NASA's Earth Observing Data and Information System (EOSDIS)
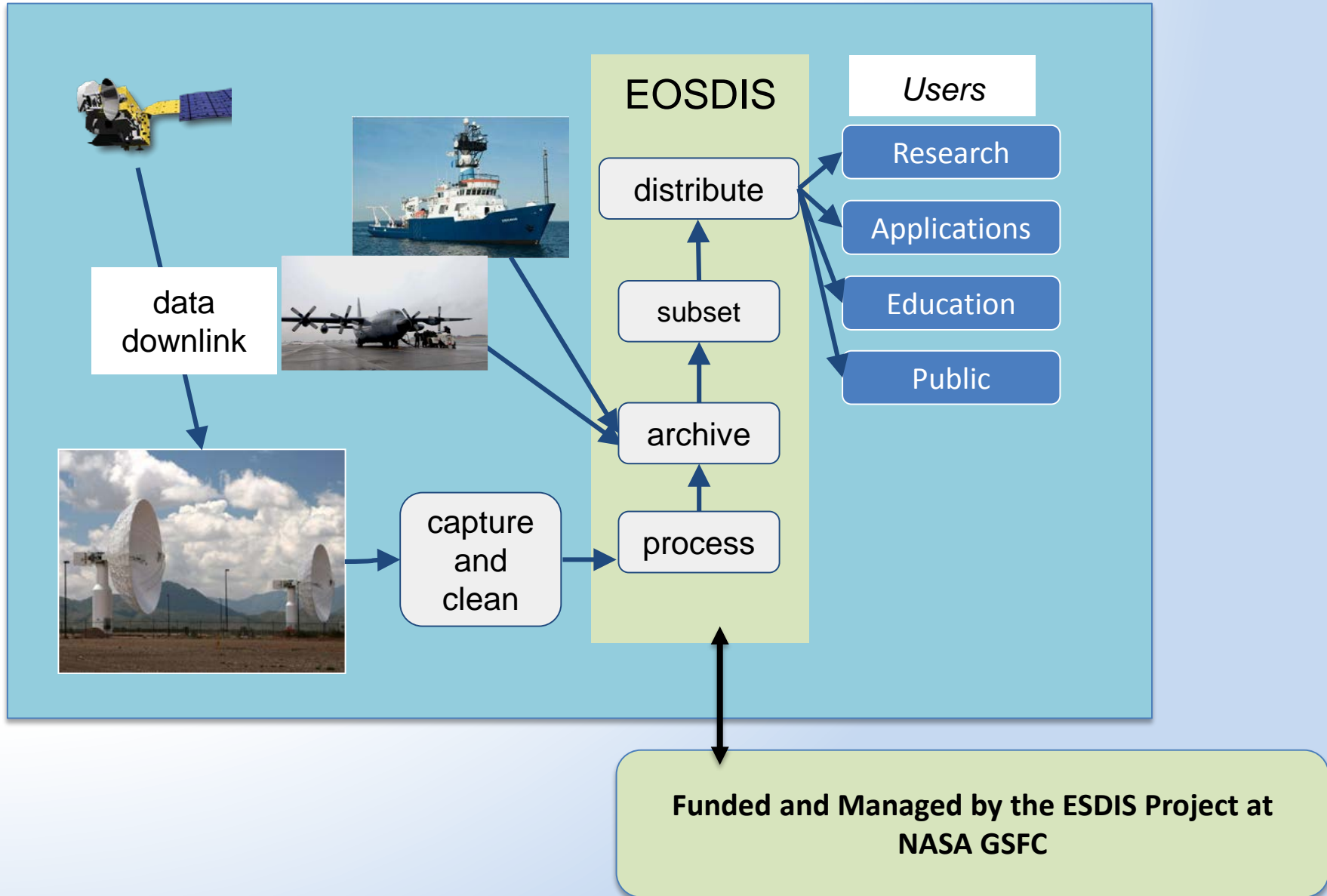
J. Behnke
NASA GSFC
Library of Congress
Designing Storage Architectures Meeting
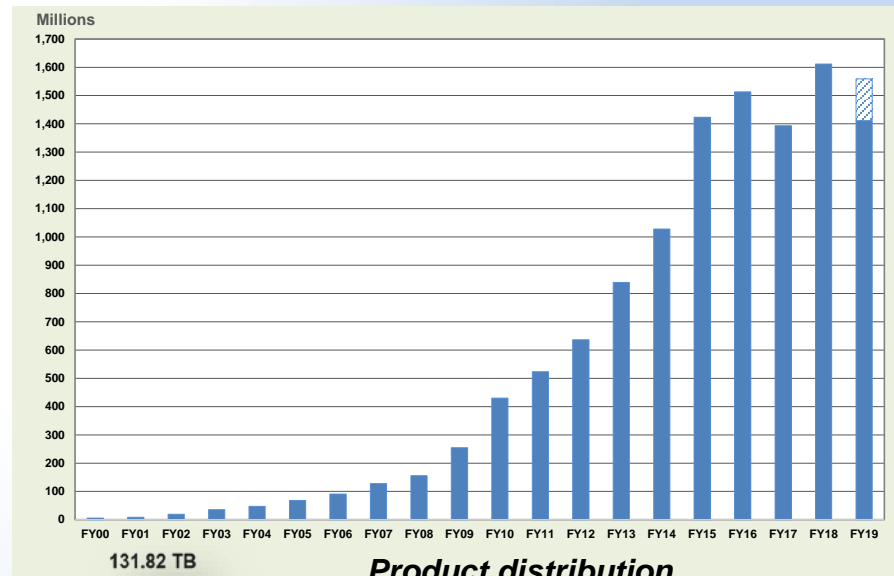**September 9, 2019**

