



NOAA/NESDIS Commercial Data Program (CDP)

Industry Day 2023

Morning Session

National Environmental Satellite,
Data, and Information Service

Nov. 16, 2023

Agenda

- Office Space Commerce Introduction
- NESDIS Introduction and Overview
- NESDIS/SAE Introduction and Overview
- CDP Background, General Information and Overview
 - IDIQ Contracts
- Commercial Weather Data Pilot Process and Projects
 - RFI / Pilot Process and Pilot History
 - Space Weather Data Pilot
 - Ocean Surface Winds Data Pilot
- CDP FY 2024 / FY 2025 Planning
- RO Modeling Experiment Overview



NOAA / Office of Space Commerce



Richard DalBello - Director, Office of Space Commerce

Janice Starzyk – Deputy Director, Office of Space Commerce

<https://www.space.commerce.gov/>



NOAA / NESDIS



Dr. Stephen Volz

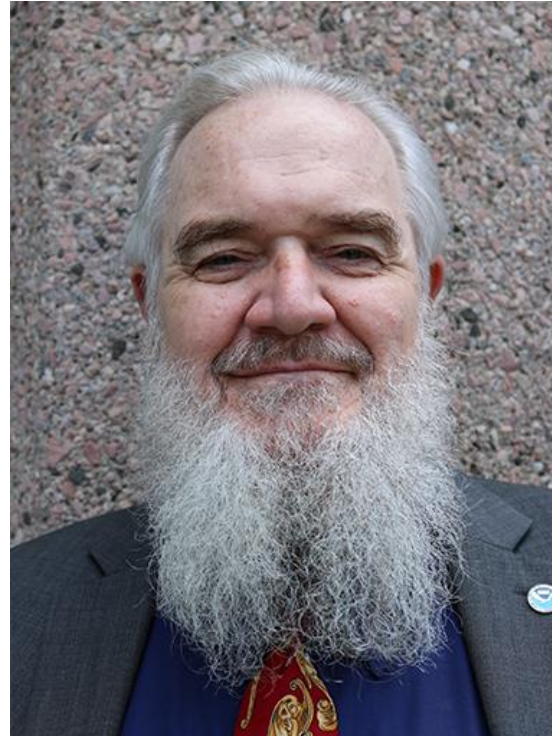
Assistant Administrator (AA) for Satellite and Information Services

[Dr Volz opening remarks](#)

<https://www.nesdis.noaa.gov/>



NESDIS / SAE



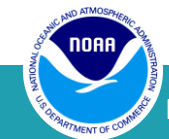
Edward Grigsby

Director, Systems Architecture and Engineering

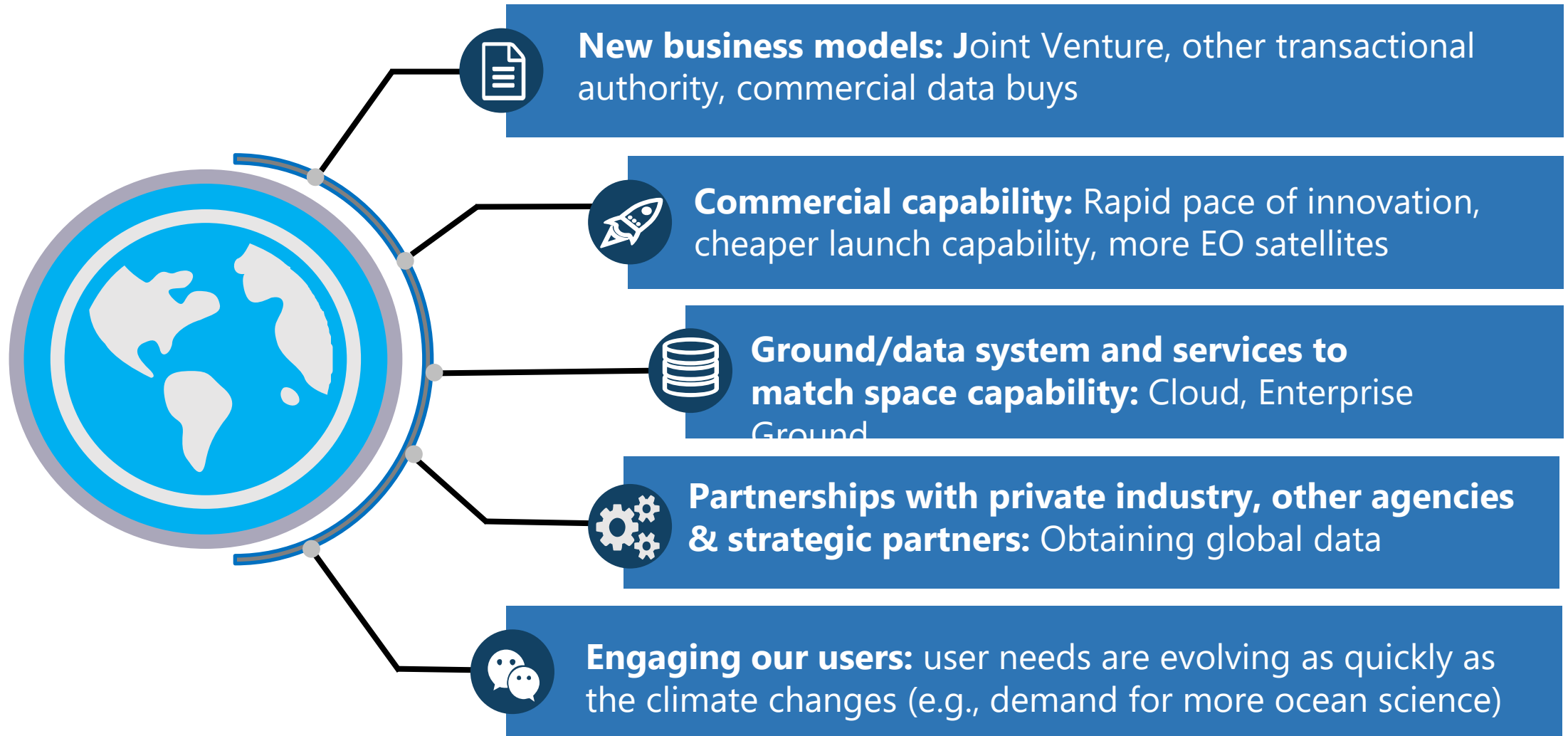
<https://www.nesdis.noaa.gov/about/our-offices/systems-architecture-and-engineering>



NOAA NESDIS and NOAA NESDIS / SAE Overview



Trends Shaping Our Next-Gen Architecture



NOAA Program of Record

SWFO
SWFO-L1 – FY 2025

DSCOVR
Operational – July 27, 2016

COSMIC-2
COSMIC-S – Operational - Feb 25, 2020

SW NEXT

JASON-3
Operational – July 1, 2016

GOES-R SERIES
GOES-16 – Operational - Dec 18, 2017
GOES-17 – Operational - Feb 12, 2019
GOES-18 – Operational – Jan 4, 2023
GOES-U – FY 2024

GeoXO

SENTINEL-6 Michael Freilich
Operational – Nov 22, 2021

JPSS SERIES
NOAA-20 – Operational – May 30, 2018
NOAA-21 – Launched – Nov 10, 2022
JPSS-3 – FY 2026
JPSS-4 – FY 2031

LEO Satellites

Supplemented by innovation and investment by commercial sector and partners



NOAA Satellites

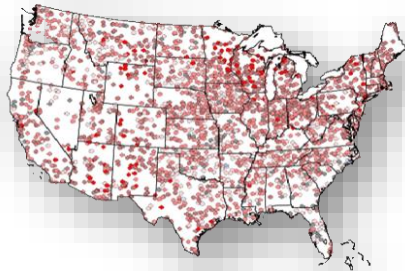
- USA
- JAPAN
- SOUTH KOREA
- INDIA
- CHINA
- FRANCE
- RUSSIA
- SPAIN

- NOAA
- EUMETSAT
- EUROPEAN COMMISSION
- NATIONAL SPACE ORGANIZATION (NSPO)
- EUROPEAN SPACE AGENCY
- NASA
- DEPARTMENT OF DEFENSE

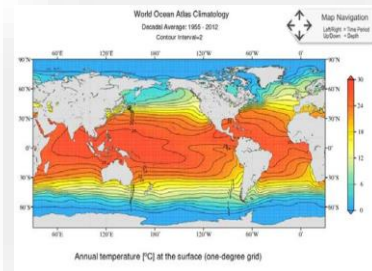


Freely Available Environmental Info is Most Useful

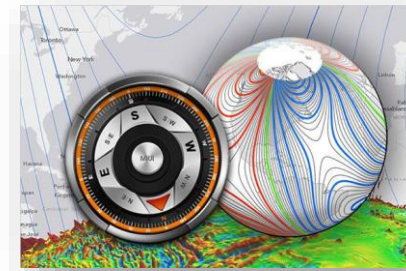
- NOAA satellite data are available on a FULL and OPEN Basis
- National Centers for Environmental Information (NCEI) includes all historical climate data sets, from present day to paleoclimate data
- From the ocean floor to the surface of the sun
- In collaboration with international community we host multiple reference data sets, including [World Magnetic Model](#), [World Ocean Database](#)
- Critical to millions of customers
- Continually updated



