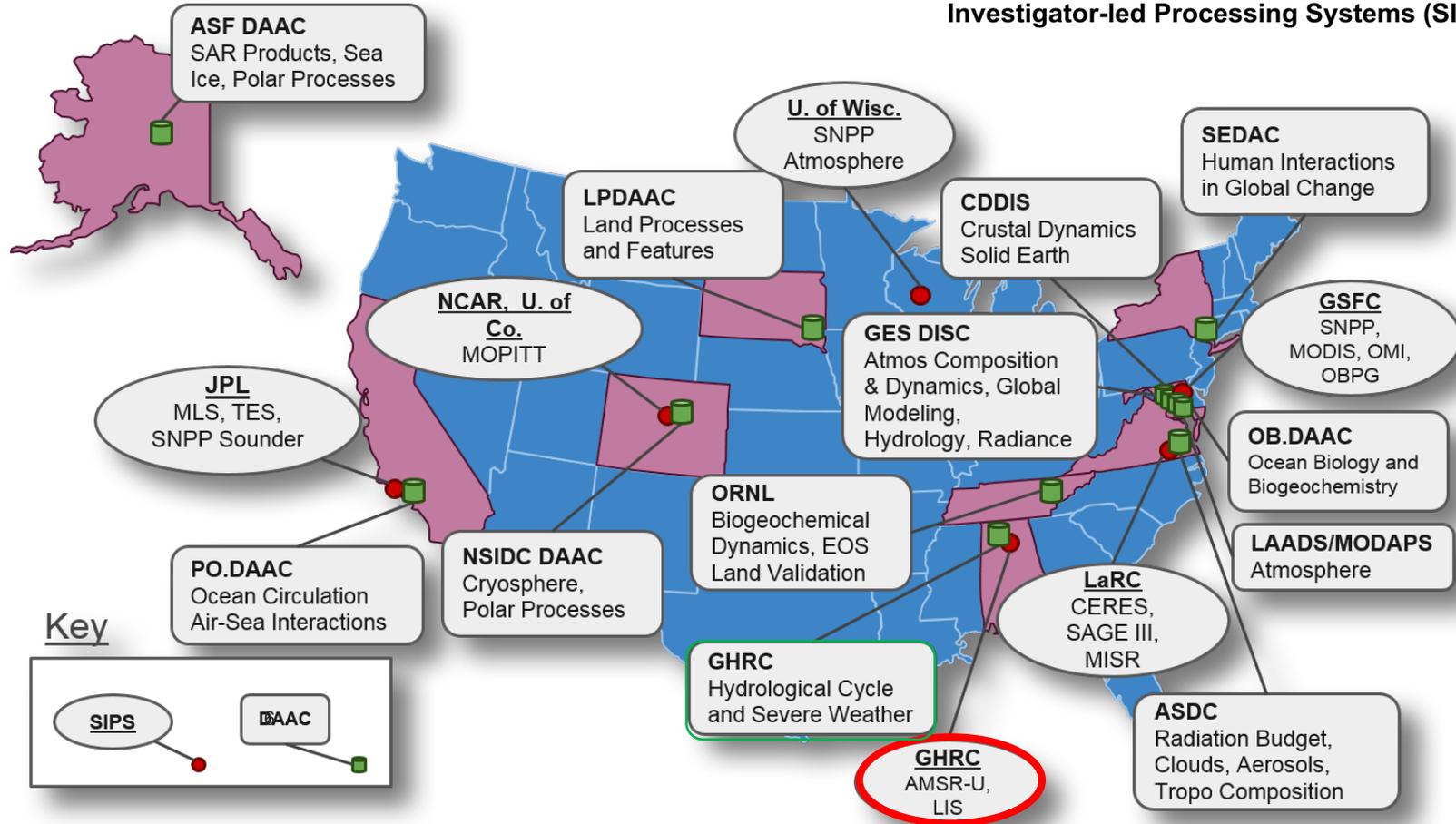


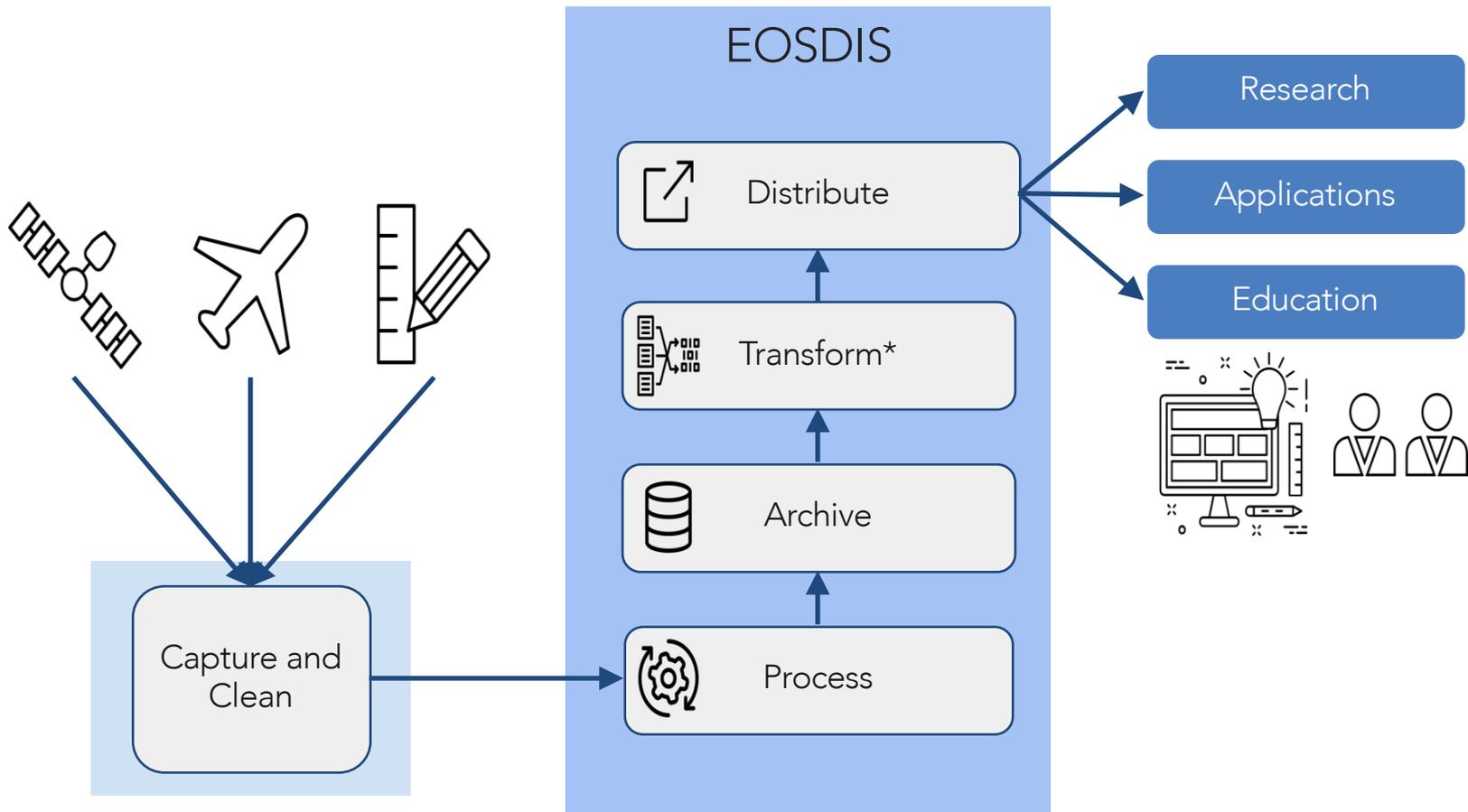


EARTH SCIENCE DATA AND INFORMATION SYSTEM (EOSDIS)

PROJECT UPDATE 2017

Distributed Active Archive Centers (DAACs), collocated with centers of science discipline expertise, archive and distribute standard data products produced by **Science Investigator-led Processing Systems (SIPS)**