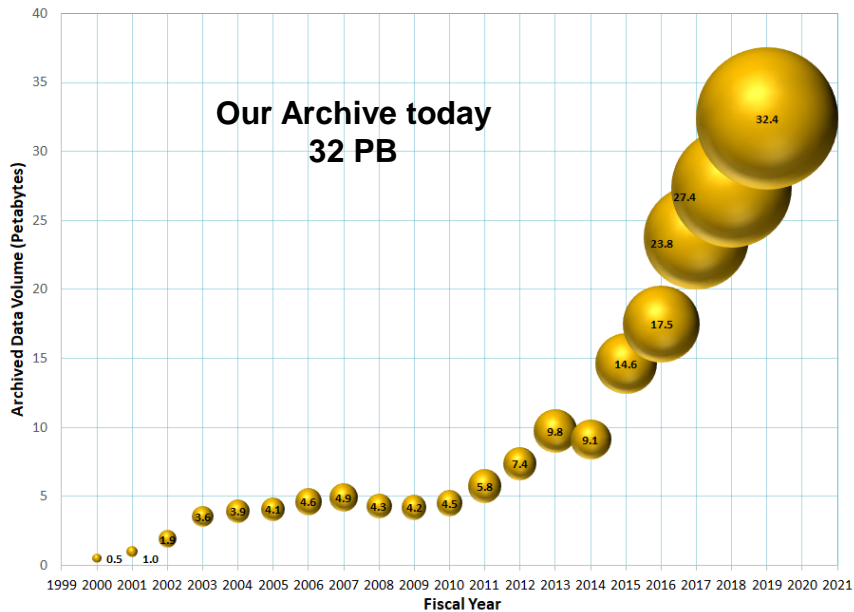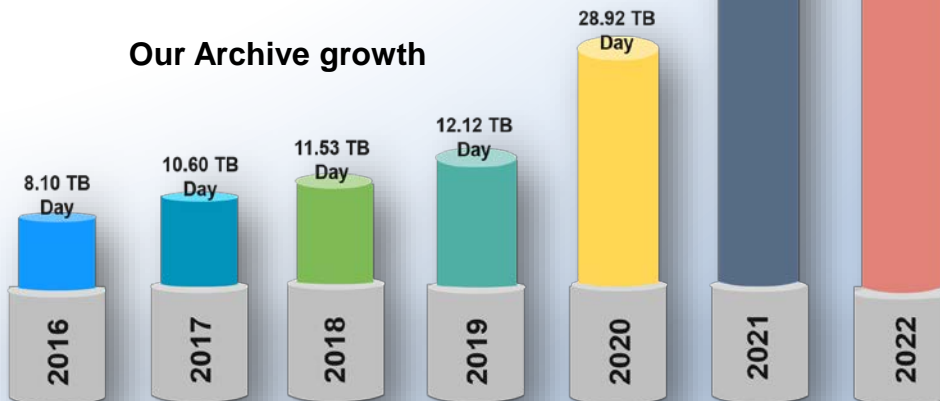# Earth Observing System Data and Information System (EOSDIS)