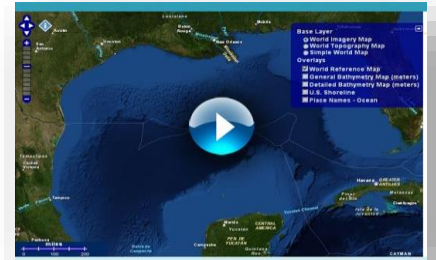
Climate Normals



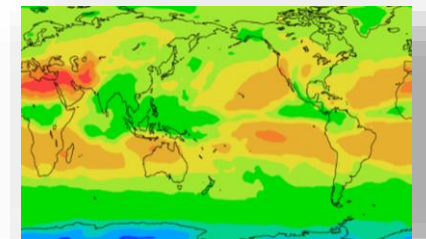
World Ocean Atlas



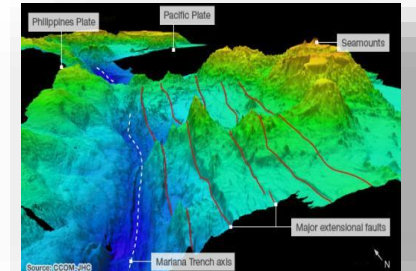
Earth's Magnetic Field



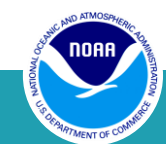
Gulf of Mexico Data



Reference
Environmental
Data Records



Coastal/Ocean Depths

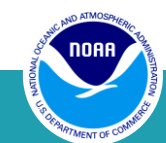


NESDIS Systems Architecture and Engineering (SAE)

<https://www.nesdis.noaa.gov/about/our-offices/systems-architecture-and-engineering>

Purpose: Accelerate our nation's environmental information services by designing and developing the next generation of Earth observation and data information systems.

- SAE provides a systematic approach to requirements, satellite architecture planning and systems engineering. This approach is used to provide critical business information and analysis to support NOAA and NESDIS' strategic observing system investment planning.
- Enables integration of NESDIS functions from observing systems to product and data dissemination systems through enterprise systems engineering processes.
- Manages product and services governance through the NESDIS product baseline and 5-year Product Plan.
- Leverages Earth observing data/technology through the CDP and Joint Venture programs.
- Manages active and continuous user engagement activities.
- Captures and documents contemporary user needs.





NESDIS / SAE

Commercial Weather Data Program

Patricia Weir, Program Manager



CDP Team Members

- **Patricia Weir, PM & Contracting Officer Rep. (COR)**
- Marty McHugh (SES Contract, Chief Engineer)
- Marc Gasbarro (SES Contract, CDP)
- Gerry Peltzer (SES Contract, CDP)
- Dana Burns (SES Contract, CDP)
- Suzanna Espinoza, Contracting Officer (CO)
- Cherron Bennett-Pettus, Contract Specialist (CS)
- Kera Wilkins, Acquisition
- Verlyn Francisco, Budget Formulation & Execution
- Randy Deinlein, General Engineer



Q&A Panel



Coordinator



In audience



NOAA Commercial Data Program Background

Purpose: Manage NESDIS' space-based commercial weather pilot and data purchase projects. Assess and acquire value-added space-based commercial environmental observation data to augment existing data streams in support of NOAA's operations and research.

The **Commercial Data Program** contains two lines of effort:

Commercial Weather Data Pilot:

Demonstrates the quality and impact of commercial data on weather forecast models

Commercial Data Purchase:

Supports operational weather forecasting

Commercial Data Program Information:

<https://www.space.commerce.gov/business-with-noaa/commercial-weather-data-pilot-cwdp/>

<https://www.nesdis.noaa.gov/data-research-services/data-purchased-noaa>



Commercial Data Authorization and Appropriation

Weather Research and Forecasting Innovation Act of 2017 (Weather Act):

- Authorizes NOAA’s space-based commercial weather pilot programs and data purchases
- For successful pilots, transition to operational use where appropriate, cost-effective and feasible
- Continue to meet international meteorological agreements
- Avoid unnecessary duplication between public and private data sources

Promoting Research and Observations of Space Weather to Improve the Forecasting of Tomorrow (PROSWIFT) Act of 2020:

- Allows NOAA to establish a pilot program to enter into commercial space weather contracts to provide space weather data, and allows NOAA to evaluate the data for use in space weather research and forecasting models of NOAA, the Department of Defense, or both.

Enacted Appropriations:

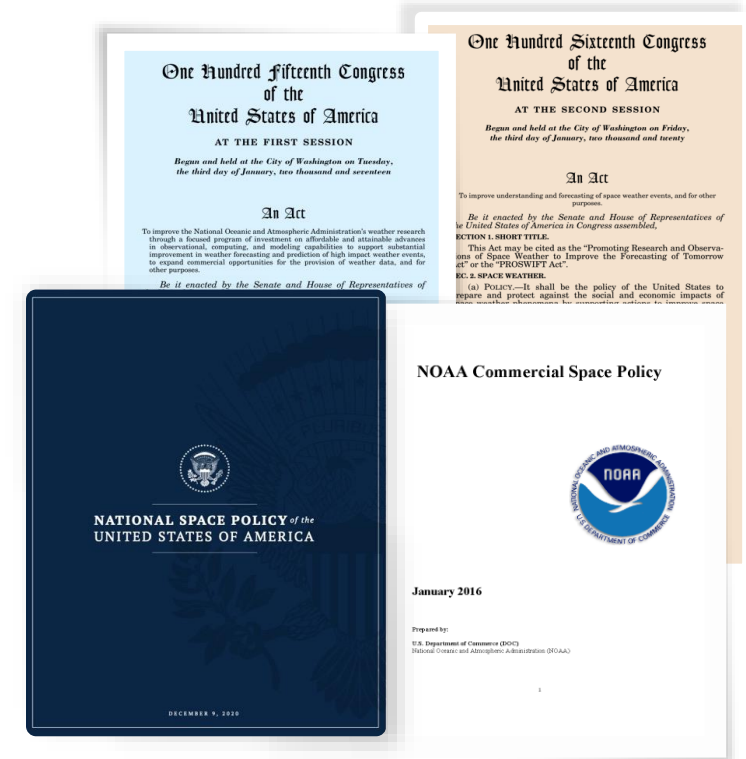
*President's Budget
 ** FY22 Consolidated Appropriations Act increase targeted for Space Weather
 ***\$10M from FY23 Supplemental Funds

Fiscal Year	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>	<u>2024*</u> <i>planned</i>
CWDP (Pilot)	\$3M	\$5M	\$6M	\$6M	\$3M	\$3M	\$8M**	\$8M	\$8M
Commercial Data Purchase	-	-	-	-	\$5M	\$9M	\$9M	\$19M***	\$25M