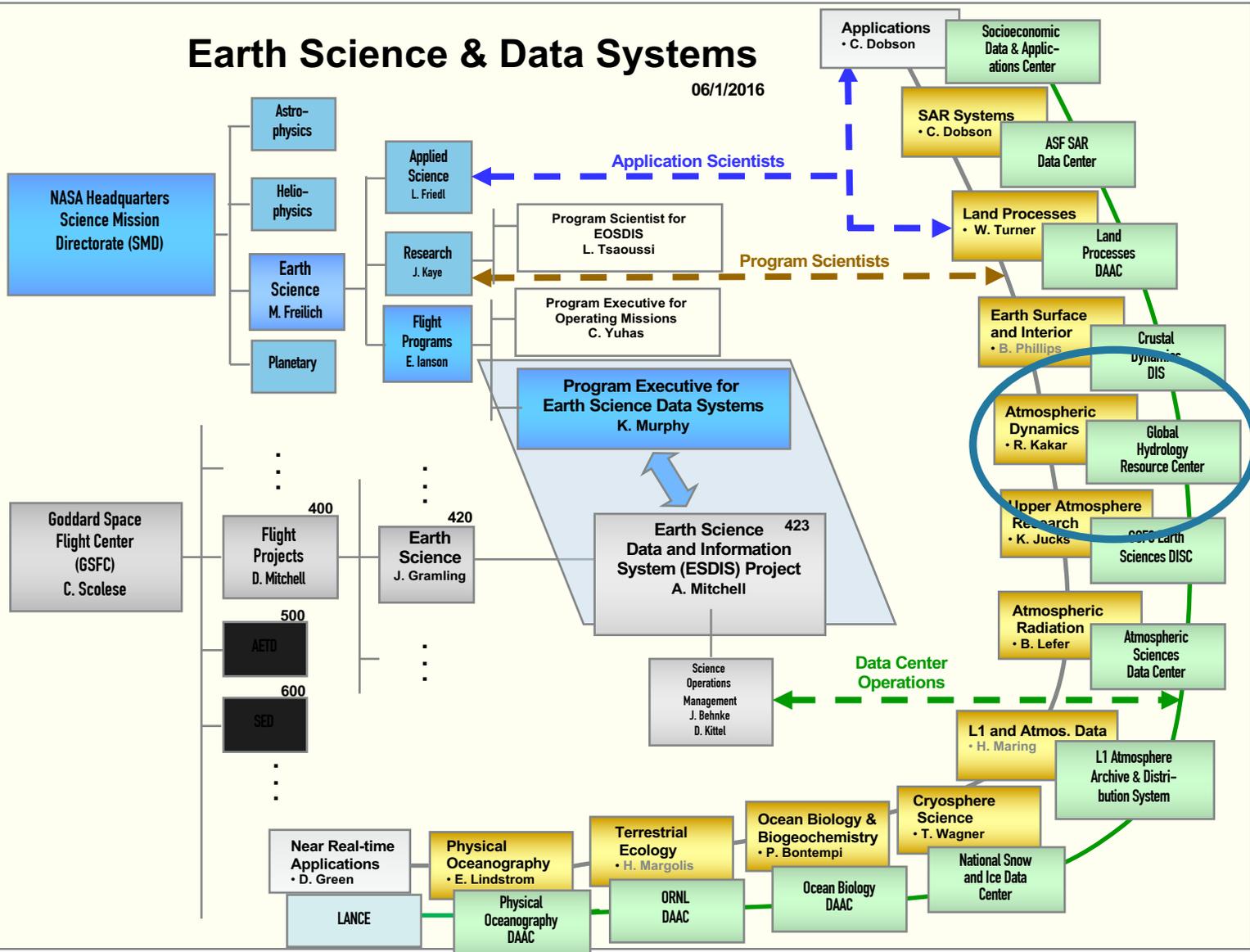




* Subset, reformat, reproject

Earth Science & Data Systems

06/1/2016





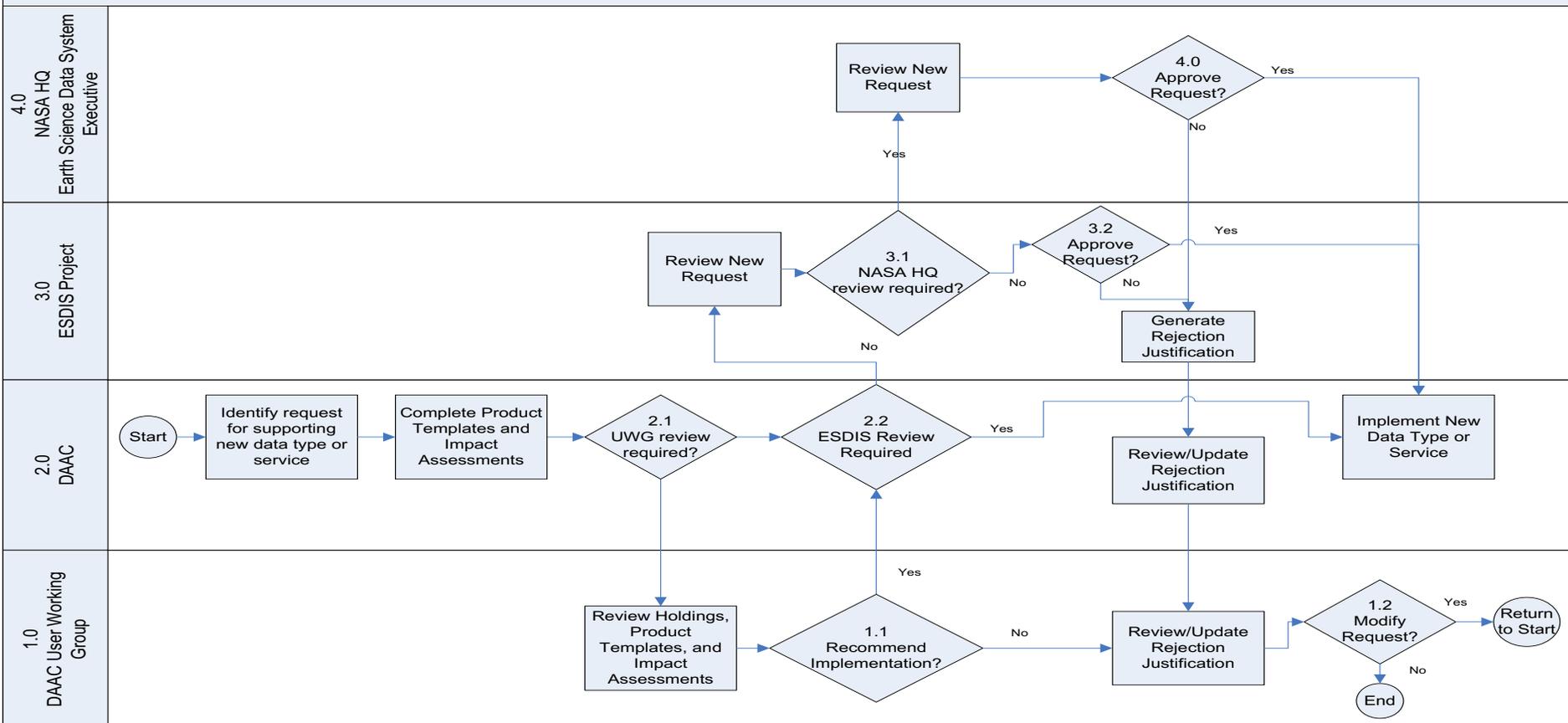
- ▶ ESDIS pulls together a consistent approach to EOSDIS data management that allows integrated view of all data
 - Single Earthdata Login system that all DAACs can use
 - Standardized access to browse imagery for all datasets
 - Establishment of standards for use across program
 - Access point to all NASA Earth Science datasets
 - Code repositories to improve software sharing among DAACs