EOSDIS

Users

Research

Applications

Education

Public

distribute

subset

archive

process

data downlink

capture and clean

Funded and Managed by the ESDIS Project at NASA GSFC

A Growing Archive and Growing Number of Users

**Our Archive today
32 PB**

(Archived Data Volume bubble chart values: 0.5, 1.0, 1.5, 3.6, 3.9, 4.1, 4.6, 4.9, 4.3, 4.2, 4.5, 5.8, 7.4, 9.8, 9.1, 14.6, 17.5, 23.8, 27.4, 32.4)

Our Archive growth

Year	TB/Day
2016	8.10 TB Day
2017	10.60 TB Day
2018	11.53 TB Day
2019	12.12 TB Day
2020	28.92 TB Day
2021	126.62 TB Day
2022	131.82 TB Day

**Product distribution
147.6 M distributed in Jul 2019
Prediction: 2 Billion products
distributed this fiscal year**

*In FY2022, predict that the archive
will grow by 48PB that year alone*

***Not the first time we
have confronted this
opportunity***

EOSDIS Storage Architecture Evolution

1990

- Near-line Storage devices - StorageTek silos
- Direct attached disk devices
- Backup Tape Devices

2000

- Reduce dependency on Near-line storage - remove Storagetek
- Increase direct and network attached disks; more RAID devices
- Robust backup tape devices

2010

- All online storage - including duplication of data across disk farms; Use of RAID throughout; system backups to tape
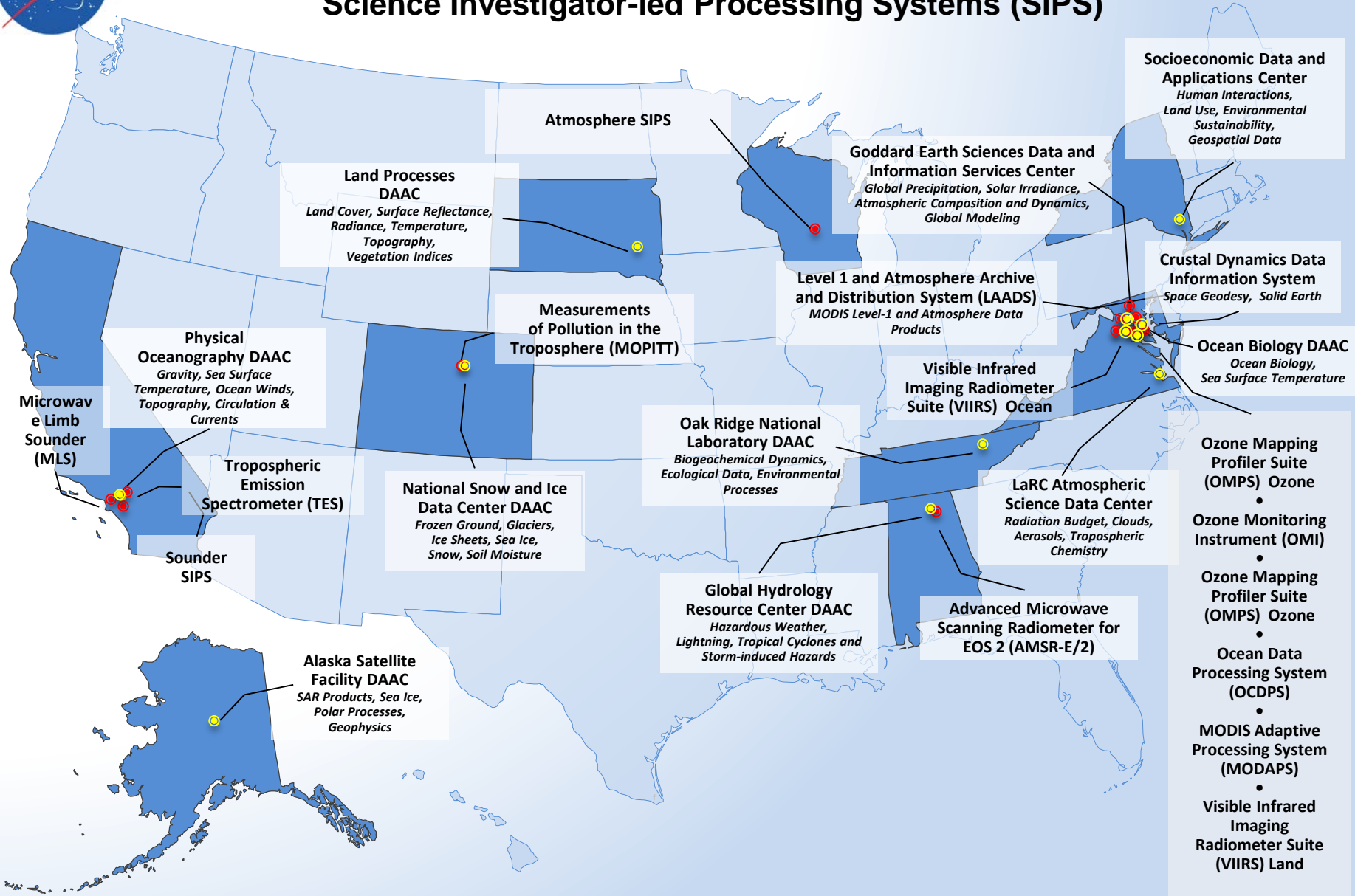- Begin assessment of Cloud Resources

