NESDIS: NOAA's Satellite & Information Service

Dr. Stephen Volz

NOAA Assistant Administrator for Satellite and Information Services

Maryland Space Business Roundtable

Oct. 18, 2016

Where did we come from?

- Current state of NOAA's Satellite Earth Observation System

Where are we now?

- Upcoming great transition

Where are going?

- Opportunities & challenges of the future for NESDIS and NOAA

Current State of NOAA's Earth Observation System

Supporting NOAA's Mission

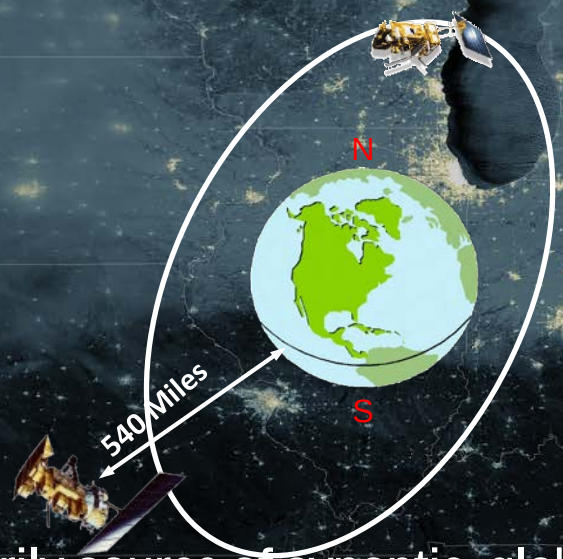
NOAA is a science-based services agency engaged with the entire Earth system science enterprise.

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

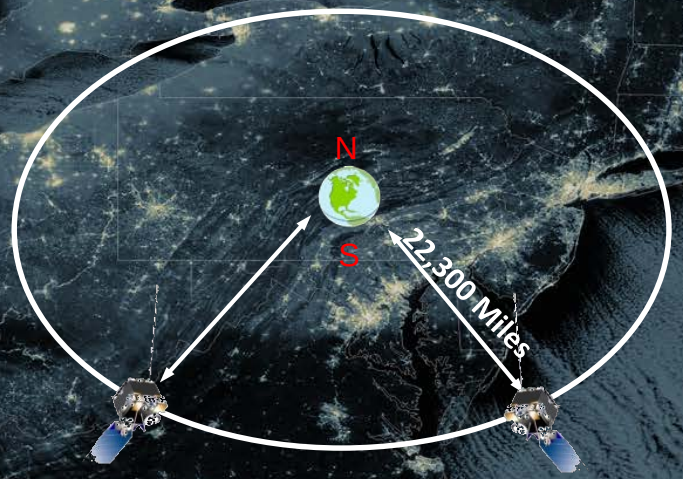
NOAA's Observational Paradigm Has Been: Two Orbits, One Mission

Polar-orbiting Operational Environmental Satellites (POES)
Operating since 1970



Primarily source of synoptic, global observations feeding Numerical Weather Models and forecasts

Geostationary Operational Environmental Satellites (GOES)
Operating since 1975



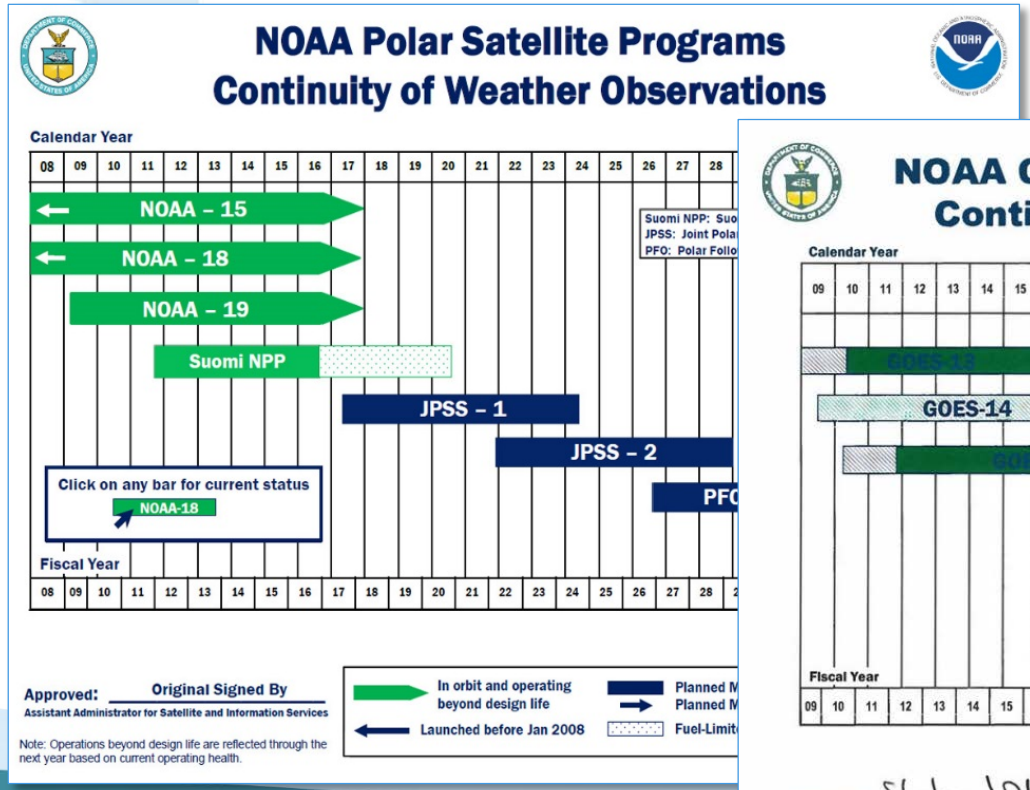
Primarily source of near real time observations for nowcasting and imaging of severe weather events

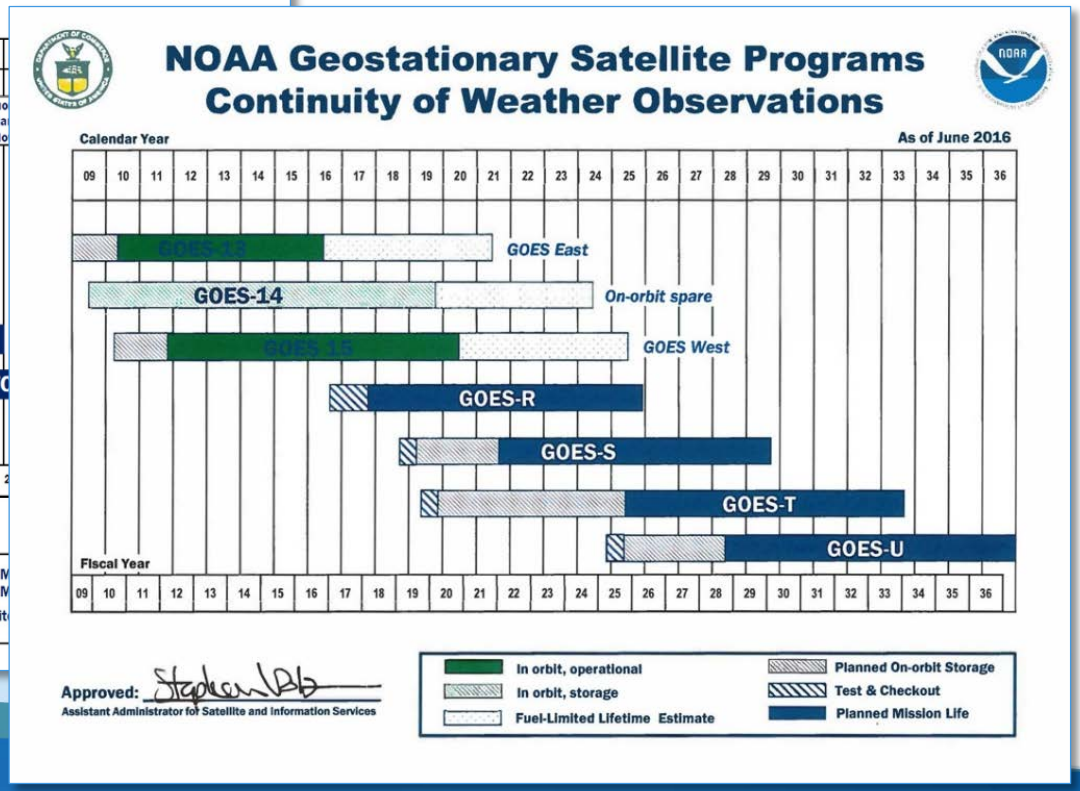
NOAA/NASA

S-NPP image of North America

Tracking the “Two Orbit” Program

- Our historical “Flyout” charts have reflected the polar and geostationary, fixed platform program approach

