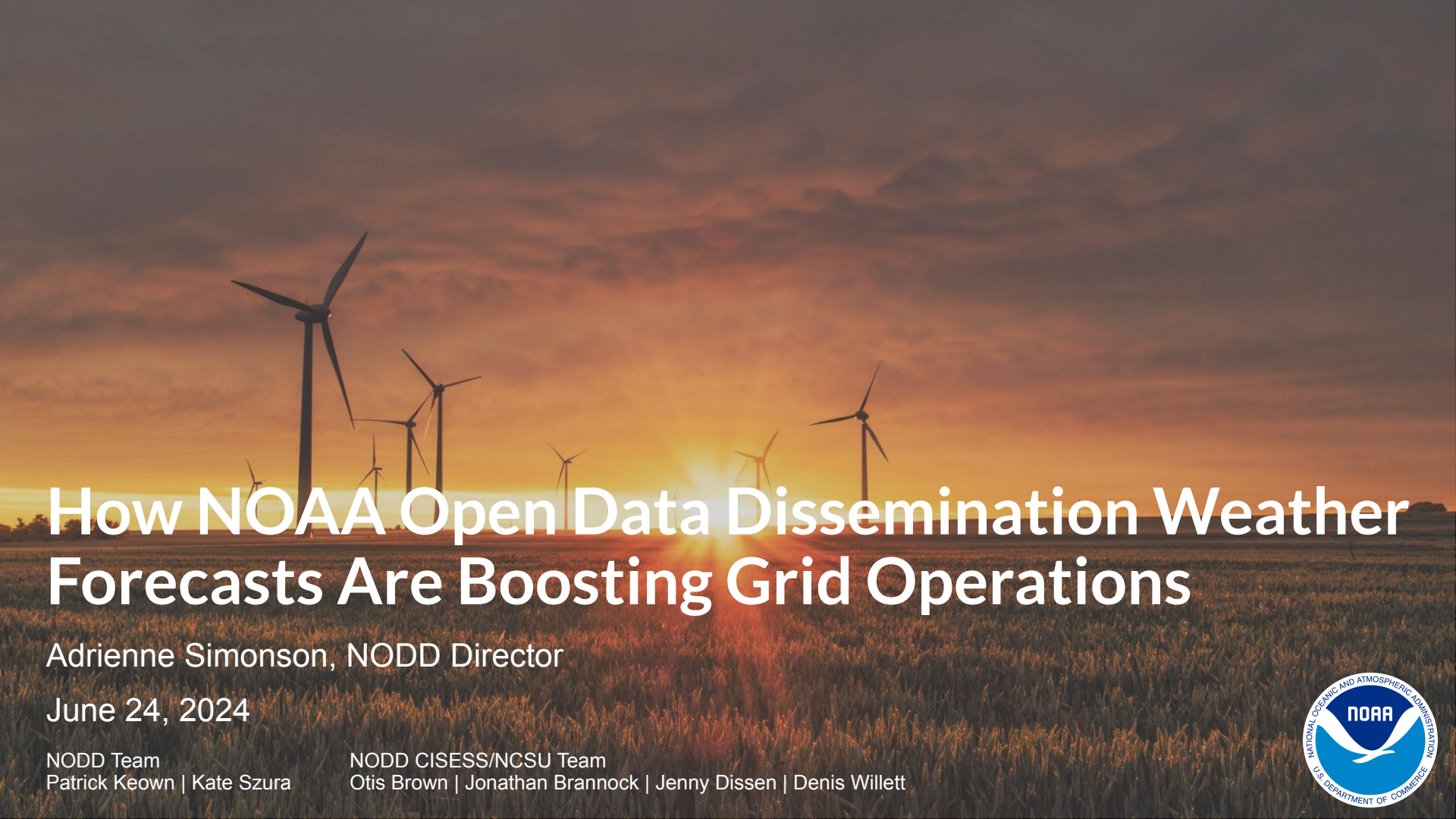


How NOAA Open Data Dissemination Weather Forecasts Are Boosting Grid Operations

Adrienne Simonson, NODD Director

June 24, 2024

NODD Team
Patrick Keown | Kate Szura

NODD CISESS/NCSU Team
Otis Brown | Jonathan Brannock | Jenny Dissen | Denis Willett

