

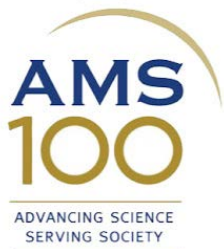
NASA Earth Science Data Systems

Open Data, Services and Software



Terra Launch
Dec 18, 1999

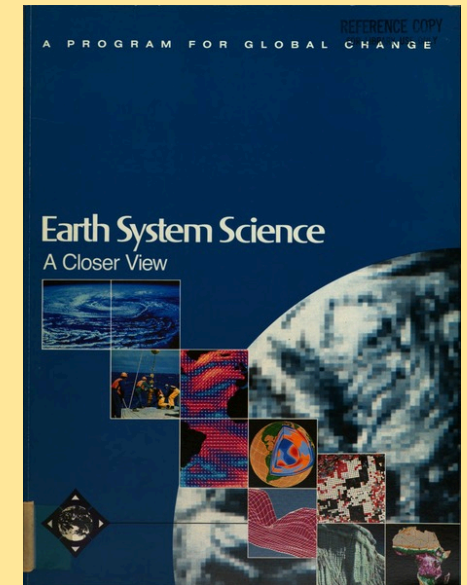
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Earth Science Data and Information Project
Goddard Space Flight Center



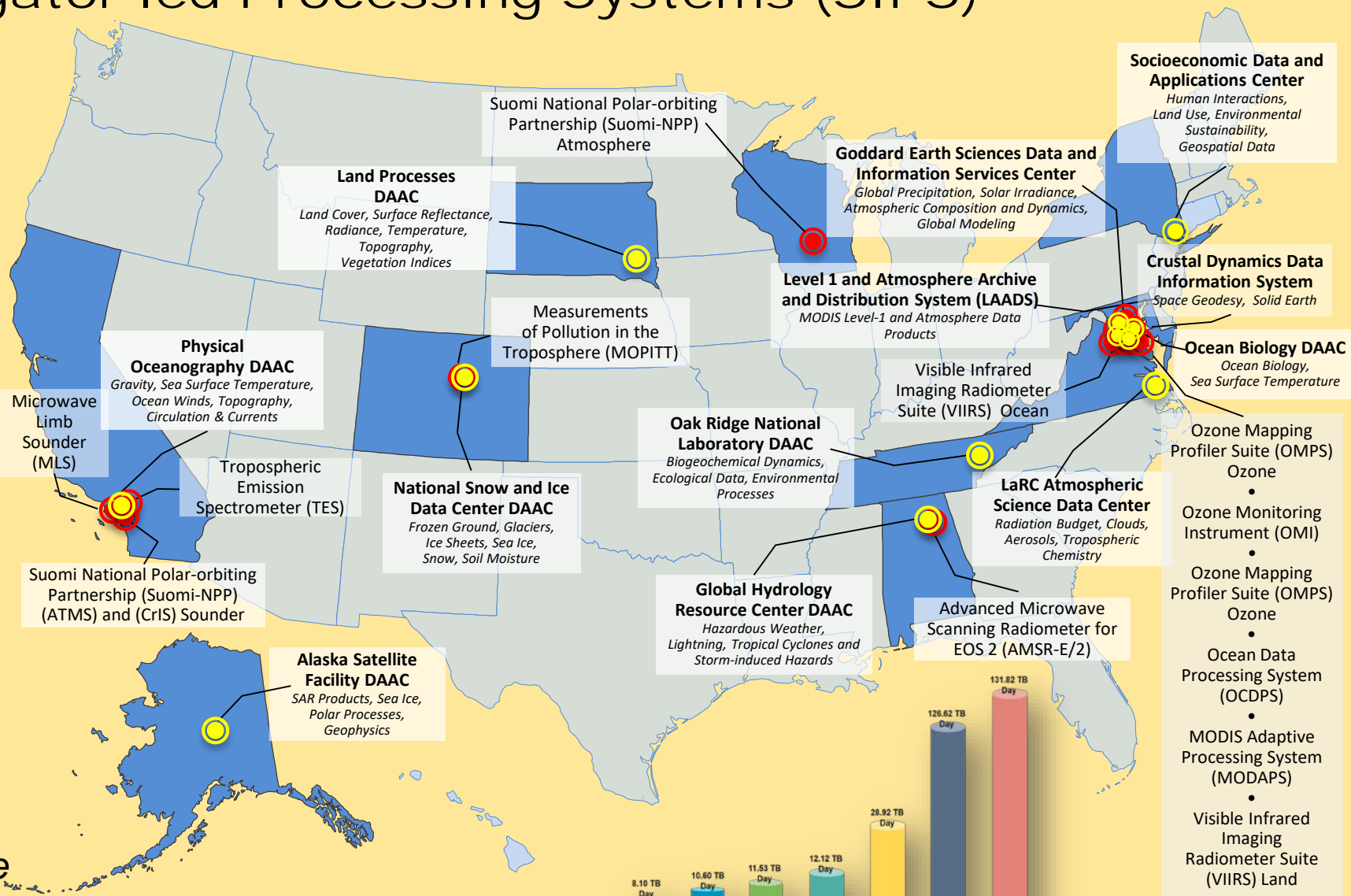
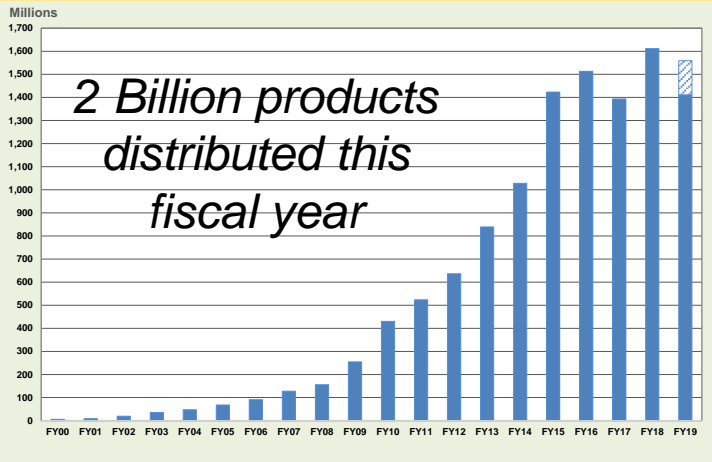
Beginnings: NASA and the “Mission to Planet Earth”