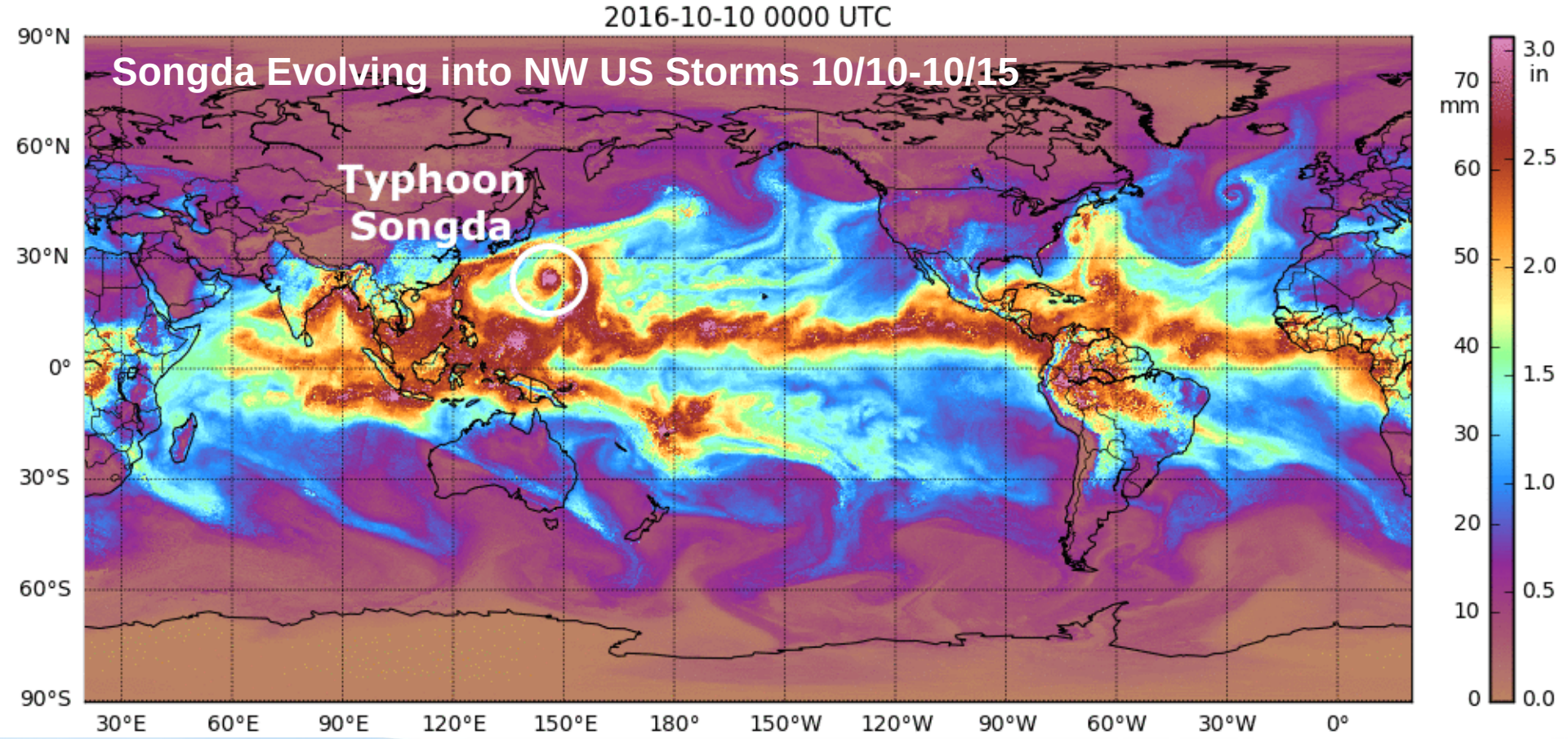




Our Weather Observations Involve Much More than NOAA

- NASA and ESA research satellites
- DOD, EUMETSAT & JMA operational satellites

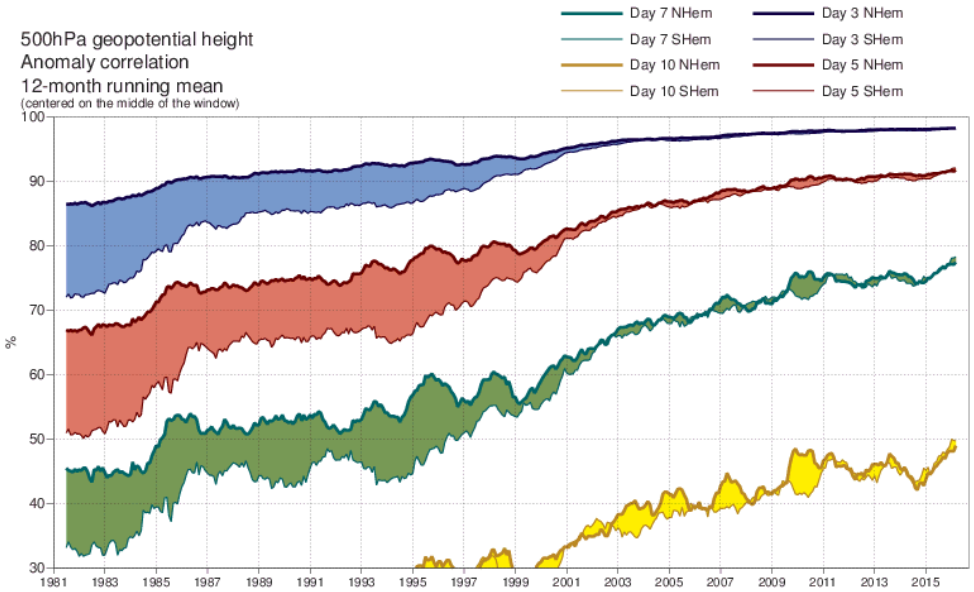
Regional Storms Require Global Observations



Total precipitable water from a constellation of microwave sounders (AMSU, ATMS) - NOAA-18, 19, MeTOP-A, -B, and SNPP.

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

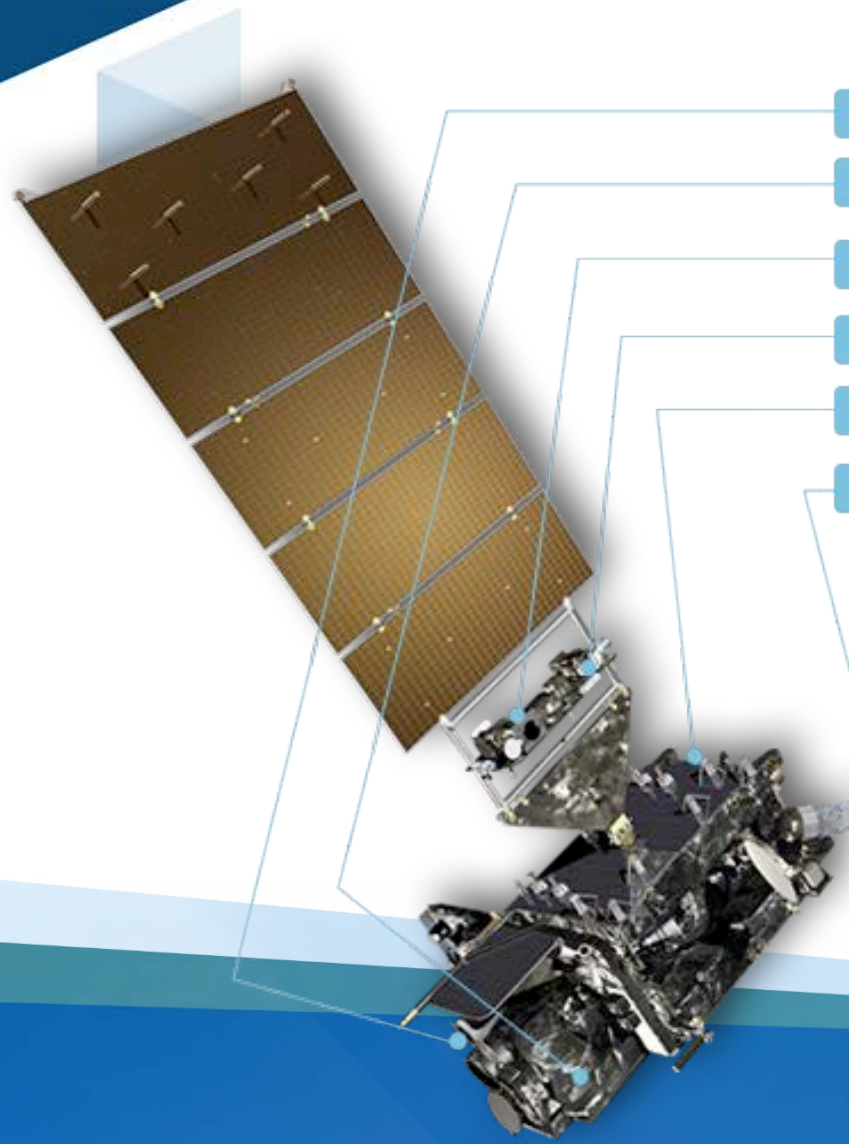
The Coming Leap Forward

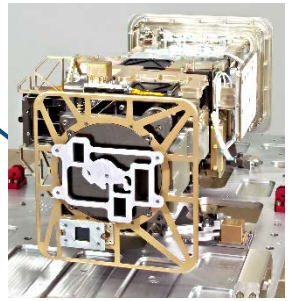
GOES-R

JPSS

Recent and Upcoming NESDIS Launches

GOES-R Series Geostationary Satellite
Launching November 2016
(Series will extend through ~2036)

