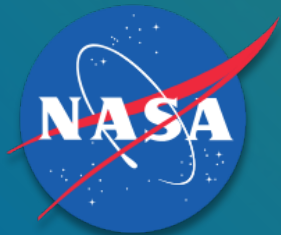


# Making an IMPACT!

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Dr. Rahul Ramachandran – Project Manager





**NASA hosts the single largest repository of Earth Science Data, integrating *multivariate/heterogeneous* data from diverse observational platforms.**

# Earth Science Data System Program

The goal of the program is to oversee the **lifecycle of Earth science data** to maximize the scientific return of NASA's missions and experiments for research and ***applied scientists, decision makers,*** and the society at large

## DOCUMENTATION

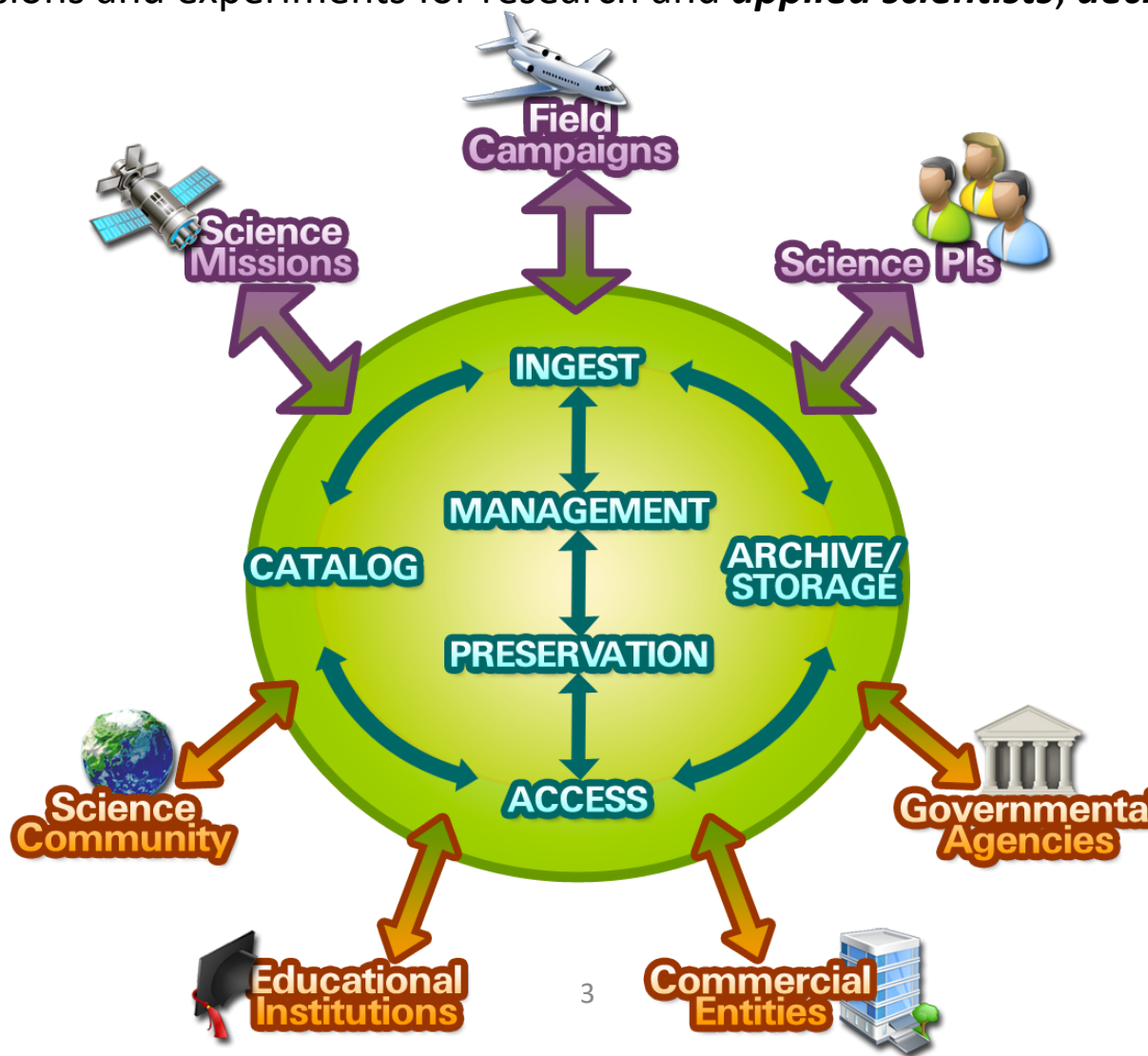
- Work with Science Teams to gather not only data but also **all relevant information including documents, papers to ensure data is discoverable, accessible and “independently understandable”** to all stakeholders without requiring experts