- **1958 founding legislation: “...provide the widest practicable and appropriate dissemination of information...”**
- **Following the 1986 space shuttle Challenger tragedy, a NASA task force headed by astronaut Sally Ride listed a Mission to Planet Earth to “study and characterize [from space] our home planet on a global scale,”**
 - *NASA set into motion the development of satellites and an information system for Earth systems science that would become the country’s main source of satellite imagery and scientific data about the planet’s climate and environment. This evolved into what is now the agency’s Earth Science program.*
- **In 1994, NASA Earth Science Division committed to an open data policy for all civil Earth observation satellites.**
 - *The Earth Observing System Data and Information System (EOSDIS) begins operations at 8 Distributed Active Archive Centers.*
 - *EOSDIS is designed to support multi-mission operations and data distribution for all NASA’s Earth Observing platforms.*
- **EOSDIS becomes the first information system to facilitate global scale Earth system data analysis and modeling by the scientific research community.**
 - *Open data services started with Tropical Rainfall Measuring Mission (TRMM) in 1997 and became front & center with the EOS era and launch of TERRA in 1999*

National Academy/NRC: Earth System Science A Closer View (1988)

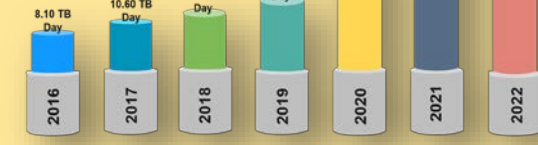


EOSDIS Distributed Active Archive Center (DAACs) and Science Investigator-led Processing Systems (SIPS)



Work must be located with Science Centers of Expertise, even if these are geographically distributed.