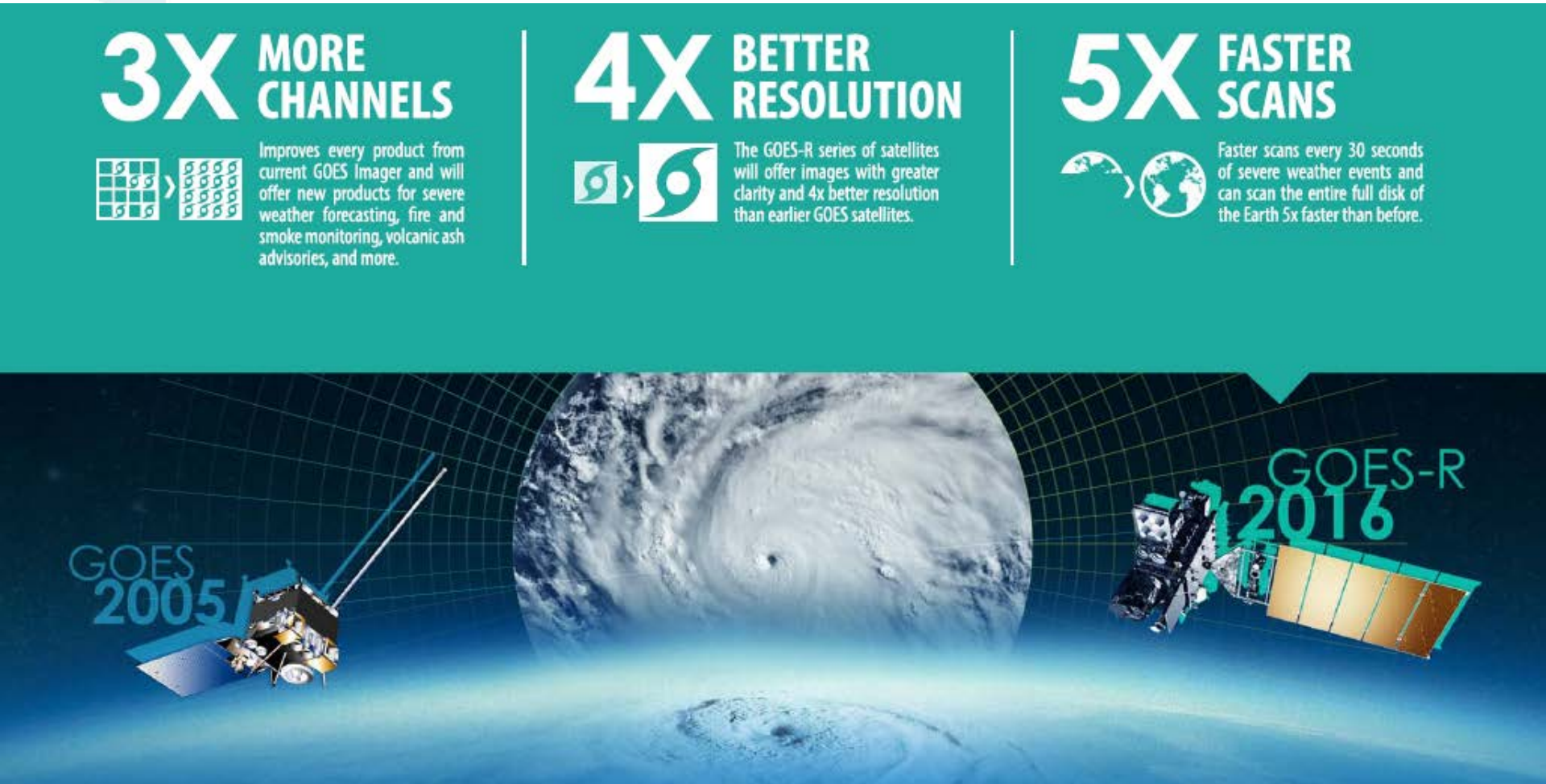


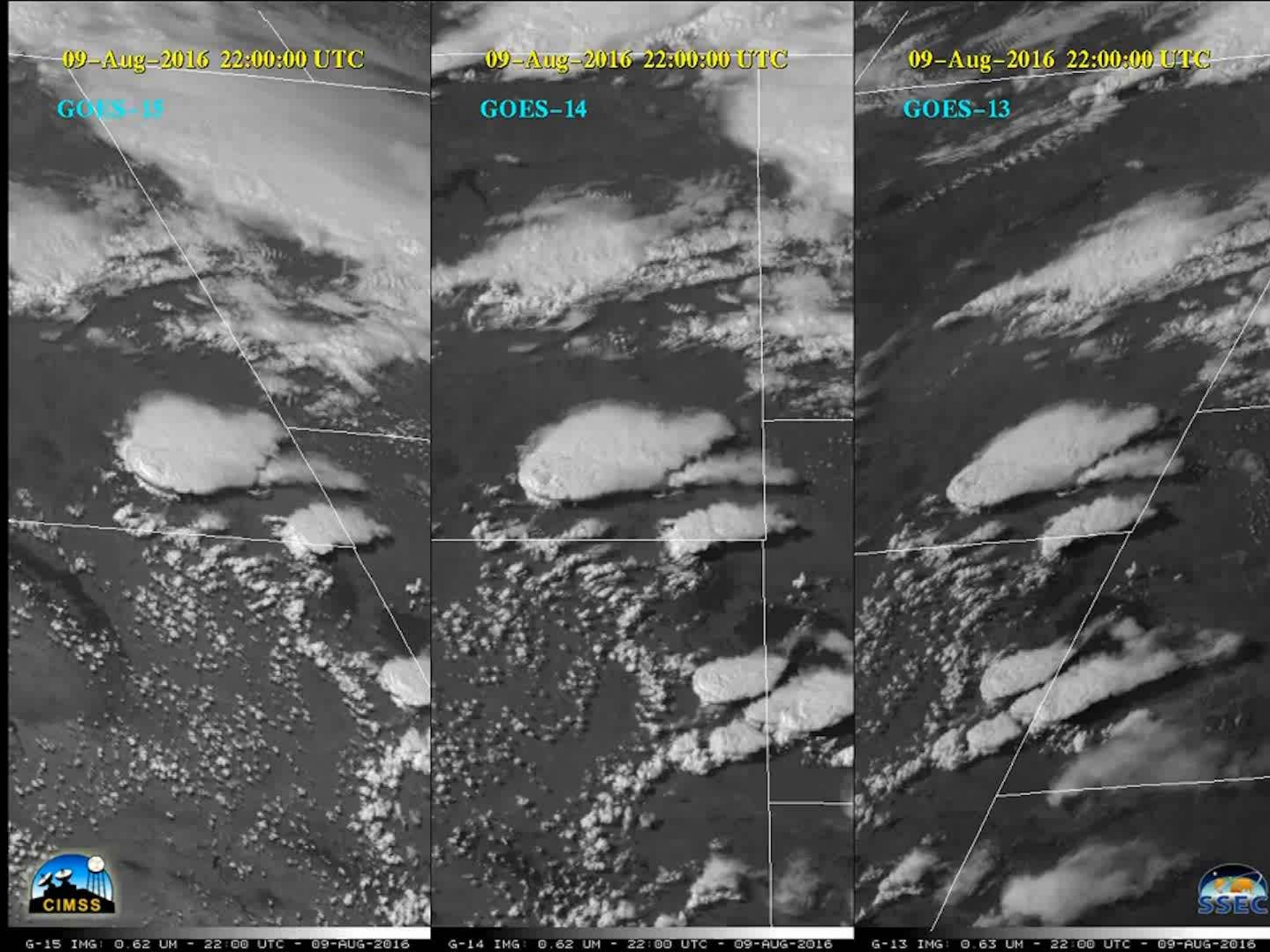


GOES-R: The Future of Forecasting

Launching in November 2016

(exact date still TBD)




09-Aug-2016 22:00:00 UTC
GOES-15
09-Aug-2016 22:00:00 UTC
GOES-14
09-Aug-2016 22:00:00 UTC
GOES-13
CIMSS
SSEC
G-15 IMG: 0.62 UM - 22:00 UTC - 09-AUG-2016
G-14 IMG: 0.62 UM - 22:00 UTC - 09-AUG-2016
G-13 IMG: 0.63 UM - 22:00 UTC - 09-AUG-2016

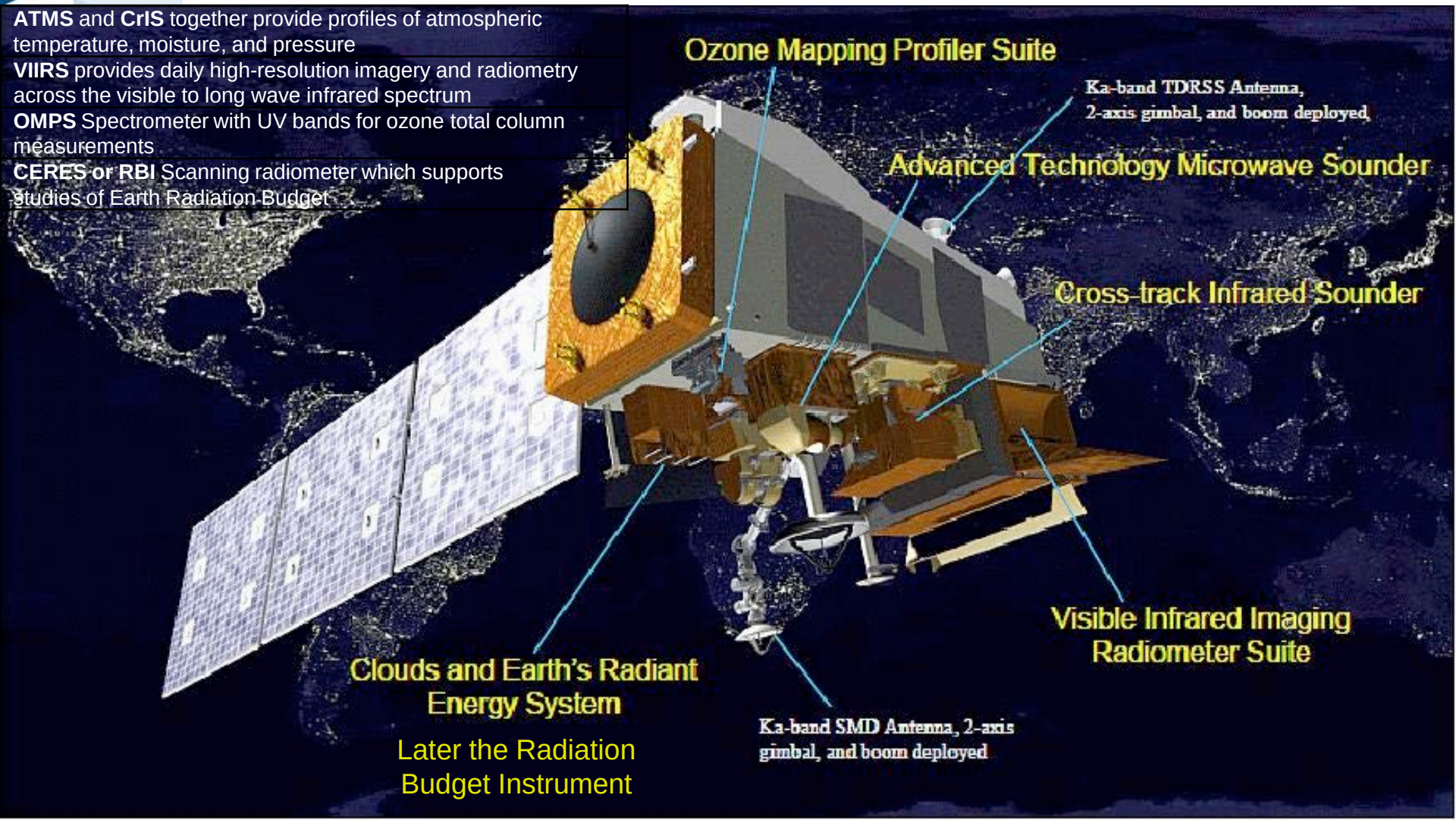
JPSS-1 Polar-Orbiting Satellite
Coming in 2017
(Series will extend through ~2038)

