



EXPLORE EARTH

YOUR HOME, OUR MISSION

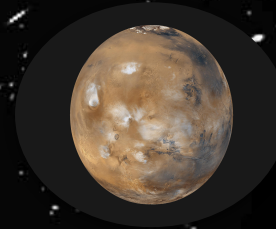
The ACSI Survey and NASA Earth Science

CFI Group and FCG – GOV CX Forum

Nov. 6, 2019 – The City Club of Washington, DC

Francis Lindsay, Ph.D.

ESDIS Project, NASA GSFC

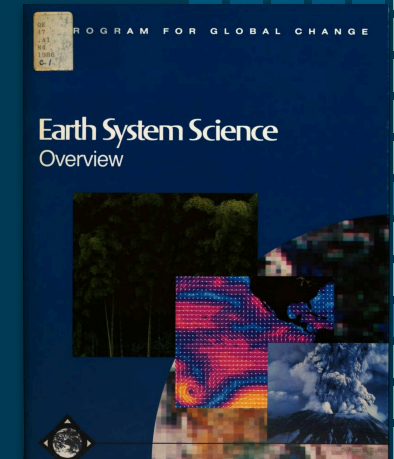
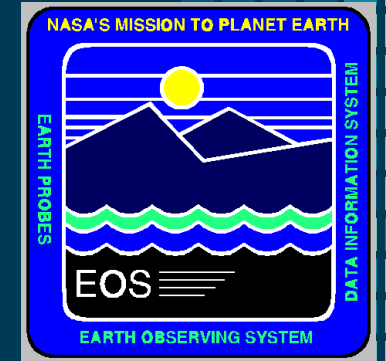


What do people think of
when they hear NASA?



NASA establishes “Mission to Planet Earth”

- Physicist Sally Ride, the first US woman to fly in space, led a study on the future of NASA after the space shuttle Challenger accident. Among the strategies to maintain US leadership in space, the Ride report cited a “**Mission to Planet Earth**” as a top priority.
- “The goal of this initiative is to obtain a **comprehensive scientific understanding of the entire Earth System**, by describing how its various components function, how they interact, and how they may be expected to evolve on all time scales,” the Ride report found.
- NASA's Mission to Planet Earth is dedicated to **understanding the total Earth system and the effects of natural and human-induced changes on the global environment**. The MTPE Enterprise is pioneering the new discipline of Earth system science space-based and in situ capabilities presently being used or developed yield new scientific understanding and practical benefits to the Nation.
- NASA set into motion the development of satellites that would become the backbone for **NASA’s Earth Observatory**, 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**.





**Increasingly the public realizes
the important role NASA plays
in Earth science research**

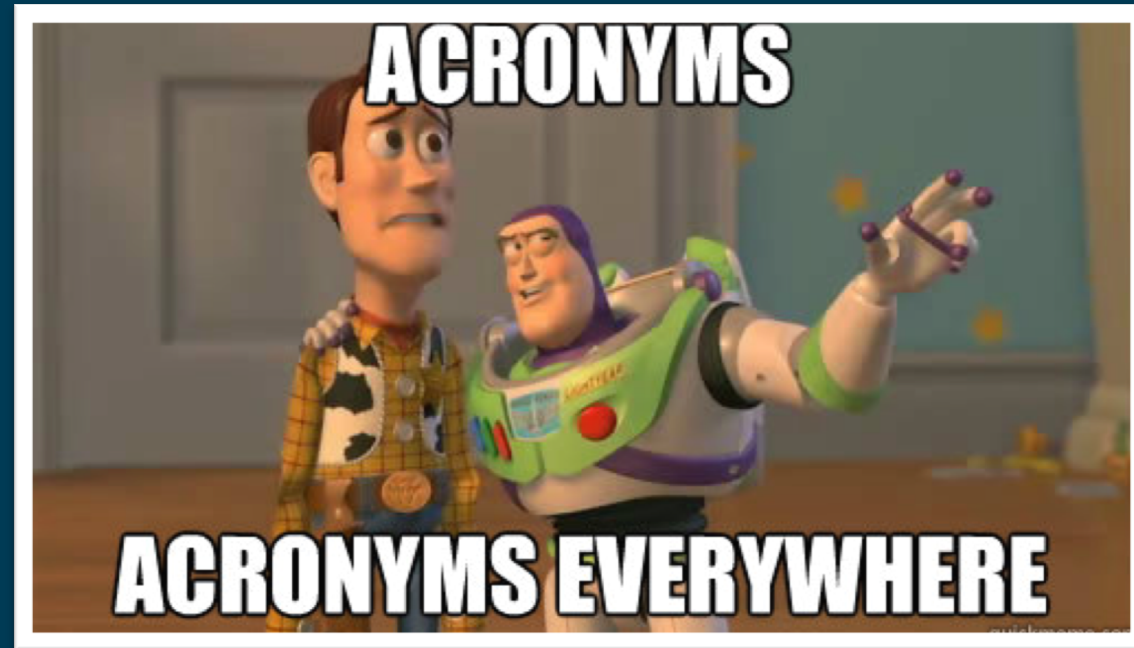
Image from the Deep Space
Climate Observatory (DSCOVR)
satellite

A Quick Introduction to EOSDIS

NASA's EARTH OBSERVING SYSTEM
DATA AND INFORMATION SYSTEM



Apologies ...