Agenda

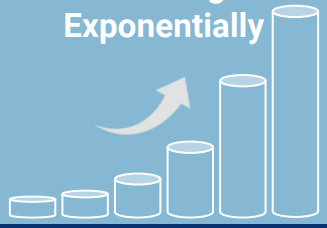
- **NOAA Open Data Dissemination (NODD):**
  - Purpose & Mission
  - Available Data
  - Program Structure & Operational Support
  - Engagement Opportunities

NODD Disseminates NOAA Line Office Data

Data hosted through NODD is:

- Open and free data with value to the public
- Moves from NOAA Line Offices to public cloud buckets via the NODD Data Broker from which an exponential amount of users can access
- Has no use restrictions and does not require user registration
- Appropriate Metadata is required for each dataset

NOAA Data is Growing Exponentially



TECHNOLOGY MODERNIZATION

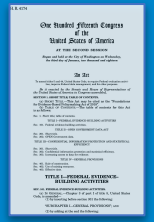
Reduces stress on NOAA's on-premise dissemination systems

Improves services for users

FULL & OPEN PUBLIC ACCESS

Supports Federal Data Strategy & Evidence Act Open Data Requirements

No egress costs

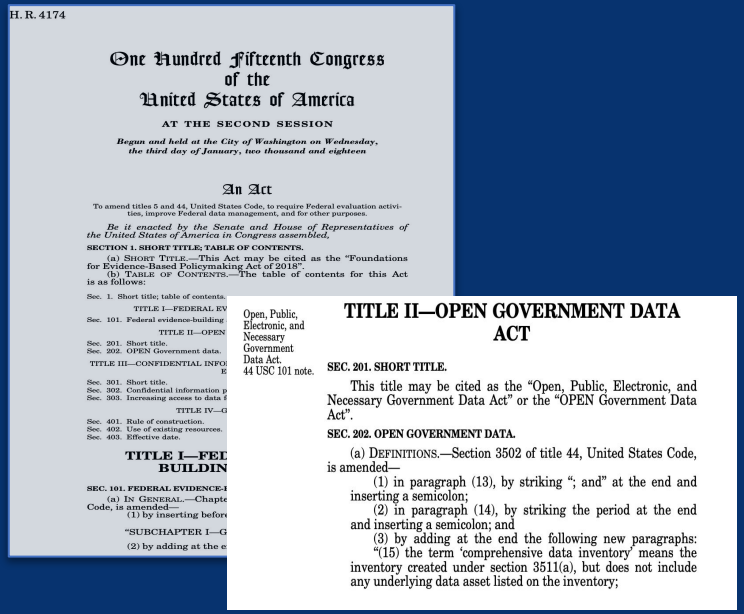


ENABLES & ENGAGES USERS

Catalyzes innovation in environmental services

Enables interoperability

NODD Supports "Foundations for Evidence-Based Policymaking Act", Including Open Data Requirements



H. R. 4174

One Hundred Fifteenth Congress
of the
United States of America

AT THE SECOND SESSION

Begun and held at the City of Washington on Wednesday, the third day of January, two thousand and eighteen

An Act

To amend titles 5 and 44, United States Code, to require Federal evaluation activities, improve Federal data management, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Foundations for Evidence-Based Policymaking Act of 2018".

(b) TABLE OF CONTENTS.—The table of contents for this Act is as follows:

Sec. 1. Short title; table of contents.

TITLE I—FEDERAL EV

Sec. 101. Federal evidence-building

TITLE II—OPEN

Sec. 201. Short title.
Sec. 202. OPEN Government data.

TITLE III—CONFIDENTIAL INFO

Sec. 301. Short title.
Sec. 302. Confidential information p
Sec. 303. Increasing access to data f

TITLE IV—G

Sec. 401. Rule of construction.
Sec. 402. Use of existing resources.
Sec. 403. Effective date.