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

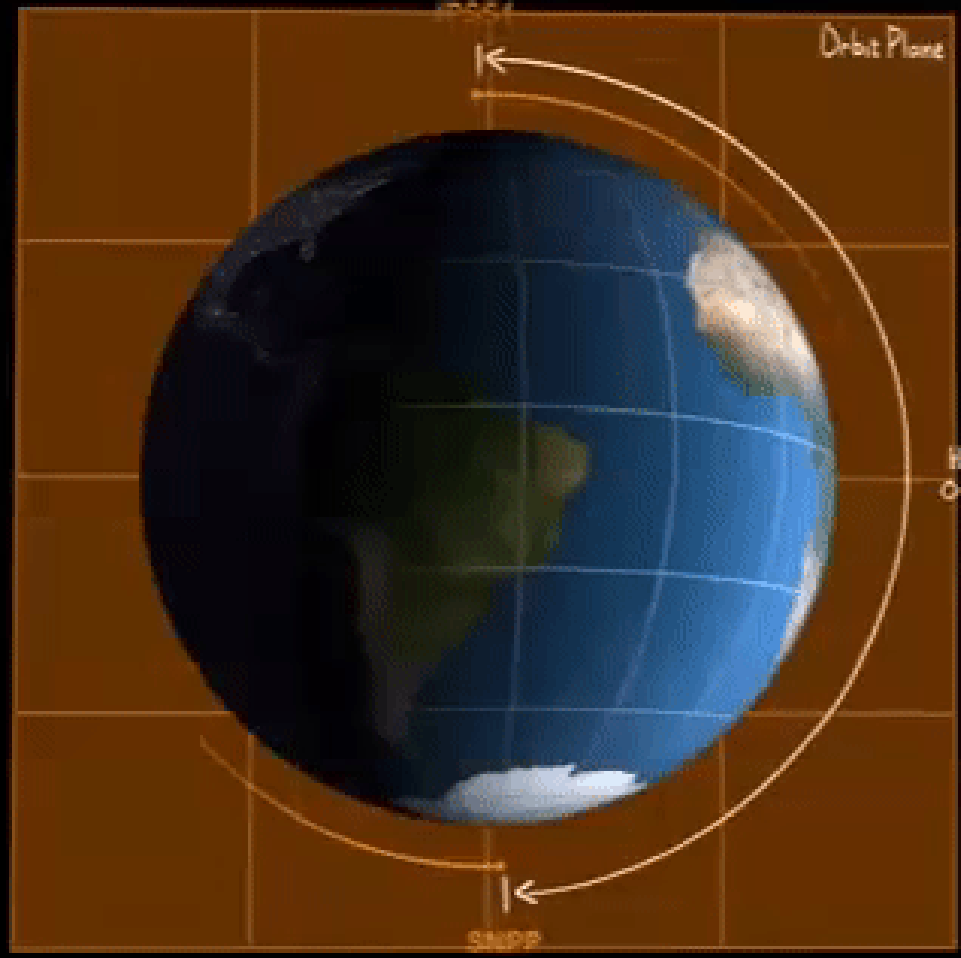
OMPS Spectrometer with UV bands for ozone total column measurements

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



Suomi-NPP/JPSS in Orbit

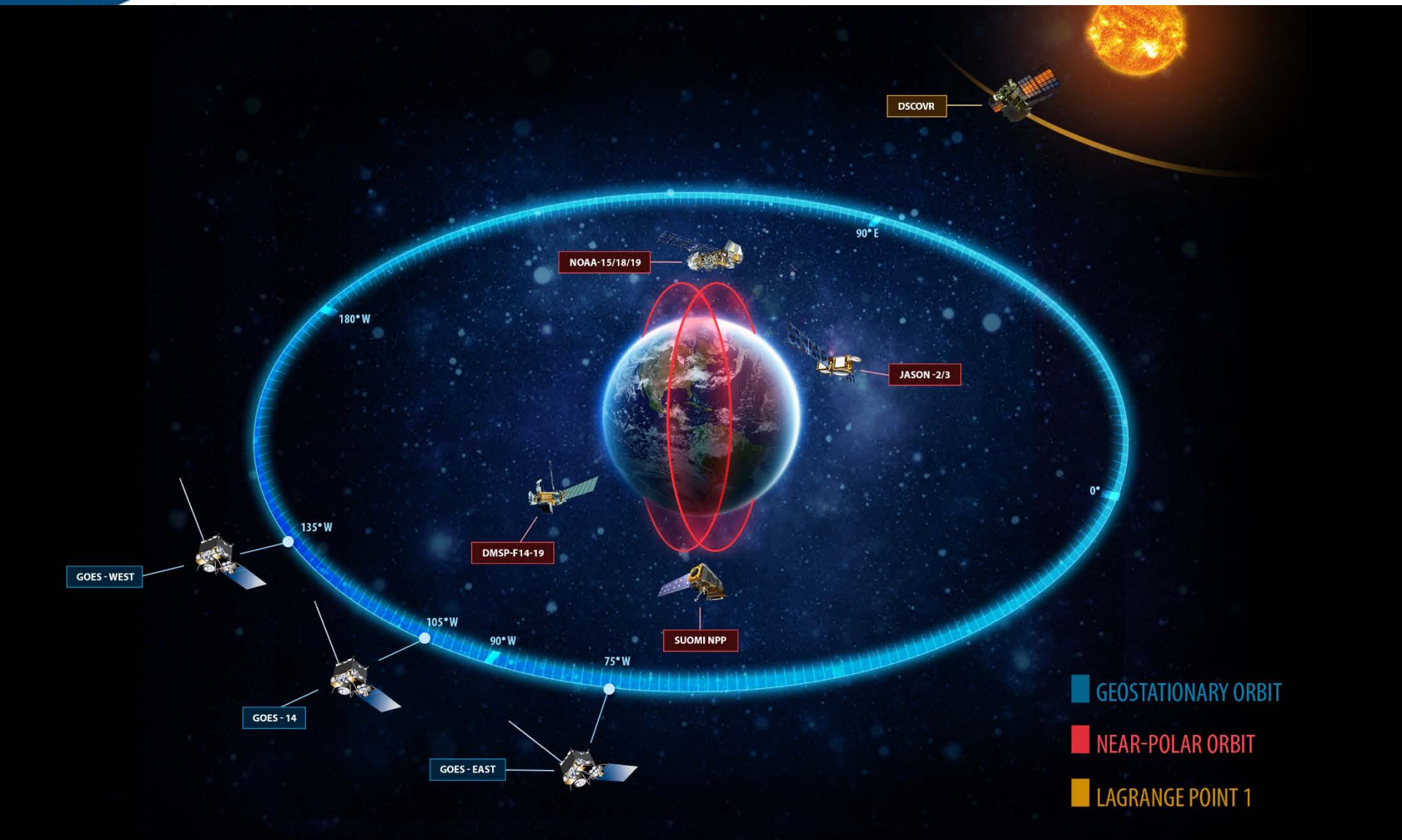
- With the launch of JPSS-1 in 2017 we will have two very capable polar satellites operating simultaneously
- The combination, with reduced latency, with further enhance forecasts
- These observations and data will serve the global community of meteorological agencies as well



* Suomi-NPP VIIRS Day Night Band

The Near and Not So Near Future for NESDIS

We Are Moving beyond exploitation of a NOAA-centric Observing System …



…To greater utilization of a growing global constellation of Earth Observation satellites