## STANDARDS/BEST PRACTICES

- Ensure data is **usable/interoperable** by tools

## PROVENANCE

- Make the preserved data/information available to all our stakeholder communities with **traceability** to support authenticity



## SCIENCE DATA PROCESSING

- Process data using **science algorithms to generate standard products**
- Translate data into standard formats, and generate browse imagery

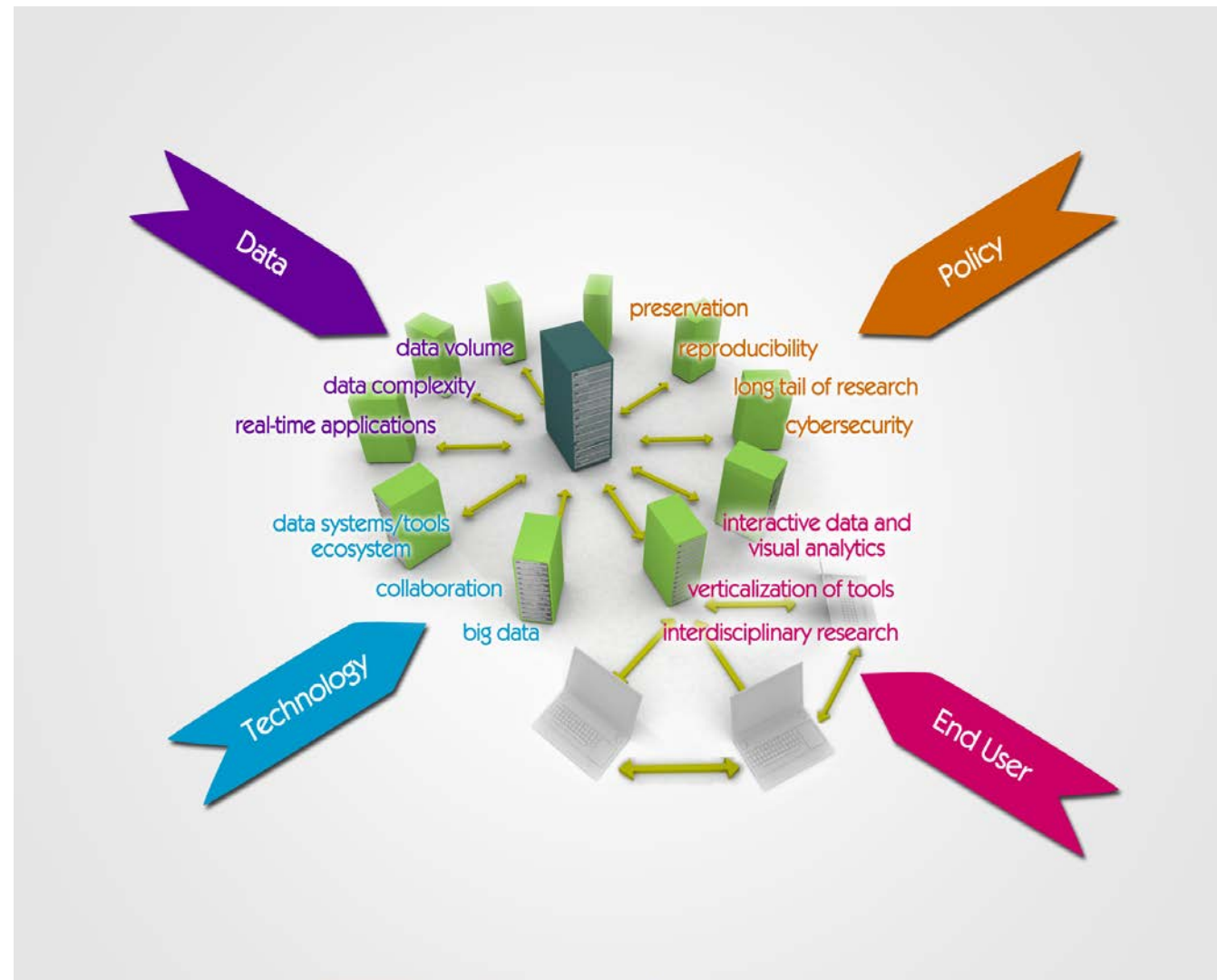
## ARCHIVE AND PRESERVATION

- Follow **documented policies and engineered** procedures at every step to insure data and information preservation against all reasonable contingencies

# Change is the only Constant

## Primary Drivers:

- New data streams
- End user expectations
- Policy requirements
- New technology



Ramachandran, Rahul, and Siri Jodha S. Khalsa. 2015. "Moving from Data to Knowledge: Challenges and Opportunities." *IEEE Geoscience and Remote Sensing Magazine*.

Data and Information Systems must continuously evolve and improve!