EOSDIS Comprises Data of 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

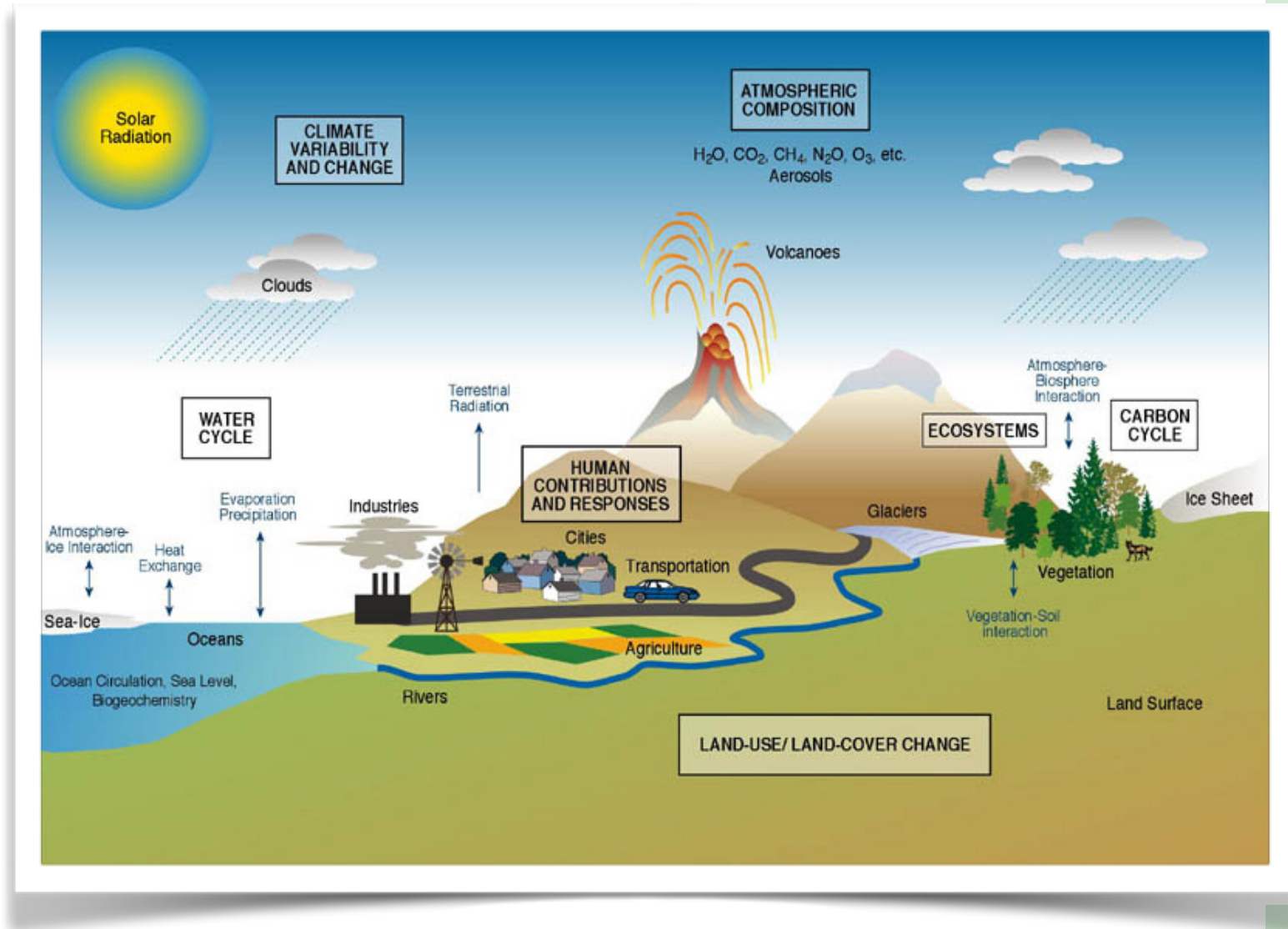
Sea/Land Ice
Snow Cover

Land

Cover & Usage
Soil Moisture
Topography & elevation
Temperature

Human Dimensions

Population & Land Use
Human & Environmental Health



NASA Earth Science Missions: Present through 2023

- (Pre)Formulation
- Implementation
- Primary Ops
- Extended Ops

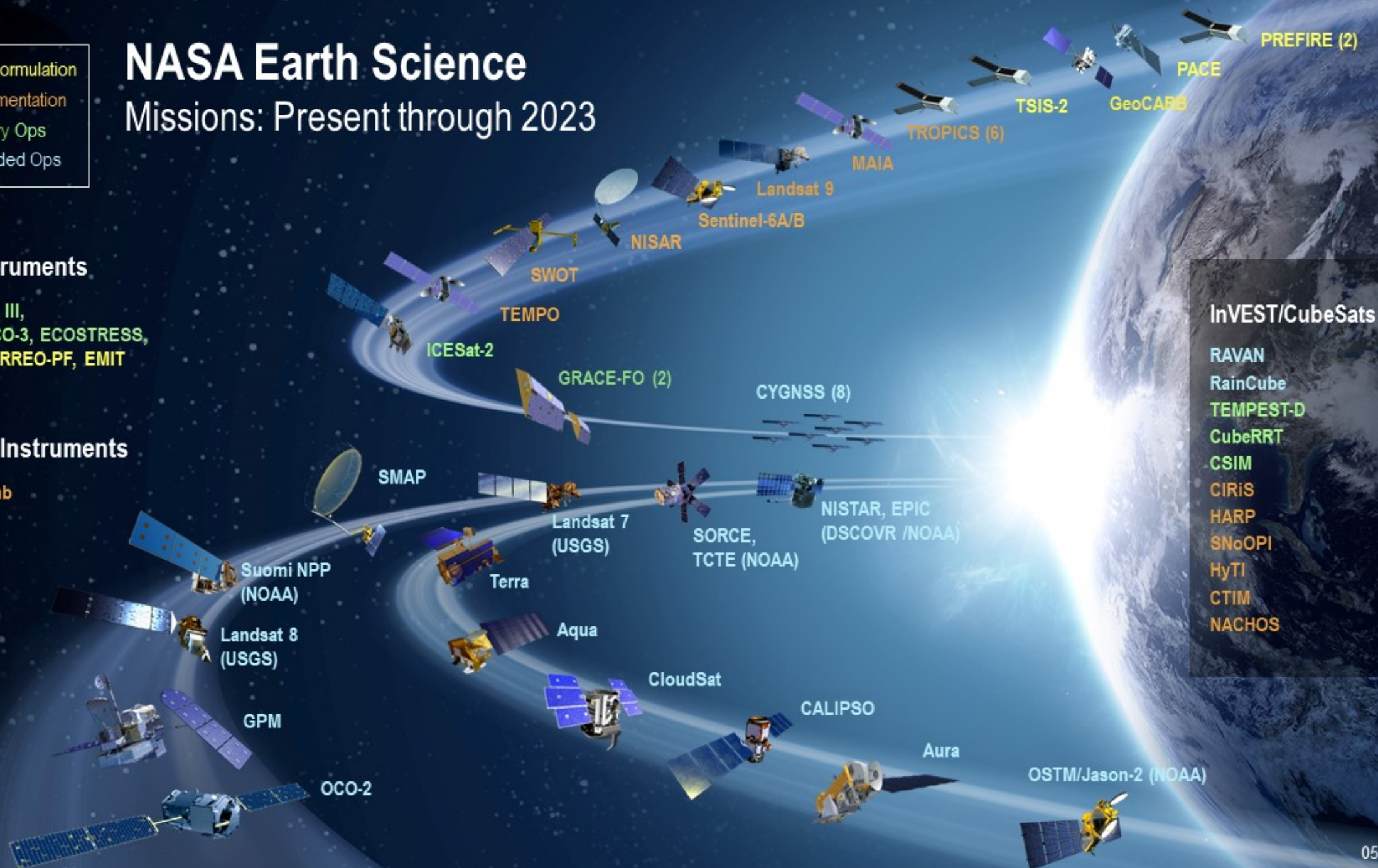
ISS Instruments

LIS, SAGE III, TSIS-1, OCO-3, ECOSTRESS, GEDI, CLARREO-PF, EMIT

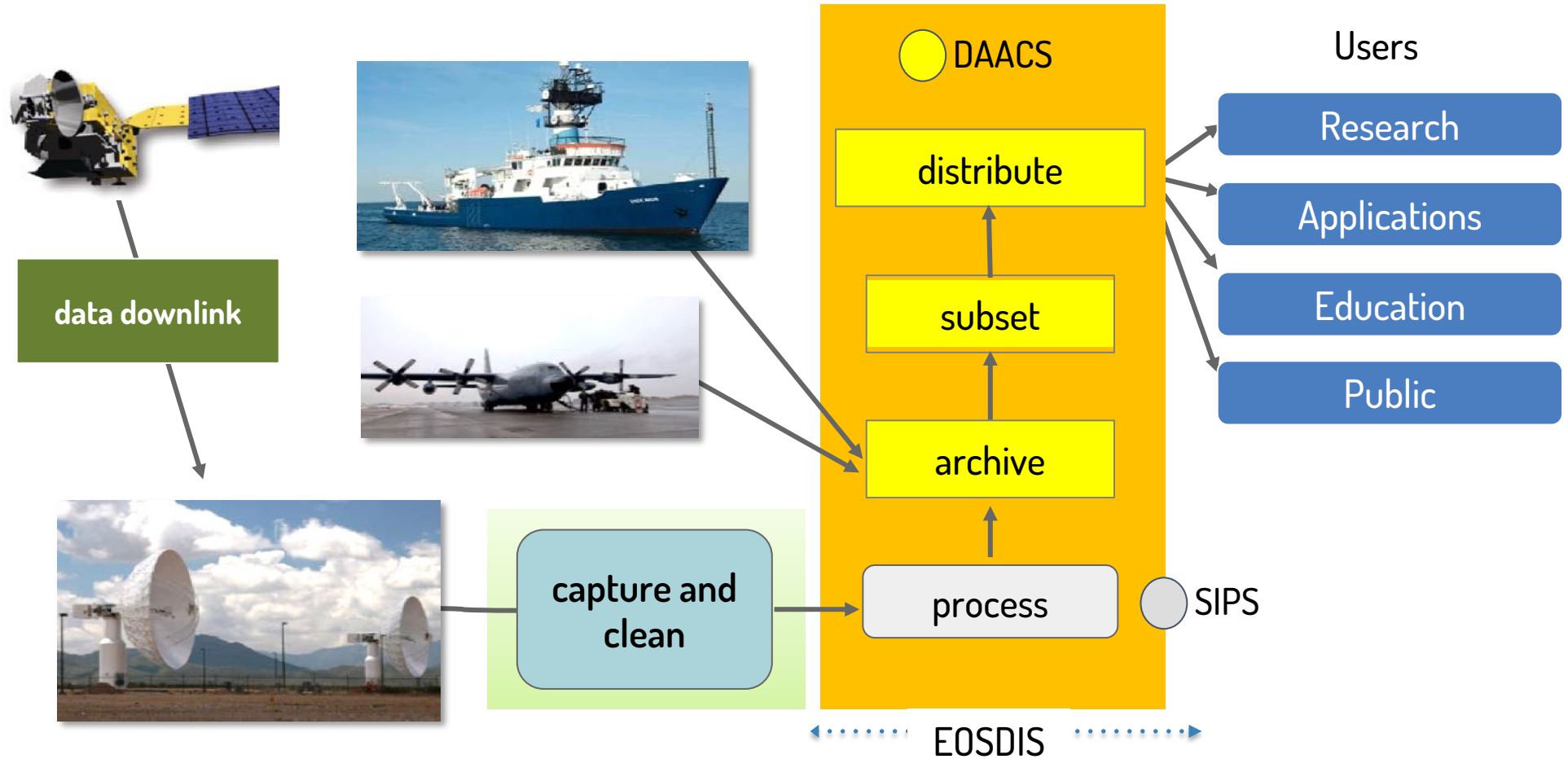