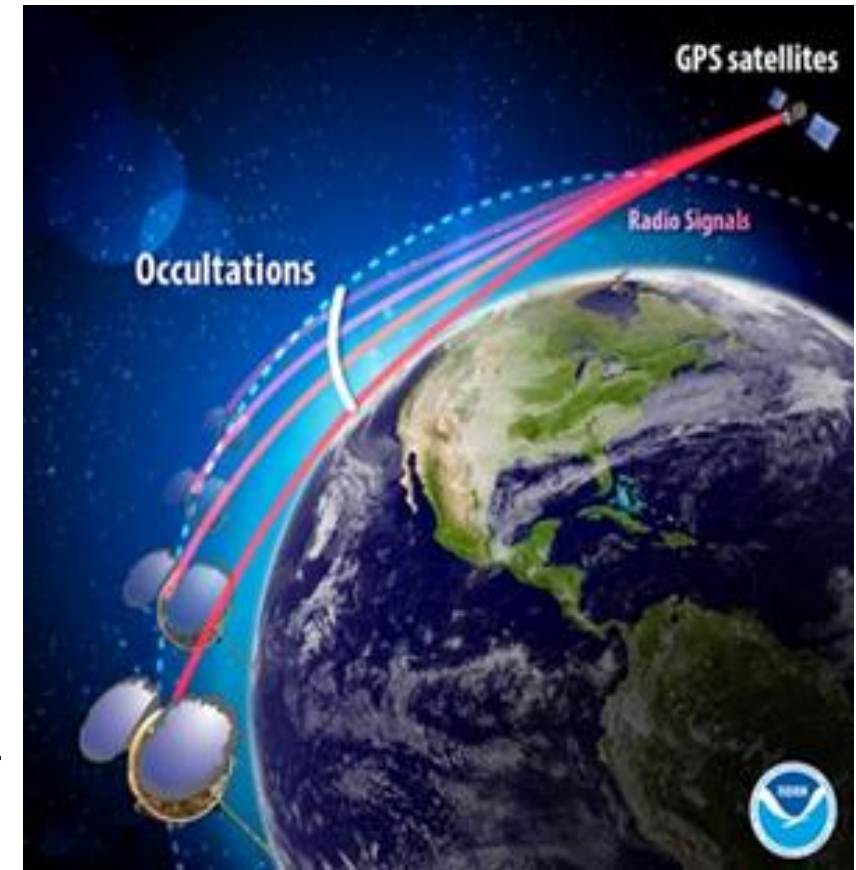
NOAA Commercial Data Program Background

- In 2016, NOAA issued its *Commercial Space Policy*, which set a broad framework for use of commercial space-based data.
- In 2016, NOAA/NESDIS initiated the **Commercial Weather Data Pilot (CWDP)** process to evaluate commercial satellite-based data, including Radio Occultation (RO) data collected from Global Navigation Satellite Systems (GNSS), for use in weather models and other systems.
- At that time, a NOAA study recommended a government backbone of 5,000 radio occultations per day, augmented by commercial data purchases of up to 20,000 occultations per day.
- In 2020, NOAA/NESDIS concluded the commercial sector was ready to provide operational RO data and initiated the **Commercial Data Program (CDP)** to manage the acquisition, ingestion, use and dissemination of commercially sourced data, including RO data.



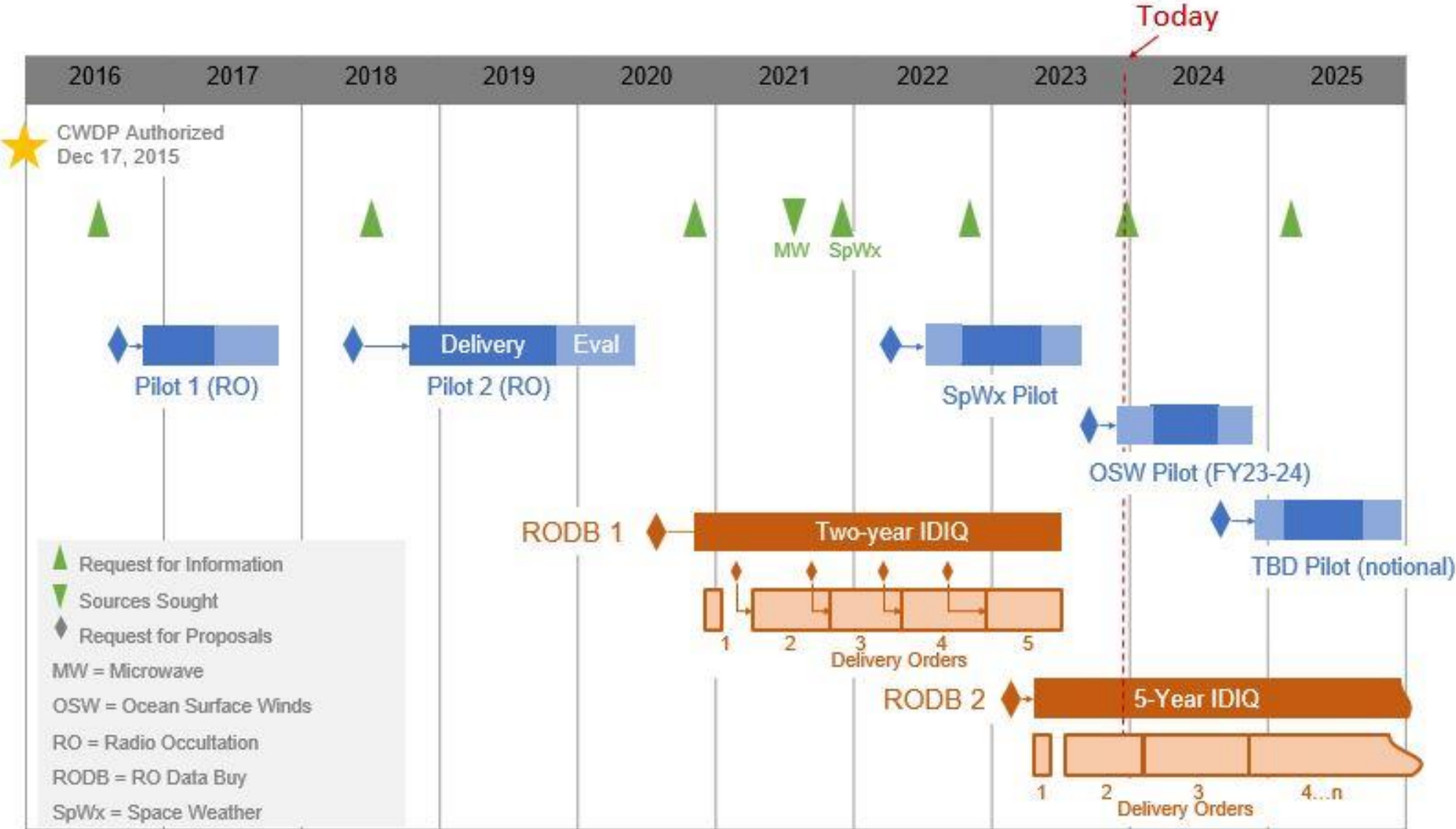
NOAA Commercial Data Program Background

- In Nov 2020, NOAA/NESDIS awarded their 1st Commercial Data Buy (RODB-1) to Spire Global and GeoOptics for 2 years.
- On Mar 27, 2023, NOAA/NESDIS awarded the 2nd Commercial Data Buy (RODB-2) to Spire Global and PlanetiQ for 5 years.
 - License: Unlimited distribution rights
- Today, NOAA uses commercially available RO data to respond to the ever-growing demand for environmental information and satisfy observational requirements, potentially at a lower cost than government alternatives.
- RO data is used to derive Neutral Atmosphere and Ionospheric products.
 - Neutral Atmosphere products include: Bending Angle, Refractivity, Temperature, Winds, Heights and Water Vapor
 - Ionospheric products include: Total Electron Content (TEC), Electron Density Profiles and Scintillation Indices



GNSS-RO receivers observe distortion of GNSS signals as they transit the atmosphere. NOAA produces quasi-vertical RO soundings based on bending angles from satellite-based RO open-loop measurements made during a GNSS occultation event.

Commercial Data Program Timeline



NOAA Data Sharing License Options

No restrictions



Highly restricted

Option 1	Unlimited distribution rights.	
Option 2	Distribution to U.S. Government agencies, National Meteorological Centers (NMC), WMO Met Centers, CGMS members, non-profits, academic entities for non-commercial use, with no further distribution	Option 2a Adds unlimited distribution after 24 hours
Option 3	Distribution to U.S. Government agencies, National Meteorological Centers (NMC), WMO Met Centers, and CGMS members for non-commercial use with no further distribution	Option 3a Adds unlimited distribution after 24 hours
Option 4	Distribution to U.S. Government agencies for non-commercial use and no further distribution (except to contractors for use on agency behalf)	Option 4a Adds unlimited distribution after 24 hours
Option 5	No distribution outside NOAA (except for contractors and grantees for use on NOAA's behalf)	Option 5a Adds unlimited distribution after 24 hours



Radio Occultation Data Purchase (RODB-1) IDIQ

IDIQ Contract:

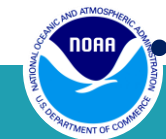
- \$23M Contract Ceiling
- GeoOptics and Spire Global awarded contracts on Nov. 20, 2020

Acquisition approach:

- Indefinite Delivery Indefinite Quantity (IDIQ) contracts covered 2 years (Nov 2020 - Nov 2022)
- NESDIS issued competitive Delivery Orders (RFPs) under the IDIQ
- Data sharing rights became less restrictive throughout the IDIQ

Key Requirements:

- Satellites must be on orbit at the time of RFP release
- RO data gathered globally from GNSS sources (GPS, GLONASS, Galileo, BeiDou)
- Specific spatial and temporal requirements
- Latency of 140 minutes or less
- Must include Precise Orbit Determination (POD) tracking data
- Quality requirements stated in terms of signal-to-noise ratio
- Specific data sharing requirements defined for each individual Delivery Order RFP