TITLE I—FE
BUILDIN

SEC. 101. FEDERAL EVIDENCE-

(a) IN GENERAL.—Chapte
Code, is amended—
(1) by inserting before

"SUBCHAPTER I—G

(2) by adding at the e

Open, Public, Electronic, and Necessary Government Data Act. 44 USC 101 note.

TITLE II—OPEN GOVERNMENT DATA ACT

SEC. 201. SHORT TITLE.

This title may be cited as the "Open, Public, Electronic, and Necessary Government Data Act" or the "OPEN Government Data Act".

SEC. 202. OPEN GOVERNMENT DATA.

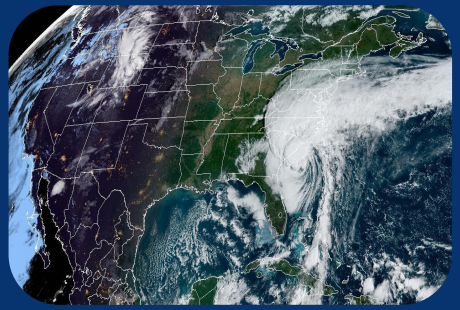
(a) DEFINITIONS.—Section 3502 of title 44, United States Code, is amended—

(1) in paragraph (13), by striking "; and" at the end and inserting a semicolon;

(2) in paragraph (14), by striking the period at the end and inserting a semicolon; and

(3) by adding at the end the following new paragraphs:

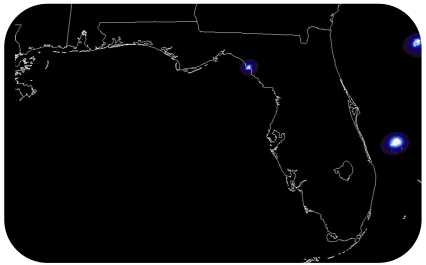
"(15) the term 'comprehensive data inventory' means the inventory created under section 3511(a), but does not include any underlying data asset listed on the inventory;

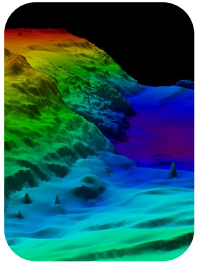


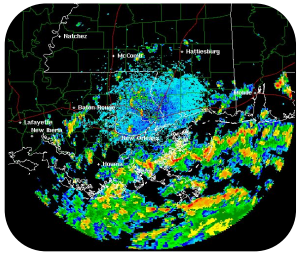
& NOAA's Priorities

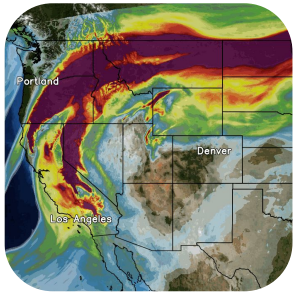
- ✓ Build a Climate Ready Nation
- ✓ Make Equity Central To NOAA's Mission
- ✓ Accelerate Growth In An Information Based Blue Economy

