

The Earth Science Data and Information Project:

“A Quick Overview of ESDIS”

NASA Airborne and Field Data Workshop

March 29-30, 2022



Earth Science Data and Information System (ESDIS)

- The ESDIS Project manages the science systems of the Earth Observing System Data and Information System (EOSDIS). EOSDIS is a comprehensive distributed Earth science data and information system designed to support NASA's Earth science missions.
- EOSDIS is designed to ingest, archive, distribute, visualize, all types of Earth Science data which include field campaign measurements, **airborne data**, in situ data, model data, ancillary products used for processing and other related datasets.
- The ESDIS Project provides and controls all aspects of the effort including but not limited to requirements, design, acquisition, development, operations, maintenance and decommission.

EOSDIS

Archives and Distributes Data from the Whole Earth System

Atmosphere

Winds & Precipitation
Aerosols & Clouds
Temperature & Humidity
Solar radiation

Ocean

Surface temperature
Surface wind fields &
Heat flux
Surface topography
Ocean color

Cryosphere

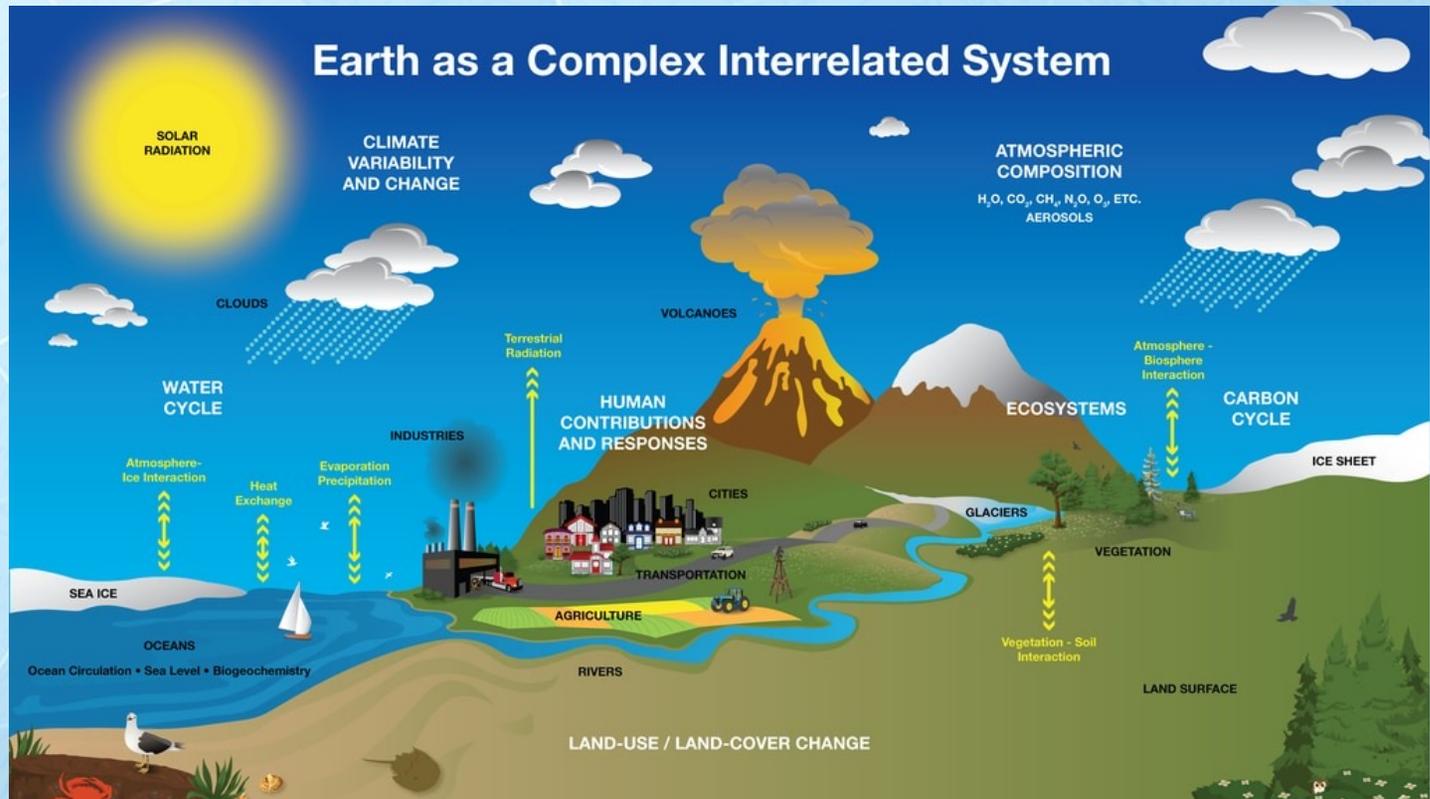
Sea/Land Ice
Snow Cover

Land

Cover & Usage
Soil Moisture
Topography & elevation
Temperature

Human Dimensions

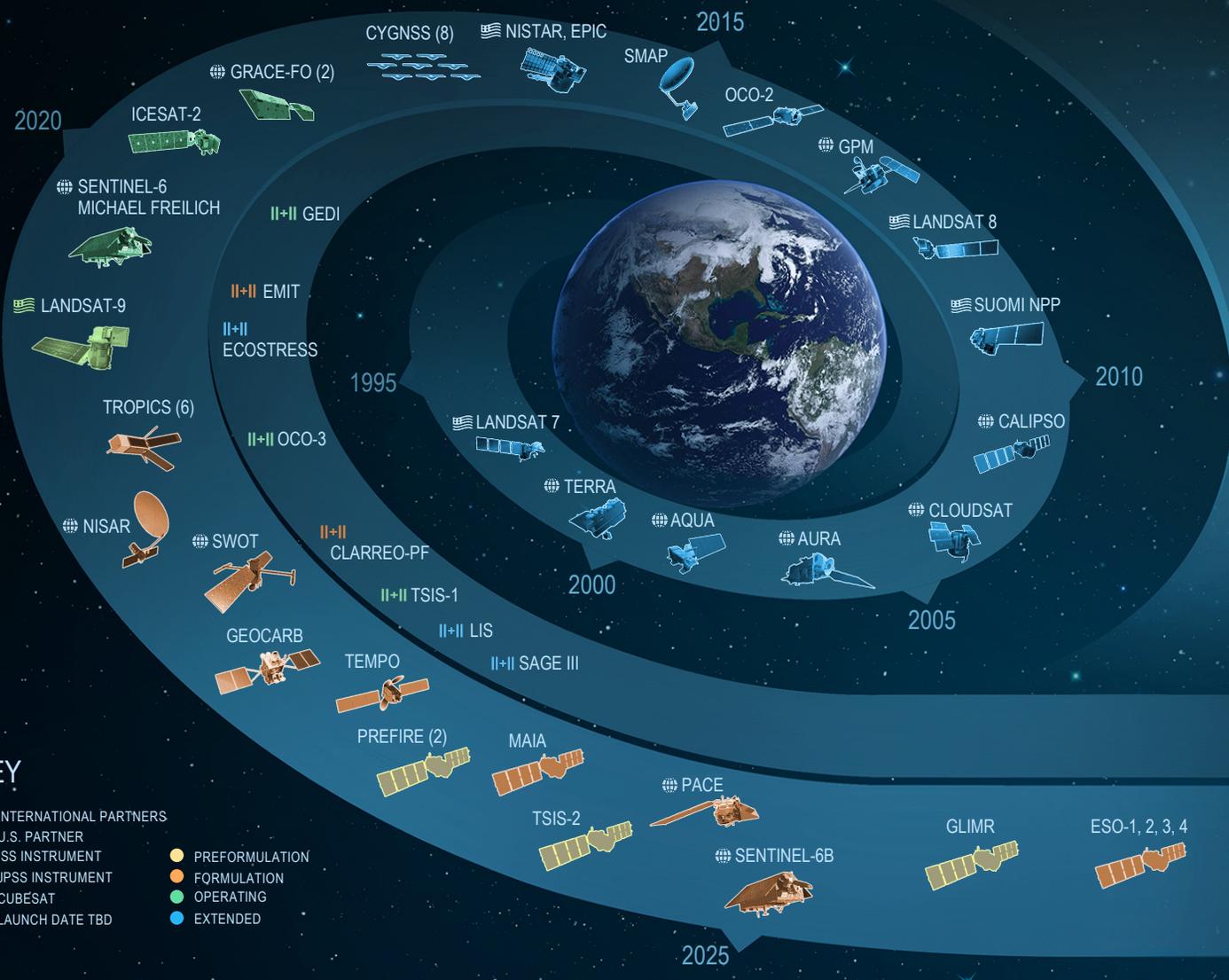
Population & Land Use
Human & Environmental
Health