- Want to ensure that our data continues to remain valuable by increasing its usage
- Can do this by better serving the non-research community

"the value of  
data  
increases  
with their  
use"

- P. Uhlir

# How do we increase data use?

- Expand Communities of Practice for Earth Observation Data
  - Building Applications
  - Agencies
  - Private companies
- Application community needs are different from research community
- Build on lessons learned from collaborations with groups like SPoRT and SERVIR
- How do we improve our tools, services to address their needs?
- I am here to learn from all you.

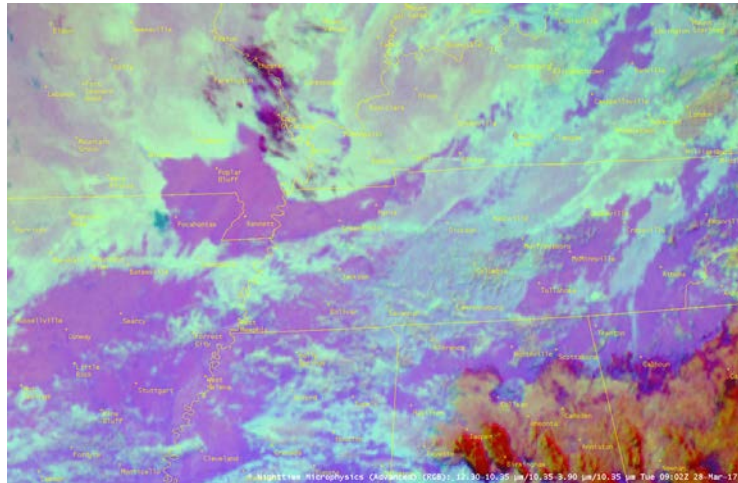
# NASA SPoRT – Research 2 Operations

- Transitions experimental/quasi-operational satellite observations and research capabilities to the operational weather community to improve short-term weather forecasts on a regional and local scale
- Active collaborations with more than 30 WFOs in all 6 NWS regions and 5 NCEP National Centers