RODB-1 IDIQ Delivery Order History

Delivery Order	Vendor	RO Profiles per day	Duration (Months)	Period of Performance	Data Sharing	Notes
1-Test	Spire GeoOptics	500 500	1	Dec 2020 - Jan 2021	US Gov	Test data; prep for operations
2	GeoOptics	1300	6	Mar - Sep 2021	US Gov	Operational use began May 2021
3	Spire	3000	6	Sep 2021 - Mar 2022	US Gov, WMO and CGMS Centers	Added Galileo GNSS occultations
4	GeoOptics Spire	500 5500	10	Mar 2022 - Jan 2023	US Gov, WMO and CGMS Centers	10-month period began March 16, 2022
5	Spire	3300	6	Jan - Jul 2023	Unlimited distribution rights	Vendors were asked to provide 2 pricing options



Radio Occultation Data Purchase (RODB-2) IDIQ

IDIQ Contract:

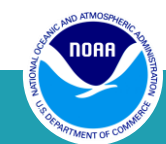
- \$59.31M Contract Ceiling
- PlanetiQ and Spire Global awarded contracts on March 27, 2023

Acquisition approach:

- Indefinite Delivery Indefinite Quantity (IDIQ) contracts covered 5 years (Mar 2023- Mar 2028)
- NESDIS will issue competitive Delivery Orders (RFPs) under IDIQ-2 over 5 years

Key Requirements:

- Satellites must be on orbit at the time of RFP release
- RO data gathered globally from GNSS sources (GPS, GLONASS, Galileo, BeiDou)
- Specific spatial and temporal requirements
- Latency of 140 minutes or less
- Must include Precise Orbit Determination (POD) tracking data
- Quality requirements stated in terms of signal-to-noise ratio
- Specific data sharing requirements defined for each individual Delivery Order RFP



What's new in the RODB-2 IDIQ?

Geographic/temporal sampling

- Added option to issue DOs to purchase data from specific geographic regions during specified periods.

Space Weather Data Requirements

- Ionospheric measurements will be used to produce space weather products including total electron content and scintillation indices; can be purchased separately with specific requirements for space weather applications.
- Lower latency requirements (baseline is 140 min) can be specified in each DO, for tropospheric or ionospheric needs. Preferred total electron content & scintillation maximum daily median latency baseline is 30 min.

Data sharing

- Unlimited distribution rights preference.

On-ramping new vendors

- Contains a mechanism *for on-ramping new vendors who were not awarded contracts in the initial IDIQ award.*
- **The need to on-ramp shall be evaluated annually** by the Commercial Data Program (CDP) Management to determine whether it is in the best interest of the Government to “reissue” an RFP.

Non-duplicative data

- To avoid situations where NOAA and partner agencies purchase the same data with licenses to share the data, a stipulation to provide *unique* data in DOs was added. Methods are being developed now to ensure that data are unique before ingesting in NWP (e.g. deconflict from EUMETSAT's RO data contract with Spire).



RODB-2 IDIQ Contracts awarded to Spire & PlanetiQ in Mar 2023

Contract ceiling (5-year POP): \$59.31M

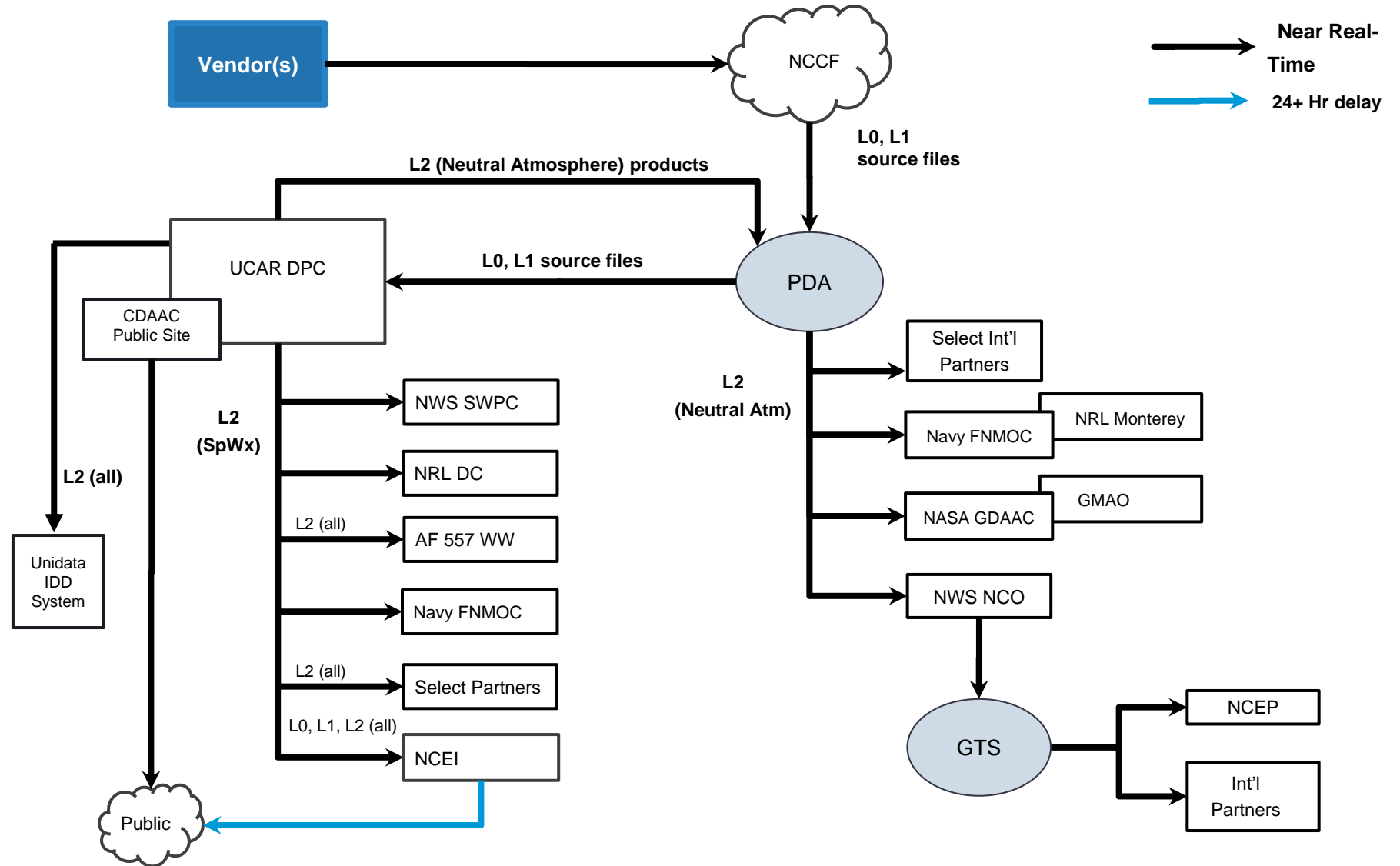
Delivery Order	Vendor	RO Profiles per day	Duration (Months)	Period of Performance	Data Sharing	Notes
1-Test	Spire PlanetiQ	500 500	1	Apr 5 - May 5, 2023	Unlimited distribution rights	Test data ; Validate that formats, latency, quality and coverage is sufficient for operational use.
2	PlanetiQ	3100	6	Jul 18, 2023 - Jan 18, 2024	Unlimited distribution rights	Data for new vendor tested and successfully assimilated into NCEP operational models.
3	TBD	TBD	TBD	Jan 18, 2024 - TBD	TBD	RFP released Oct 16th
4	TBD	TBD	TBD	TBD	TBD	
DO-n	TBD	TBD	TBD	TBD	TBD	



RODB-2 DO-2 Data Flow Diagram

Data Sharing License:
Unlimited distribution rights

- L0, L1, L2:** Level 0, Level 1, Level 2 data
- GTS:** Global Telecommunication System
- NCCF:** NESDIS Common Cloud Framework
- NCEI:** National Center for Environmental Information
- NCEP:** NOAA Centers for Environmental Prediction
- NCO:** NCEP Central Operations
- NWS:** National Weather Service
- PDA:** Product Distribution and Access system
- SWPC:** Space Weather Prediction Center
- UCAR DPC:** University Center for Atmospheric Research Data Processing Center



RO Commercial Data Product Users

• US Gov't users:

- Receiving products that UCAR processes:
 - NWS Space Weather Prediction Center (SWPC)
 - NWS NCEP Central Operations (NCO) and NCEP Environmental Modeling Center (EMC)
 - NESDIS STAR
 - Navy Fleet Numerical Meteorology & Oceanography Center
 - Navy Research Labs (NRL)
 - USAF 557th Weather Wing
 - NASA Goddard Space Flight Center / Global Modeling & Assimilation Office
 - Joint Center for Satellite Data Assimilation (JCSDA)

• International Partner users:

- Product Distribution and Access system (PDA) is preferred dissemination means for existing PDA users
- NWS Telecommunications Gateway (via GTS) point-to-point distribution is the alternate path
 - GTS: Global Telecommunication System