JPSS-2 Instruments

OMPS-Limb

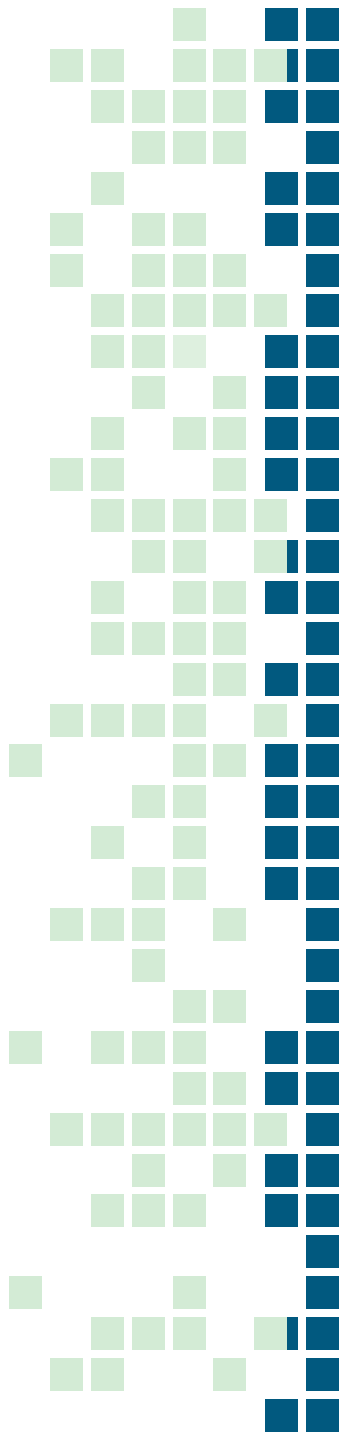
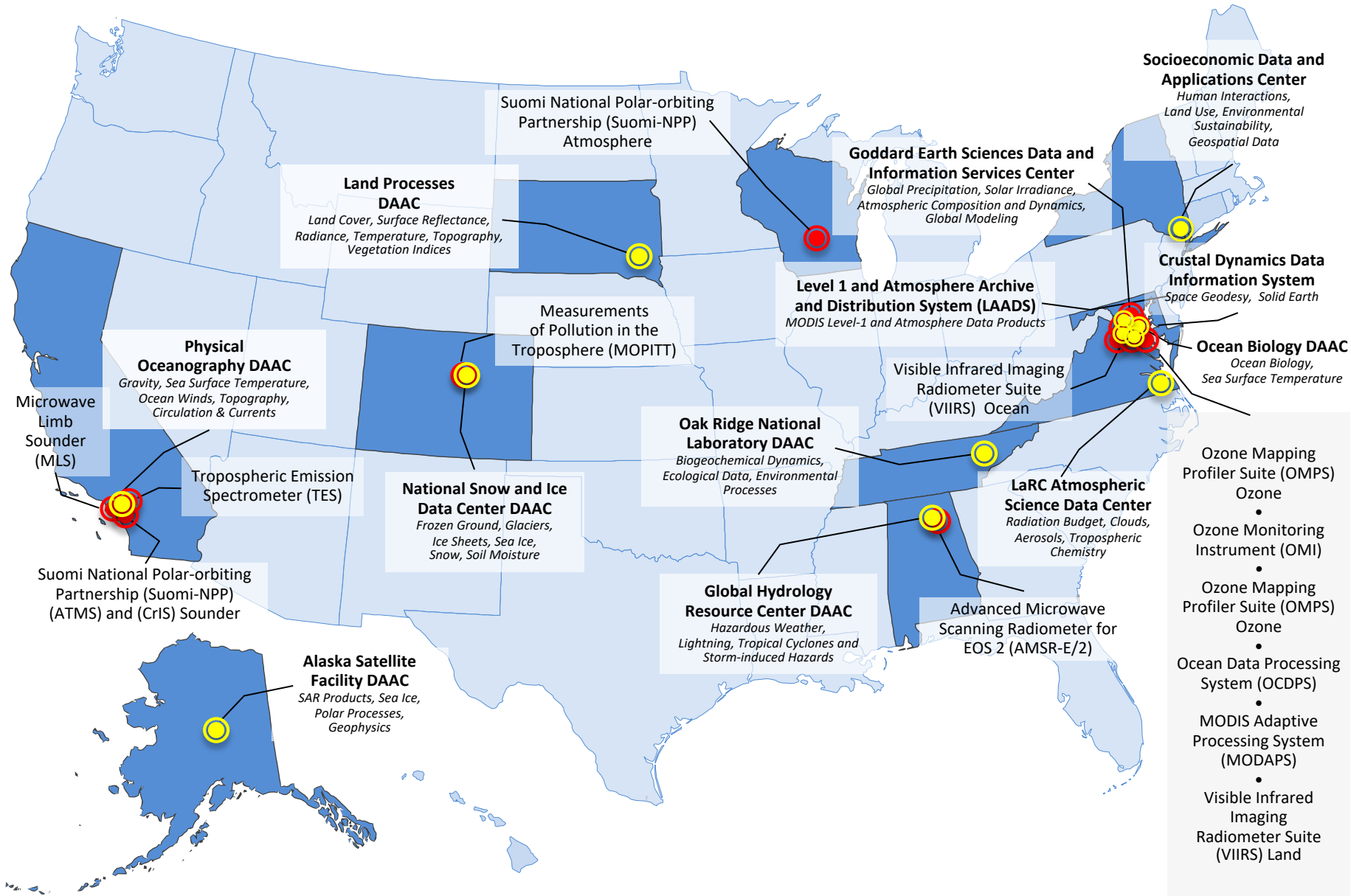
- ### InVEST/CubeSats
- RAVAN
 - RainCube
 - TEMPEST-D
 - CubeRRR
 - CSIM
 - CIRiS
 - HARP
 - SNoOPI
 - HyTI
 - CTIM
 - NACHOS



Components of the EARTH OBSERVING SYSTEM DATA AND INFORMATION SYSTEM



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





EOSDIS has over



33.5 Petabytes

of accessible Earth science data

... ability to search over

34,500 Data Collections

in the On-line Archive (Common Metadata Repository)...