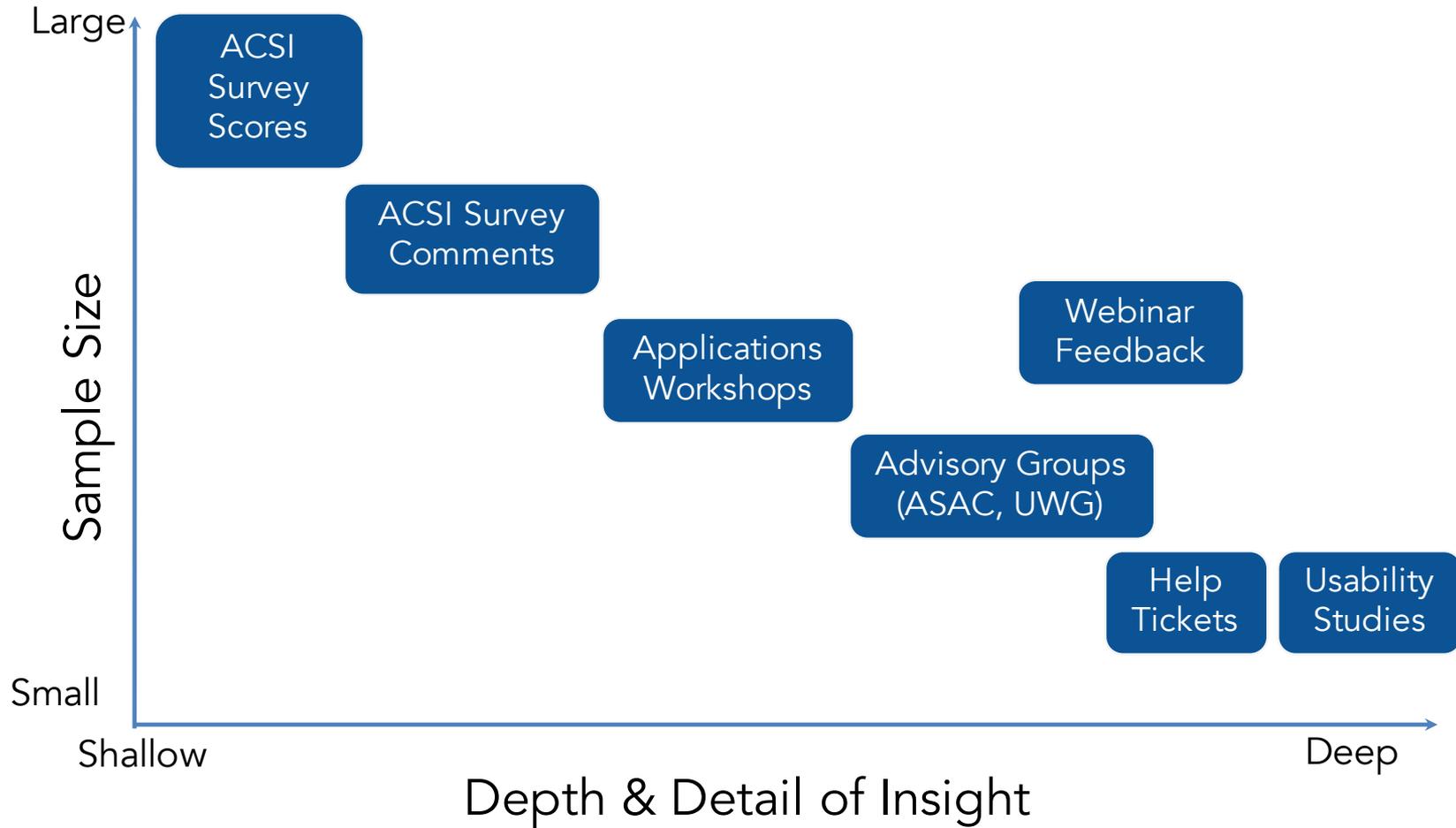
- ▶ GHRC DAAC focuses on meeting the needs of data users
 - The mission of the GHRC DAAC is to provide a comprehensive active archive of both data and knowledge augmentation services with a focus on hazardous weather, its governing dynamical and physical processes, and associated applications. Within this broad mandate, GHRC will focus on lightning, tropical cyclones and storm-induced hazards through integrated collections of satellite, airborne, and in-situ data sets.
 - Managing the needs of the DAAC users
 - Improving the exchange of data and information between Earth scientists and data users
 - Share DAAC expertise with the user community
 - Provide support to the research and educational communities engaged in the use of atmospheric data related to lightning, tropical cyclones, and storm-induced hazards.

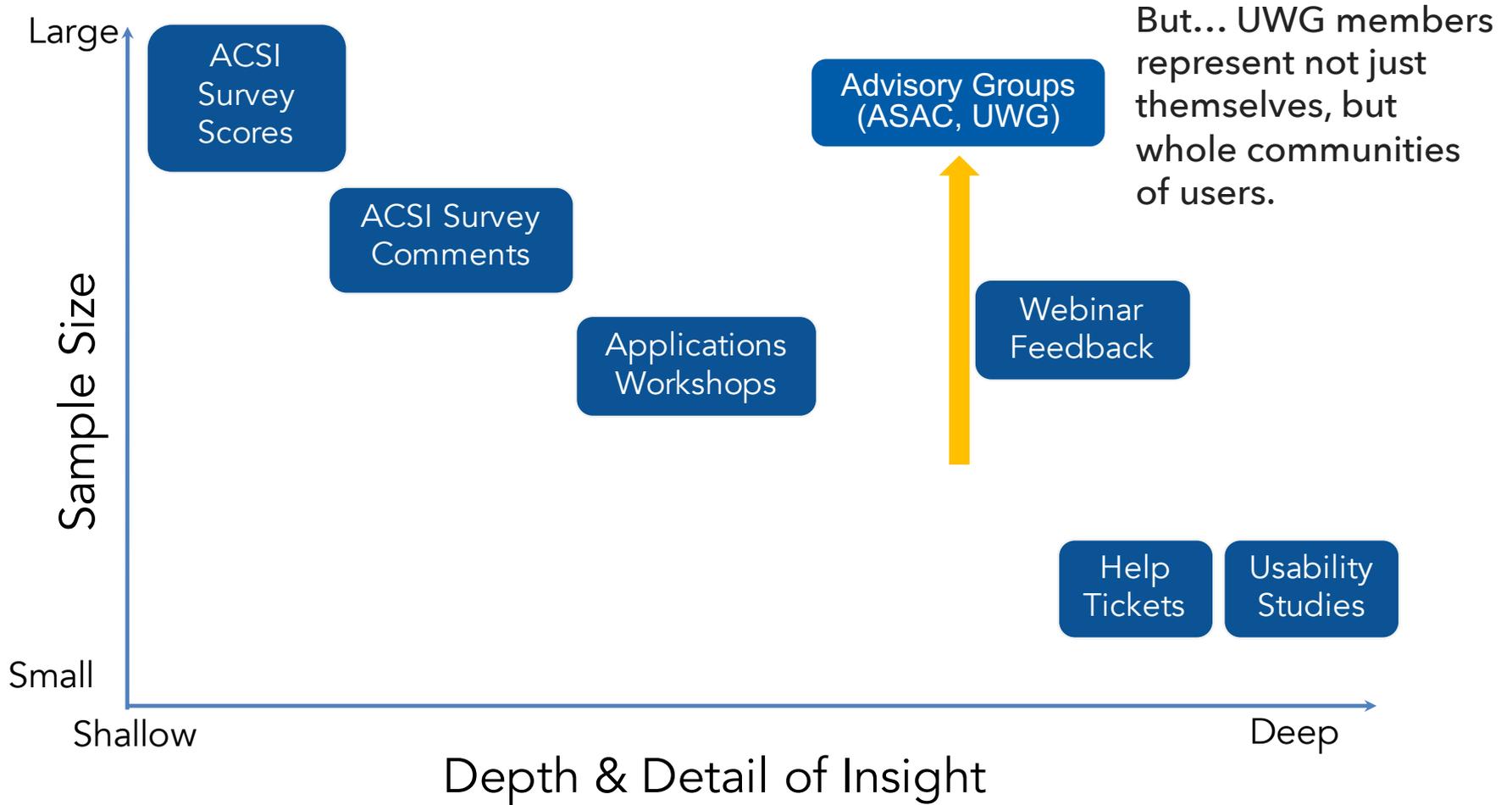


- ▶ The GHRC User Working Group
 - UWG members comprise users, data providers, scientists, NASA HQ, data center members, and ESDIS
- The Roles of the GHRC User Working Group include:
 - Assist in defining and accomplishing the DAAC's science goals
 - Provide guidance on DAAC data management priorities
 - Provide guidance on DAAC activities, including data set acquisition, development of value-added products, user support, development activities, and operational functions
 - Provide recommendations about DAAC annual work plans and long-range planning
 - Coordinate science issues with the ESDIS Project staff and HQ Program Scientists.

DAAC Process for Implementing New Data Types and/or Services (As Is)







USER NEEDS: DAAC INVOLVEMENT IN IMPROVING OUR UNDERSTANDING OF USERS



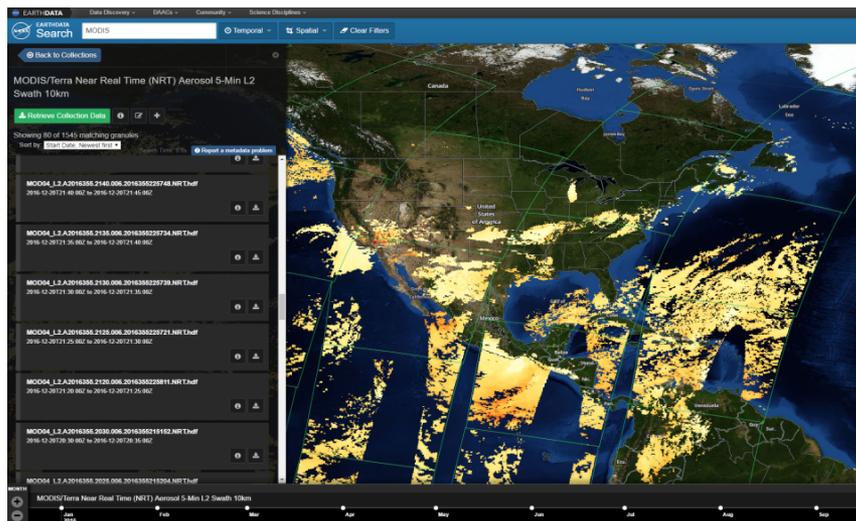
Rank	Recommendation Description	Score	# of voting DAACs
1	Create getting started guide (video, pdf, print)	12	4
2	Improve RMA and communication across EOSDIS and DAACs at machine level	11	5
3	Documentation: improve delivery, coordinate templates of what documentation is delivered, consider DOIs on all documentation for each data product.	11	4
4	Hold user focus group to address data transformation, perform gap analysis, and find out what users really want	10	4
5	Have a common interface/seamless services user experience	9	3
6	Develop a robust download manager compatible with URS 4	7	3
7	Externally share availability of services and APIs	7	2
8	Better (retrievable) metrics on EOSDIS services	7	3
9	Make OPeNDAP more user friendly (e.g. auto-generate commands)	6	2
10	Hold user focus group for dynamic browse	4	2
11	Incorporate chat function for user questions	3	2
12	Remove 2K granule download limit	3	2
13	Ability to track user behavior as they navigate tools	1	7
14	Have a shared place for URS login issues and solutions (curl, wget)	0.909	8
15	Add more datasets to Worldview/GIBS	0.773	6
16	Share tech solutions for FTP to HTTP transition	0.773	7
17	Capture/store GIS testing routines and feedback for DAACs to share	0.773	6
18	Internally share EOSDIS availability of APIs and services in addition to tools	0.727	4
19	Create consistent software maturity definitions (alpha/beta/operational)	0.545	5
20	Create a user forum within the Developer Portal	0.500	4
21	Hold informative telecon about Developer Portal and invite DAAC staff to be alpha/beta testers	0.409	5
22	Add download browse option to Earthdata Search Client	0.227	4
23	Better link NRT data to the standard data products in Worldview.	0.182	4
24	DAACs assess their user community needs as they relate to reformatting	0.182	3