National Aeronautics and Space Administration



EARTH FLEET



INVEST/CUBESATS

- CSIM-FD 2023
- HARP 2022
- CIRIS 2023
- CTIM* 2022
- HYTI* 2022
- SNOOPI* 2022
- NACHOS* 2022
- NACHOS2* 2022

JPSS INSTRUMENTS

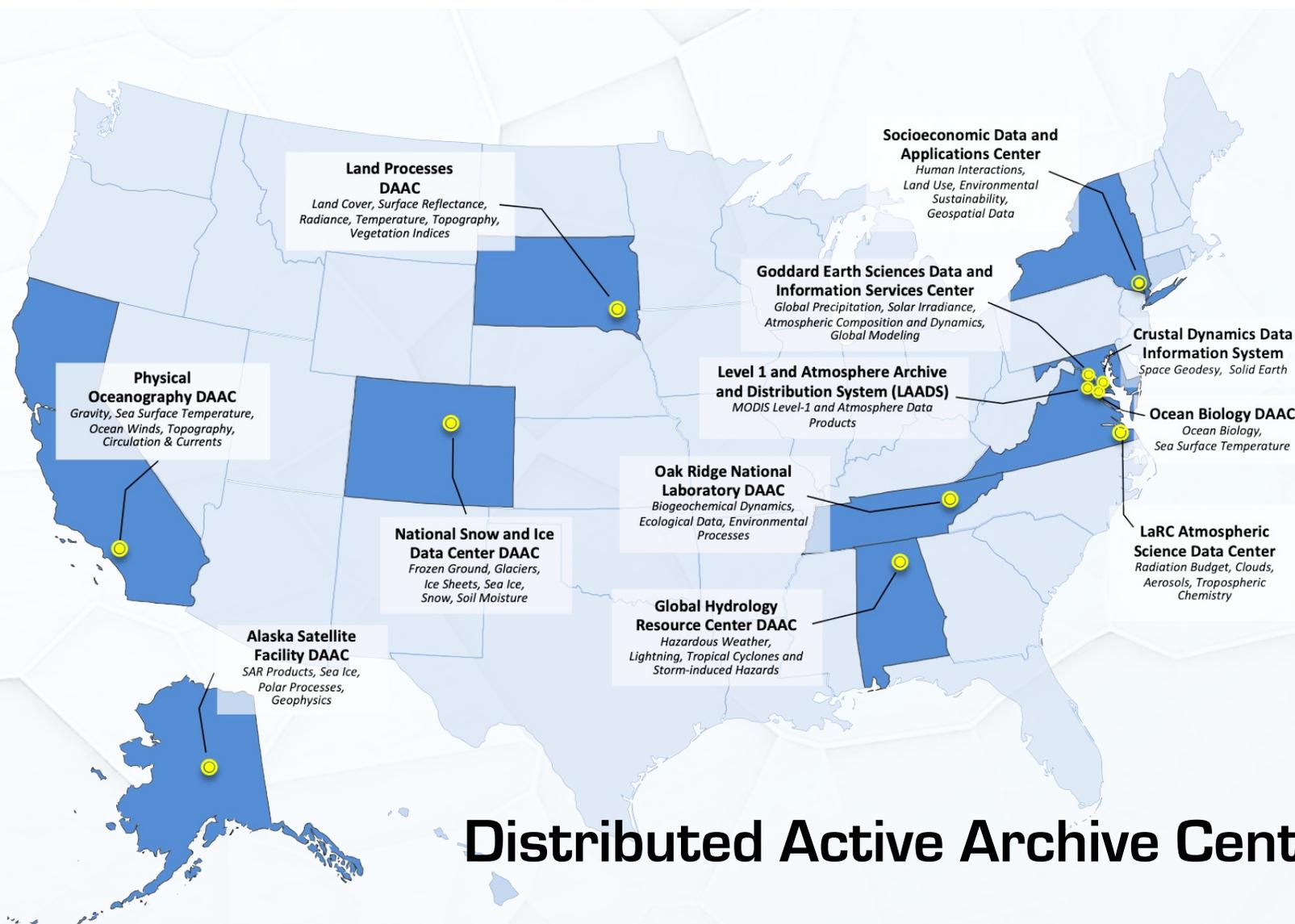
- OMPS-LIMB 2022
- LIBERA 2027

ISS INSTRUMENTS

MISSIONS

KEY

- INTERNATIONAL PARTNERS
- U.S. PARTNER
- ISS INSTRUMENT
- JPSS INSTRUMENT
- CUBESAT
- LAUNCH DATE TBD
- PREFORMULATION
- FORMULATION
- OPERATING
- EXTENDED