• Researchers:

- NCEI and UCAR's COSMIC Data Analysis and Archive Center (CDAAC) portal



Int'l Partner Agencies Currently Receiving Data

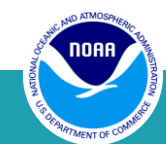
Country/Region	Agency	Membership
Australia	Bureau of Meteorology (BOM)	WMO
Canada	Environment & Climate Change Canada (ECCC) Canadian Meteorological Center (CMC)	WMO
China	China Meteorological Administration (CMA)	WMO & CGMS
Europe	European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT)	CGMS
Europe	European Centre for Medium-Range Weather Forecasts (ECMWF)	WMO
France	Centre National d'Etudes Spatiales (CNES)	CGMS
Germany	Deutscher Wetterdienst (DWD)	WMO
Hong Kong	Hong Kong Observatory (Weather Forecasting Office)	WMO
India	India Meteorological Department	WMO & CGMS
India	Indian Space Research Agency (ISRO)	CGMS
Japan	Japan Meteorological Agency (JMA)	WMO & CGMS
Korea	Korea Meteorological Administration (KMA)	WMO & CGMS
New Zealand	Meteorological Service of New Zealand (MetService)	WMO
United Kingdom	The Met Office (UKMO)	WMO



RO Data Operationally Assimilated by NOAA

as of quarter ending: 6/30/2023

Mission	Daily Occs.	% of Total Operational
COSMIC-2	4,593	42%
SPIRE (EUMETSAT & NOAA)	4,988	45%
METOP-B	588	5%
METOP-C	617	6%
TERRA	58	0.5%
KOMPSAT-5	33	0.3%
TANDEM	67	0.6%
PAZRO	111	1%
Total Operational June 30, 2023	11,055	100%
GRACE-C	108	1% of Total Daily
GRACE-D	119	1% of Total Daily
SENTINEL-6A	894	8% of Total Daily
Total Daily June 30, 2023	12,176	



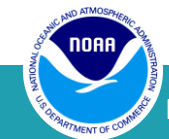
Commercial Data Purchase Team

Organization	Office Name	Role with the CDP
NESDIS/SAE	Systems Architecture and Engineering	Program Management, Communication, Reporting
NWS/NCEP	National Center for Environmental Prediction	Requirements, Assimilation, Analysis, Evaluation, Impact Assessments (<i>Primary user</i>)
NCEP/EMC	Environmental Modeling Center	NWP Operational Assimilation, Analysis and Evaluation
NCEP/SWPC	Space Weather Prediction Center	Requirements, Ionospheric Products (from RO) Assimilation, Analysis and Evaluation
OAR/ORTA	Office of Research, Transition and Application	Data evaluation, Data quality and Impact assessment studies
NESDIS/STAR	Center for Satellite Applications and Research	Product development, refinement, calibration/validation and monitoring; Data assessment & Impact analysis in NOAA Applications
UCAR	University Center for Atmospheric Research	Data processing, Data quality analysis & assessment
NESDIS/OCS	Office of Common Services	Secure data ingest and internal dissemination into NOAA Common Cloud Framework (NCCF)
NESDIS/NCEI	National Center for Environmental Information	Data archive and External dissemination
AGO	Acquisition and Grants Office	Acquisition planning and Contract Management
NESDIS/IIAD	International/Interagency Affairs Division	International communications



Commercial Weather Data Pilot

Process and Projects



Commercial Weather Data Pilot (CWDP) Process

Market Research

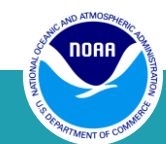
- Pulse community: Issue *Request for Information* or *Sources Sought* Notice to identify potential data types of interest
- Evaluate responses against NOAA goals, requirements, resources and schedules

Pilot Planning

- Organize team and allocate resources
- Develop requirements, engaging user community and experts
- Release draft “Statement of Work”
- Issue solicitation (“Request for Proposals”)
- Evaluate proposals
- Award contracts as appropriate

Pilot Execution

- Plan for data ingest, processing, dissemination and archive
- Conduct data delivery period
- Evaluate data quality and impact
- Report results to leadership and community at large
- Recommend data type for operational purchase when appropriate



NESDIS Strategic Guidance Documents

<https://www.nesdis.noaa.gov/about/documents-reports/nesdis-policies-procedures-and-plans>

NESDIS Level Requirements ([NESDIS-REQ-1001.1](#))

- Establishes top-level observing systems requirements to codify and validate user needs and expectations
- Includes all validated requirements to support NOAA's mission

NESDIS Product Baseline ([NESDIS-REQ-1002.2](#))

- Builds off of the NESDIS Level Requirements
- Defines a baselined set of products and accompanying threshold attribute specifications for product sustainment
 - Geographic coverage, refresh, latency
- Sets foundation to focus on users' fundamental needs, optimize products and maximize benefits

NESDIS Five-Year Product Plan ([NESDIS-REQ-1003.2](#))

- Outlines how NESDIS will strategically sustain and introduce new products/algorithms over the next 5-year period
- Informed by user impact-driven product priorities, available satellite and in-situ data sources, scientific/algorithm improvements, schedules and lifecycle costs; bounded by anticipated funding; updated annually

Space Weather Next Program Objectives ([NESDIS-REQ-4500.3](#))

- Provides the aspirational functional and performance requirements for the Space Weather Next System
- Provides the full scope of validated, technically realizable, space weather user needs; budget agnostic

NOAA Satellite Observing System Architecture Study ([NSOSA Report - 2018](#))

10-yr outlook for operational environmental satellite capabilities likely to be available in 2028

Home / About / Documents & Reports

NESDIS Policies, Procedures, and Plans

This document repository includes systems engineering and project management policies, procedures, and plans affecting all NESDIS Offices.

- Policy Directive Template +
- Complete List of Current Directives (Master List)**
- 0000-0999 Federal Policies and Directives +
- 1000-1999 ESSENTIAL POLICIES, PLANS, AND PROCEDURES** -

[NESDIS-REQ-1001.1 - NESDIS Level Requirements - September 2020](#) (PDF)

[NESDIS-REQ-1002.2 - NESDIS Product Baseline - September 2022](#) (PDF)

NESDIS Level Requirements

[REQ-001] NESDIS will provide environmental data, information, products, services, and reports in the Foundational, Geophysical, and Analytical thematic product areas.

Foundational

Imagery
Sensor Data

Geophysical

Atmosphere
Atmospheric Composition and Air Quality
Atmospheric Temperature
Atmospheric Water Vapor
Clouds
Lightning
Precipitation
Radiation Budget
Tropical Cyclone Characteristics
Volcanic Eruption Characteristics
Winds

Cryosphere
Lake and Sea Ice
Snow and Glaciers

Land & Surface Hydrology
Fires
Flood
Surface Moisture
Surface Temperature
Vegetation

Oceans, Freshwater and Coasts
Biology and Biogeochemistry
Surface Height
Topography and Bathymetry
Water Pollution
Water Temperature and Salinity