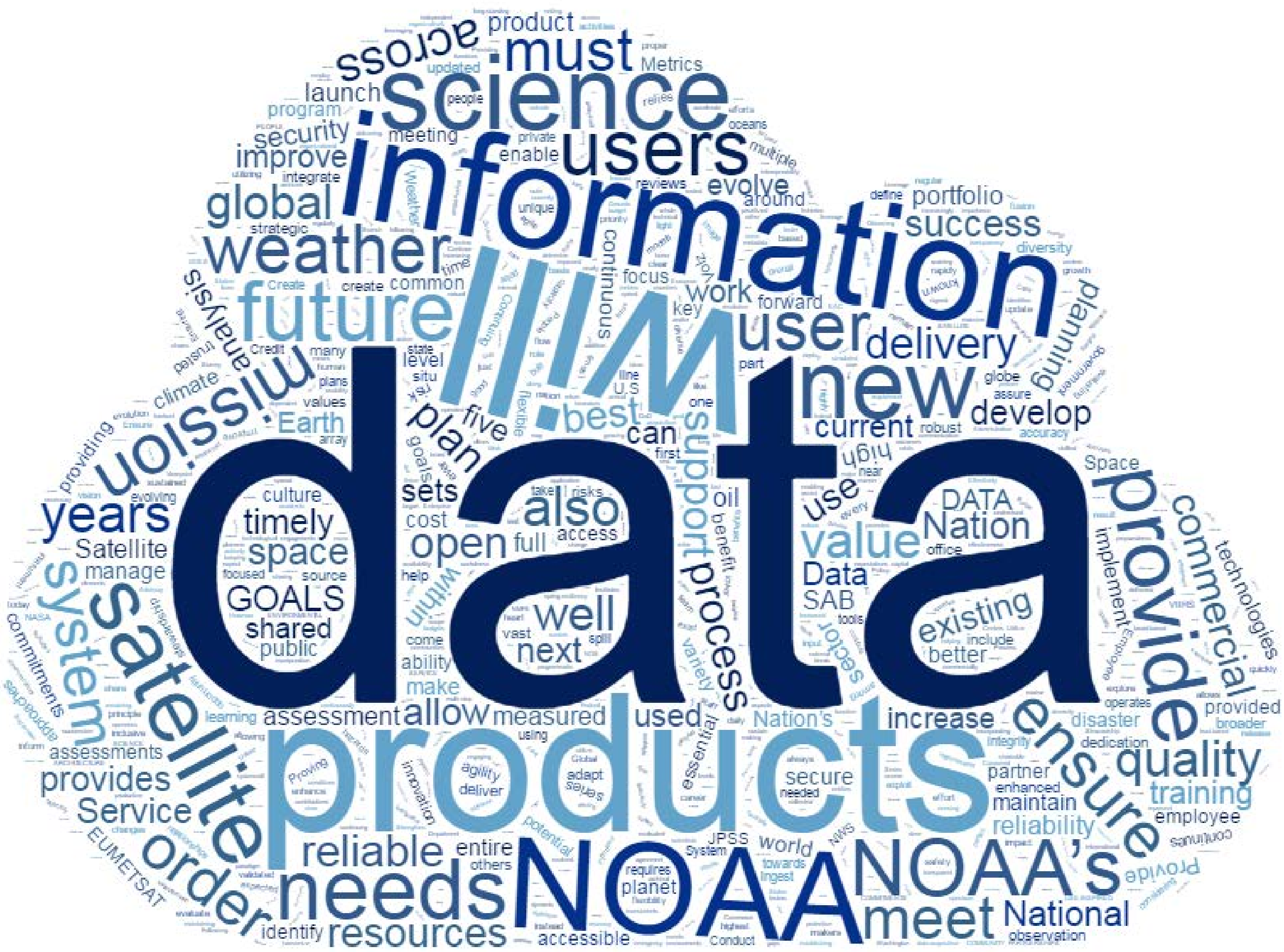
The NESDIS Strategic Plan

NESDIS Vision:
To expand understanding of our dynamic planet as a **trusted source** of **environmental data**

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Released September 2016

The NESDIS Strategic Plan



The NESDIS Strategic Plan

*We have to deliver without interruption the data and observational products our **Users** require.*

*We must ensure the space and ground assets are current, secure, and delivering the necessary information to meet **User** needs.*

*We must maintain a vibrant and capable workforce within and trusted partnerships globally to meet our **Users**' needs.*

Commitments

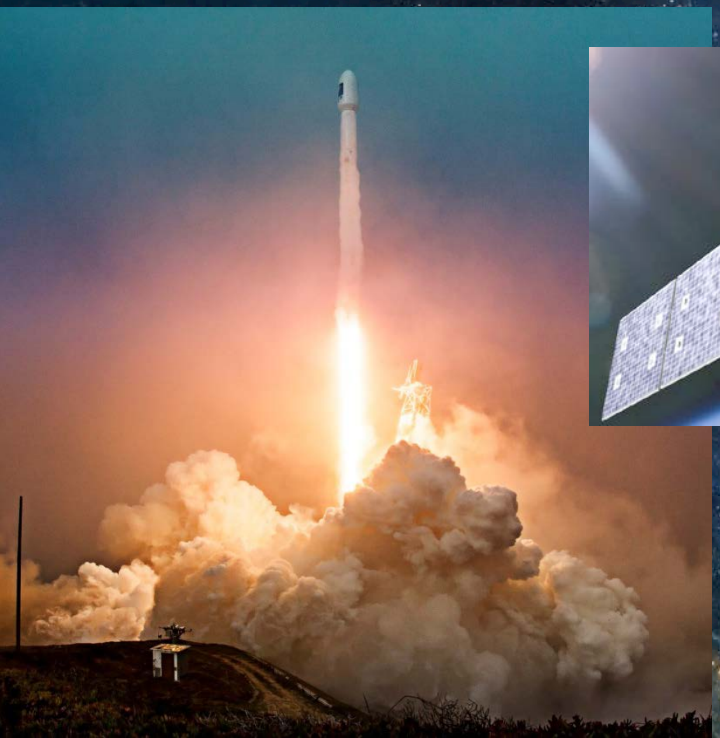
- **Continuity**
  - NESDIS must continue to ensure the continuity of our observations over time and anticipate future risks to mission success with the reliability and robustness that have come to define the organization.

- **Data & Information**
  - NESDIS must not only deliver single-source informational products, but also broad-based data-acquisition and distribution products that utilize and integrate multiple sources of data, allowing a broader spectrum of use.

CONTINUITY

NESDIS must continue to ensure the continuity of our observations over time and anticipate future risks to mission success with the reliability and robustness that have come to define the organization.

CONTINUITY



GOES-T
2019

GOES-U
2024

GOES-S
2018

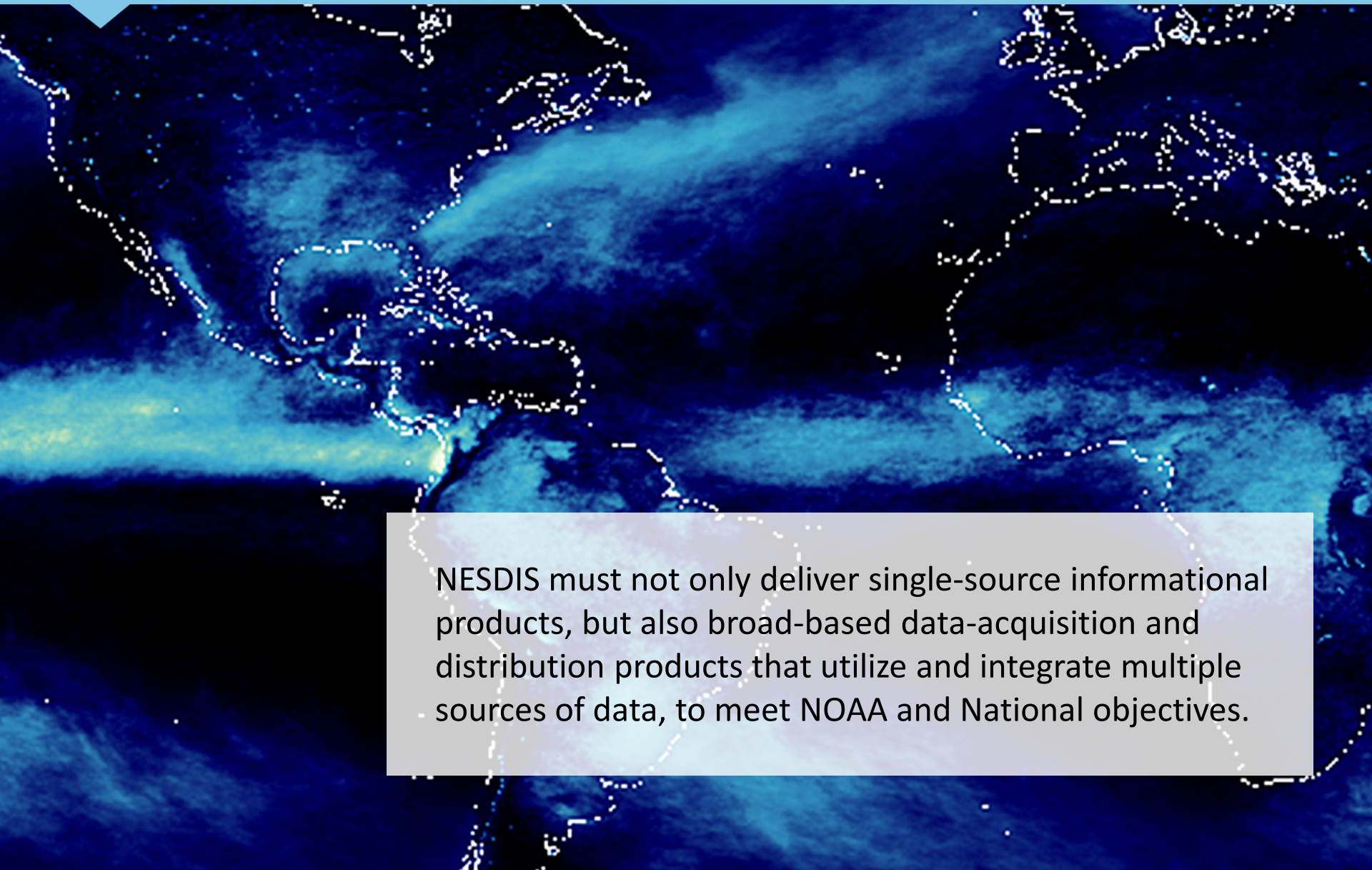
First Focus:
Return on National investment!