Outcome from the 2016 User Needs TIM, Boulder Colorado. A ranked order of key users needs agreed to by all DAACs.



A two-pronged approach to help end users discover data...

Earthdata Search for Data-Centric End Users



<https://search.earthdata.nasa.gov>

Worldview for Imagery-Centric End Users



<https://worldview.earthdata.nasa.gov>



GIBS / Worldview Goal:

To transform how users interact with and discover NASA Earth data; make it visual

Approach:

- The **Global Imagery Browse Services (GIBS)** provide open access to full resolution imagery derived from NASA products to any mapping client and script

<https://earthdata.nasa.gov/gibs>

- **Worldview** is an open source, browser-based client to interactively explore GIBS (and SEDAC) imagery and download the underlying data

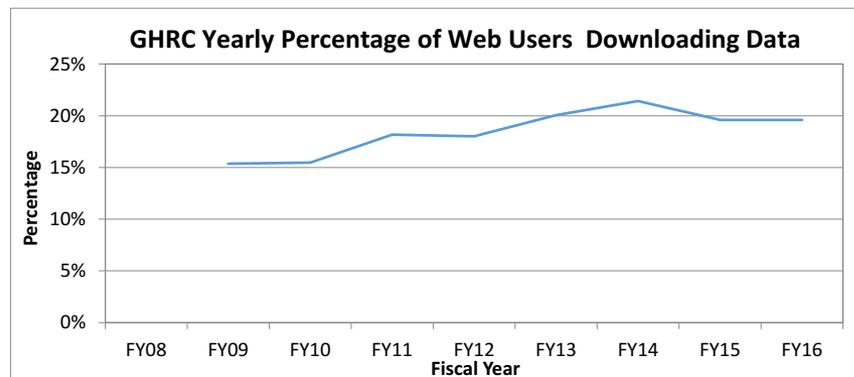
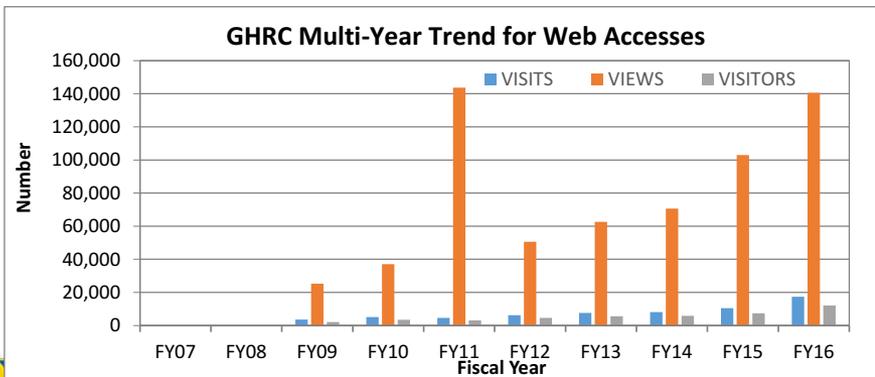
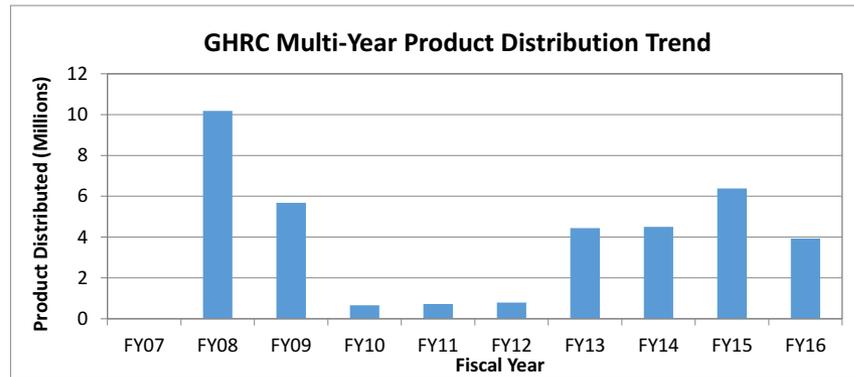
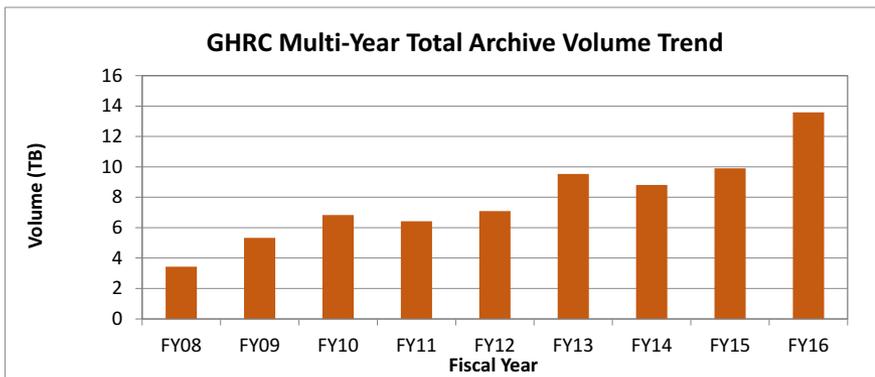
<https://worldview.earthdata.nasa.gov>

Open-Access Servers
Client



FY2016 Metrics (Oct 2015 to Sep 2016)		
Item	EOSDIS	GHRC
Unique Data Sets	11,140	307
Distinct Users of EOSDIS Data and Services	3,210,968	13,910
Web Site Visits	2,351,536	17,347
Average Archive Growth	12,355.2 GB/day	6.7 GB/day
Total Archive Volume	17,923.2 TB	13.584 TB
End User Distribution Products	1,512.9 M	3.9 M
End User Average Distribution Volume	40,987.6 GB/day	24.7 GB/day

GHRC Distribution and User Trends (Oct 2015 to Sep 2016)				
Item	Total FY2016	Change from FY2015	Monthly Average	12 Month Trend
Files (Millions)	3.9	↓ -38.4%	0.3	
Volume (TB)	8.8	↓ -45.2%	0.7	
Data User	3,112	↓ -24.8%	308	
Web User	12,048	↑ 63.6%	1,446	



COMPARISON BETWEEN FY 2015 AND FY 2016



FY2015 Metrics (Oct. 1, 2014 to Sept. 30, 2015)		
Item	EOSDIS	GHRC
Unique Data Sets	9,462	365
Distinct Users of EOSDIS Data and Services	2,613,113	10,058
Web Site Visits	2,442,189	10,494
Average Archive Growth	16,428.2 GB/day	3.1 GB/day
Total Archive Volume	14,983.9 TB	9.895 TB
End User Distribution Products	1,423.4 M	6.4 M
End User Average Distribution Volume	32,917.5 GB/day	45.3 GB/day

FY 2015

FY2016 Metrics (Oct 2015 to Sep 2016)		
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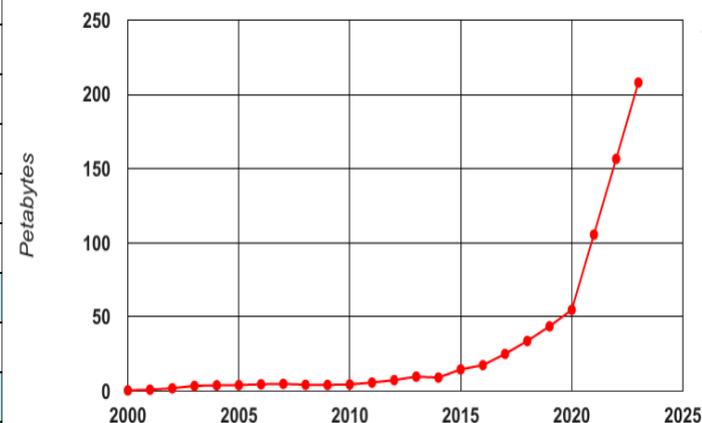
FY 2016