SPoRT's Collaborative Partners

# NASA SPoRT – Research 2 Operations

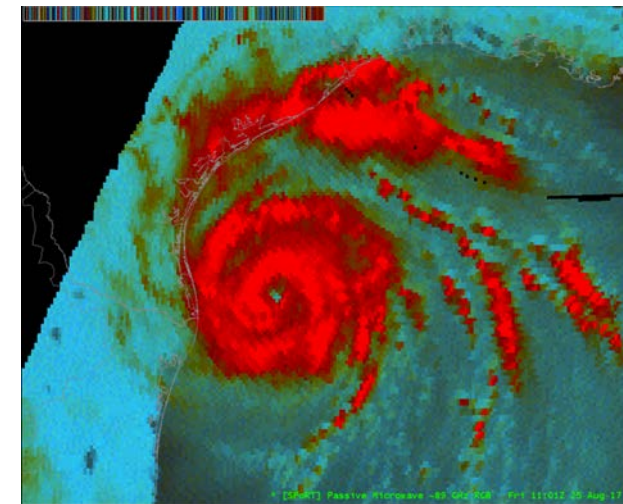


## False Color Composites (RGBs)

- Past assessments and demonstrated value of multispectral compositing of NASA Aqua and Terra MODIS and NASA/NOAA Suomi-NPP VIIRS, continued now via NOAA/NASA GOES-R Series instruments.
- Products are designed to use multispectral capabilities of direct broadcast (MODIS/VIIRS) and real-time (GOES-R Series) data in a manner that visually highlights hazards such as low clouds and fog (left) as well as dust or snowfall.

## NASA GPM Data:

- Partnerships with the Naval Research Lab focused on routine generation of false color composites of passive microwave brightness temperatures of varying frequency and polarization
- False color composites focus imaging on internal tropical cyclone structure, rain bands, and eyewall features
- GPM cross-calibrated constellation of passive microwave sensors leads to routine use of these products in the analysis of tropical storms to diagnose center location
- Benefit of passive microwave: “see through” cirrus overcast to better pinpoint center of circulation, particularly in sheared systems
- GPM constellation rainfall estimates (IMERG) provide monitoring of heavy rainfall rates from these storms, particularly in radar-void areas





# NASA SERVIR

- Joint venture between NASA and the U.S. Agency for International Development in Washington
- Provides satellite-based Earth monitoring, imaging and mapping data, geospatial information, predictive models and science applications
- Helps improve environmental decision-making among developing nations

