

Future NOAA LEO Constellation:

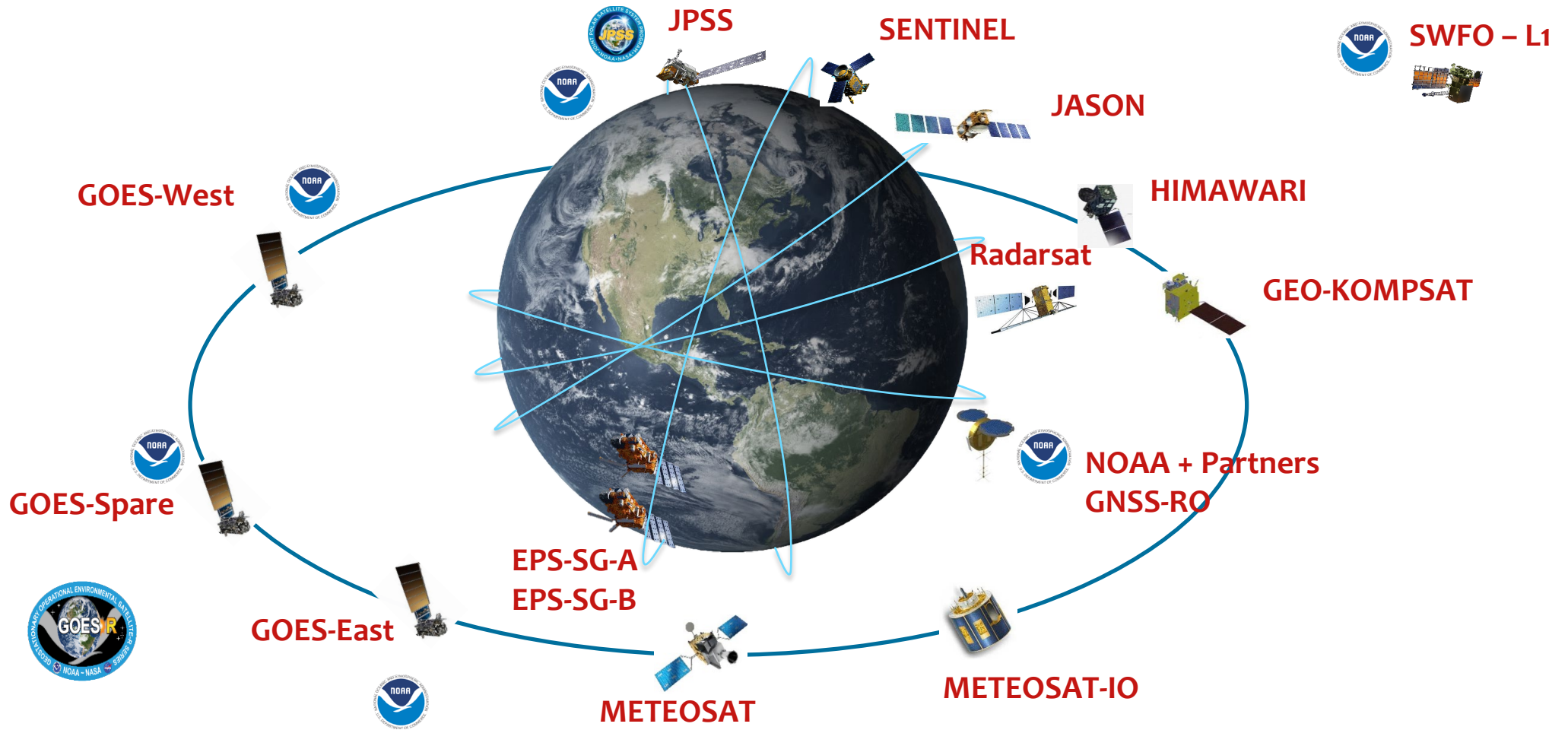
Temperature & Moisture Sounding for NWP & Future Observations