THE NEXT 5 YEARS: MISSION VOLUMES ARE SET FOR ANOTHER PARADIGM SHIFT



Missions	Launch Date	Daily Data Volume
Sentinel-5P	June 2017	626 GB/day
JPSS-1	July-Sept 2017	1.7 TB/day
Sentinel-3B	Nov 2017	128 GB/day
GRACE FO	Feb 2018	19 MB/day
TSIS on ISS	Apr 2018	541 MB/day
ICESat-2	Sept 2018	891 GB/day
ECOSTRESS	2019	585 GB/day
GEDI on ISS	Mar 2019	3.5 GB/day
SWOT	April 2021	15.5 TB/day
TEMPO	2021	1.7 TB/day
NISAR	Dec 2021	86 TB/day
JPSS-2	Oct 2021-Feb 2022	1.7 TB/day
PACE	Jun 2022	3.5 TB/day
TOTAL		114 TB/day



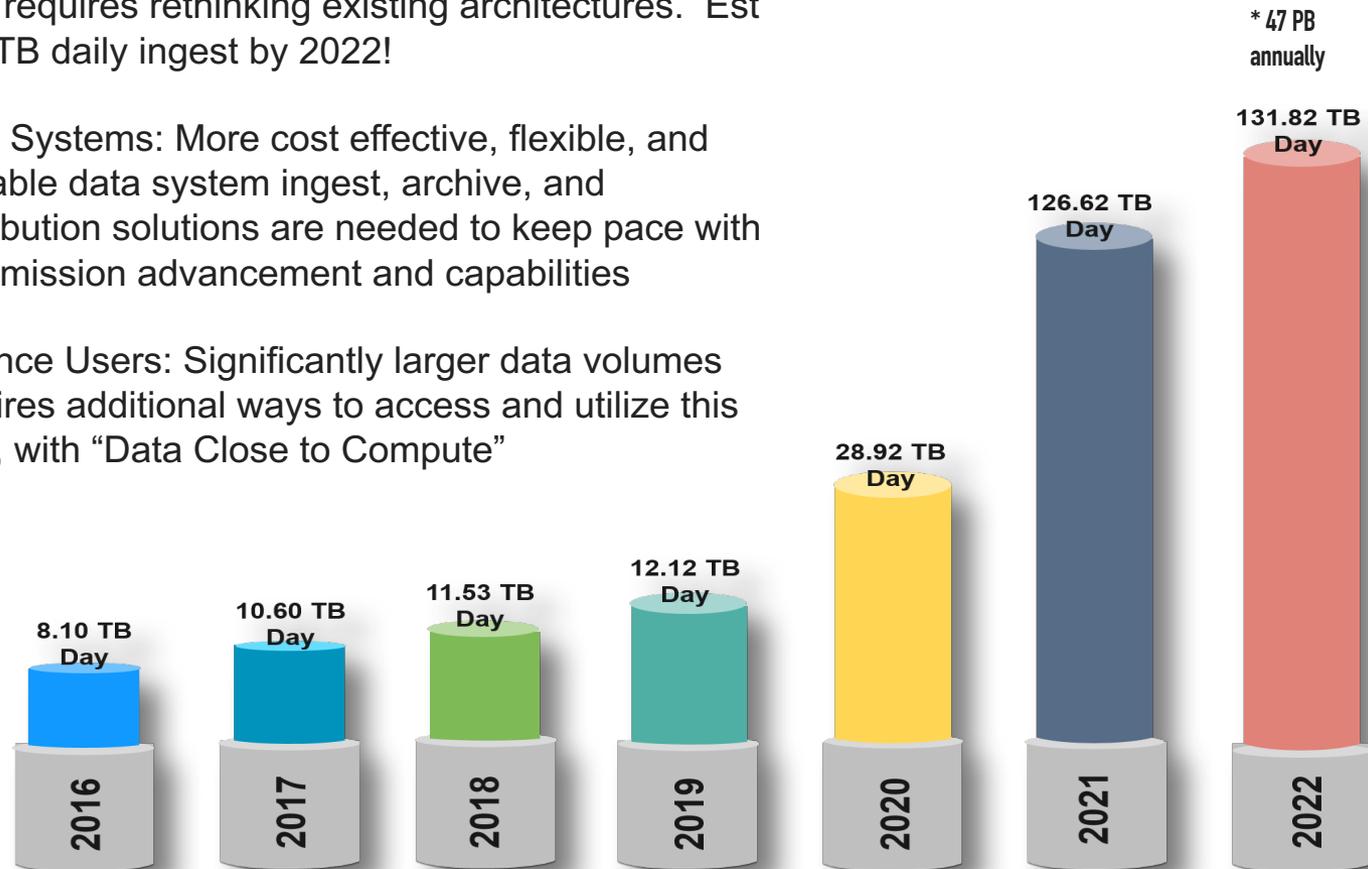
GETTING PROTOTYPES AND ANALYSIS EFFORTS UNDERWAY NOW: NEAR-TERM MOTIVATION



Growth of Mission Data & Processing: Projected rapid archive growth and the need to effectively process significantly larger volumes of new mission data requires rethinking existing architectures. Est 132 TB daily ingest by 2022!

Data Systems: More cost effective, flexible, and scalable data system ingest, archive, and distribution solutions are needed to keep pace with new mission advancement and capabilities

Science Users: Significantly larger data volumes requires additional ways to access and utilize this data, with “Data Close to Compute”



Cloud Evolution (ExCEL) Project

Estimated Daily Data Volume Over 5 Years



Large Volume Data Storage

Centralized mission observation & model datasets stored in auto graduated AWS object storage (S3, S3-IA, Glacier)

Scalable Compute

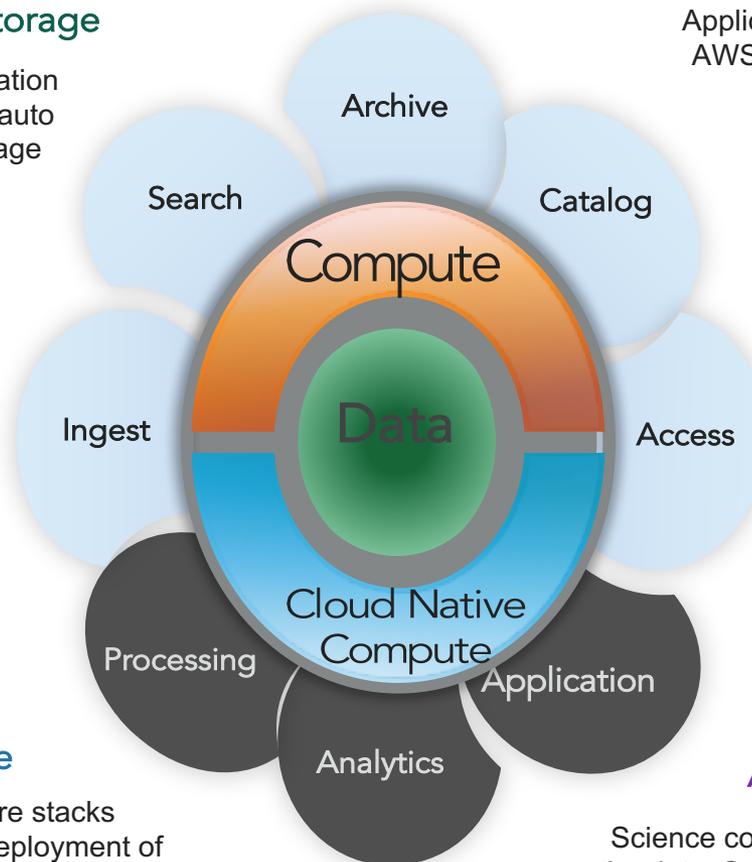
Provision, Access, and terminate dynamically based on need. Cost by use

Cloud Native Compute

Cloud vendor service software stacks and micro-services easing deployment of user based applications

EOSDIS Applications & Services

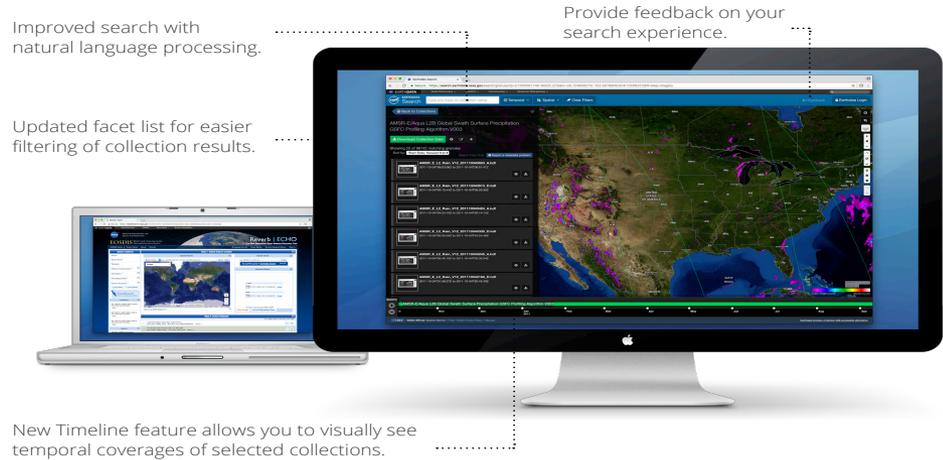
Application and service layer using AWS compute, storage (S3, S3IA, Glacier), and cloud native technologies



Non-EOSDIS / Public Applications & Services

Science community brings algorithms to the data. Support for NASA & non-NASA

GOODBYE REVERB: HELLO EARTHDATA SEARCH!