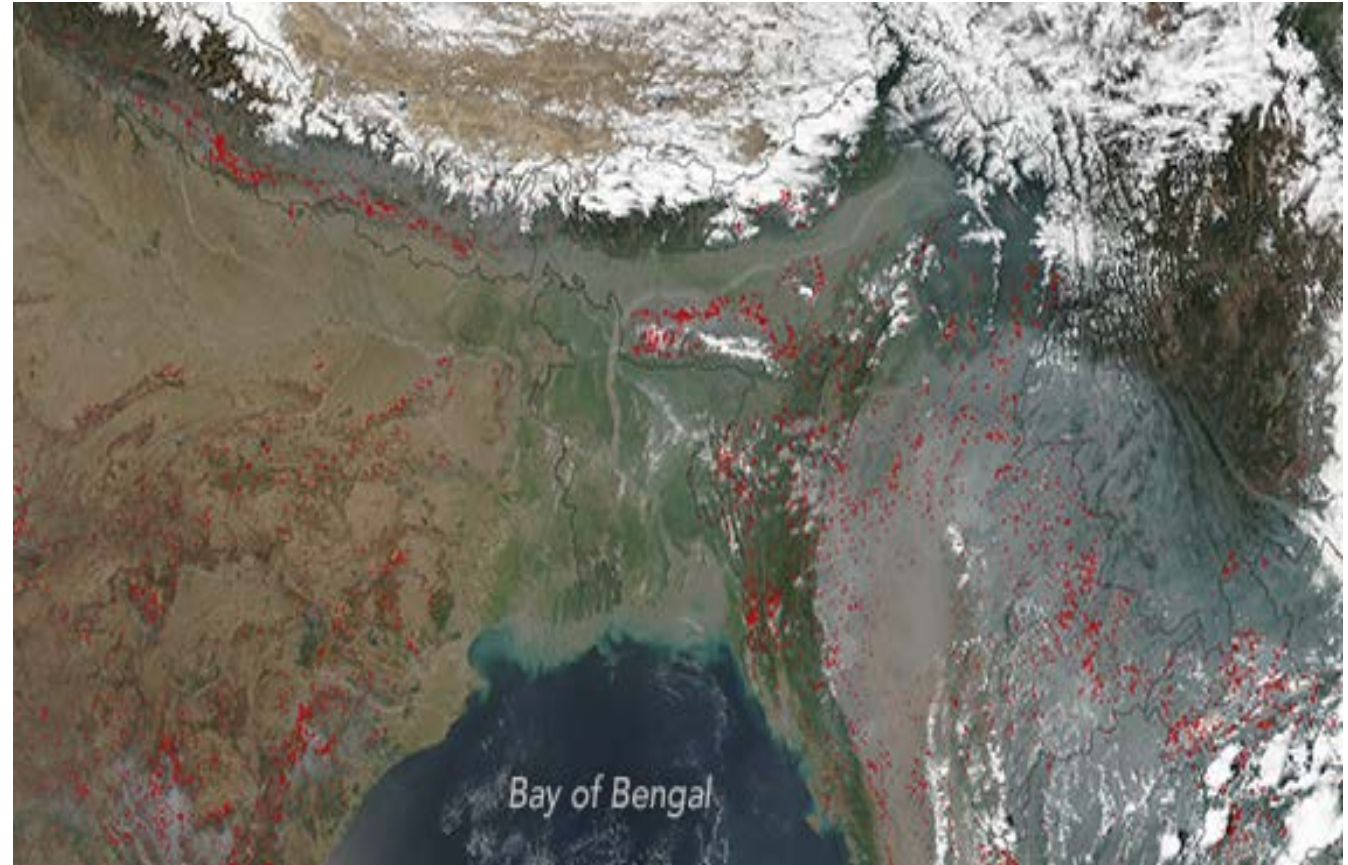


SERVIR is a global network of regional partners dedicated to environmental management through the integration of Earth observations and geospatial technologies.

Credits: NASA SERVIR



SERVIR's Forest Fire Monitoring System displayed in Nepal government lobbies

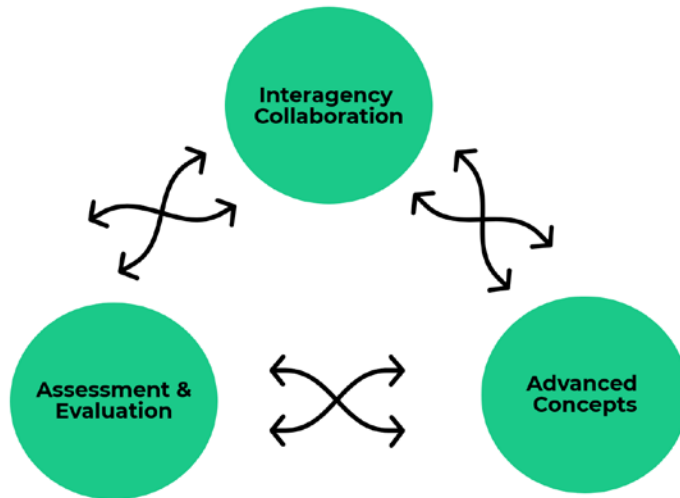


Red dots indicate forest fire hot spots, as detected by the satellite thermal sensors

Through SERVIR's fire monitoring system, use of satellite data is firmly embedded in Nepal's government Forest Department. This system triggers action and response on the ground, especially in remote areas of the country.