... of which 98% of searches for data complete

in less than **1 Second**



EOSDIS delivered over

1.9 Billion data products

to over **3.1+ Million**

science users from around the world

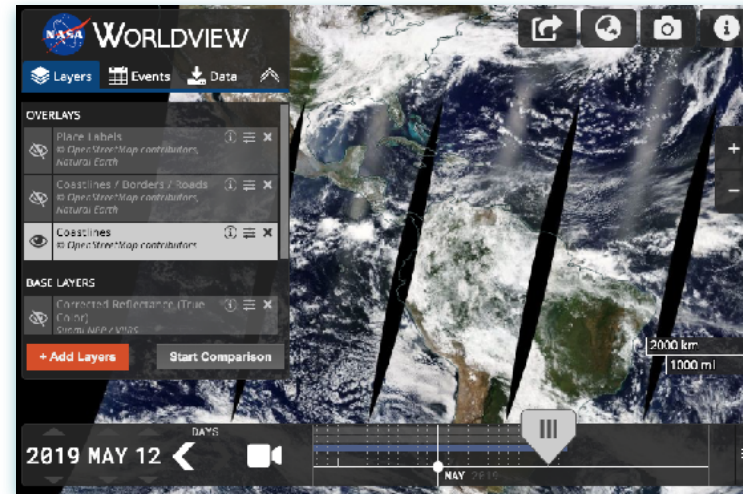
FISCAL 2019



... with over

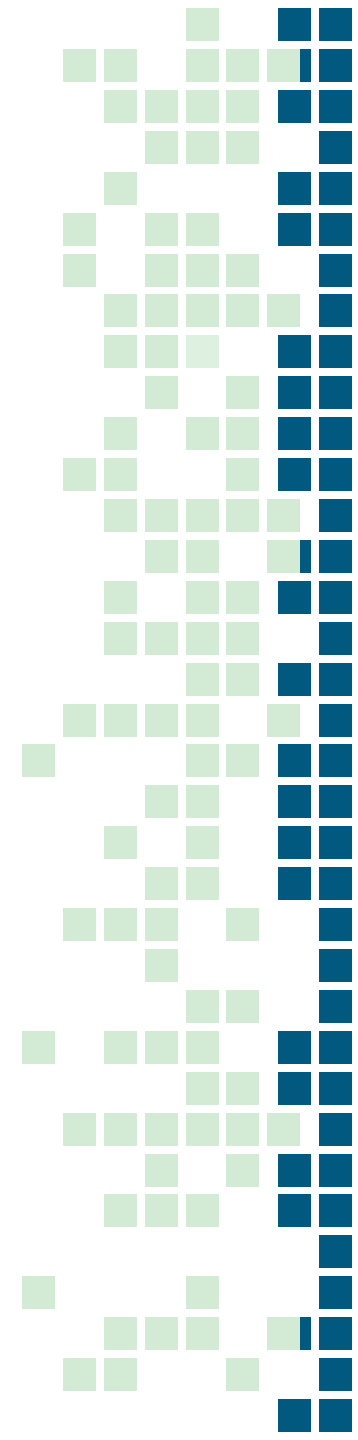
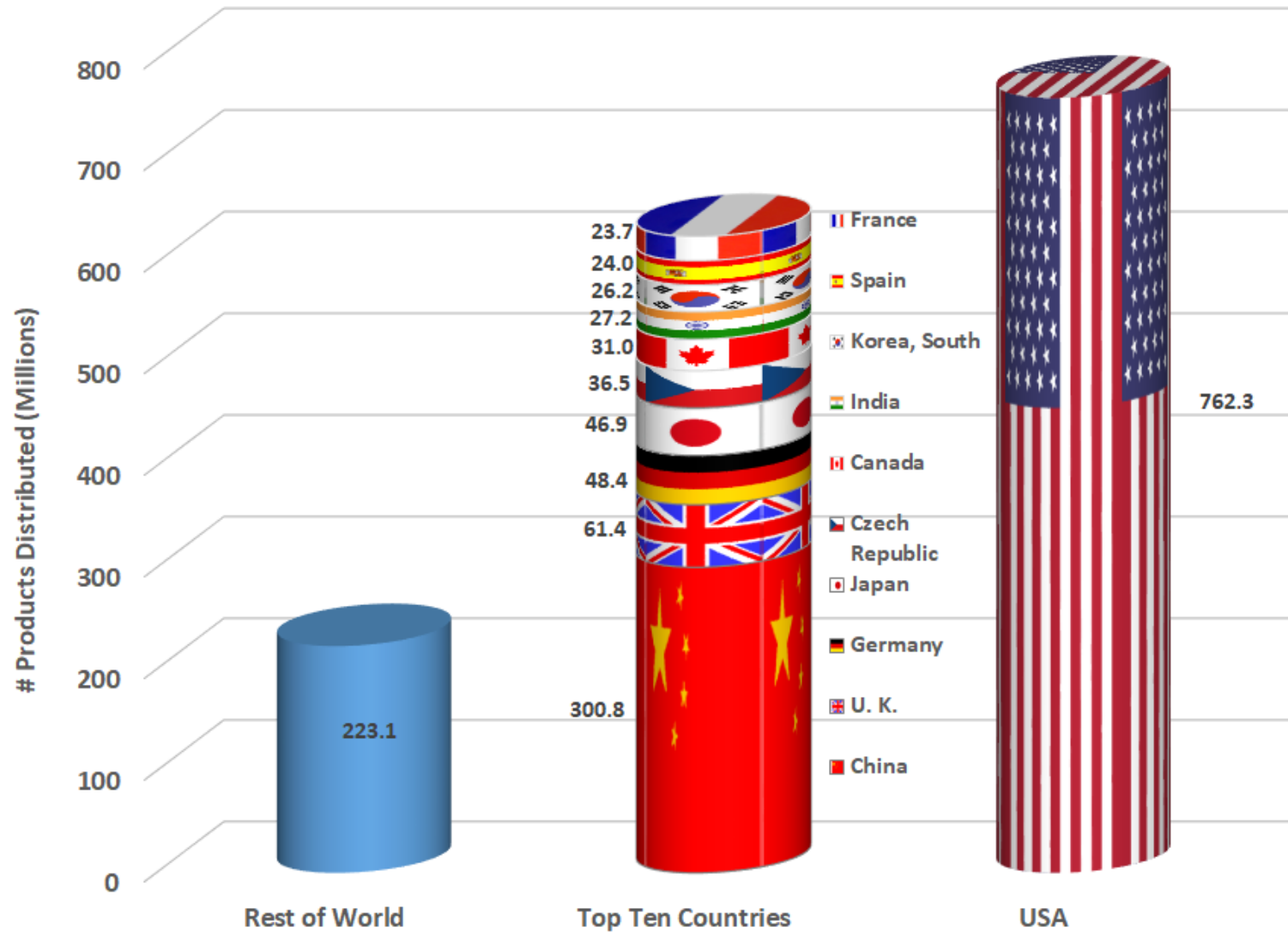
462 Million

Science data files (individual pieces of data)...



... and our **LANCE** system supports **over 530** unique near real-time datasets... distributed over 134 million files and produced 1 Petabyte of data **within 3 hours** of satellite acquisition

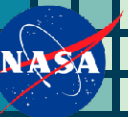
Data from EOSDIS is consumed throughout the World (2018)



Why Does NASA Use the ACSI Survey?

- To better understand our users/user communities
- Understand changes in preferences and expectations of users
- Are our data and services meeting user needs?
- Are we investing in the right systems and services?
- To track our Data Centers' performance over time
- To calculate a yearly ACSI score for our Data Centers
- To have an unbiased, and widely-used metric to assess EOSDIS to management and government oversight

Implementing the ACSI Survey @ NASA



The NASA ACSI Survey Design

- The ACSI Survey is updated every year, the type of questions have evolved over the past 15 years.
- The survey has two sections, one general question section (applicable to all), and a DAAC (data center)-specific section.
- The survey questions focus on the user experience of finding, accessing and using NASA data. The results from these are key to making design choices in resource constrained environments.
- Care is taken when developing constrained response versus open-ended survey questions. “Don’t ask for something you do not analyze!”
- Question changes can take a year or more to gain OMB approval so ongoing planning for future surveys is in place.

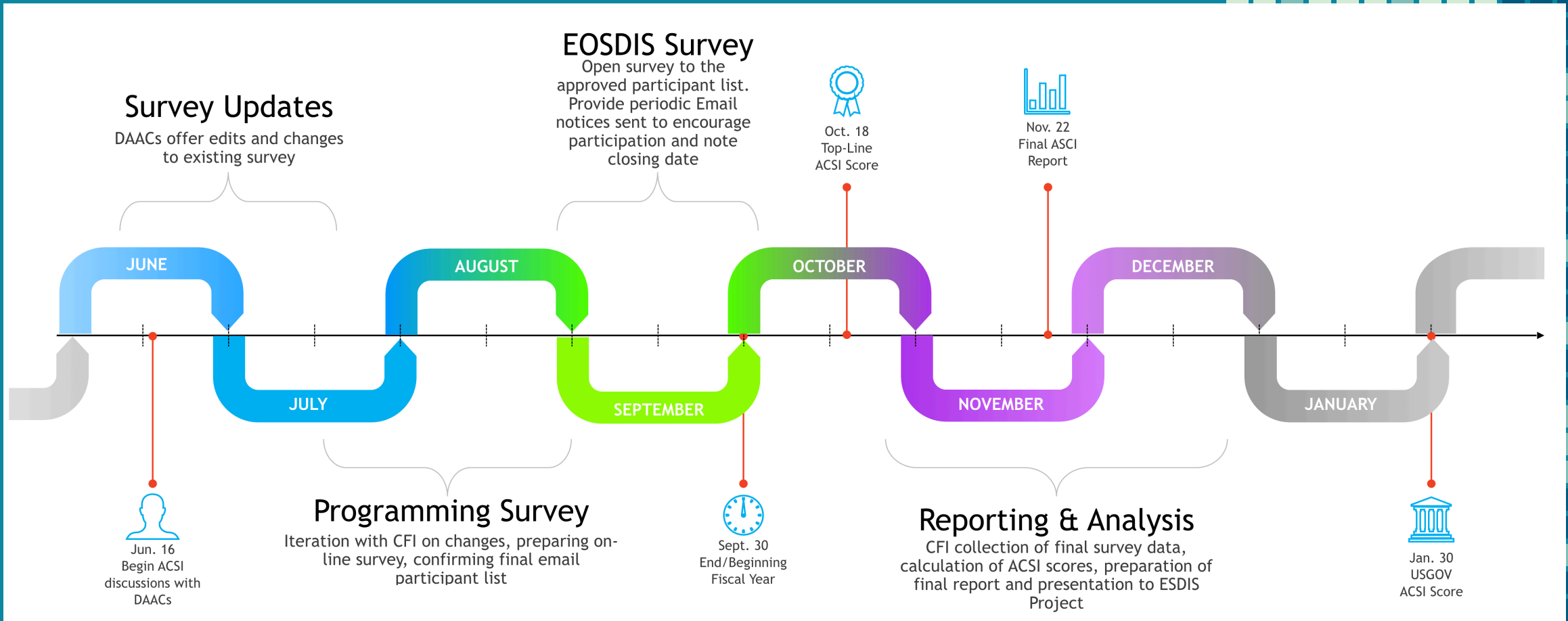




Size and Scope of the Annual Survey

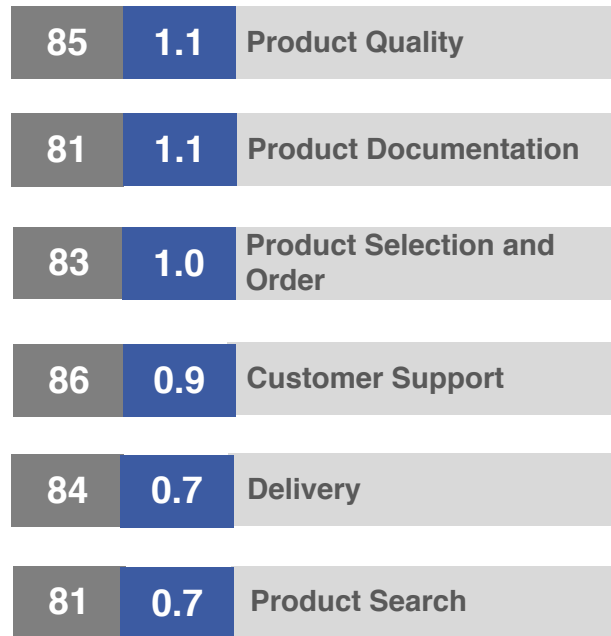
- We use our central user registration (Earthdata) email list along with special data center-specific lists
- Generally, over 200,000 invitation are mailed out by CFI
- We allow people to 'opt-out' of any survey or other contact from NASA
- We also allow people to also 'opt-in' if they had not received an invitation to take the survey
- We work with CFI to monitor the response rates and end the survey when sufficient data is collected (approx. 3 weeks)