<https://search.earthdata.nasa.gov>

EOSDIS's Reverb data search and discovery system retires on **January 1, 2018**, and will be fully replaced by Earthdata Search. *Here's what this means for you:*

-  Earthdata Search will be the primary user interface for searching NASA's Earth Observation data archives
-  Using the Common Metadata Repository, or CMR, Earthdata Search provides sub-second searches through the entire EOSDIS data collection.
-  Improvements to the map and user interface make finding data products and visualizing measurements easier.
-  Improvements to the overall workflow will make ordering data products easier.



Thanks!

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Stephen.W.Berrick@nasa.gov

Drew.H.Kittel@nasa.gov

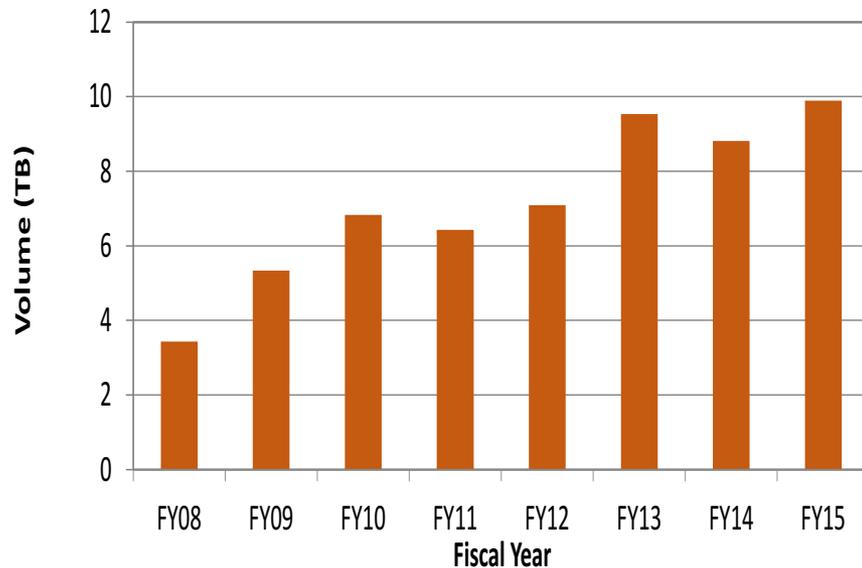
Kathleen.Baynes@nasa.gov

GHRC SUMMARY FOR FY 2015

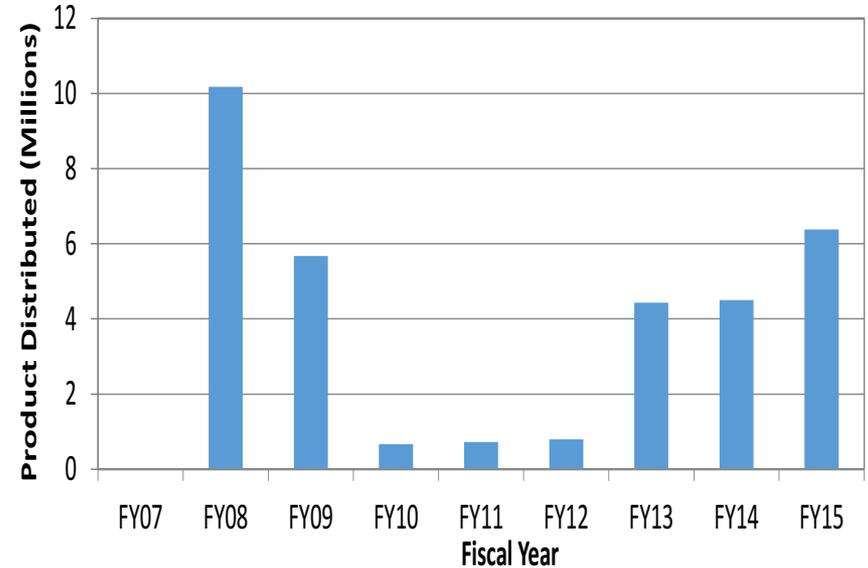
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End User Average Distribution Volume	32,917.5 GB/day	45.3 GB/day

GHRC Distribution and User Trends (Oct 2014 - Sep 2015)				
Item	Total FY2015	Change from FY2014	Monthly Average	12 Month Trend
Files (Millions)	6.4	↑ 41.9%	0.5	
Volume (TB)	16.1	↑ 79.6%	1.3	
Data User	4,136	↑ 14.6%	411	
Web User	7,365	↑ 25.7%	644	

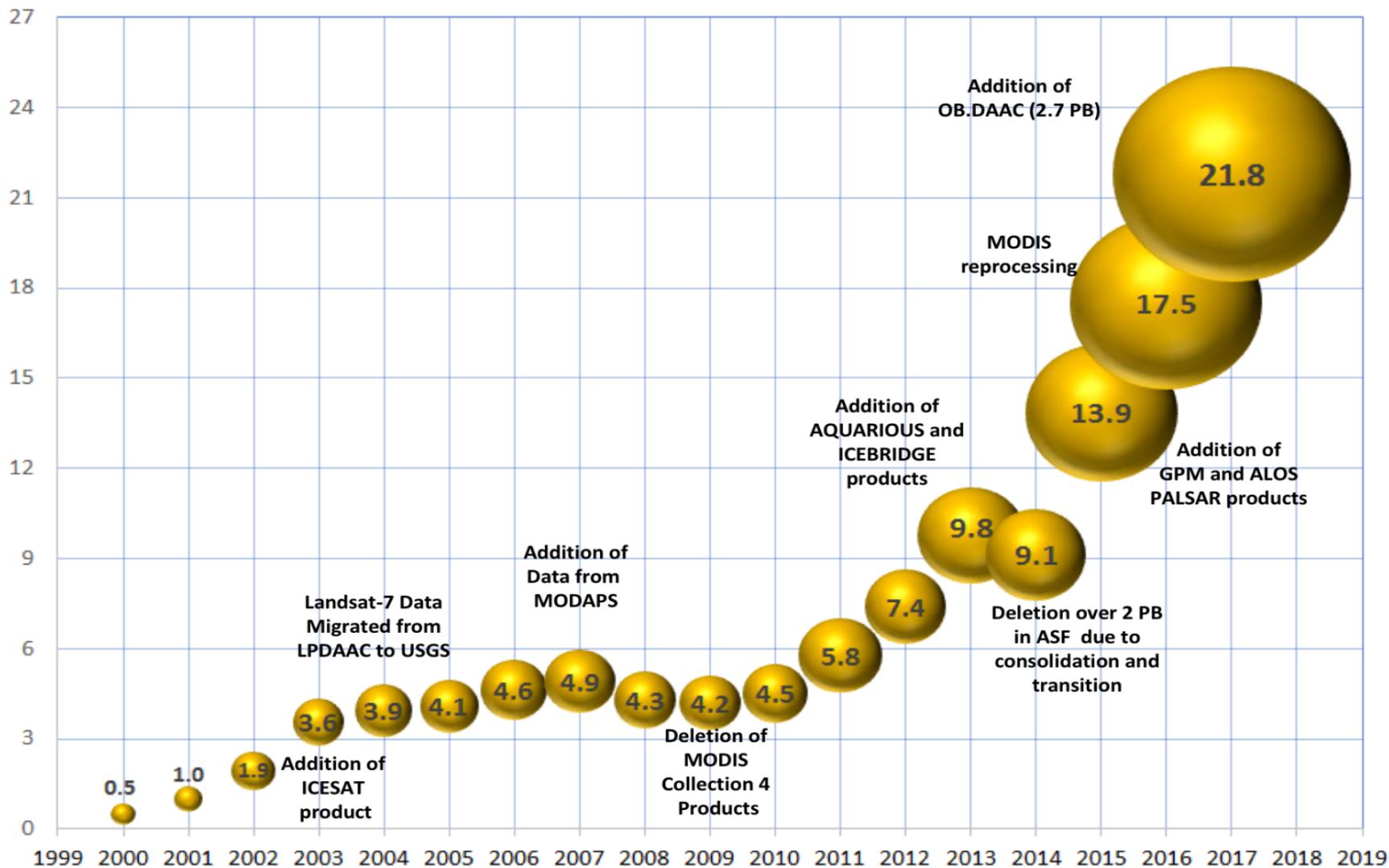
GHRC Multi-Year Total Archive Volume Trend