National Environmental Satellite,
Data, and Information Service

12-16 July 2021

V. Griffin, F.W. Gallagher III, D. Spencer
NESDIS, Office of System Architecture and Advanced
Planning

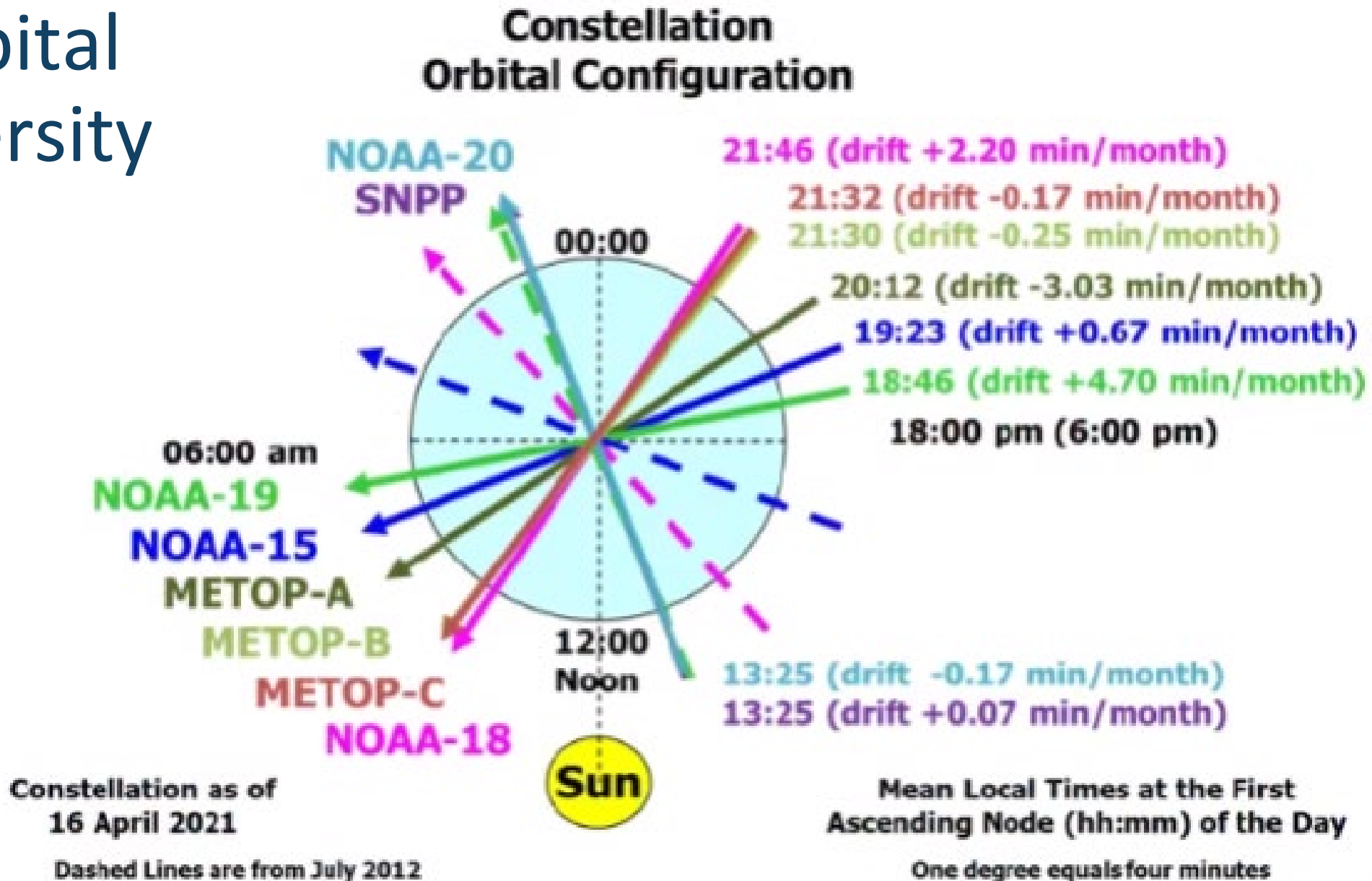
Today's Space Architecture



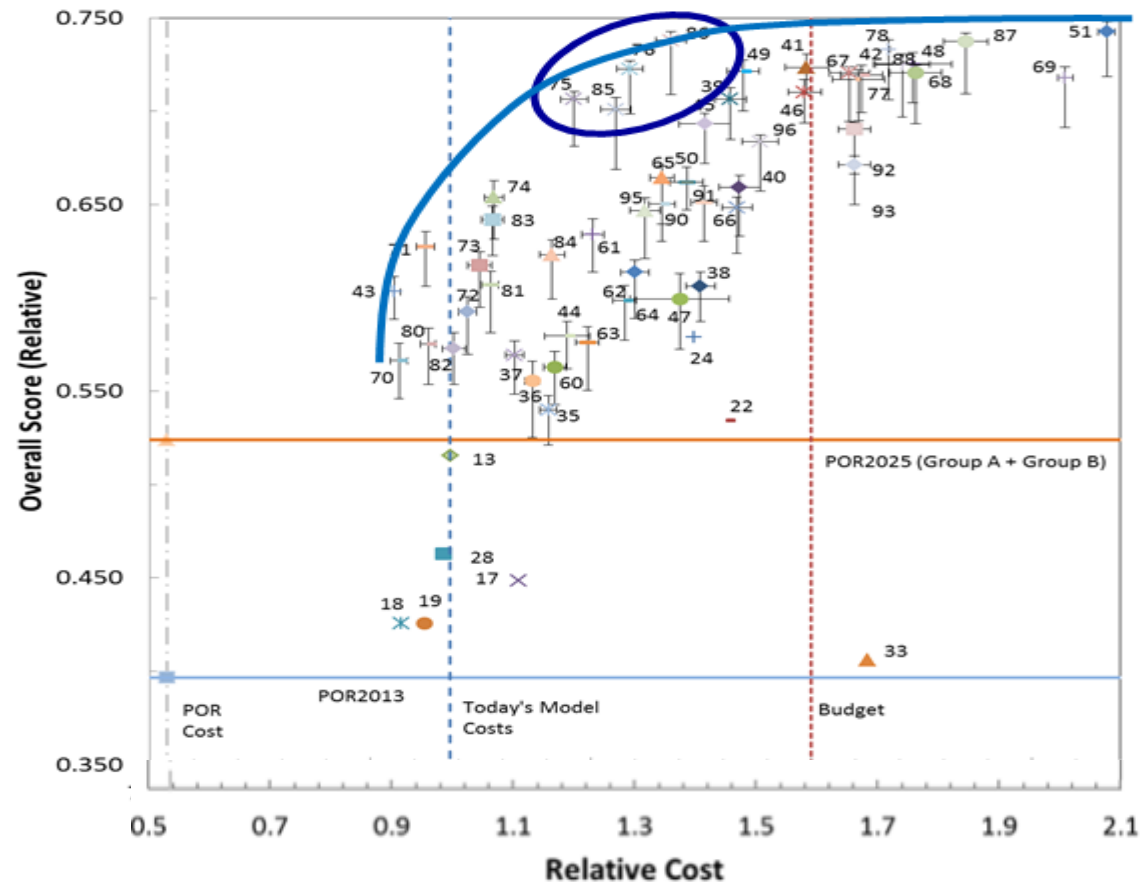
Planned Architecture, Program of Record (POR) 2025

NOAA National Environmental Satellite, Data, and Information Service

Orbital Diversity



NSOSA Identified Desired Features of NOAA'S New Architecture: Prioritizing Disaggregated LEO



Mix of observations with higher mission impact

- Small and medium platforms
- Enhanced imagery and high-latitude coverage
- New & more observations

More agility

- Disaggregated LEO – smaller building blocks
- Onramps for new technologies
- Evolving partner observations

New business models

- Data purchases, ride shares, hosted payloads
- Commercial communication & data-relay services
- Instruments of opportunity

Trends Favoring SmallSats

- Intensifying demand for timelier and more accurate extreme weather predictions, delivered in faster, user-friendly ways.