The NASA ACSI Survey Cadence



2018 NASA EOSDIS – Customer Satisfaction Model

SATISFACTION DRIVERS



FUTURE BEHAVIORS

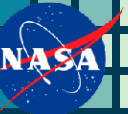


Scores represent your performance as rated by **your** customers

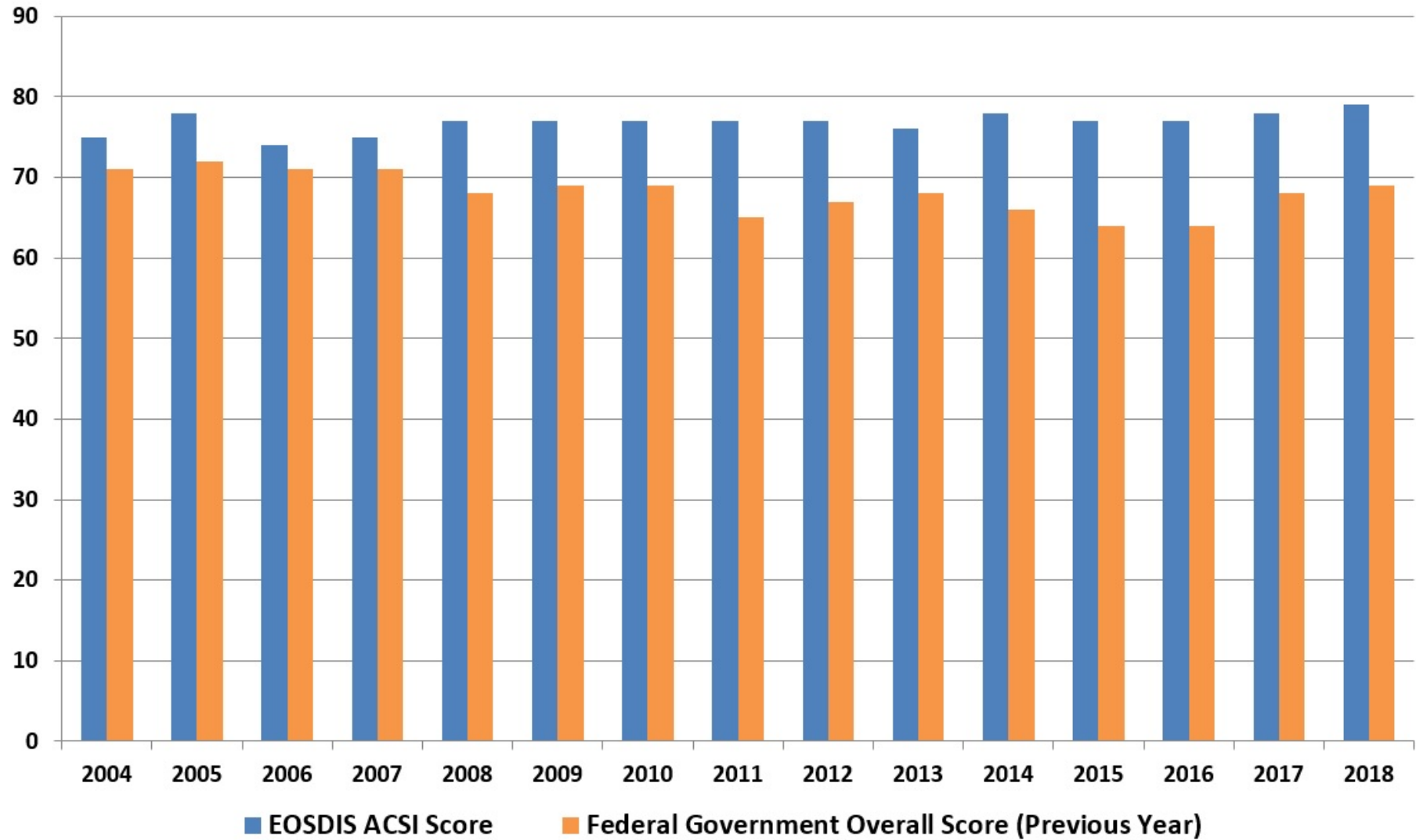
Driver Impacts show you which driver has the most/least leverage – where improvements matter most/least to **your** customers

Future Behavior Impacts represent the impact of CSI on the future behaviors of **your** customers