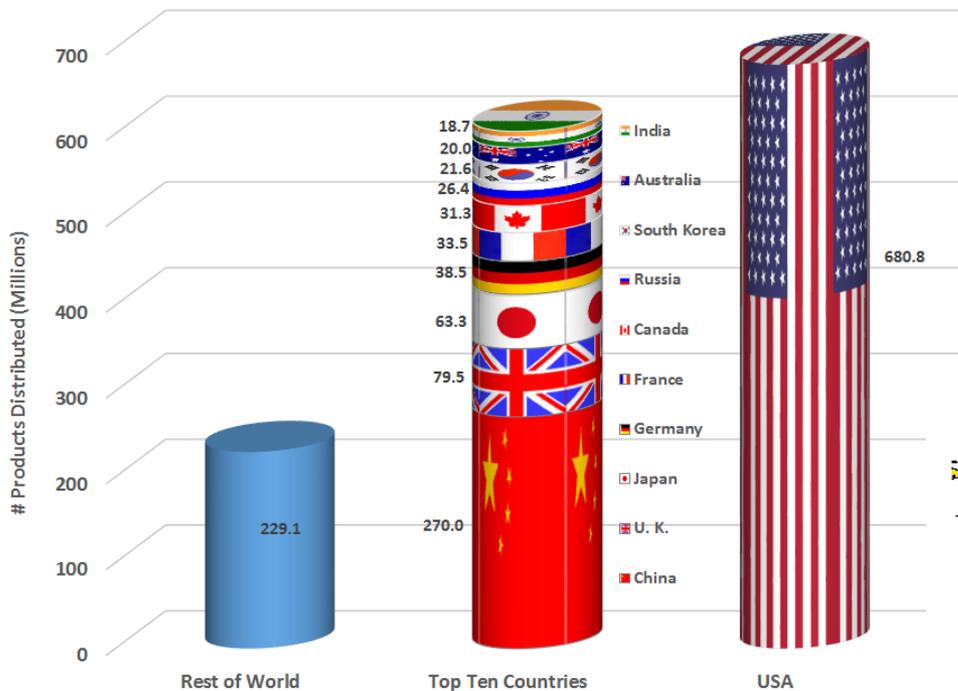
GHRC Multi-Year Product Distribution Trend



EOSDIS DATA ARCHIVE VOLUME: PETABYTES, 2000-2017

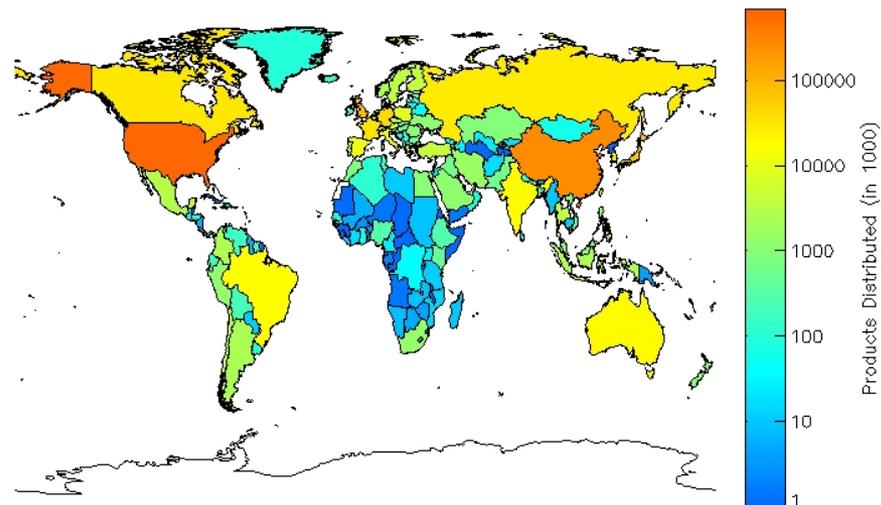


FY 2016 EOSDIS NUMBER OF DATA PRODUCTS DISTRIBUTED: BY COUNTRY



Top 10 Countries

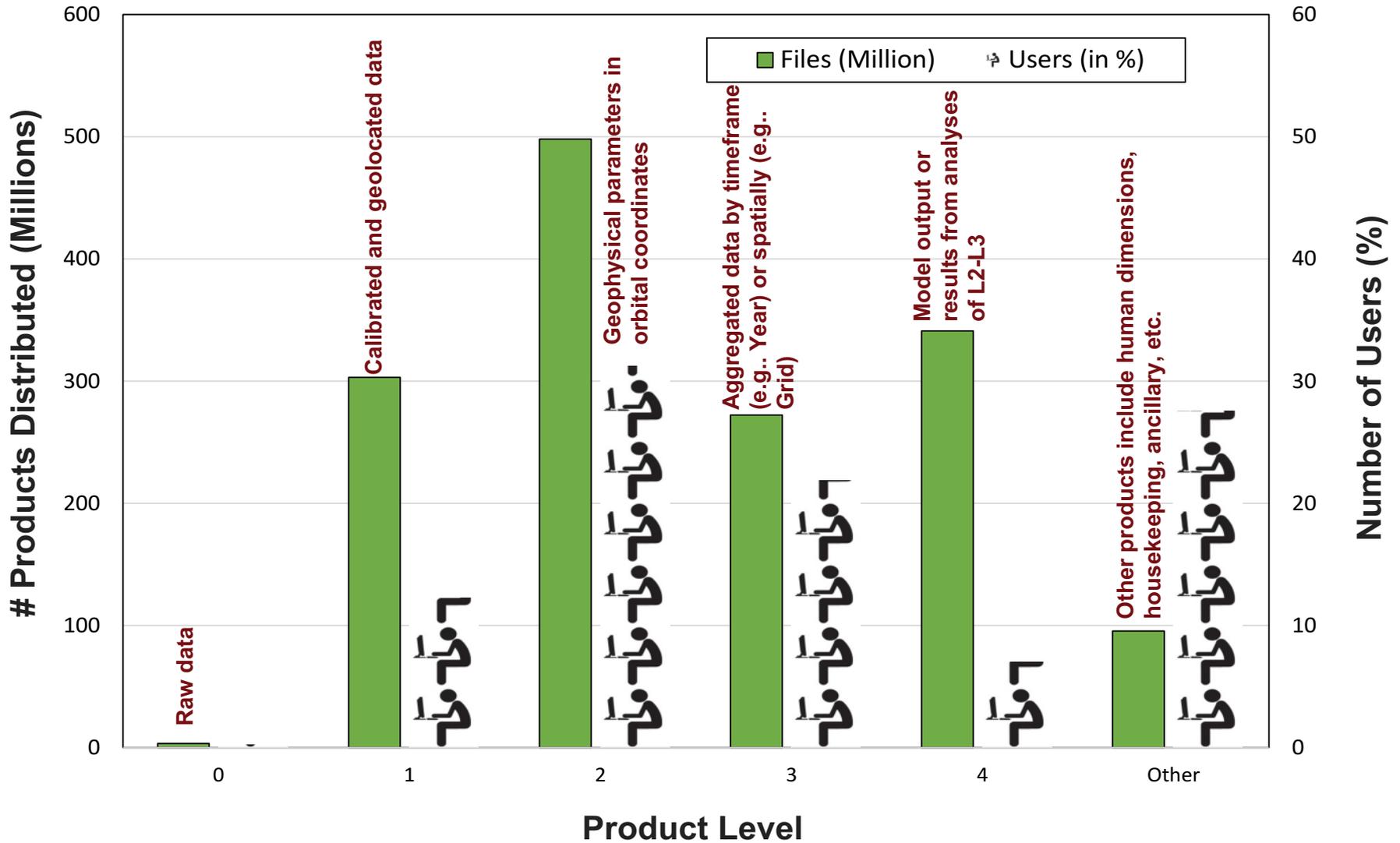
- United States
- China
- United Kingdom
- Japan
- Germany
- France
- Canada
- Russia
- South Korea
- Australia