JPSS-2
2021

JPSS-3
2026

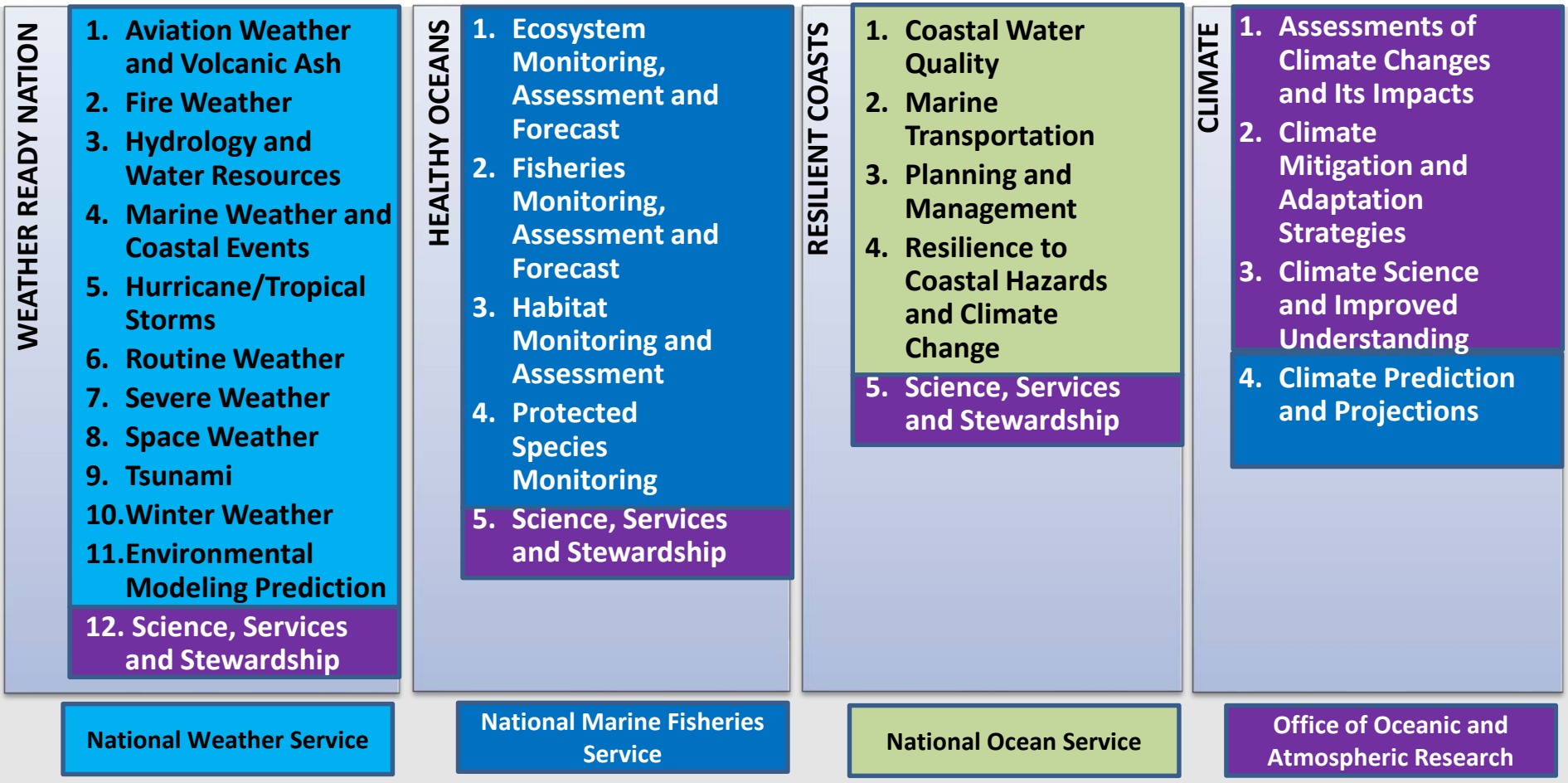
JPSS-4
2031

DATA & INFORMATION



NESDIS must not only deliver single-source informational products, but also broad-based data-acquisition and distribution products that utilize and integrate multiple sources of data, to meet NOAA and National objectives.

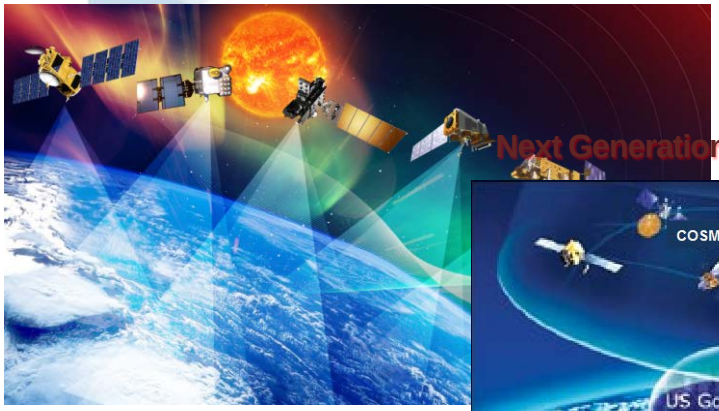
Addressing Needs Across NOAA



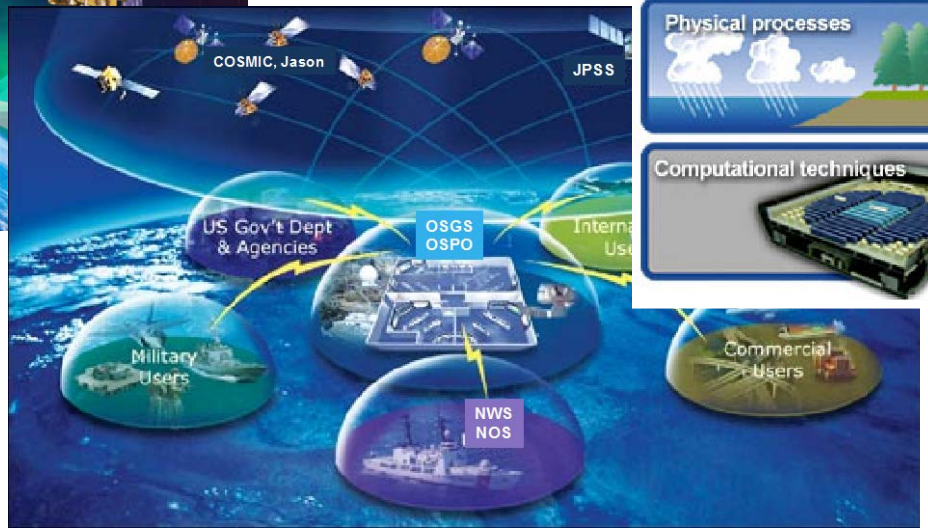
NOAA Mission Service Areas by Line Office

Architecting the Future

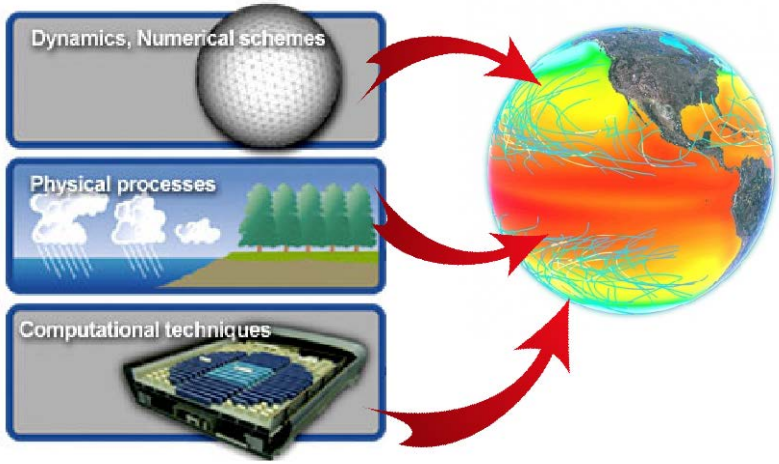
Global Earth Observing Satellite System



Next Generation Integrated & Adaptive Gro



Integrated & Assimilated Operational Data Flow

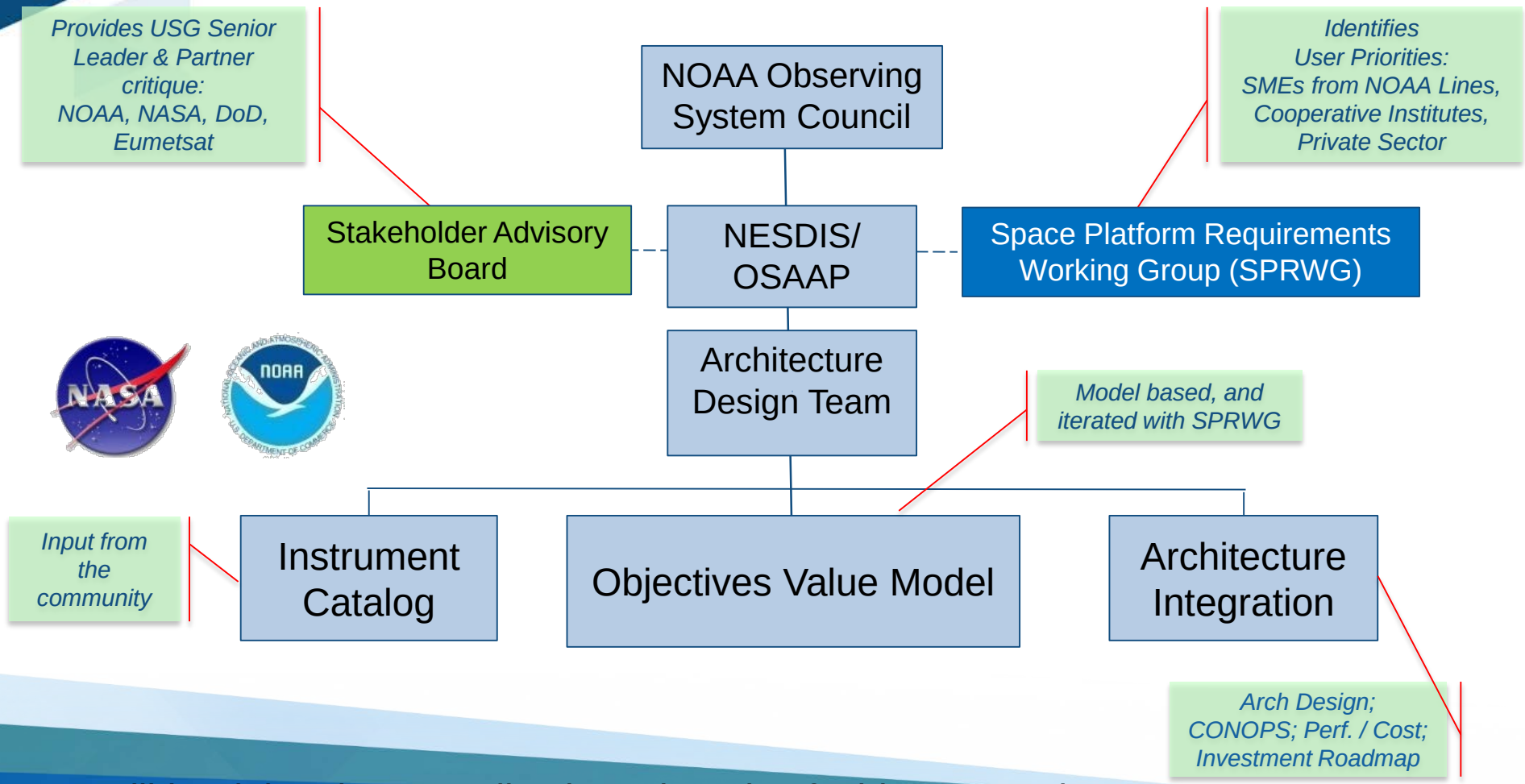


Defining the next observations

Merging the data with models to meet user needs

Defining the integrated operations and data management system

Building the Space Architecture



We will be doing these studies in an iterative fashion, engaging NOAA and External stakeholders at each cycle, completed over the next 12 months.