- Increasing value in environmental assessments and projections to inform long-term land-use, infrastructure and commercial investments.
- Rapid rise in capability of U.S. aerospace industry and strategic partners in both launch and remote-sensing.
- An unprecedented pace of innovation in ground systems (artificial intelligence, quantum computing and machine-learning) is advancing forecast modeling.



LEO Broad Agency Announcement

NOAA issued a Broad Agency Announcement (BAA) in 2019 seeking industry input, focusing on temperature and moisture soundings:

- **Industry Concept Studies:** 15 studies with nine companies to study sounding instruments, missions and spacecraft in LEO
- **Instrument Concepts:**
 - Request concept studies at the NSOSA Target Baseline performance level
 - Request concept studies within total range to identify:
 - Where low increases in cost could yield higher increases in performance
 - Where small relaxations in performance could yield high cost savings



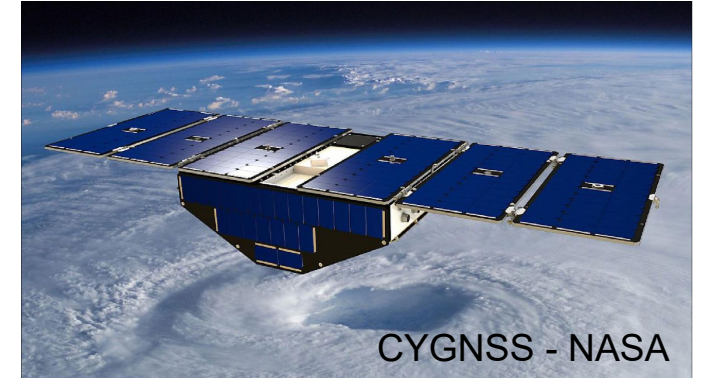
Sounder Project Industry Concept Analyses