Distributed Active Archive Centers

What does a DAAC do?

1. Data and metadata

- Serve as primary point of contact for mission science teams
- Ensure **quality and fitness for purpose** of the organization's data and metadata assets
- Support identification/creation of simulated data product for early adopters
- Ingest science data products into cloud
- Archive additional documents associated with the data (preservation content)

2. Information management

- Capture and catalog scientific information from publications into **searchable databases linked to data resources**

3. Open-source software support

- Support open-source software development projects

4. Cross-mission science and modeling

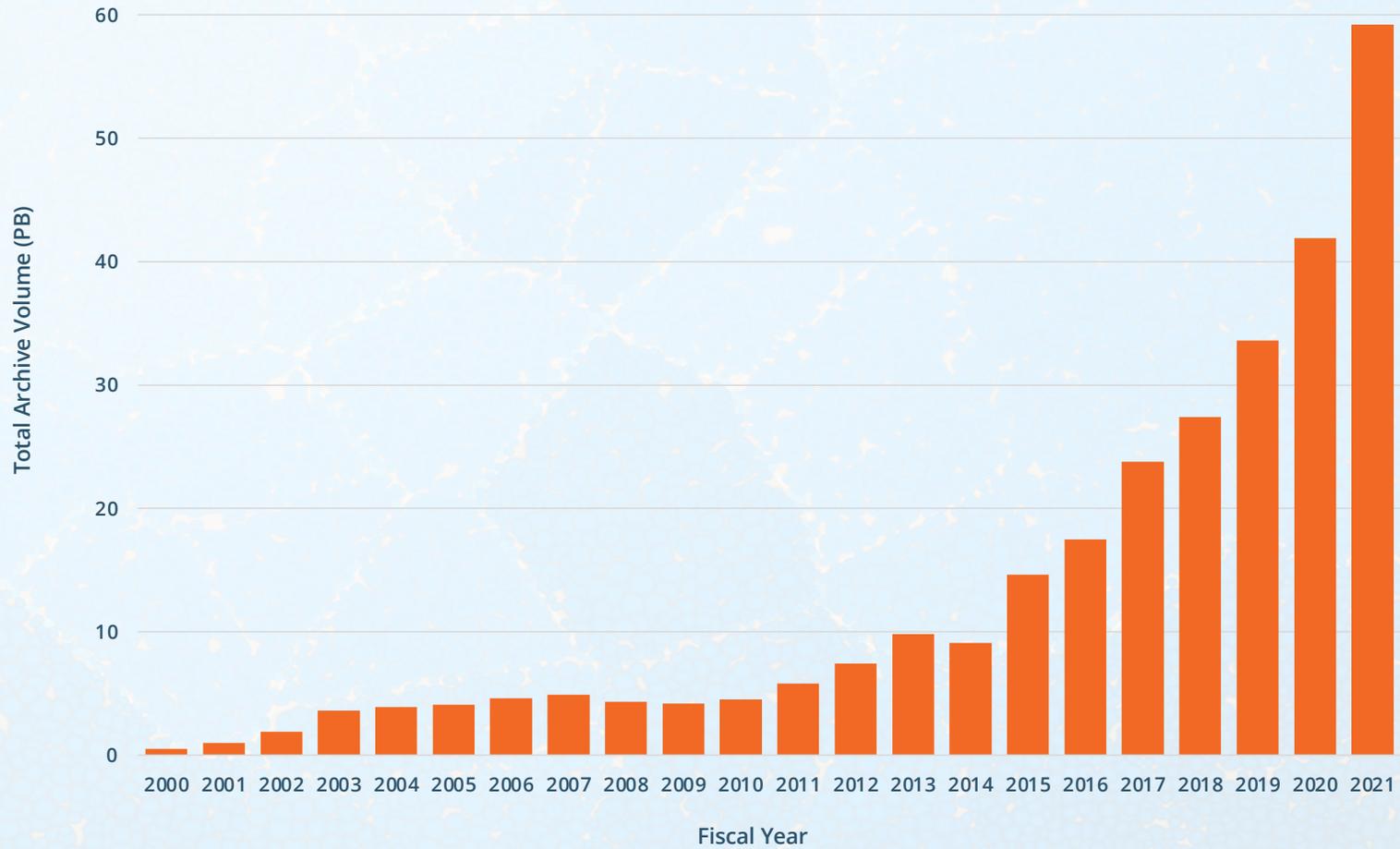
- Address cross-mission and division science and provide support for modeling communities to better integrate and fuse observational data into models

