiRaTA and MicroMAS-2/TROPICS (pictured).

Potential Enabling Technology: NASA investment in CubeSat based mid-wave IR sounders for the JPL CubSat Infrared Atmospheric Sounder (CIRAS) mission (Pictured)

- Low cost, quickly deployable systems allow for potential cost reduction, increased resiliency and continuity of observation while augmenting existing operational systems
- Validation (success/failure) of multiple easily deployable assets allows shorter turn times to address gaps
- Short turn times allow for tech insertion and revectoring of resources upon system validation
Planning for the Future Observation Architecture

Strategic Priorities | Observation Priorities | Technology Opportunities | Commercial Opportunities

Architecture Analysis

Pre-Phase A

Commercial Data Sources
Partner Sources
Enterprise Ground
Program(s) of Record

Instrument Capabilities Allocated to Orbits Assurance / Replenishment / Launch policies High Level Cost estimates Technology and Integrated roadmaps
Example of operational demonstration plan (NOAA/NASA collaborative Ops)

- Earlier collaboration with NASA in its selection of Earth Venture and other competitive selections
  - Explore co-investments, co-authored calls, joint selection
  - Potential for additional NOAA funding to support enhanced operational features (e.g., near real time access)
- Participation in cal/val and execution of operational demos to assess potential operational impact
- Inform operational system requirements and priorities

- Operational demonstration and impact assessment of value of GNSS-derived ocean vector winds; potential residual operations

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= Partner Funded
= NOAA Funded
= Joint Participation
Example of leveraging a NASA investment: NASA Surface Water & Ocean Topography (SWOT)

- NASA/CNES mission to measure ocean topography and waves, hydrology
  - Altimeter, Ka-band Radar Interferometer, Microwave radiometer
- NOAA could:
  - Develop and operationally deploy algorithms (leveraging NASA science team investment)
  - Participate in the Calibration/Validation
  - Provide operational or mature "experimental" products to NWS, NOS to achieve currently unsatisfied observation requirements
Opportunity to leverage international partnership: India’s Ocean Surface Scatterometer Mission

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<td>OceanSat-3 Operational Mission</td>
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<td>Cal/Val</td>
<td>Operational Product Production</td>
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= Partner Funded  = NOAA Funded

- Indian Space Research Organization (ISRO) missions to measure ocean surface vector winds
  - ScatSat-1 gapfiller: OceanSat Scatterometer
  - OceanSat-3: OceanSat Scatterometer

- NOAA could:
  - Develop and operationally deploy algorithms (leveraging previous scatterometer algorithm work)
  - Build data pipe and secure ingest of data
  - Provide operational products to NWS and NOS through 2023
Planning for the Future Observation Architecture

- **Strategic Priorities**
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- **Technology Opportunities**
- **Commercial Opportunities**

**Architecture Analysis**
- Pre-Phase A
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- Program(s) of Record

Instrument Capabilities Allocated to Orbits
Assurance / Replenishment / Launch policies
High Level Cost estimates
Technology and Integrated roadmaps
Commercial Weather Data Pilot

Win-win for both NESDIS and the commercial sector

FY16 $3M Round 1
May 2016
Release RFI
Jun/Jul 2016
Released draft RFQ/Held Industry Day
Jul 2016
Released Final RFQ
Sept 2016
Awarded 2 Contracts
Oct 2016 - Apr 2017
Collect Data
Through Sept 2017
Evaluate Data through FY 2017

Data type: Radio Occultation

FY17 $5M Request Potential Round 2

Release RFQ
Award Contract(s)
Collect Data
Perform Data Evaluation

Data type: To Be Determined

Additional Outreach to the Commercial Community is likely
Recent guidance to NESDIS

• Administration: FY 2018 Budget Blueprint
  – Maintains the development of NOAA’s current generation of polar orbiting and geostationary weather satellites
  – Achieves annual savings from NOAA’s Polar Follow On satellite program
  – Provides additional opportunities to improve robustness by expanding the utilization of commercially provided data to improve weather models

• Congress: Weather Research and Forecasting Innovation Act of 2017
  – Quantitative assessments of the relative value and benefits of observing capabilities and systems
  – NAS study of future satellite data needs
  – Authorizes commercial data purchases and hosted payloads
  – NOAA strategy for use of commercial sector capabilities
  – Pilot program to demonstrate commercial capabilities, and for the purchase and operational use of commercial capabilities once demonstrated
  – Continued adherence to international data sharing agreements
Our Challenges Remain

• Continue to deliver the complex and expensive systems on time and on budget
  ▪ Challenge: Maintaining the performance and reliability of the observing system, led by GOES and JPSS systems, under the revised budget guidelines

• 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 and service provision as by the satellite input
  ▪ Challenge: Places significantly greater emphasis on the end-to-end system performance, including satellites but also data processing, ground system hardware and data management, and service providers such as NWS
The 2016-17 Independent Review Team report provides expert analysis of how well NESDIS has addressed recent challenges and opportunities and its strategic path forward. This marks the third such review we've commissioned since 2012. We welcome you to read the executive summary (PDF) and the full report (PDF).

Members of the news media may contact NESDIS by reaching out to our office of public affairs:

John Leslie
Email: John.Leslie@noaa.gov
Phone: 301-713-0214

Latest

A Note to the Weather Community about Using GOES-16 Data
NOAA Scientist Receives Prestigious Space Science Award (PDF)
Flasy First Images Arrive from NOAA's GOES-16 Lightning Mapper
NOAA's GOES-16 Satellite Sends First Images to Earth (PDF)
Thank you!