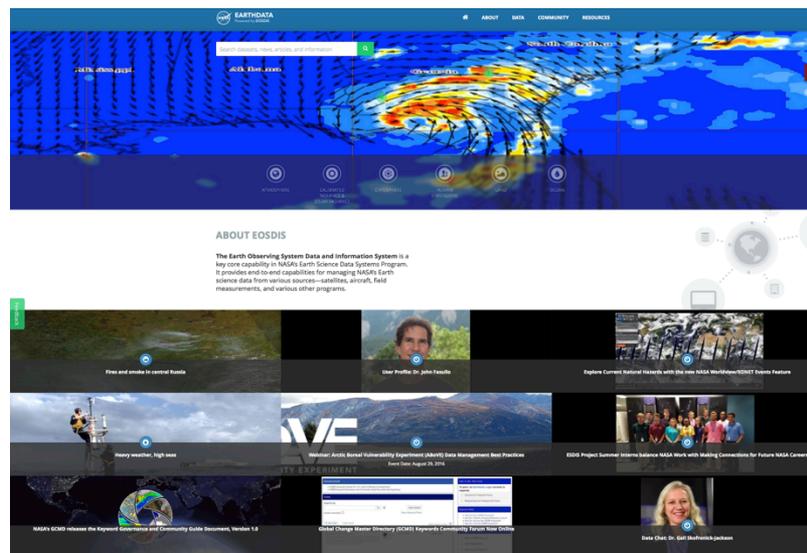
* Our charts report only distribution to the public and do not include distribution to science teams, for data processing or testing



FY 2016 EOSDIS NUMBER OF DISTINCT USERS & DISTRIBUTED PRODUCTS: BY PRODUCT LEVEL

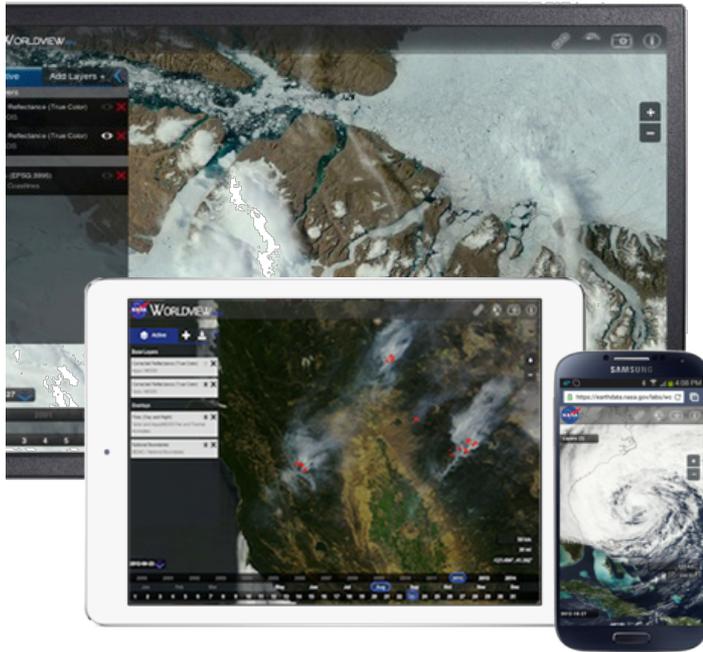


- Earthdata is the face of EOSDIS and represents our community's need for Earth science data and information.
- Earthdata serves as an EOSDIS on-ramp for new and interdisciplinary users and helps to guide them to the appropriate DAACs.
- Earthdata was designed to support collaboration within and between organizations, and for development and integration of new applications.
- Built using the Conduit Content Management System (CMS). Conduit is undergoing open source release.
- The Earthdata Developer Portal supports application developers with organized documentation on EOSDIS APIs, guide documentation, and release notes.



earthdata.nasa.gov





Data products (registration* required)

- Near Real-Time webpages:
<https://earthdata.nasa.gov/lance>
- Earthdata Search
<https://search.earthdata.nasa.gov/>
- Worldview (visual search)
<https://earthdata.nasa.gov/worldview>

Imagery (no registration required)

- Worldview
- Global Imagery Browse Services
- Rapid Response

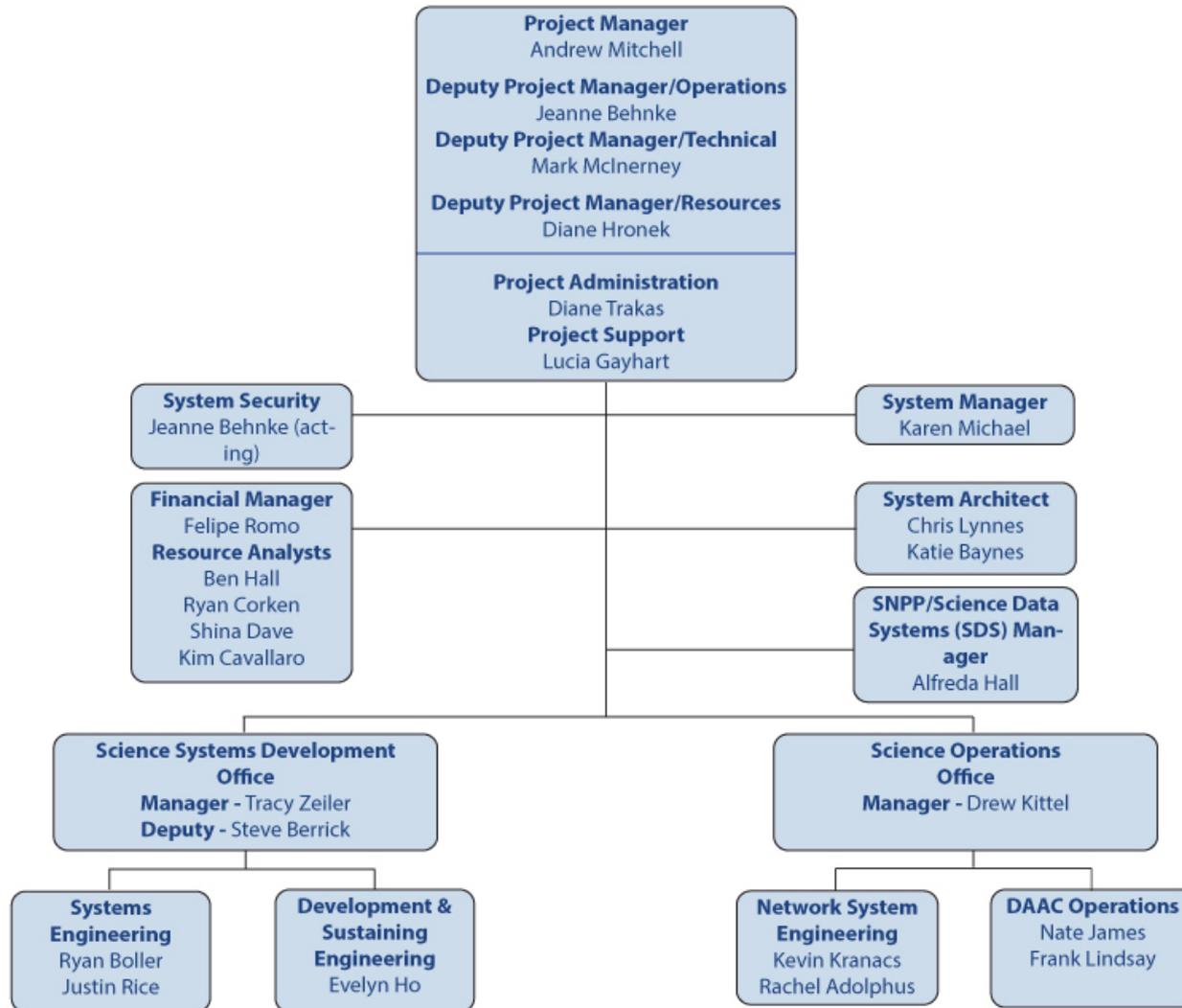


Fire Information for Resource Management System (FIRMS)

- MODIS Hotspot/Active Fire data sent via Email alerts, or available as vector/txt files



Earth Science Data and Information System (ESDIS) Project - Code 423



March 2017

- ▶ NASA commits to the full and open sharing of Earth science data obtained from NASA Earth observing satellites, sub-orbital platforms and field campaigns with all users as soon as such data become available.
- ▶ There will be no period of exclusive access to NASA Earth science data. Following a post-launch checkout period, all data will be made available to the user community. Any variation in access will result solely from user capability, equipment, and connectivity.
- ▶ NASA will make available all NASA-generated standard products along with the source code for algorithm software, coefficients, and ancillary data used to generate these products.
- ▶ All NASA Earth science missions, projects, and grants and cooperative agreements shall include data management plans to facilitate the implementation of these data principles.
- ▶ NASA will enforce a principle of non-discriminatory data access so that all users will be treated equally. For data products supplied from an international partner or another agency, NASA will restrict access only to the extent required by the appropriate Memorandum of Understanding (MOU).
- ▶ <http://science.nasa.gov/earth-science/earth-science-data/data-information-policy/>