5. User support

- Answer scientific questions about data and information, evaluate and merge community contributions to open-source software, address technical questions, and develop unique software to serve science and applications communities.
- Support Early Adopter activities across a variety of communities
- Develop and operate tools, services, tutorials, hack weeks and other resources for specific science communities and applications users

And so much more.....

Total EOSDIS Accumulated Data Archive Volume (Petabytes)



EOSDIS highlights from 2021

EOSDIS distributed almost
2 BILLION
data products to over
1.7 MILLION
distinct data users
around the world



There were more than
59 PETABYTES
of Earth science data in
the EOSDIS archive



Number of products distributed
by discipline:
LAND: 1.34 BILLION
ATMOSPHERE: 399 MILLION
OCEAN: 115 MILLION
CRYOSPHERE: 31 MILLION
OTHERS: 30 MILLION
RAW: 28 MILLION
RADIANCE: 19 MILLION



with over
3.56 BILLION
files in the EOSDIS
archive

Our Land, Atmosphere
Near real-time Capability
for Earth Observing
System (LANCE) had
OVER 820
unique datasets,
distributed more than
125 MILLION FILES
and produced 2.57 Petabytes of data
WITHIN 3 HOURS OF A
SATELLITE OBSERVATION

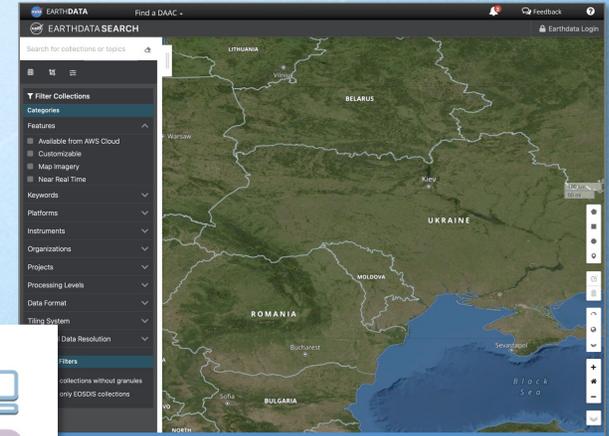
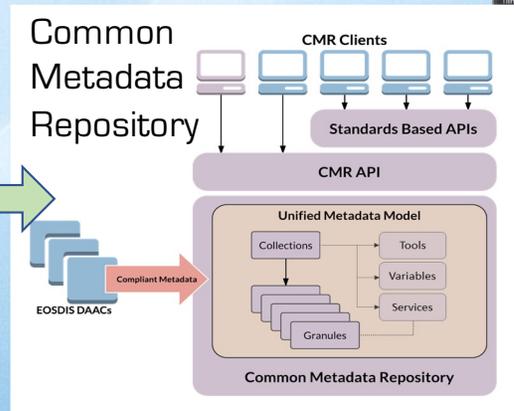