NOAA Datasets Accessible via NODD



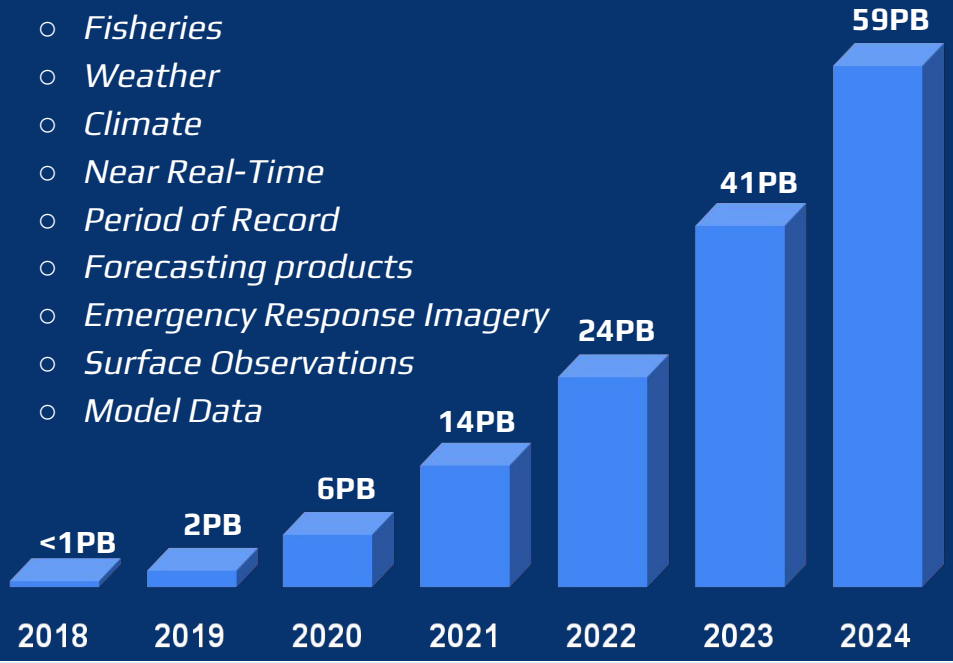






VISIT NOAA.GOV/NODD TO EXPLORE THE FULL LIST

- Atmospheric
- Oceanic
- Fisheries
- Weather
- Climate
- Near Real-Time
- Period of Record
- Forecasting products
- Emergency Response Imagery
- Surface Observations
- Model Data



Highlighted Datasets for the Energy Sector

- **Numerical Weather Prediction (NWP)**
  - Climate Forecast System (CFS)
  - Global Forecast System (GFS)
  - Global Ensemble Forecast System (GEFS)
  - High-Resolution Rapid Refresh (HRRR)
  - Rapid Refresh (RAP)
- **Radar**
  - Next Generation Weather Radar (NEXRAD)

Do you have any data questions or requests?

Please reach out to the NODD team at NODD@NOAA.GOV with any questions. The team can assist or connect you with a NOAA subject matter expert or cloud subject matter expert.

- **Satellite Data**
  - Geostationary Operational Environmental Satellites (GOES) - R Series
    - Solar Information
  - Joint Polar Satellite System (JPSS)
- **Weather/Climate Data**
  - Global Historical Climatological Network
  - nClimGrid
  - Climate Normals
  - Integrated Surface Database (ISD)
  - Storm Events Database

Data is made available via our three cloud service providers (CSPs):

Microsoft Azure aws Google Cloud

NODD Architecture

Data updates are available via SNS, Pub/Sub, and Azure Event Notifications. Please refer to the cloud service provider (CSP) landing page to see if a dataset of interest has an event driven notification set up.