Space
Heliosphere
Ionosphere
Magnetosphere
Solar

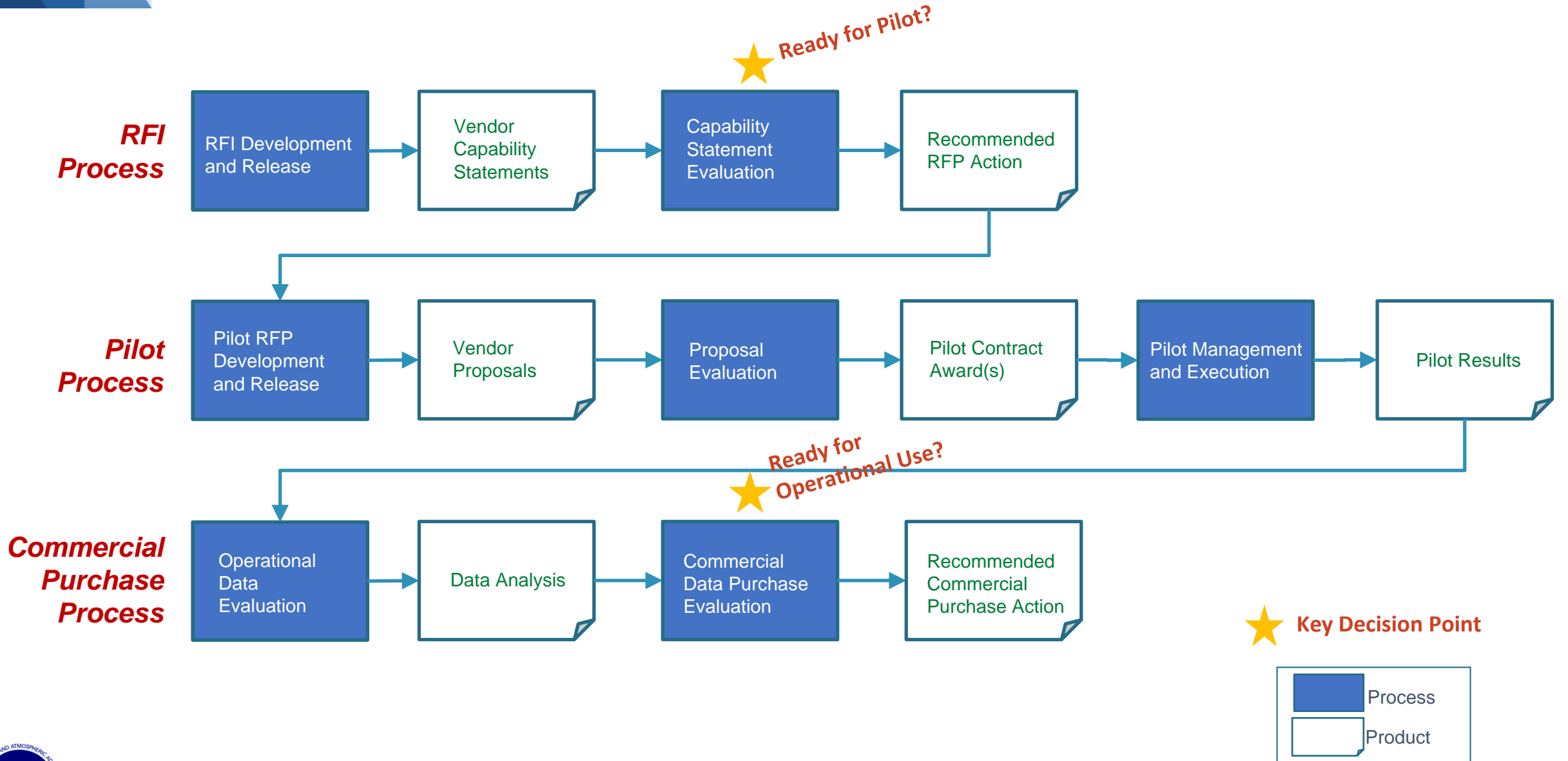
Analytical

Climate
Weather
Oceans, Freshwater & Coasts

Figure 1 - Thematic Product Areas and Product Categories



Commercial Weather Data Pilot (CWDP) Process



Typical Pilot Execution: 3 Phases

Phase 1: Preparation - 3 months

In this initial phase, the Contractor shall supply the necessary technical documentation which may include format specifications, calibration data, and any other information that will be needed to ingest and process the data. Delivery mechanisms and data handling processes will be communicated to the Contractor. The Contractor will provide engineering support as needed to the Government to enable acquisition and processing of the supplied datasets. A delivery of 24-hours of sample data will be required during this phase and used to test and adjust the delivery and data flow process as needed.

Phase 2: Data Delivery - 6 months

In this phase, the Contractor shall supply a series of data deliveries for a period of 6 months meeting the requirements stated in the SoW. The start and end date/time of this data delivery period will be coordinated with the CO and COR. The Contractor shall meet with the Gov team as required.

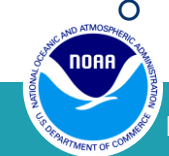
Phase 3: Evaluation - 3 months

In this final phase, the Contractor will be available for limited reach-back engineering/technical support as needed for problem resolution and technical assistance, as the Government evaluates the supplied dataset.



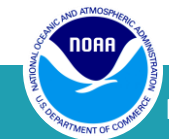
Commercial Weather Data Pilot (CWDP) History

- Began in 2016 to assess the operational readiness of radio occultation (RO) data.
 - CDP Conducted two successful pilots in 2016 and 2018 for neutral atmosphere RO data.
 - After the second pilot, NOAA concluded that RO data was ready for operational use; resulted in RODB-1 IDIQ.
- **CWDP FY21 Pilot (Microwave):**
 - Market Research for commercial Microwave data was posted in July 2021 via a Sources Sought Notice.
 - In August 2021, numerous vendors responded; a Microwave Capability Assessment Team was stood up to evaluate vendor capability assessment statements based on a predetermined evaluation criteria; NESDIS decided not to move forward with a Microwave Pilot but will continue to assess commercial viability.
- **CWDP FY22 Pilot (Space Weather):**
 - As directed by Congress, per the PROSWIFT Act, NESDIS conducted market research into the availability of commercial Space Weather data for a pilot study.
 - In Dec 2021, Market Research revealed multiple companies capable of providing GNSS-RO measurements of the ionosphere suitable for pilot studies.
 - Note - some GNSS-RO ionospheric measurements were already being provided by CDP's ongoing operational purchase; however, these did not have sufficiently low latency and lacked specific scintillation measurements.
 - NESDIS released an RFP in May 2022, soliciting Space Weather GNSS-RO observations; Pilot subsequently awarded.
- **CWDP FY24 Pilot (Ocean Surface Winds):**
 - Recently awarded a pilot to deliver GNSS Reflectometry (GNSS-R) data to derive ocean surface wind speed products.



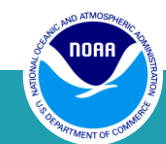
Commercial Data Program (CDP)

Space Weather Data Pilot

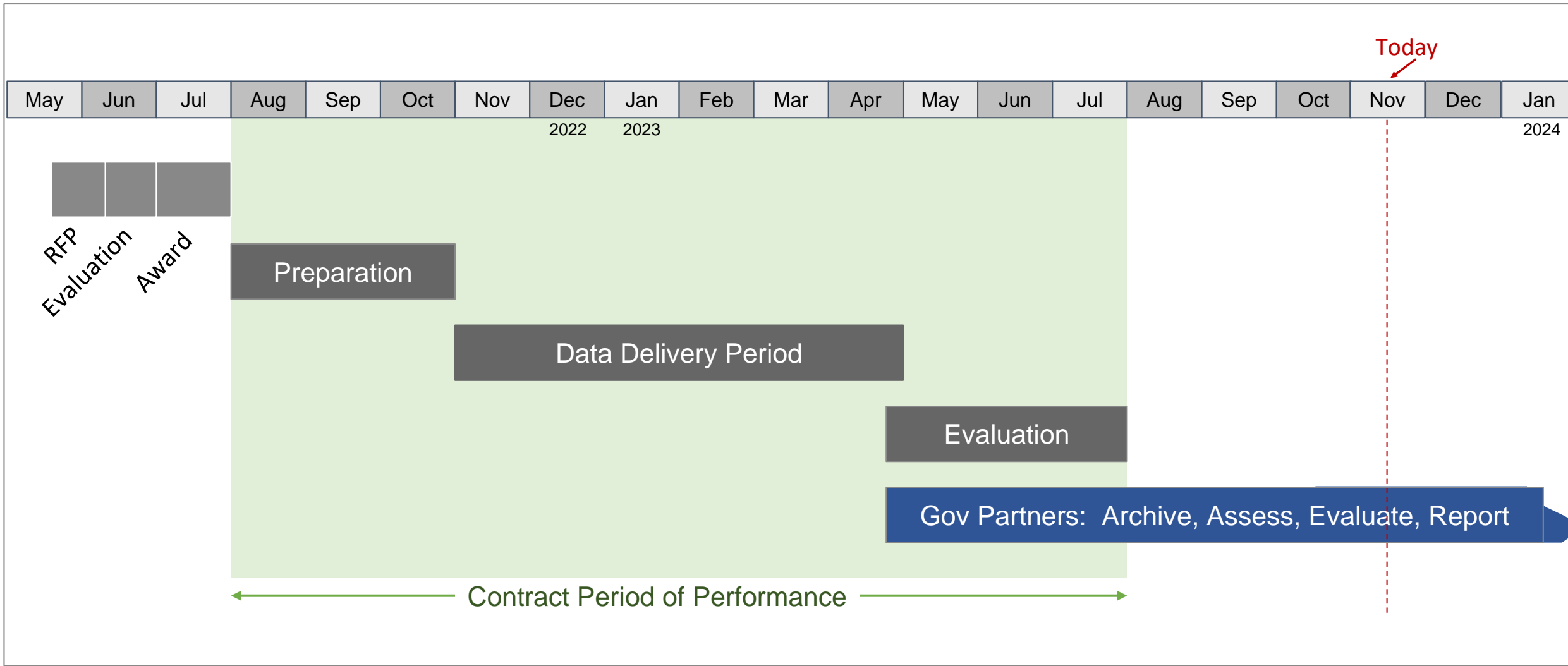


Space Weather Data Pilot Overview

- **Objective:** Derive ionospheric products that meet current and anticipated operational space weather model and application needs.
 - Total Electron Content (TEC)
 - TEC observations help specify the electron density structure in the ionosphere/plasmasphere
 - From TEC, can derive vertical electron density profiles; useful for radio wave propagation and satellite navigation applications
 - Scintillation Phase and Amplitude - High rate data (≥ 50 Hz)
 - Scintillation refers to rapid, localized, intense fluctuations in the ionospheric state
 - Scintillation affects the power and phase of radio signals propagating through the ionosphere; also affects satellite navigation
 - Max daily median latency 30 minutes
- On July 14, 2022, NOAA awarded contracts to three companies:
 - GeoOptics Inc. (Pasadena, CA)
 - Space Sciences and Engineering LLC, dba PlanetiQ (Golden, CO)
 - Spire Global Subsidiary, Inc (San Francisco, CA)
- Began Aug 1, 2022 for one year
- License sharing - Limited to U.S. Gov, National/WMO Met centers, CGMS members for non-commercial use only
- Based on post-award developments, GeoOptics effort bilaterally concluded Nov 2022