Notional Technology Insertion Plan

May be replicated for high value observation targets

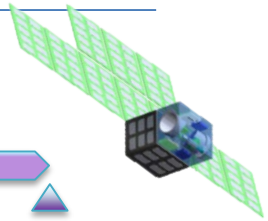
FY 2016 | FY 2017 | FY 2018 | FY 2019 | FY 2020 | FY 2021 | FY 2022 | FY 2023 | FY 2024

Microwave Sounder

Risk Reduction → Development → Validation → Transition → Operational

LRD

EON-Microwave



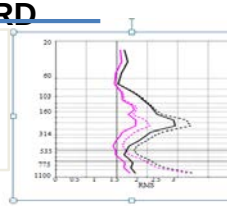
LRD

Infrared (IR) Sounder

Study / Select → Risk Reduction → Development → LD → Transition

BAE Advanced, Miniature Dispersive Infrared Spectrometer will demonstrate capability for providing temperature and humidity profiles.

Vertical Temperature Profile Retrieval with MWIR Sounder Only Slightly Less Accurate than AIRS – *J. Susskind, NASA/GSFC*



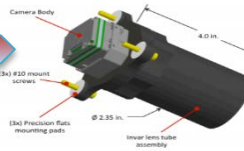
Visible / IR Imager

Study / Selection → Risk Reduction → Development

NASA/ESTO Advanced Technology Investment Programs
- IIP, ACT, AIST, InVEST

NASA/OCT Innovative Advanced Concepts
FFRDC, UARC Inter-Agency Agreements
Inter-Agency (DOD) & International Partnerships
Commercial Opportunities

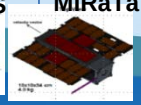
Potential Technology Enabler
USAF Weather Satellite Follow-on Design Study
APL Passively Cooled Micro-bolometer



MicroMAS

ARCS

MiRaTa



ATMS (Flight)

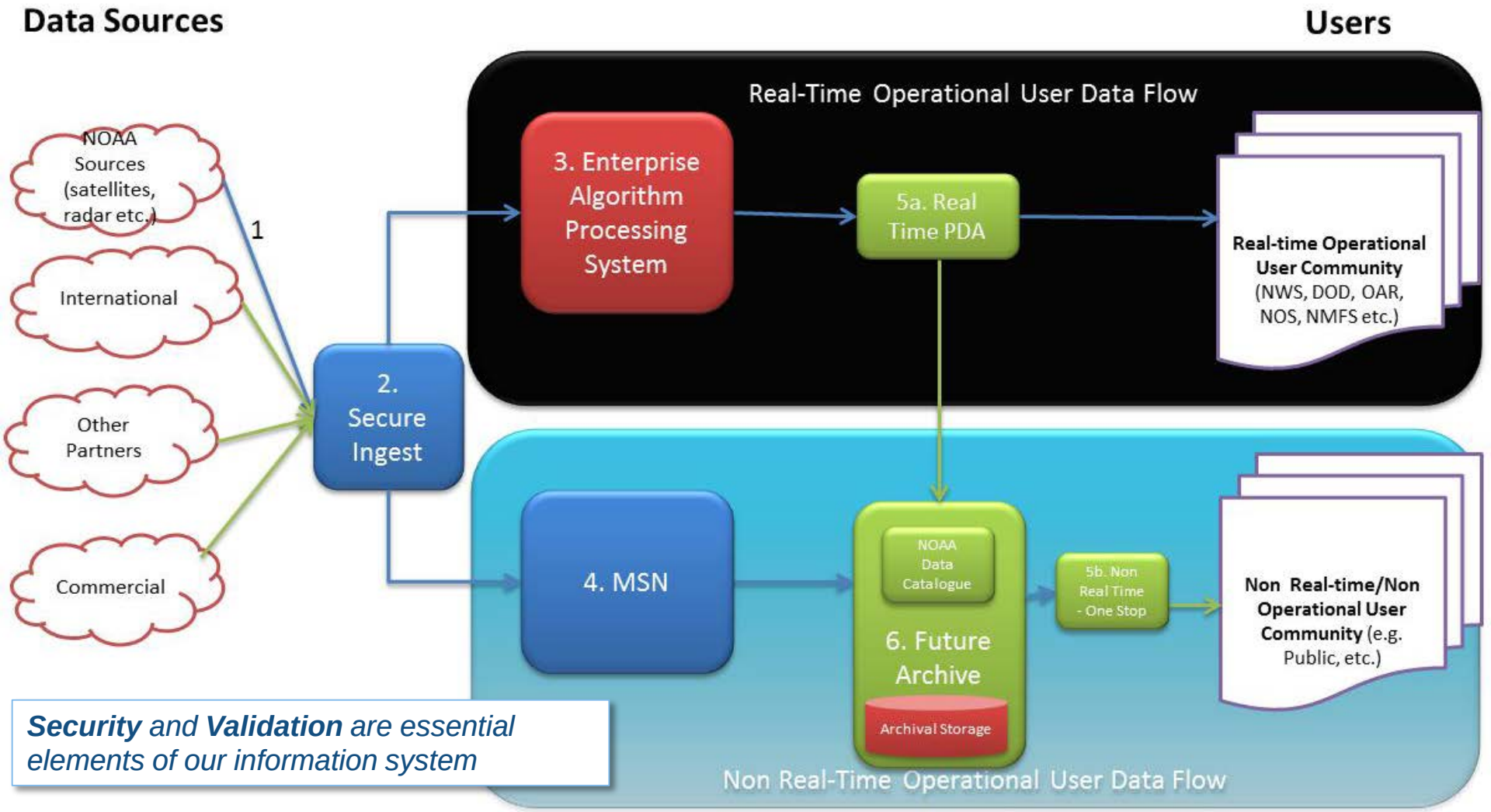
HyMAS (Ground)

SMAP (Flight)

Leveraged Technologies already demonstrated

Building the Ground Architecture

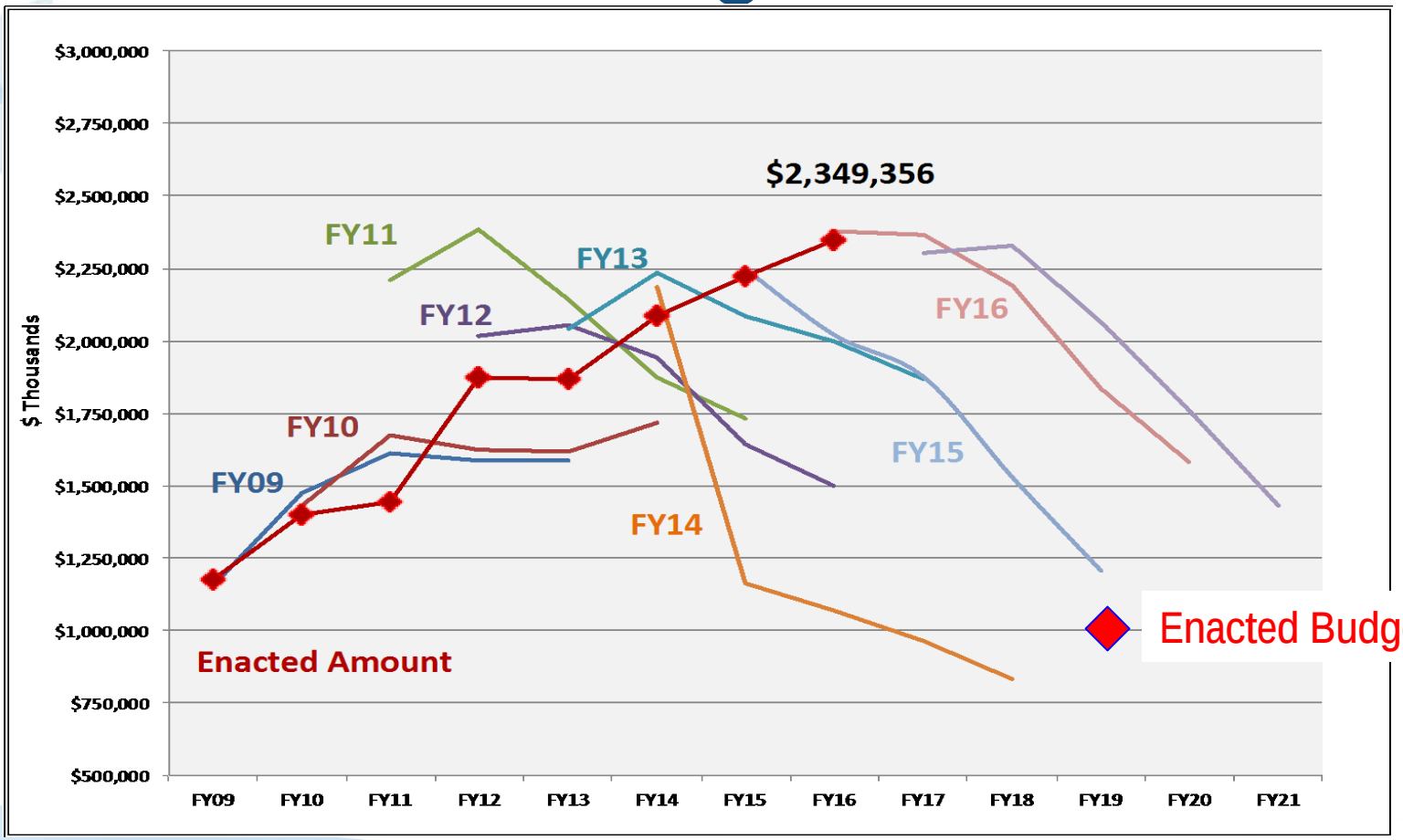
Bringing the Data into NESDIS



***Security** and **Validation** are essential elements of our information system*

Opportunities & Challenges

History of NESDIS Requested and Enacted Budgets: 2009 - 2016



Challenge #1: Generating Stakeholder advocacy to sustain the satellite observing system for the long run

