NOAA: Current and Future Satellite Systems

12th Asia-Oceania Meteorological Satellite Users Conference (AOMSUC-12)

Ms. Irene Parker
Deputy Assistant Administrator Systems
NOAA NESDIS

November 15, 2022
NOAA’s National Environmental Satellite Data and Information Service (NESDIS) -- at a Glance

- NESDIS operates the Nation’s weather satellites, 24/7
- Acquires next-generation Earth observation satellites
- Provides data and imagery for predictive environmental and atmospheric modeling
- Provides definitive assessments of the U.S. and global climate
- Maintains one of the most significant archives of environmental data on Earth
With a Global Perspective

NESDIS Mission

Provide a truly integrated digital understanding of our earth environment that can evolve quickly to meet changing user expectations by leveraging our own capabilities and partnerships.
## NOAA’s Next-Gen Earth Observation Strategy

**Integrated, Adaptable, and Affordable: Orbits, Instruments & Systems**

<table>
<thead>
<tr>
<th>LEO</th>
<th>GEO</th>
<th>Space Weather</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miniaturized instruments on small, lower cost, and proliferated satellites and partner data improving forecasts through better and additional data. Better precipitation forecasts, wave height predictions, ocean currents, and more.</td>
<td>Continuous real-time observations supporting warnings and watches of severe weather and hour-by-hour changes. High-inclination orbits to observe northern latitude &amp; polar regions.</td>
<td>Reliably monitoring coronal mass ejections from L1, GEO, and LEO can protect the nation’s valuable, vulnerable infrastructure. New capabilities at L5 and high earth orbit can provide additional insight and improve forecasts.</td>
</tr>
</tbody>
</table>

### Common Ground Services

Secure ingest of data in different formats from different partners requires a flexible, scalable platform. Common Services approach integrates cloud, AI, and machine-learning capabilities to verify, calibrate, and fuse data into new and better products and services.
NOAA Satellite Data is Freely & Openly Available

- NOAA satellite data are available on a FULL and OPEN Basis
- National Centers for Environmental Information (NCEI)
- From the ocean floor to the surface of the sun
- Trusted, reliable, unique
- Real-world relevance
- Critical to millions of customers
- Continually updated
Data Systems Societal Impact

NESDIS data, products and services are foundational to NOAA’s mission. The delivery of timely, accurate, precise, accessible, and useable information drives public response, understanding, and preparedness.

NESDIS data touches people's lives every day.
Growing User Needs

**LEO:** Users expect NOAA to provide improved observations and forecasts:

- **Higher resolution forecasts for short term and long term weather prediction** - improved microwave, infrared and RO soundings. More frequent observations with improved spatial and vertical resolution to measure the atmosphere closer to Earth’s surface.

- **The Blue Economy and coastal communities** requires improved information on phytoplankton and harmful algal blooms - hyperspectral ocean color imagery at improved spatial resolution.

- **Timely and accurate forecasts of air quality hazards** require enhanced atmospheric chemistry sensors for monitoring gases such as sulphur dioxide that cause smog. Improved measurements of ozone and trace gases such as nitrogen dioxide, methane and formaldehyde are need to assess climate change.

**GEO:** Users expect NOAA to meet new requirements with new observations:

- **Improved numerical weather prediction and local nowcasting** - delivered by Hyperspectral IR Sounder.

- **Monitoring dynamic coastal/ocean features, ecosystem change, water quality, and hazards** - delivered by Ocean Color Instrument.

- **Monitoring air quality and linkages with weather and climate** - delivered by Atmospheric Composition Instrument.

![Images of geospatial data]
Growing User Needs

**Space Weather:** Users expect NOAA to meet new requirements with new observations:

- **Longer-lead time** and **more accurate solar storm warnings** require operational off-Sun-Earth-axis (L5) observations.
- **Aviation, energy, and defense** require forecast the location of the auroral oval and probability.
- **Aviation, space commerce, energy, defense** would use thermosphere imagery and in situ observations for upper atmospheric weather and satellite drag forecasting.

**Climate Products & Services:** Users expect NOAA to meet new requirements with new climate product and services.

- **Increase focus on fire weather products**
  - Long and short-term fire products that address critical gaps in the fire product lifecycle and improves understanding of long-term trends in fire activity, emissions, and land surface properties
  - Ensure coordination with fire community, NOAA line offices (esp OAR/NWS), underserved communities, and Fire Weather Testbed research and applications development

- **Ocean, coastal, and Arctic/Antarctic products**
  - Will improve ability to understand and assess environmental change, enable development of new climate applications, and amplify climate services to address the needs of underserved communities
  - Provides products to NOAA; the public; and commercial, academic, and international users

- **Improving local, state, and regional climate services and private sector development for the emerging Climate Enterprise**
  - Supports place-based climate services and information products to inform decision making relevant to region-specific economic activity, hazards, and vulnerability
  - Invigorating the State Climate partnership, train local forecast offices on NOAA’s climate assets, and strengthen regional and state partnerships.
  - Provides baseline essential climate information, enabling a capable, expansive commercial Climate Enterprise to develop
Application: Tonga Volcano Eruption – January 2022
Application: NOAA CoastWatch Supporting Pakistan Flooding Information

Ocean Color Team Monitoring of Severe Flooding in Pakistan Using VIIRS False Color Images Routine daily monitoring

Higher resolution data from OLCI (Ocean and Land Colour Instrument) aboard Sentinel 3
Application: Fire Monitoring

Images from NOAA-20 VIIRS. November 2019

Eastern Australia

NOAA-20 captures plumes of smoke from the Camp Fire in Northern California, September 2020

GOES-R provides nearly continuous observations of fires
Application: Coral Reef Watch Bleaching Alert

coralreefwatch.noaa.gov/
Alone: NOAA Operates 16 Satellites
Together: We Form an International Community
Thank you!

9 Feb 2020: Himawari-8, GOES-17, GOES-16, Meteosat-11
(image credit: CIMSS/SSEC)
Back-up Slides
NOAA Geostationary Satellite Programs
Continuity of Weather Observations

Calendar Year

12 14 16 18 20 22 24 26 28 30 32 34 36 38 40

As of January 2022

GOES-14

GOES-15

GOES-16

GOES-17

GOES East

GOES West

NOTE: Reliability analysis-based extended life estimates are assessed after one year on orbit.

Click on any bar for current status

Click on bar for current status

Fiscal Year

13 14 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

In orbit, operational
In orbit, storage
In orbit, active storage
In orbit, checkout
Planned in-orbit Storage
Planned in-orbit Checkout
Planned Mission Life

Reliability analysis-based extended weather observation life estimate (60% confidence) for satellites on orbit for a minimum of one year – Most recent analysis: 1 August 2021

Approved: Stephen Volz
Assistant Administrator for Satellite and Information Services
NOAA Polar Satellite Programs
Continuity of Weather Observations

Calendar Year

- NOAA - 15
- NOAA - 18
- NOAA - 19
- Suomi NPP
- NOAA - 20
- JPSS - 2
- JPSS - 3
- JPSS - 4

Suomi NPP: Suomi National Polar-orbiting Partnership
JPSS: Joint Polar Satellite System Program

Click on any bar for current status

NOAA-18

In orbit, operational
Launch date prior to Jan 2013
Reliability analysis-based extended weather observation life estimate (60% confidence) for satellites on orbit for a minimum of one year -- Most recent analysis: 1 August 2021

Planned Mission Life (from launch date)
Planned Mission Life (beyond 2038)

Approved: Stephen Volz
Assistant Administrator for Satellite and Information Services