Interacting with EOSDIS: Enterprise Tools and Services

Hello, I'm a user

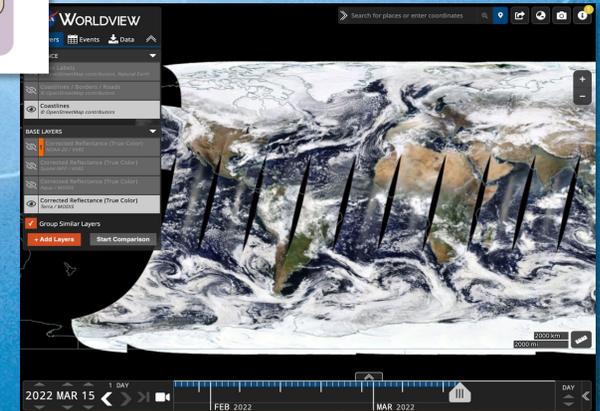


Earthdata Website/DAACs

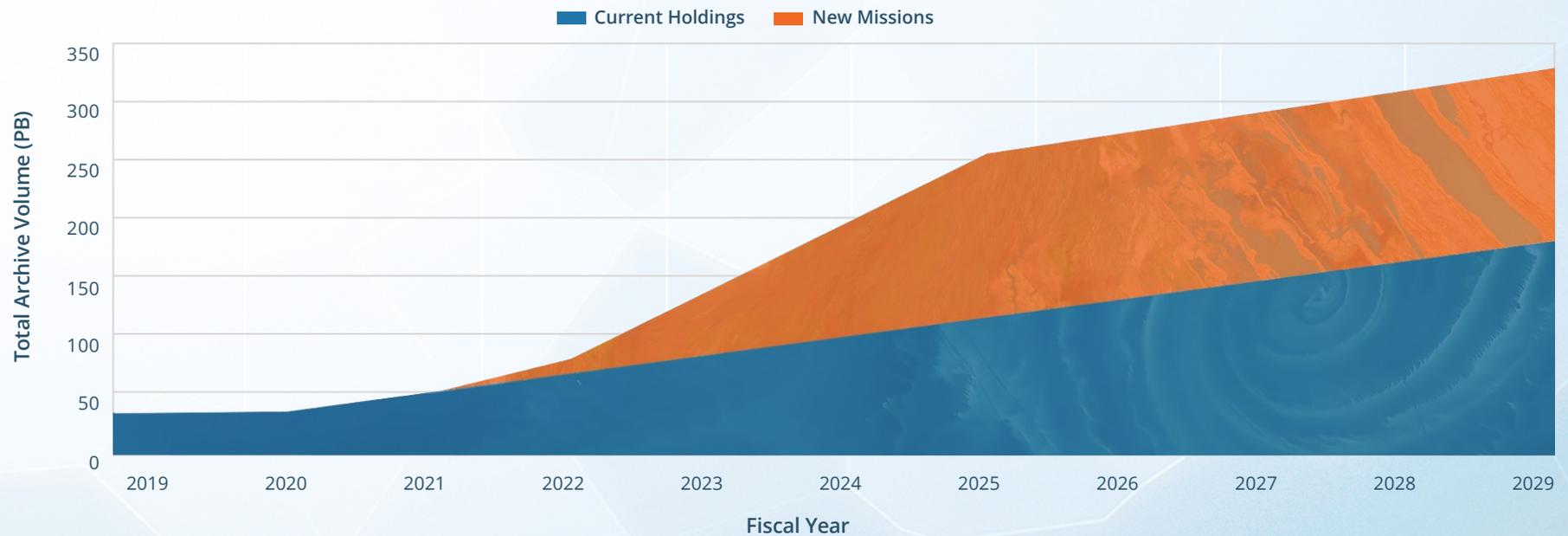


Earthdata Search

Worldview Visualization/LANCE



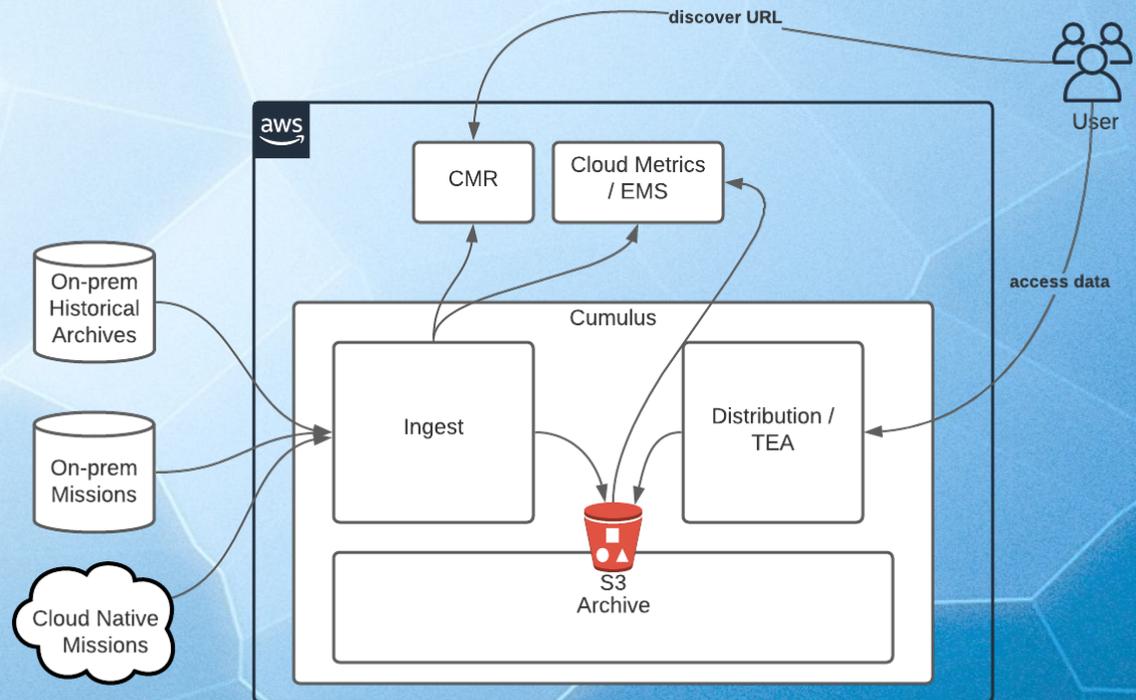
Yearly Archive Growth Projections for Current Holdings and New Missions (FY 2019 – FY 2029)



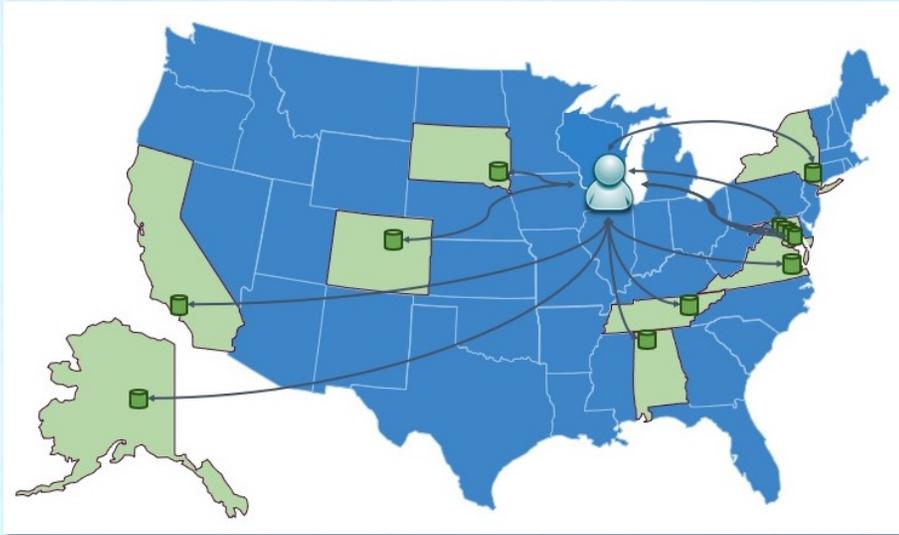
Based on current launch schedules, the archive volume is expected to grow to more than 250 PB by 2025 with the addition of data from upcoming high-data-volume missions like SWOT (scheduled 2022 launch) and NISAR (scheduled 2023 launch).

Earthdata Cloud (EDC)

- “Managed” commercial cloud for EOSDIS
- Improves the efficiency of NASA’s data systems operations – maintaining free/open data policy
- Architected for EOSDIS applications and mission data ingest, archive, distribution
- Operational July 2019, DAAC focused needs.
- Routine systematic onboarding of mission data by DAACs.