2020

- Migrate data on disk farms to Cloud Data Lake
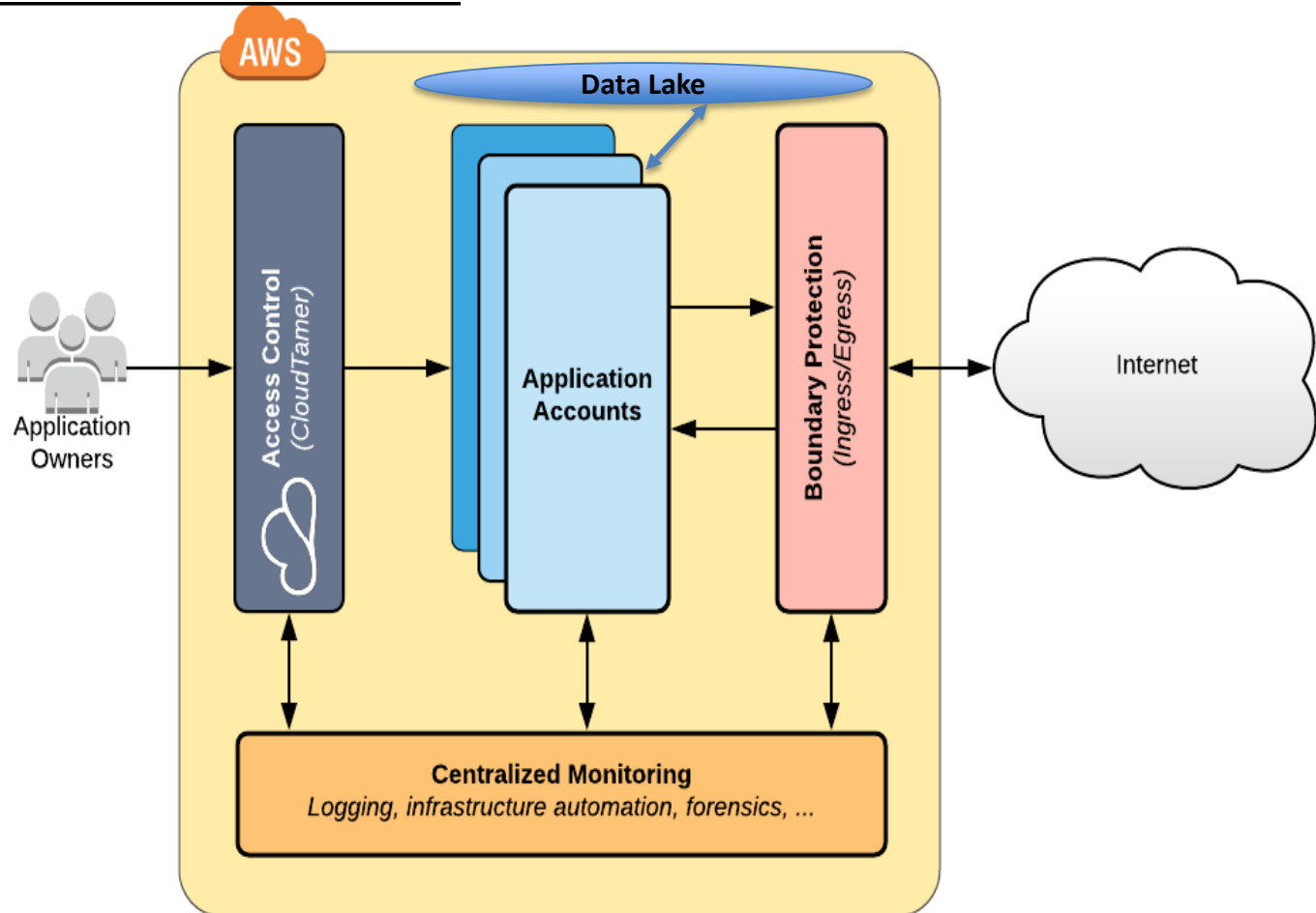- Keep golden copy on premise on RAID and tape