NESDIS 5 yr Budget Picture

President's FY2017 Budget Proposal

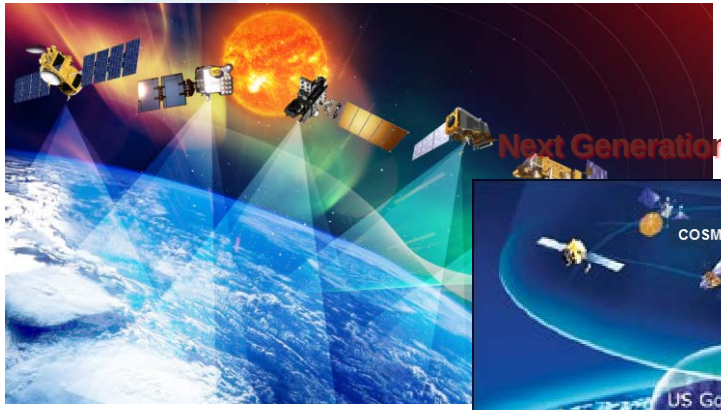
FY 2017 PROPOSED OPERATING PLAN ($ in Thousands)	FY 2016 President's Budget	FY 2016 Omnibus	FY 2017 PB Submit	FY 2018	FY 2019	FY 2020	FY 2021
Environmental Satellite Observing Systems							
Satellite and Product Operations	93,081	93,000	**123,424**	123,424	123,424	123,424	123,424
Facility Operations	9,000	9,000	**14,250**	14,250	14,250	14,250	14,250
Product Development, Readiness & Application	26,316	26,000	**34,270**	34,270	34,270	34,270	34,270
Commercial Remote Sensing Regulatory Affairs	1,200	1,000	**2,065**	2,065	2,065	2,065	2,065
Office of Space Commerce	1,000	600	**2,000**	2,000	2,000	2,000	2,000
Group on Earth Observations (GEO)	500	500	**500**	500	500	500	500
National Environmental Information Office	59,247	58,986	**63,478**	63,478	63,478	63,478	63,478
Total, NESDIS - ORF	**190,344**	**189,086**	**239,987**	**239,987**	**239,987**	**239,987**	**239,987**
Geostationary Systems - R	871,791	871,791	**752,784**	518,532	335,879	214,674	148,588
Jason-3	7,458	7,458	**4,357**	7,651	5,338	4,648	4,648
Joint Polar Satellite System (JPSS)	808,966	808,966	**787,246**	745,777	572,240	445,082	376,061
Polar Follow On	380,000	370,000	**393,000**	594,000	581,000	579,000	469,000
Cooperative Data and Rescue Services (CDARS)	500	500	**500**	48,950	32,800	18,550	2,400
DSCOVR	3,200	3,200	**3,745**	3,622	3,579	3,579	3,579
Space Weather Follow On	2,500	1,200	**2,500**	53,700	186,100	154,500	81,500
COSMIC 2/GNSS RO	20,000	10,100	**16,200**	16,200	16,400	8,800	8,800
Satellite Ground Services	58,525	54,000	**59,025**	57,325	57,325	57,325	57,325
System Architecture and Advanced Planning	4,929	3,929	**4,929**	4,929	4,929	4,929	4,929
Projects, Planning and Analysis	30,488	25,200	**33,488**	33,488	33,488	33,488	33,488
Commercial Weather Data Pilot	0	3,000	**5,000**	tbd	tbd	tbd	tbd
Subtotal, NESDIS Systems Acquisition	**2,188,357**	**2,159,344**	**2,062,774**	**2,084,174**	**1,829,078**	**1,524,575**	**1,190,318**
Total, NESDIS - PAC	2,189,283	2,160,270	**2,063,700**	2,085,322	1,827,776	1,523,273	1,189,016
GRAND TOTAL NESDIS	2,379,627	2,349,356	**2,303,687**	2,325,309	2,067,763	1,763,260	1,429,003

Challenge #2: Managing the Budget to Support and Integrated Observing System

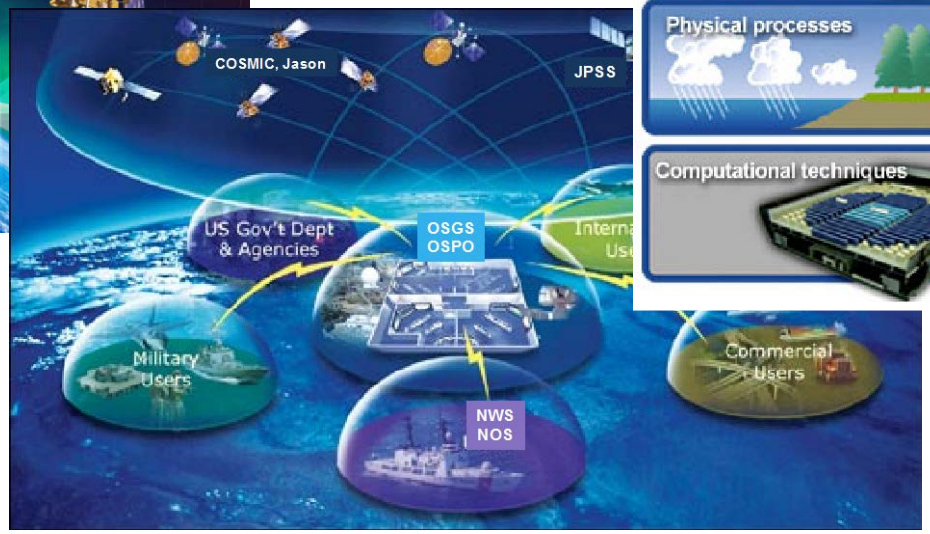
Architecting the Future:

Engaging the Community

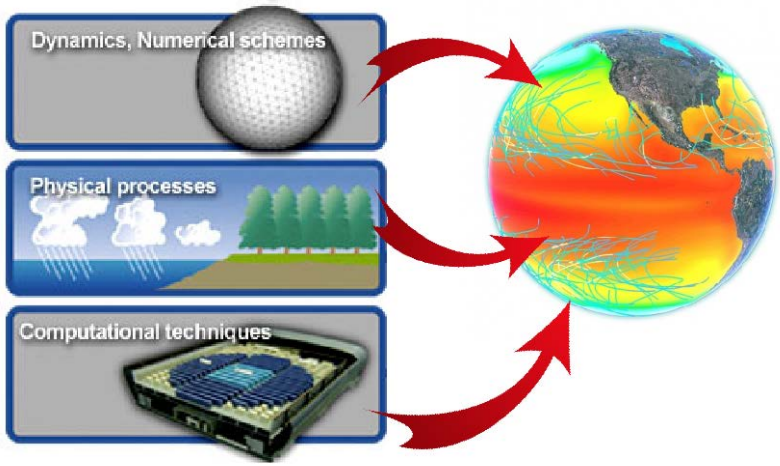
Global Earth Observing Satellite System



Next Generation Integrated & Adaptive Gro



Integrated & Assimilated Operational Data Flow



Challenge #3: Maintaining Active Engagement with US & International Partners, and with the commercial and industrial community

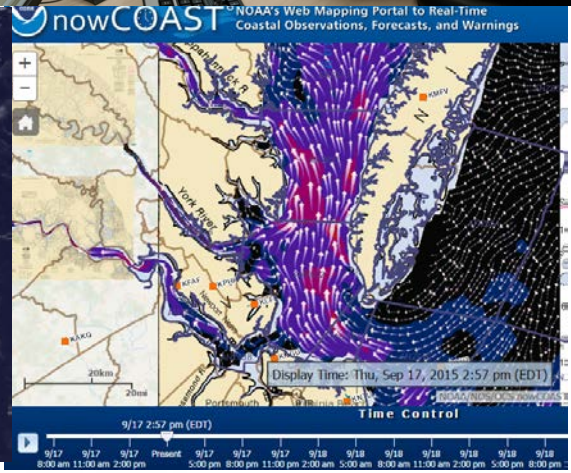
Navigating the Public Private Partnership in Earth Observations

- Commercial Sector is expected to grow significantly in the coming years
  - Likely to be providing a broad spectrum of observational services
- NOAA has a long heritage of providing critical services
  - Long history of operations
  - Established and productive data and operations sharing practices with other Met agencies
- Government & Commercial have different cultures with some different metrics for success
  - Government: low risk tolerance, priority on reliability
  - Commercial: innovative, with focus on earlier ROI

Challenge #4: Establishing a productive, mutually supportive relationship between NOAA and the emerging commercial sector.

Focused on Meeting User Needs

NOAA's products and services protect lives and property



Thank you!

Community

- Partnerships
  - Successful partnerships allow us to meet our mission cost-effectively and to be more responsive to the needs of our users and stakeholders. Under this strategic plan, our international and interagency partnerships will remain a priority for NESDIS.
- People
  - As the scope, breadth and level of expertise of services and information provided by NESDIS expands in the years to come, we will continue to rely on a workforce that is engaged, diverse, dedicated and nationally and internationally recognized as authorities in their fields.

Capabilities

- Architecture
  - NESDIS will work to evolve its ground and space architecture and move away from stand-alone systems in order to improve observational capabilities, resiliency and efficiency.
- Use-Inspired Science
  - NESDIS has an opportunity to help better inform future environmental assessments through innovative science and meaningful engagements with stakeholders and decision makers. These engagements will also help develop the next generation of science-based product and services.