Priorities in LEO:

- Sounder instruments providing critical data for NWP
- Small to medium instruments that can be built and launched comparatively quickly allowing for an agile constellation

Industry awards to explore design and capability options:

- Sounding instruments (microwave, infrared, radio occultation)
- New acquisition and observing system concepts:
 - Commercial services
 - Multi-orbit coverage
 - Common satellite bus for flexibility in instruments flown
 - Rapid launch cadence
 - Demonstration missions
 - Risk tolerance and observing system risk management



2020: Initial pre-Phase A studies completed

2021: Complete pre-Phase A and begin focused industry designs and collaborations

Mid-2020s: Demonstration Flights

Focusing on Products: Five High-Level Requirements

The NESDIS Level Requirements support implementation of NOAA's mission:
Science, Service and Stewardship

REQ-001 Data to be collected

REQ-002 Where the data comes from

REQ-003 Timeliness of the data

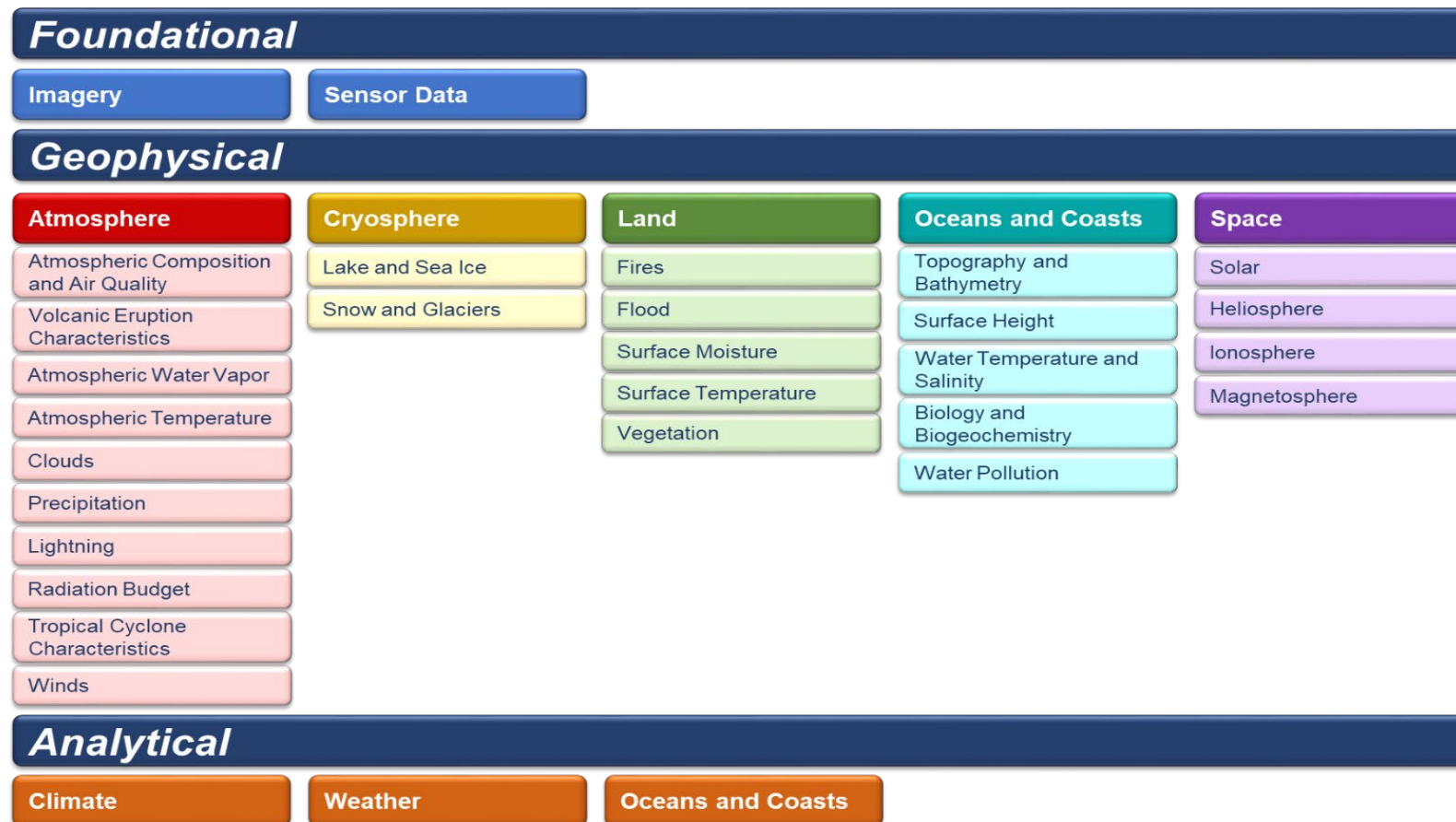
REQ-004 Data is accurate and we archive it and
provide stewardship