Some Sample ACSI Survey Results



The EOSDIS ACSI Score 2004-2018

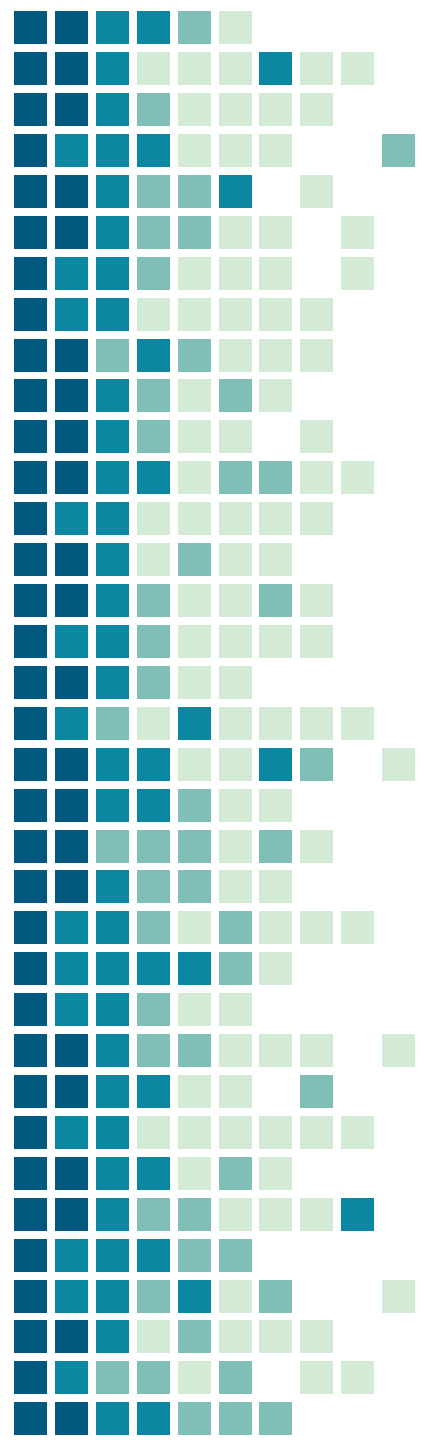


Survey Responses by DAAC

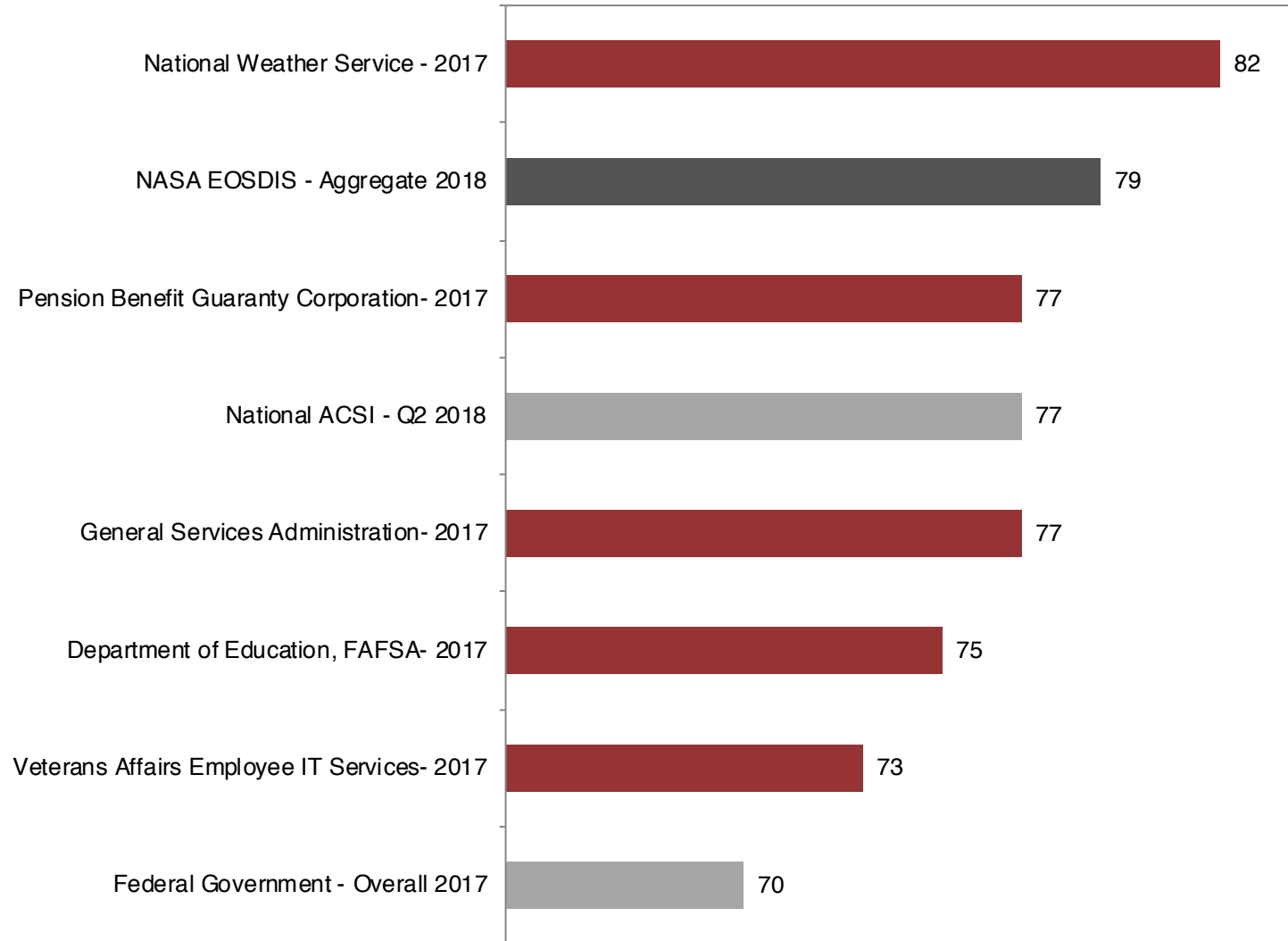
	2017	2017	2017	2018	2018	2018
	%	N	CSI	%	N	CSI
Data center evaluated						
ASDC-LaRC	7%	548	77	8%	217	74
ASF SAR DAAC	9%	688	80	17%	475	82
CDDIS	3%	191	77	1%	37	79
GES DISC	11%	830	77	13%	357	77
GHRC	5%	405	72	5%	148	73
LP DAAC	38%	2,829	79	30%	840	80
MODAPS LAADS	11%	847	78	10%	291	77
NSIDC DAAC	5%	396	79	5%	143	79
OB.DAAC	2%	124	76	1%	35	85
ORNL DAAC	2%	164	82	2%	45	81
PO DAAC-JPL	2%	187	80	3%	76	82
SEDAC	4%	296	75	4%	114	76
Number of Respondents	7,505	7,505	7,505	2,778	2,778	2,778

Survey Responses by User Type

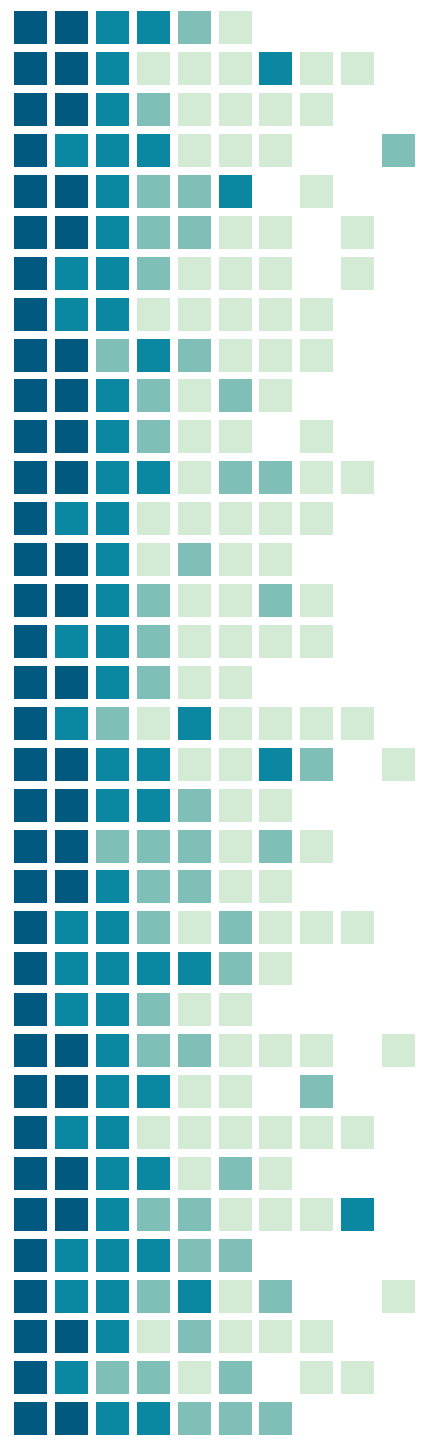
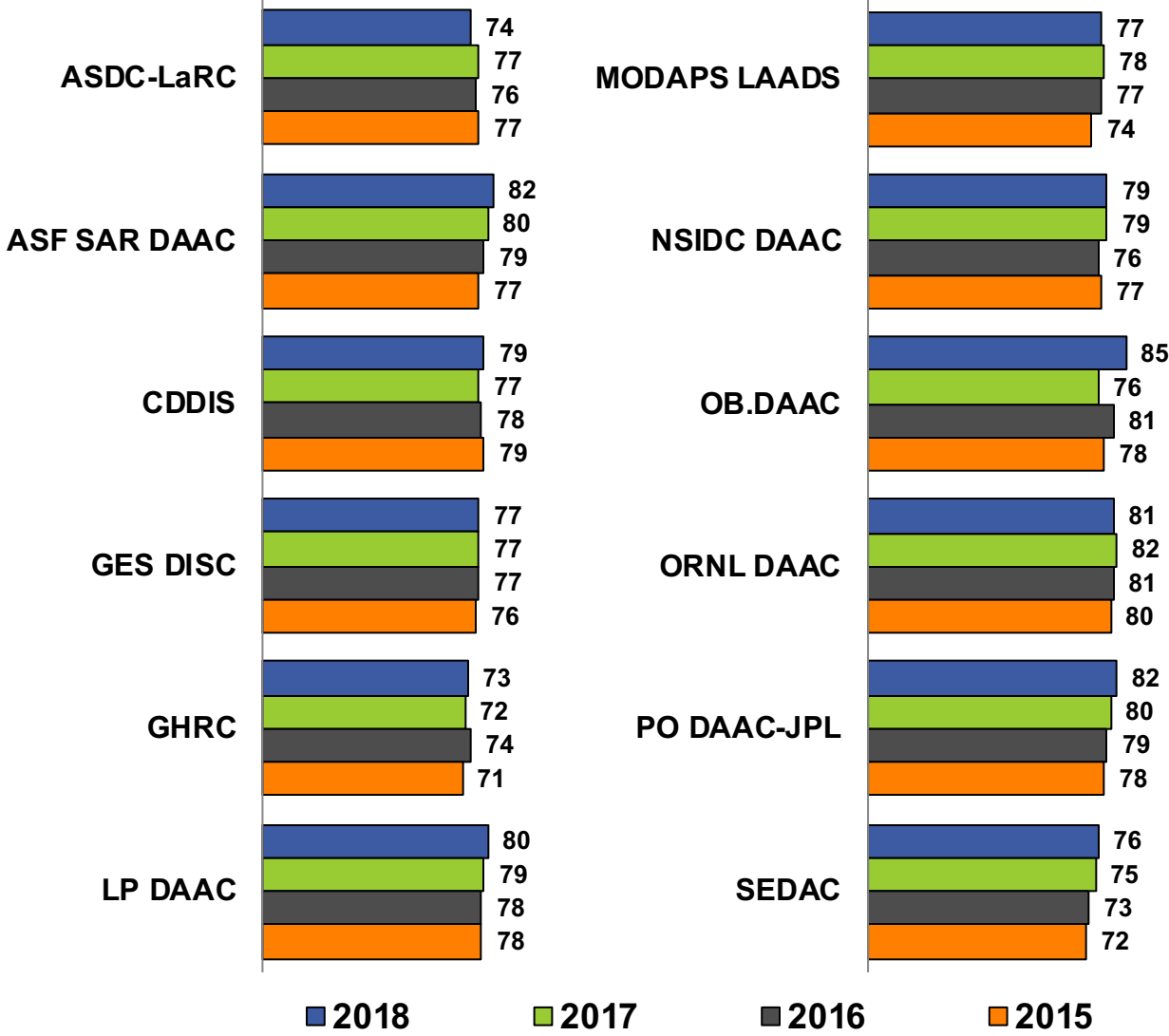
	2017	2017	2017	2018	2018	2018
	%	N	CSI	%	N	CSI
Type of User~						
General Public	14%	1,037	76	13%	349	77
Elementary, Middle, High School Teacher	1%	86	77	1%	38	77
University Professor	16%	1,193	81	16%	446	81
University Undergraduate Student	9%	656	76	10%	273	76
University Graduate Student	29%	2,204	77	29%	802	77
Other Education and Outreach	5%	355	79	6%	180	79
Earth Science Researcher	32%	2,409	79	34%	932	80
Earth Science Modeler	9%	650	79	11%	304	77
NASA-affiliated Scientist	1%	102	80	2%	45	75
Non-NASA-affiliated Scientist	4%	320	78	5%	131	77
NASA Science Team Member	1%	68	80	1%	39	75
Data Tool Developer/Provider	5%	409	77	7%	191	76
Decision Support Systems Analyst	6%	429	76	6%	165	77
Interdisciplinary user	0%	0	--	12%	335	79
Applications Scientist	0%	0	--	13%	361	79
Other User Type	9%	656	77	7%	202	78
Number of Respondents	7,505	7,505	7,505	2,778	2,778	2,778