In FY2022, the archive will grow by 48PB



How users access data from the DAAC archives

Earthdata Search

* Highlights selected collection, observation time, granule location

* Selects additional data services such as subsetting, reformatting

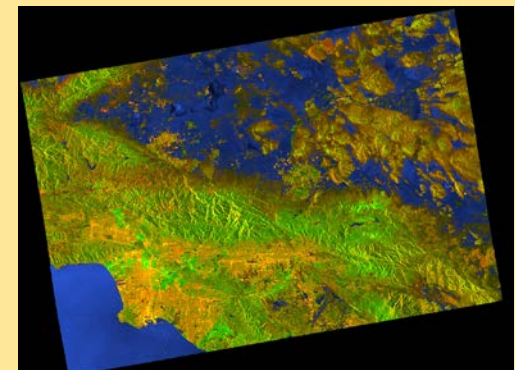
* Downloads from the DAAC archive to user's facility

Earthdata.nasa.gov

Worldview.earthdata.nasa.gov

The screenshot displays the Earthdata Search web application. At the top, a search bar contains 'Sentinel-1B'. Below it, the search criteria are shown: 'Start: 2019-06-16 00:00:00 Stop: 2019-06-16 23:59:59' and a bounding box 'Rectangle: SW: 30.480468750000004,-1 NE: 35.2285625,-114.363281'. A map of the United States and Mexico shows a red bounding box over the West Coast. Below the map, there are options to 'Back to Collections' and 'View details'. The search results section shows '5 Granules' and a 'Download All 5 Granules' button. A table lists five granules with their IDs, start, and end times. At the bottom, a timeline for the month of June 2019 shows the granules as vertical bars.

The screenshot shows a file download dialog box titled 'Opening S1B_IW_RAW_OSDV_20190616T014930_20190616...'. It displays the file name '...16T014930_20190616T015002_016715_01F75E_5805.zip' which is 1.5 GB in size. The source is identified as '.../asf-ngap2-p-s1-raw-98779950.s3.amazonaws.com'. The dialog asks 'What should Firefox do with this file?' and offers three options: 'Open with Archive Utility (default)', 'Save File' (which is selected), and 'Do this automatically for files like this from now on.' There are 'Cancel' and 'OK' buttons at the bottom.



Earth Science Research

- NASA Headquarters Earth Science Division develops research programs and awards research to develop instruments observations, collect and analyze data about the science of the Earth. Research solicitations include open data terms and conditions such as:
 - *Requiring a data management plan.*
 - *Requirements for adding competitive program data products to EOSDIS.*
 - <https://earthdata.nasa.gov/collaborate/new-missions/adding-competitive-other>
- The NASA Headquarters Earth Science Research and Analysis Program supports generation and analysis of data from NASA missions and international partners, as well as data purchased from commercial vendors.
 - *Some data sets obtained through partnerships may be made available for NASA research purposes only. Upon EOSDIS login registration, users must agree to specific license provisions; e.g., not use for commercial or operational applications.*

Principal Investigator data

- **All NASA funded PIs must follow NASA data standards**
 - *Data standards are publicly available online from Earth Science Data Information Systems Standards Office.*
 - *Prescribes open data formats and standards for metadata*
 - <https://earthdata.nasa.gov/esdis/eso/standards-and-references>
- **EOSDIS data engineers work with PIs early in their projects, advise on data and metadata formatting practices and the use of the standards**
- **EOSDIS develops/expands existing data services to support the PI-generated data, or may integrate specific PI-provided data services at the DAAC**
 - *Data services are funded separately from research*

Long-Term Preservation

[for the life of the Program]

- **EOSDIS maintains the archive of all past and present NASA Earth science data and information**
 - *Continuous technology infusion and evolution; e.g., robust data access services; transition from tape silos to spinning disk archives in 2007.*
 - *Currently exploring advantages of commercial cloud services, archives of analysis-ready data and provisions for big “data lakes”.*
 - *Sponsoring preservation standards for digital geographic data and metadata (e.g., ISO 19165).*
- **At the end of each active mission, campaign or research project, we collect and archive of all information necessary to re-use the data in future research, to enable repeatable results.**
 - *DAACs utilize an instrument data preservation checklist to capture data, documentation, software from the mission, aircraft, and campaign team*
 - https://earthdata.nasa.gov/files/NASA_ESD_Preservation_Spec.pdf

Implications of the Open Government Data act to EOSDIS

- **We will continue to improve open data services for the science, applications and education communities.**
- **Continue to support the open data policy for NASA-funded Earth science research.**
- **Continue to work with international and US partners to encourage and arrange for open data licenses.**
- **Revisit existing agreements and policies to remove data restrictions as much as possible.**