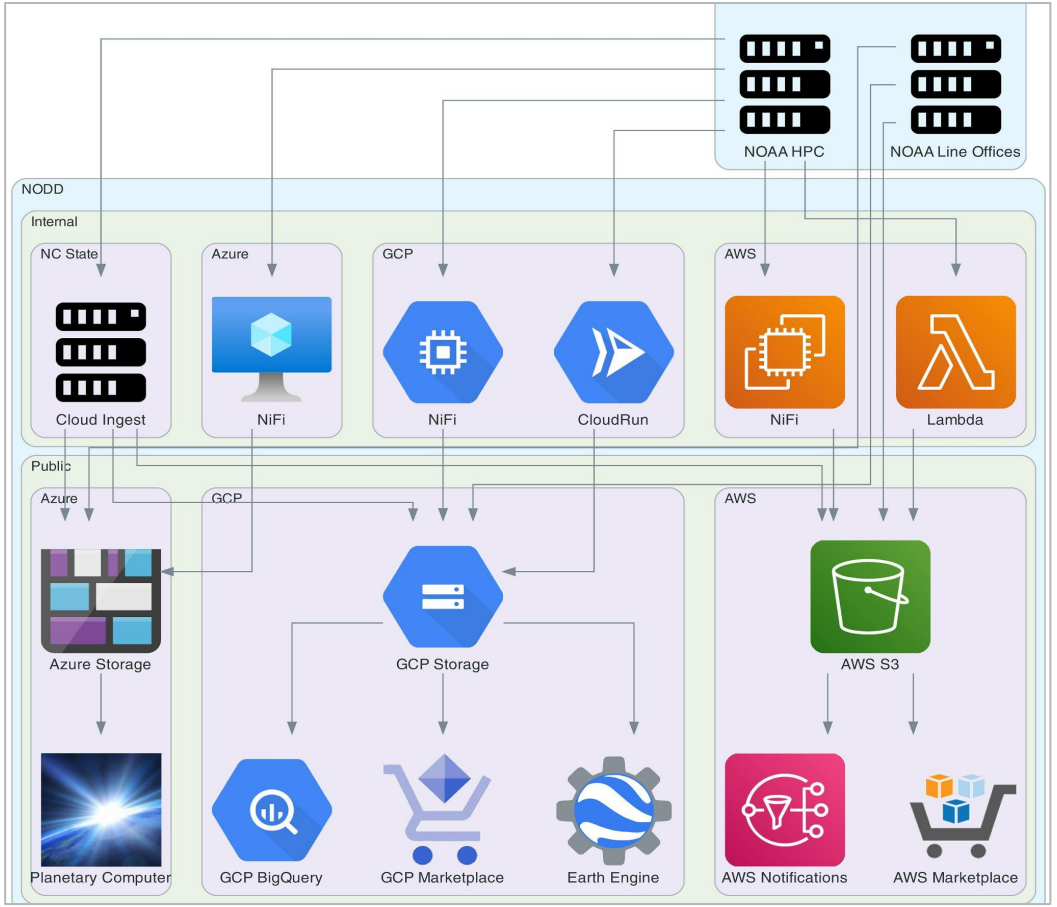
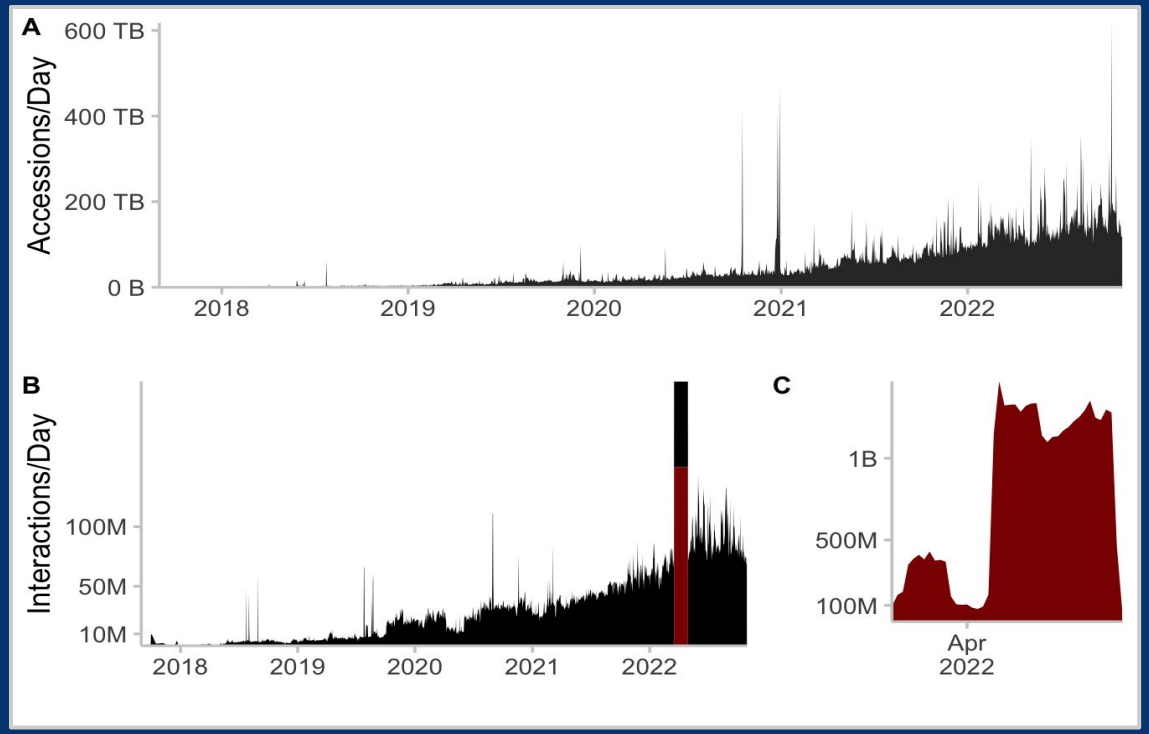


Figure: NODD architecture displaying data movement from NOAA on-prem systems to each of the three cloud service providers.