A Few Government Benchmarks



ACSI Scores by DAACs



Areas & Use of Earth Science Data & Services

	2017	2017	2017	2018	2018	2018
	%	N	CSI	%	N	CSI
General areas need or use Earth science data and services~						
Atmosphere	29%	2,206	78	30%	843	77
Biosphere	16%	1,198	79	16%	449	79
Calibrated radiance	8%	629	79	7%	207	78
Cryosphere	7%	556	79	8%	225	80
Human dimensions	13%	984	77	12%	345	79
Land	67%	5,062	78	61%	1,695	78
Near-real-time applications	13%	1,008	79	13%	355	78
Ocean	14%	1,072	78	14%	380	78
Space geodesy	9%	692	77	9%	245	78
Emergency/Planning Management	0%	0	--	15%	403	78
Hydrology	0%	0	--	38%	1,066	77
Natural hazards	0%	0	--	32%	883	79
Other general area	8%	630	76	8%	223	78
Not applicable	0%	36	82	0%	9	80
Number of Respondents	7,505	7,505	7,505	2,778	2,778	2,778

What Tools are Users Using with ESODIS Data?

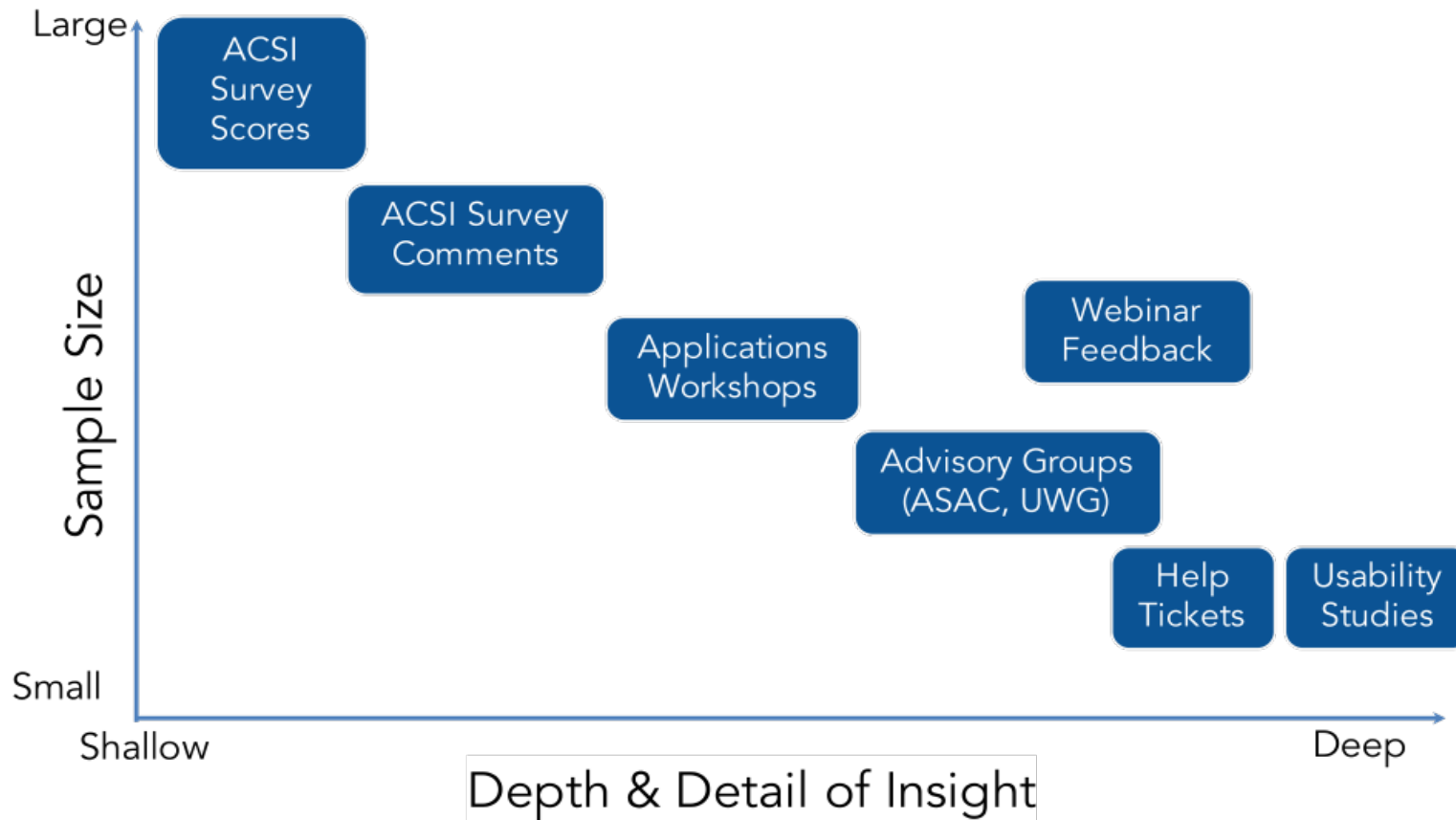
	2018	2018	2018
	%	N	CSI
Tool(s) used to work with data~			
ArcGIS	64%	898	81
Convert to Vector	6%	80	80
ENVI	32%	450	82
ERDAS/IMAGINE	20%	278	82
Excel	29%	409	81
Ferret	1%	10	77
Geomatica	4%	53	78
Global Mapper	15%	206	81
GrADS	3%	46	83
GRASS	12%	174	82
HDFLook	2%	27	84
HDFView	10%	138	79
HEG	1%	20	81
IDL	7%	100	83
IDV	1%	12	86
IDRISI	7%	96	81
MapReady	2%	22	85
MATLAB	18%	255	81
MODIS Reprojection Tool (MRT)	9%	126	81
NCL	3%	47	84
Panoply	9%	121	80
Quantum GIS (QGIS)	42%	587	81
R	22%	315	80
SeaDAS	3%	46	81
Other/open source	23%	320	81
Don't know/Not applicable	1%	8	88
Number of Respondents	3,656	3,656	3,656

Thoughts:

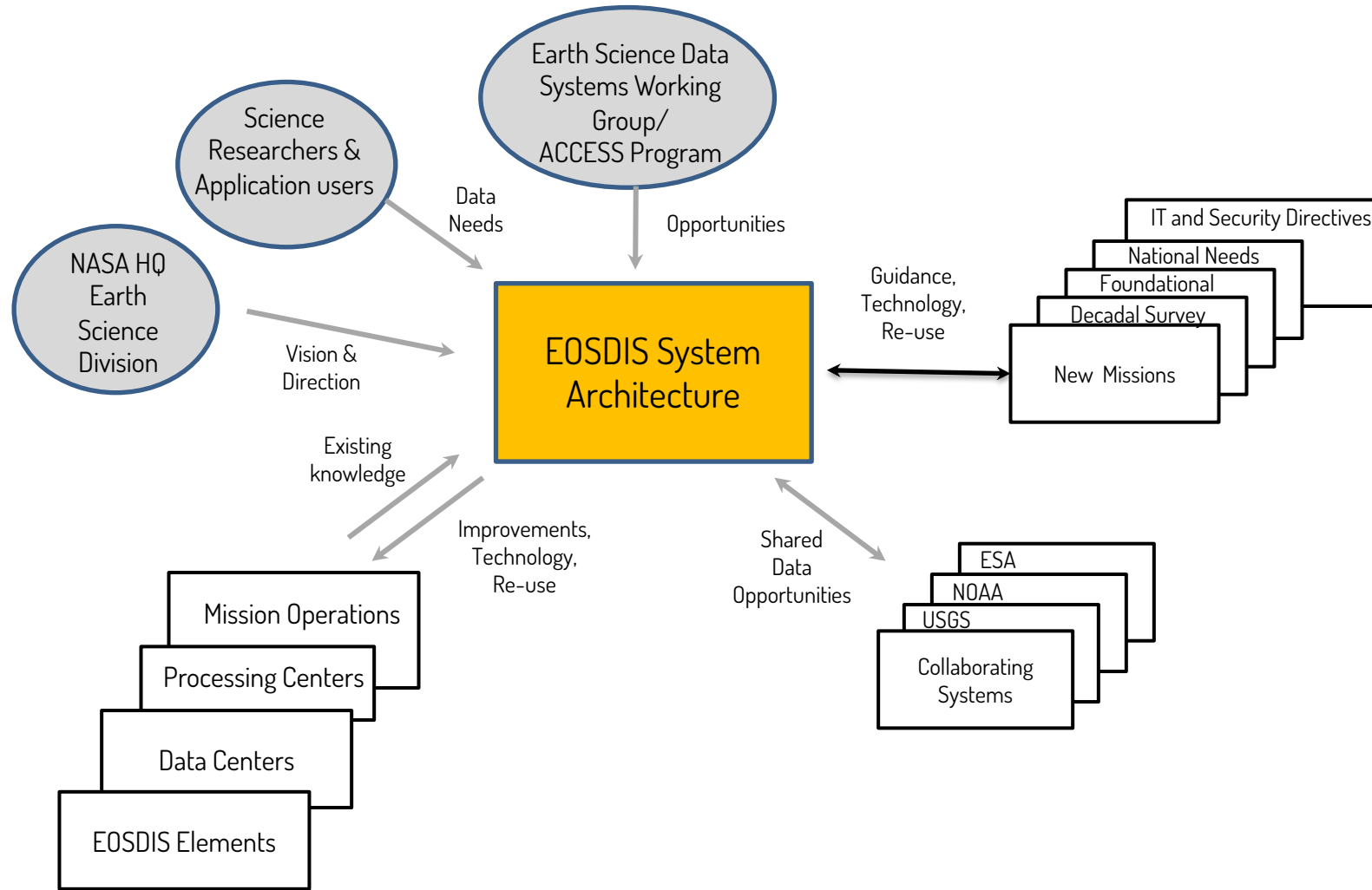
Mechanisms for Gathering User Feedback –
Challenges and Opportunities for Furthering
Insight into User Satisfaction



Gaining Knowledge from EOSDIS Users and Stake-holders



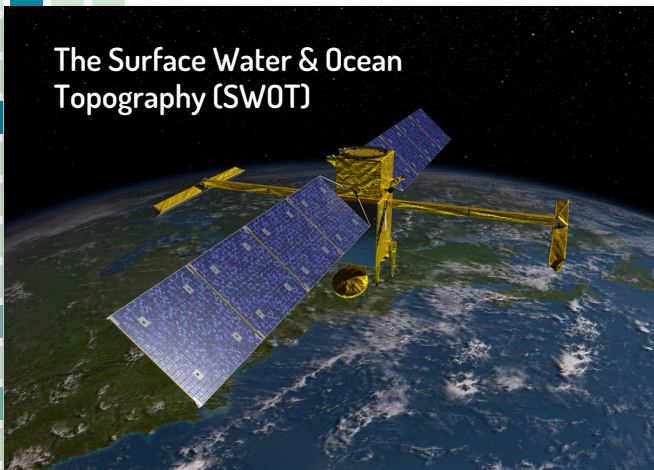
Integrating User Feedback into System Design



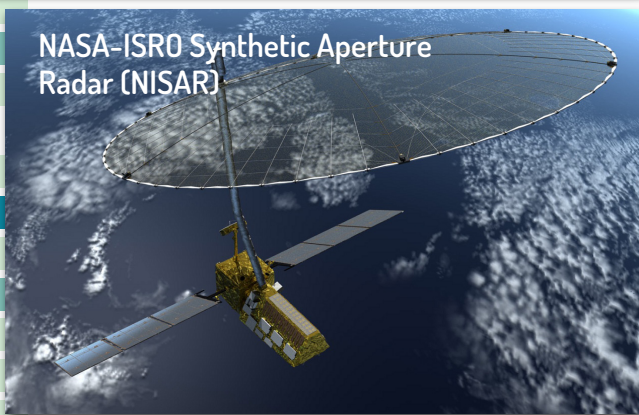
The NASA ACSI Survey: Issues NASA Confronts

- **Survey Burnout** for our users. How to maintain user interest in an annual survey, with few changes?
- Survey structure, its length, depth of questions, time for completion, etc. Are we **maximizing the survey** as a tool?
- **User bias**. People love what you do or they hate it! Can we discern macro trends based on our user responses.
- We have a diverse user base and are looking into way to make the survey more **multilingual**-accessible.
- Is once a year sufficient? How do we get more **timely feedback** from the ACSI?
- There remain **differences between DAACs** due to the different user communities, we need to separate questions applicable to all versus those that are appropriate for a single center.

The Surface Water & Ocean Topography (SWOT)



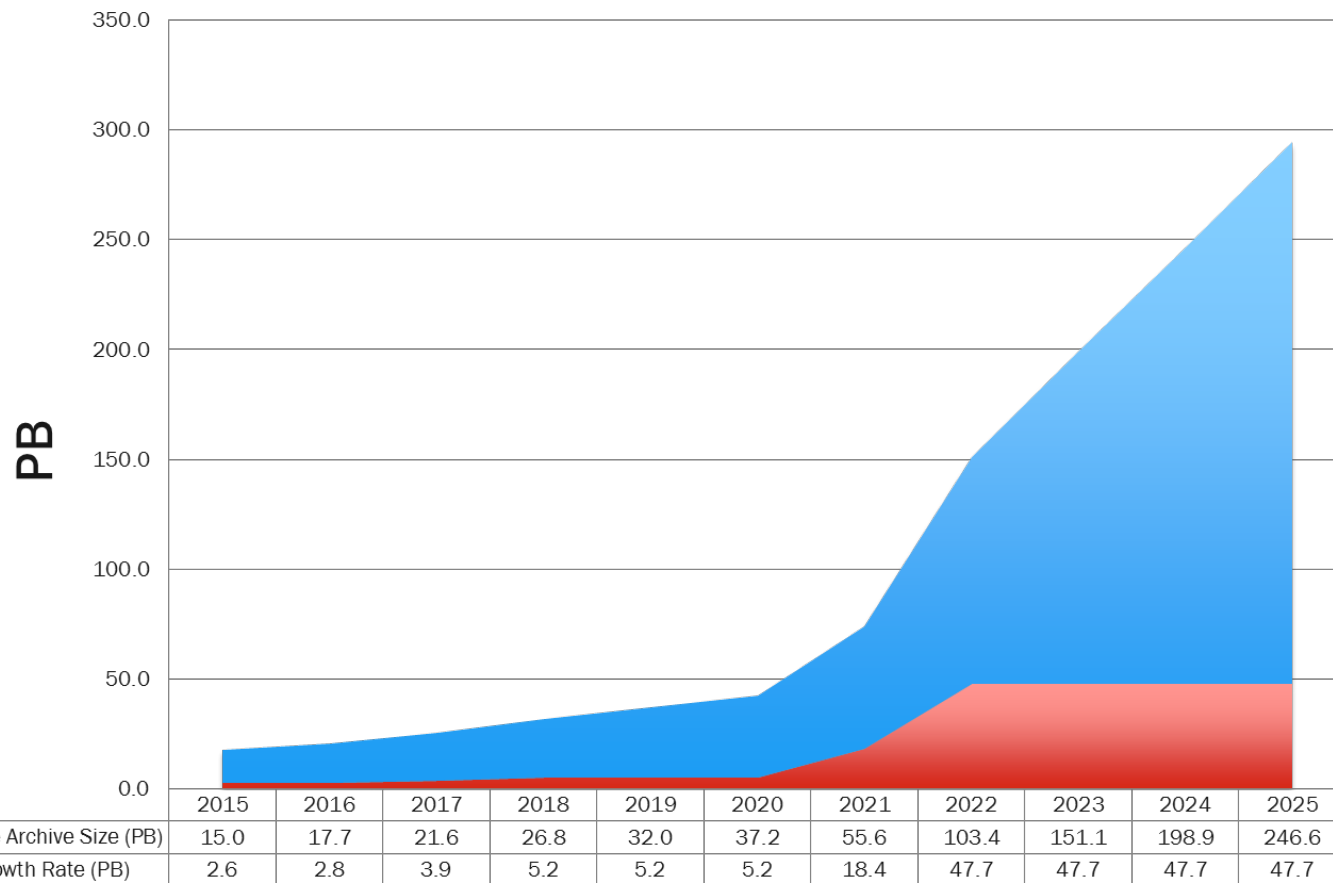
NASA-ISRO Synthetic Aperture Radar (NISAR)



Plankton, Aerosol, Cloud, Ocean Ecosystem (PACE)



User Expectations and System Capabilities will be Growing!



■ Archive Growth Rate (PB) ■ Cumulative Archive Size (PB)

THANKS!

You can contact me anytime at:

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