Space Weather Data Pilot Schedule

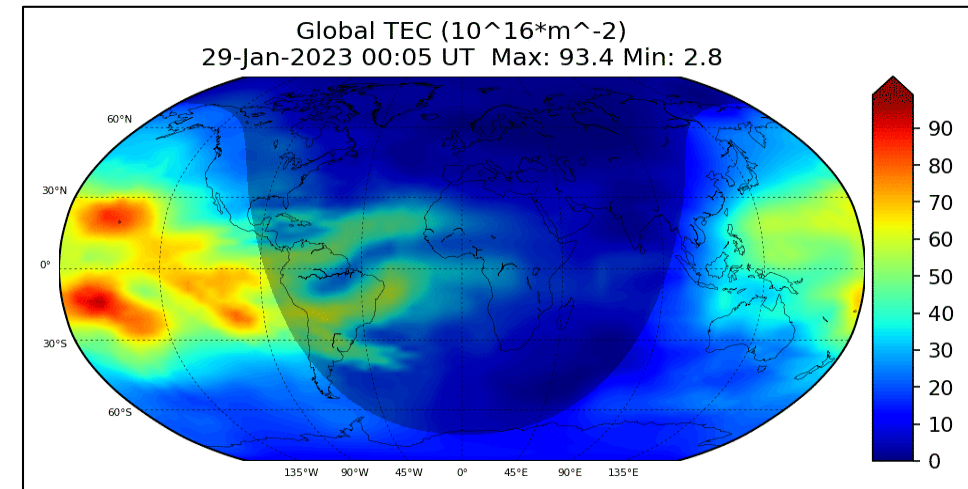


Final Space Weather Pilot Evaluation *estimated* completion for Spring 2024.



Space Weather Data Pilot: Preliminary Results

- Data and vendor evaluation
 - Data delivery by both vendors exceeded 500 compliant observations per day
 - Electron density & total electron content (TEC) demonstrated good accuracy
 - Low-latitude TEC and scintillation data validates well with existing data sources
 - Commercial TEC and scintillation data coverage complements COSMIC-2 data very well
 - Contributes to global coverage of data, especially away from ground stations
- Lessons Learned
 - Onboard algorithm to identify scintillation events (to trigger download) needs updating for high latitudes
 - Differential code bias processing differences need resolving
 - High-latitude geolocation methods are under development
 - RFI detection metrics need improving

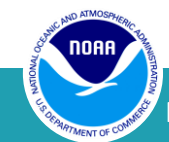


GloTEC Total Electron Content (TEC)
(ground+Spire+PlanetiQ)

First comprehensive analysis/research on measuring high-latitude scintillation with RO data

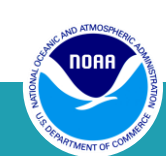
Commercial Data Program (CDP)

Ocean Surface Winds Pilot



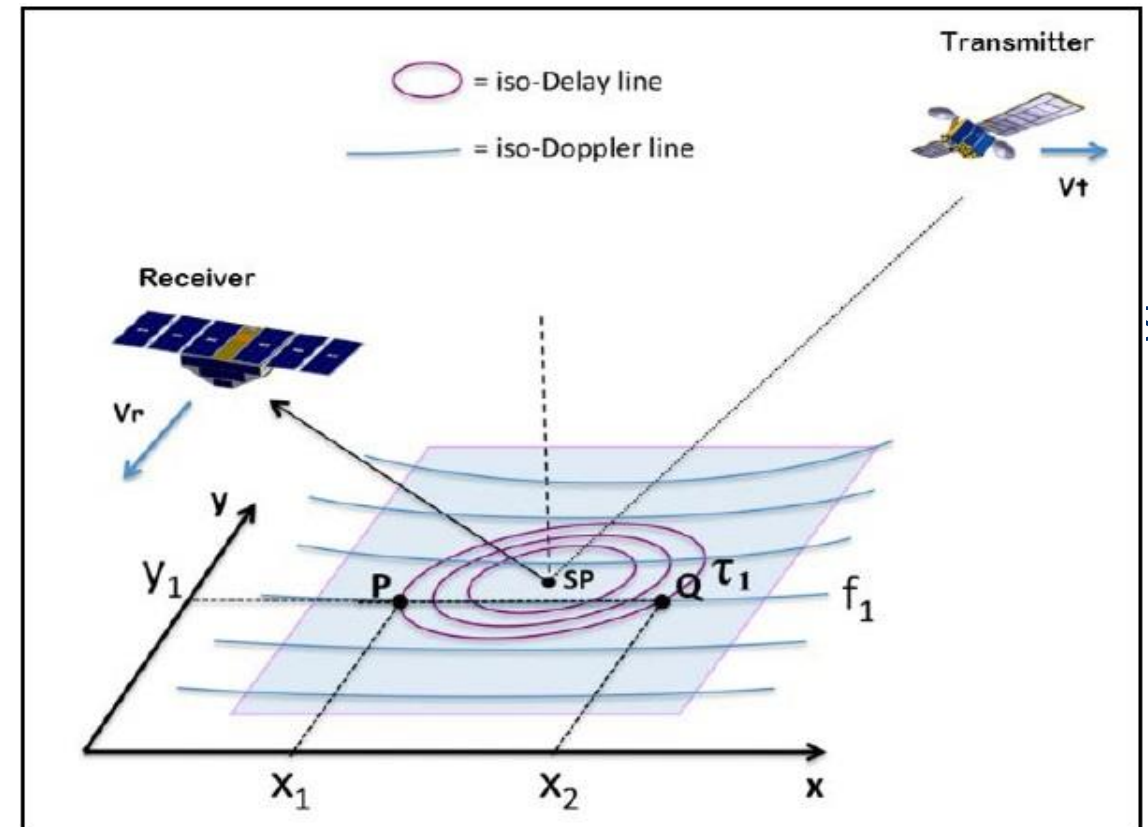
Ocean Surface Winds (OSW) Pilot Overview

- NOAA posted a Request For Information (RFI) in September 2022.
- NOAA solicited information on existing or planned commercial satellite environmental data and related capabilities that will be available in the FY 23-30 time frame.
- Vendors were requested to submit Capability Statements to address which NESDIS Level Requirements their commercially-provided data and related capabilities could augment in those capability areas.
 - 14 vendors responded
- CDP stood up a Capabilities Assessment Team and assessed responses based on mission needs, mission impacts and vendor's on-orbit capabilities.
- CDP briefed the NESDIS AA in April & May 2023 with results & recommendations for the next pilot.
 - Result: Obtain and process GNSS-Reflectometry (GNSS-R) data
 - Focus on Ocean Surface Wind measurements
 - Data may yield insights into other areas (e.g. sea ice, soil moisture)
- NESDIS issued an RFP in August 2023; Awarded to Spire Global on Sep. 18, 2023
- Pilot began Oct 25, 2023 for a 12-month period