NODD Data Accessibility



- NODD supports high volume of traffic for interactions
- NODD has supported sustained interactions by count of 1.2 -1.5 billion per day for 28 days straight for GOES data
- And interactions by volume – we have seen 1.2PB of the data accessed in a single day

Not possible with on-premise system

Benefits to Users of Cloud Scalability via NODD

Metrics Track Increased Use on Cloud Platforms

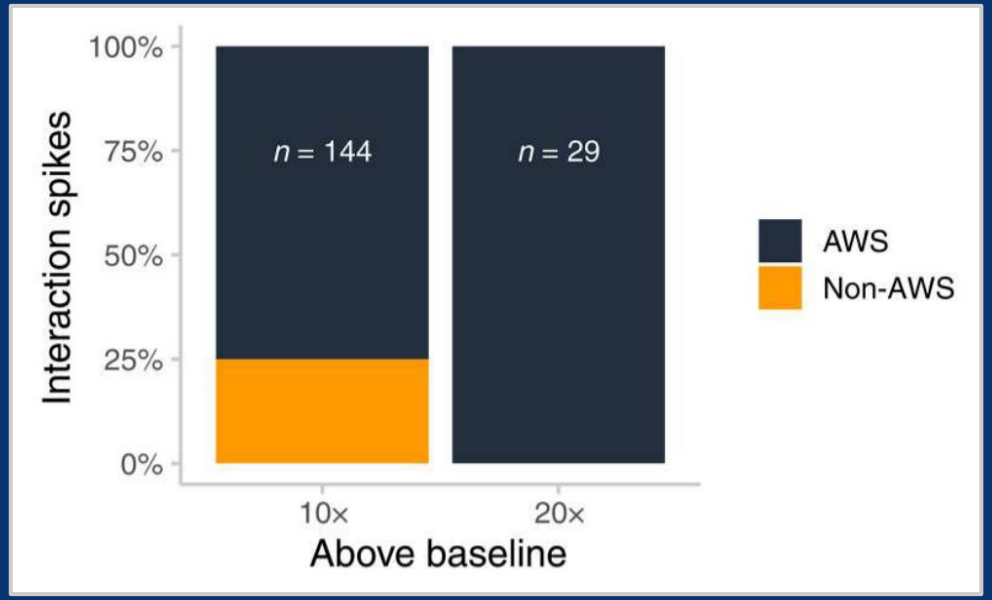
SCIENCE ADVANCES | RESEARCH RESOURCE

PLANETARY SCIENCE

NOAA Open Data Dissemination: Petabyte-scale Earth system data in the cloud

Denis S. Willett[1]*†, Jonathan Brannock[1]†, Jenny Dissen[1], Patrick Keown[2], Katelyn Szura[2], Otis B. Brown[1], Adrienne Simonson[2]

NOAA Open Data Dissemination (NODD) makes NOAA environmental data publicly and freely available on Amazon Web Services (AWS), Microsoft Azure (Azure), and Google Cloud Platform (GCP). These data can be accessed by anyone with an internet connection and span key datasets across the Earth system including satellite imagery, radar, weather models and observations, ocean databases, and climate data records. Since its inception, NODD has grown to provide public access to more than 24 PB of NOAA data and can support billions of requests and petabytes of access daily. Stakeholders routinely access more than 5 PB of NODD data every month. NODD continues to grow to support open petabyte-scale Earth system data science in the cloud by onboarding additional NOAA data and exploring performant data formats. Here, we document how this program works with a focus on provenance, key datasets, and use. We also highlight how to access these data with the goal of accelerating use of NOAA resources in the cloud.