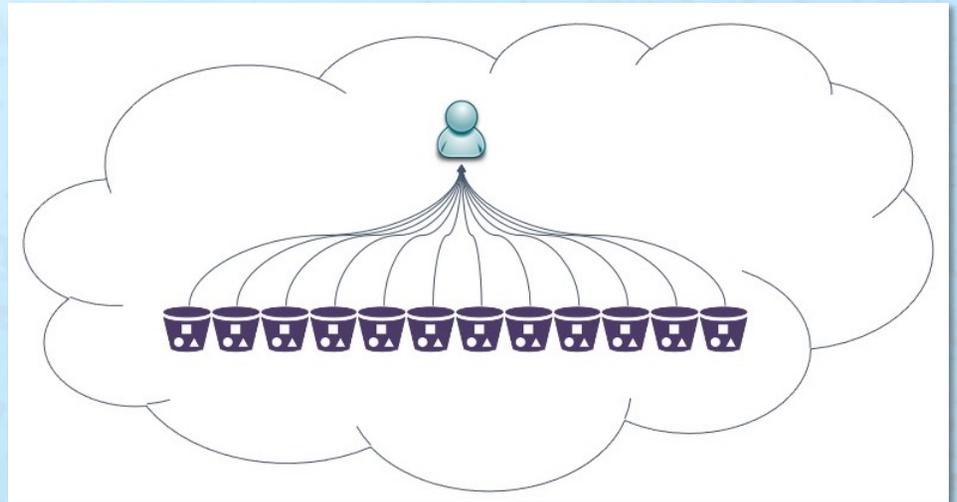


EOSDIS Transition: DAACs moving data to the EDC



Today users seeking NASA's data may have to visit several DAACs to fulfill their needs. Moving between data centers and interfaces can be less efficient and time consuming.

As more EOSDIS data is moved into NASA's Earthdata Cloud, users will **be increasingly** able to (seamlessly) use data across traditional discipline silos – making the near future look a lot like a 'Data Lake'.



Understanding User Needs and Assessing Performance

- **DAAC User Working Groups** – Provide assessments and recommendations based on unique DAAC mission requirements
- **DAAC Customer Satisfaction**
 - Annual Online survey of all DAAC users to evaluate satisfaction and measure performance
 - Performed by CFI Group, the American Customer Satisfaction Index (ACSI) is the #1 national indicator of customer satisfaction for more than 225 companies and 130 Federal programs
- **EOSDIS Metrics System** – collects complex metrics on ingest, archive and distribution for evaluation of system performance.
 - Enables EOSDIS to characterize use of the EOSDIS, and report to NASA Headquarters and OMB.
- **User Services/UN Working Group** – DAAC User Services personnel work together to best service science communities
 - User feedback – via Kayako
 - Personal interaction with users



NASA's Earth System Observatory Core and associated marine missions in the late 2020s

SOLID EARTH

- Aerosols - ASDC
- Gasses - ASDC
- Surface Deformation - CDDIS, ASF
- Surface Composition - LP DAAC, ASF
- Geologic Hazards - CDDIS, ASF
- Human Impacts - SEDAC

WATER CYCLE

- Precipitation — GHRC
- Ice Mass Evolution - NSIDC
- Snow Albedo and Melt — NSIDC
- Total water storage - PO.DAAC
- Human Impacts - SEDAC

ECOSYSTEMS AND NATURAL RESOURCES

- Boundary Layers — LP DAAC, GES DISC, ASDC
- Ecosystem Structure — ORNL
- Vegetation Type/Physiology — ORNL, LP DAAC
- Human Impacts - SEDAC

LAND-SEA CONTINUUM

- Phytoplankton, Organic Matter, Ecosystems— OB DAAC, PO.DAAC
- Cloud, Boundary layers-ASDC, GHRC, PO.DAAC
- Human Impacts - SEDAC

LOOKING AHEAD: EOSDIS and Airborne Data User and Producer Collaboration

- **Airborne** data has been part of **EOSDIS** since its inception in the 1990s. Airborne data specific to the validation of EOS on-orbit missions and related heritage missions are included within EOSDIS. With the IceBridge and EVS programs, the need to manage airborne data independently has become a new challenge for Earth Science Data Systems. Some areas of focus include:
 - **Metadata** created from airborne derived data will benefit from the ongoing EOSDIS efforts to improve the robustness and usefulness of metadata.
 - **Tools and Services** developed for airborne data currently in use at the DAACs will gain more users and spark new ideas for needed future tools and services.
 - **User Support** from the widely known and highly praised DAAC User Services will be available to the airborne science and applications communities.
 - **Synergy** among the airborne and remote sensing users and producers as data and services from each are more easily discoverable, available and useable within the EDC.





For more information visit: earthdata.nasa.gov