REQ-005 We do science, research, and
development



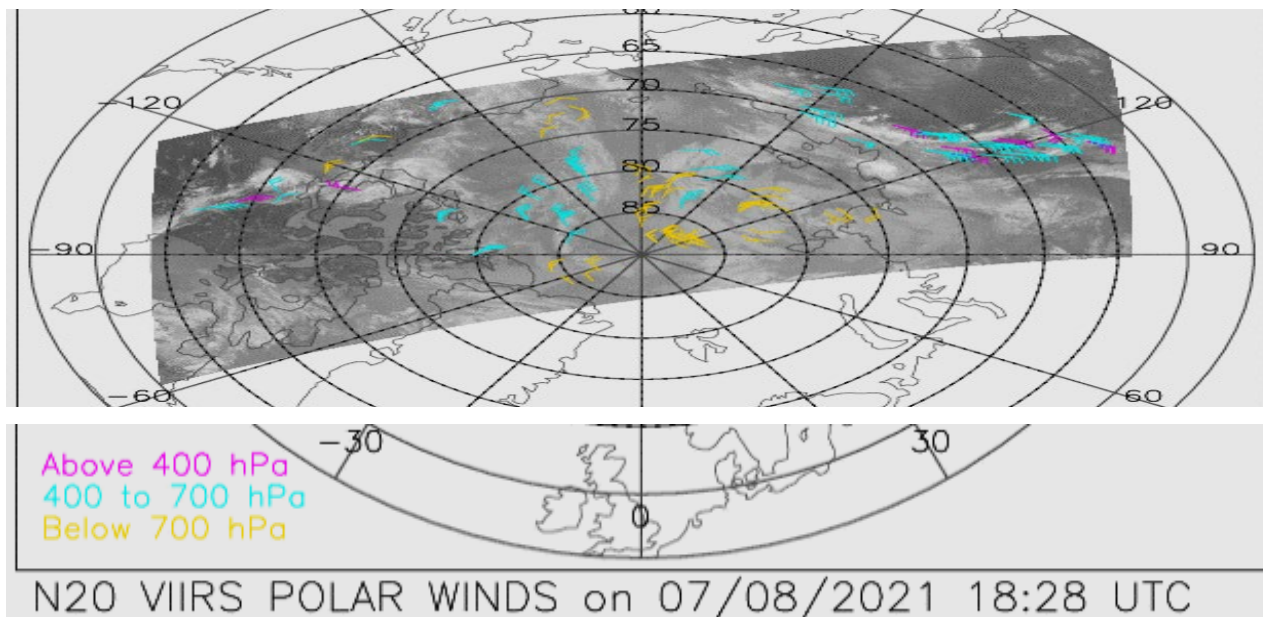
NLR REQ-001:

NESDIS will provide environmental data, information, products and reports in the Foundational, Geophysical and Analytical thematic product areas.



Next Steps in LEO: Beyond Soundings

- Initiate Constellation Trade Study
- Enhance **critical sounding data** now, replenish later
- Launch satellites more frequently to **enhance global observations collected from earth observation satellites**, beginning in mid-2020s
- **Hybrid approach**: data from NOAA satellites, strategic partners, and commercial providers



Global Environmental Observations

“Real Time” Imaging

“Non-Real-Time” Imaging

Temperature and Moisture Sounding (IR, MW, GNSS-RO)

Ocean Color

Atmospheric Composition

Ocean Surface Vector Winds

Sea Surface Height

Ozone (Profile and Total Column)

Microwave Imagery

3D Winds

Joint Venture

- Leveraging capabilities being developed by other federal partners and industry to provide high return on funds
- New NOAA/NESDIS Funding Line Item
 - Exploit partner data (Data Exploitation)
 - Exploit partner technologies (Tech Exploitation)
 - Initial Concept Development to operationalize new data & technology
- Evaluates unproven technology/data sources with potential high return for missions and operations
- Prioritizes potential projects for funding based on NESDIS enterprise needs



Thank you