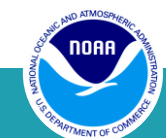
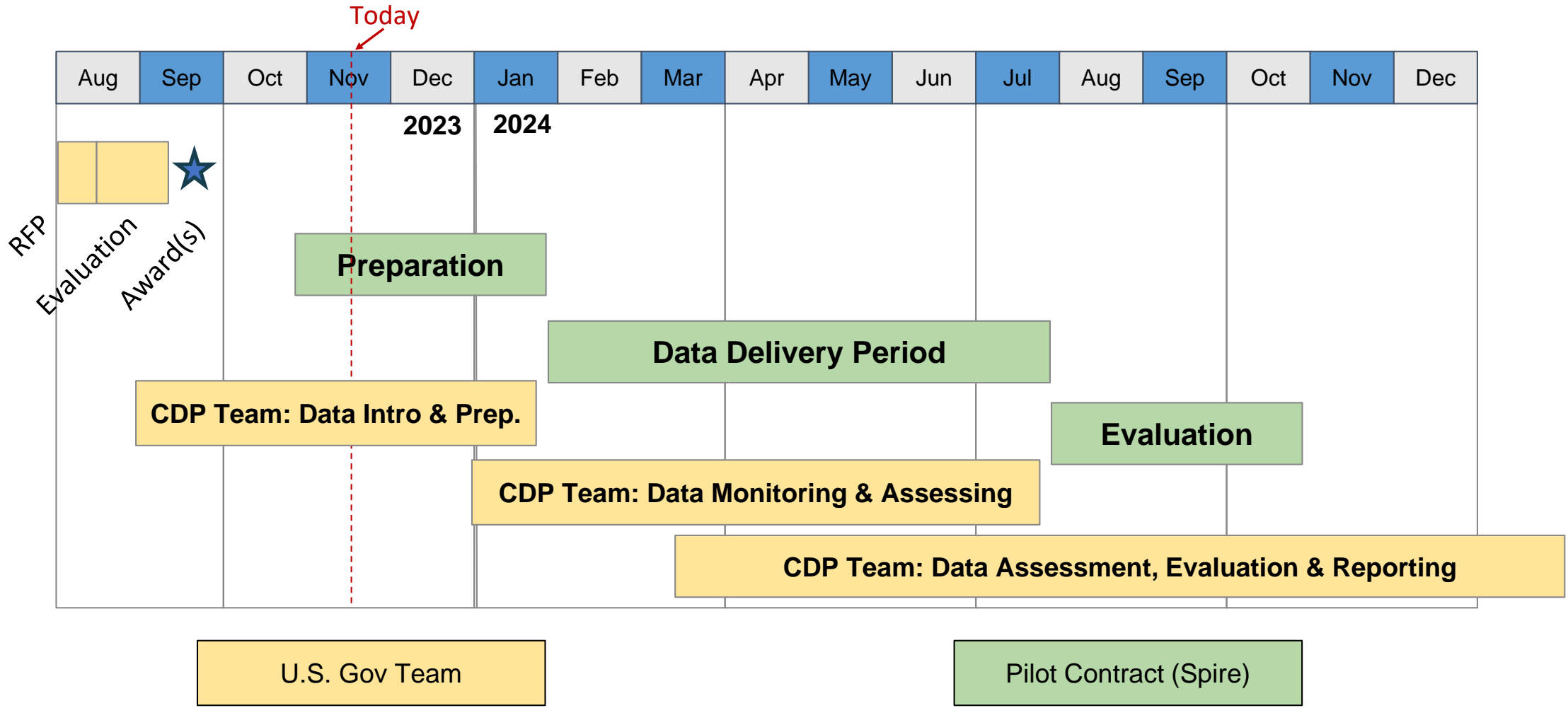


Ocean Surface Winds (OSW) Pilot Overview

- **Objective:** To conduct studies to improve upon GNSS-Reflectometry (GNSS-R) derived ocean wind speed products previously developed by NOAA and investigate the utility of wind speed products developed by vendors. Also to assess the quality and impact of commercial GNSS-R observations for add'l environmental measurements.
 - Provide L1 & L2 grazing angle GNSS-R observations for sea ice and altimetry measurements.
 - Produce calibrated Delay Doppler Maps and Specular reflection point location estimates.
 - NESDIS & NWS will compare the commercial R measurements with other more satellite measurements.
 - Leverage past reflectometry research with the NASA-led Cyclone GNSS (CYGNSS) mission.
 - Investigate insights into other parameters (e.g. sea ice, soil moisture, flood mapping).



Ocean Surface Winds (OSW) Pilot Schedule



Commercial Data Program (CDP)

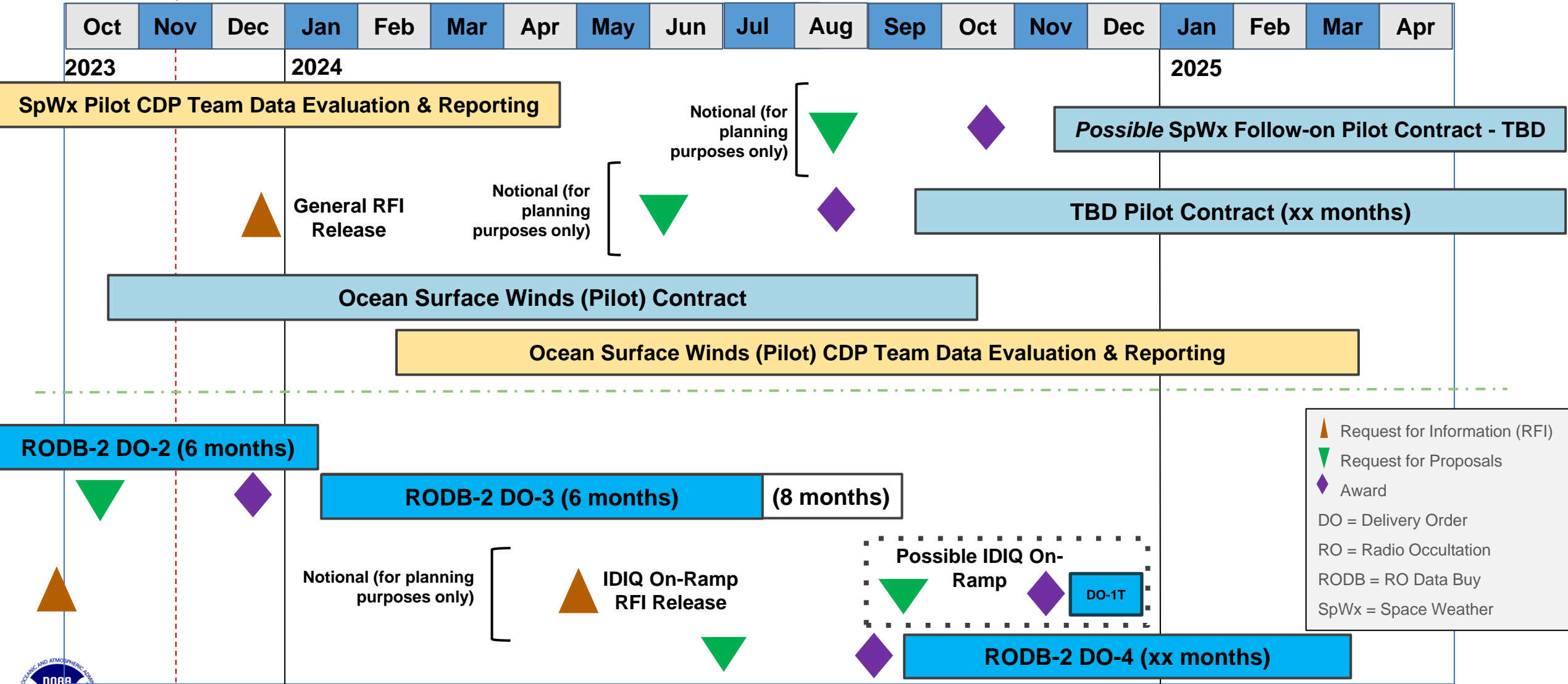
FY 2024/FY 2025 Planning



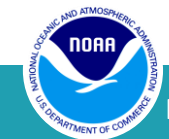
CDP FORECAST: FY 2024 - 2025

DISCLAIMER: This is for planning purposes only and is subject to changes

Today



Radio Occultation Modeling Experiment (ROMEX)



ROMEX Overview

- Purpose/Objective:
 - Collaborative effort to explore the impact of RO observations obtained & shared by the community
 - Quantify the benefit of increasing the quantity of RO observation assimilation into NWP models
 - Find a bend in the knee of cost (quantity)/benefit of assimilating RO profiles into NWP models
 - Complete in 2024 (critical to planning beyond COSMIC-2's estimated end of life in 2027)
- Int'l RO Working Group (IROWG) initially indicated min of 20K RO profiles p/day
- Research shows that the most impact per observation is in first 30K RO profiles p/day
- ROMEX Study:
 - Led by EUMETSAT, JCSDA
 - Participants: UCAR, NOAA, ECMWF, UKMO, NASA, USAF, Int'l WMO Centers, Industry (Spire, PlanetiQ)
 - Obtain and share RO data for set-periods of experimentation
 - Ingest, run, and compare controlled NWP runs
 - Conduct data assimilation and impact assessments from data-denial experiments
 - Factors for consideration:
 - Data Quantity, Quality (i.e. latency, SNR), Spatial/temporal resolution, Make vs. Buy (Gov vs. Comm), Forecast Sensitivity-based Observation Impacts (FSOI)
- Final results ready in mid-late 2024; Results will be shared publicly





Thank You!