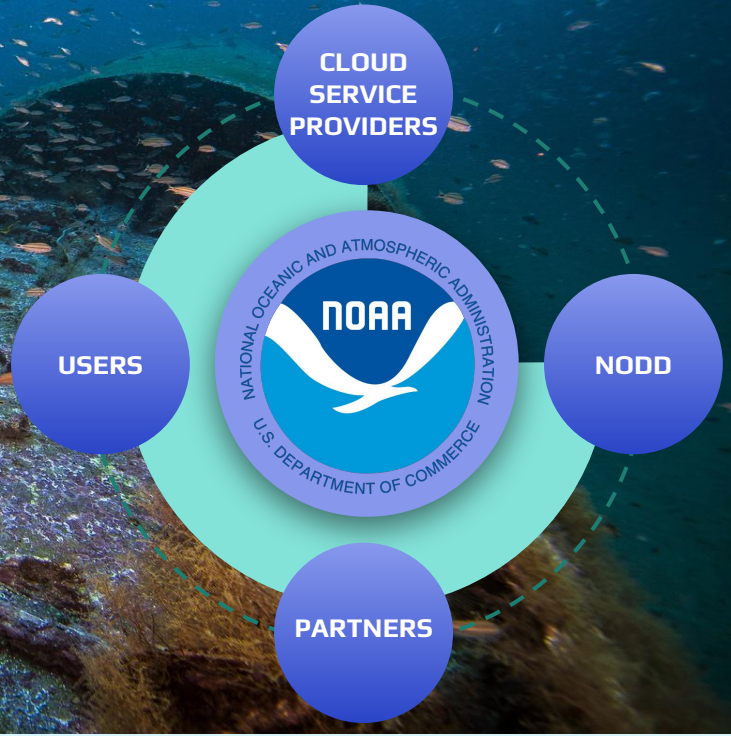
AWS usage metrics reveal sustained access of more than 5 PB per month and more than 1 billion interactions per week, with occasional sustained interactions of 1.5 billion per day. This suggests users are availing themselves of CSP platform tools rather than egressing the data, especially for large analyses not typically possible via traditional infrastructure.

NODD As An Ecosystem

"Data have value when they are used in decision making. If not, then the economic value of such data is effectively zero."

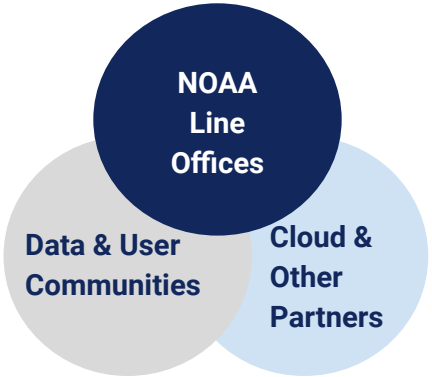
Lessons Learned:

- Access on cloud platforms has resulted in increased usage of NOAA's data.
- Integration of NOAA data into industry tools is most effective.
- Key NOAA asset is expertise to understand and support use of NOAA's data.
- Users appreciate the option to receive service delivery notifications.
- User engagement provides valuable customer experience insight.



Questions? Email us at NODD@NOAA.GOV

Who is Using NODD?



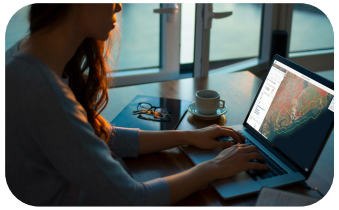
NODD works with NOAA Line Offices, our cloud service providers and other partners, and data and user communities to create an ecosystem where users can access valuable NOAA data to create analyses that drive decision-making worldwide.

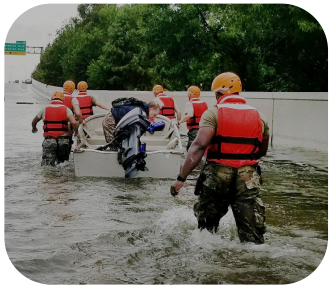
What Value Comes from Data Sharing?

Economic & Societal

Cloud access allows for both faster and larger-scale analyses not typically possible via traditional infrastructure. The ability to analyze data faster and in tandem with other datasets helps drive analysis, new insights and innovation, and decision-making at scales not previously possible.