EOSDIS Distributed Active Archive Center (DAACs) and Science Investigator-led Processing Systems (SIPS)

Socioeconomic Data and Applications Center
Human Interactions, Land Use, Environmental Sustainability, Geospatial Data

Atmosphere SIPS

Goddard Earth Sciences Data and Information Services Center
Global Precipitation, Solar Irradiance, Atmospheric Composition and Dynamics, Global Modeling

Land Processes DAAC
Land Cover, Surface Reflectance, Radiance, Temperature, Topography, Vegetation Indices

Crustal Dynamics Data Information System
Space Geodesy, Solid Earth

Level 1 and Atmosphere Archive and Distribution System (LAADS)
MODIS Level-1 and Atmosphere Data Products

Measurements of Pollution in the Troposphere (MOPITT)

Physical Oceanography DAAC
Gravity, Sea Surface Temperature, Ocean Winds, Topography, Circulation & Currents

Visible Infrared Imaging Radiometer Suite (VIIRS) Ocean

Ocean Biology DAAC
Ocean Biology, Sea Surface Temperature

Microwave Limb Sounder (MLS)

Oak Ridge National Laboratory DAAC
Biogeochemical Dynamics, Ecological Data, Environmental Processes

Tropospheric Emission Spectrometer (TES)

National Snow and Ice Data Center DAAC
Frozen Ground, Glaciers, Ice Sheets, Sea Ice, Snow, Soil Moisture

LaRC Atmospheric Science Data Center
Radiation Budget, Clouds, Aerosols, Tropospheric Chemistry

Ozone Mapping Profiler Suite (OMPS) Ozone

•

Ozone Monitoring Instrument (OMI)

•

Ozone Mapping Profiler Suite (OMPS) Ozone

•

Ocean Data Processing System (OCDPS)

•

MODIS Adaptive Processing System (MODAPS)

•

Visible Infrared Imaging Radiometer Suite (VIIRS) Land

Sounder SIPS

Global Hydrology Resource Center DAAC
Hazardous Weather, Lightning, Tropical Cyclones and Storm-induced Hazards

Advanced Microwave Scanning Radiometer for EOS 2 (AMSR-E/2)

Alaska Satellite Facility DAAC
SAR Products, Sea Ice, Polar Processes, Geophysics

Development of the Earthdata Cloud

- Earthdata Cloud Platform is a multi-account, Infrastructure-as-a-Service (IaaS) cloud platform operating on Amazon Web Services (AWS) under a single ESDIS owned top level "payer account", <u>providing shared cloud services and controls to EOSDIS</u>.

Common Services & Controls

1. Single Contract into Commercial Cloud Services

EOSDIS operates under multiple contracts & partner Agencies. Centralized cloud contract through NASA's Enterprise Managed Cloud Computing (EMCC) program provides seamless access to cloud.

2. User Access to Earthdata Cloud Development

Secure PIV/Token login, NASA Agency-based account provisioning,

3. NASA Approved Amazon Services

Vetted AWS and 3rd party SAAS services, with process to add new services

4. Code Deployment Services

Through the use of Bamboo, code is security scanned, built, and deployed into Earthdata Cloud.

4. Data Recovery Services

Developing a service to backup collection in lower cost cloud resource; but also keeps 'golden' copies on premise.

4. Budget Distribution and Enforcement

Our components in the Earthdata Cloud operate their environment, ESDIS gets the bill. ESDIS Capability to capture intended costs, distribute approved budgets into project level accounts, monitor, and protect against inadvertent cost overruns or bad actors.

How the users look at information/data in the Storage Systems

Current Earthdata search and access to science data in the cloud

✴ **Highlights selected collection, observation time, granule location**

✴ **Downloads from S3 bucket archived in AWS commercial cloud**

THANKS!

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Worldview
https://worldview.earthdata.nasa.gov

Earthdata Search
https://search.earthdata.nasa.gov

Youtube Webinars:
https://www.youtube.com **and search for Earthdata**