Sectors Using NODD








NODD Office Hours

Connecting Data Users to NOAA Scientists & Cloud Subject Matter Experts

Visit NOAA.GOV/NODD for resources

Eight Office Hours To Date

Reaching over 750 registrants

- High-Resolution Rapid Refresh (HRRR)
- S-100/S-111 Forecast Guidance of Surface Water Currents
- Global Ensemble Forecast System (GEFS)
- National Water Model (NWM)
- Geostationary Operational Environmental Satellites (GOES-R) Cryosphere Products
- Emergency Response Imagery (ERI)
- Joint Polar Satellite System (JPSS) via Google & AWS

Key Office Hours Findings

- Eight Office Hours hosted to date in collaboration with each of the ***three cloud service providers*** and with ***NOAA Line and Program offices***
- Users heard about product updates, cloud access options, and participated in hands-on Jupyter notebook trainings
- Users had the opportunity to ask experts technical product questions, and expressed interest in cloud-optimized formats and learning about technical support options. Please visit our website at ***NOAA.GOV/NODD*** to view notes that include Q&As from each session

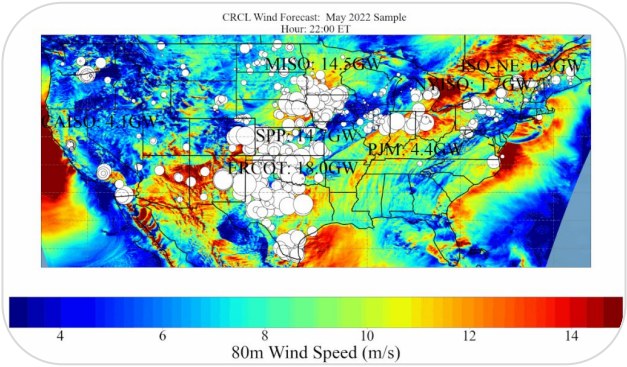
NODD Energy Sector Case Study:
Enverus Acquires CRCL Solutions

AT A GLANCE

Enverus, who recently acquired CRLC Solutions, is an energy-focused SaaS platform that provides data, analytics, and insights for the oil, gas, and renewable energy sectors to help companies optimize their operations and strategic decision-making. They recently acquired CRCL Solutions, a company that developed AI-based energy forecasting solutions, specifically wind and solar forecasts, down to the turbine and farm level, to those participating in wholesale markets. These analytics help balance the supply and demand side of energy.

NOAA DATA USED: *HRRR (High Resolution Rapid Refresh)*

Enverus' AI forecasting model accesses historical HRRR via AWS

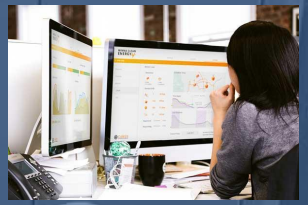


IMPACT PROVIDED

The AI method uses the HRRR model for both near real-time and historical data. They pull the near real-time data through NOAA's NOMADS environment and accesses historical HRRR via AWS as part of NODD.

All data and conversions are completed within their own cloud environment. NOAA HRRR data is an important input for providing wind and solar forecast information to the energy industry.

CAMUS



AT A GLANCE

Camus Energy is a SaaS company that provides grid management software to distribution utilities.

CAMUS delivers distributed energy resource (DER) orchestration in support of zero-carbon grid operations.

NOAA DATA USED

HRRR

High Resolution Rapid Refresh

Via Google Cloud

Camus uses HRRR data in machine learning models that forecast load & generation for the distribution system from minutes to 48 hours in the future.

IMPACT PROVIDED

Forecasts enable more efficient operations allowing distribution utilities to improve

- Safety
- Reliability
- Cost of service
- Renewable energy integration

Let's Connect.

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Katelyn Szura, NOAA OCIO, Communications Lead
Otis Brown, Director, CISESS / NC State University
Jonathan Brannock, Cloud Software Engineer, CISESS / NC State University
Jenny Dissen, Engagement & Partnerships, CISESS / NC State University
Denis Willett, Cloud Software Engineer, CISESS / NC State University