# IMPACT

Interagency  
Implementation and  
Advanced Concepts



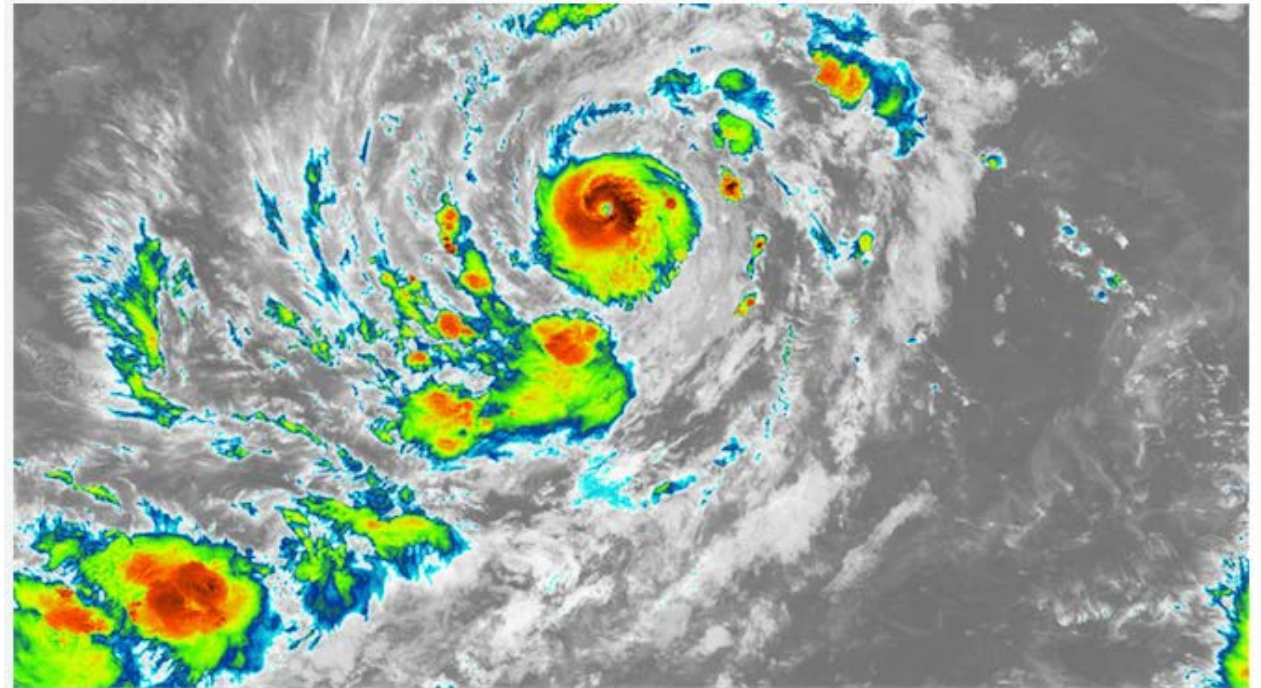
Encourages cross community collaboration with other government agencies and organizations

Promotes the integration of NASA's Earth science data, services and tools into application workflows

Monitors trends across the informatics, data science and information technology fields

Develops new, effective solutions for Earth science data management and dissemination

- GeoPlatform.gov provides open GIS data & services to support disaster and recovery response
- Supports various disaster response efforts including Hurricane Irma response and recovery
- Providing relevant NASA data and services in Geoplatform.gov could contribute to these efforts



At the request of the Federal Emergency Management Agency (FEMA), the Homeland Infrastructure Foundation-Level Data (HIFLD) Executive Secretariat has launched this Open Data website on the GeoPlatform to provide best available open GIS data and services to support mapping and related response & recovery efforts to Hurricane Irma.

<https://www.geoplatform.gov/hurricane-irma-response-and-recovery/>

# How Does IMPACT Help?

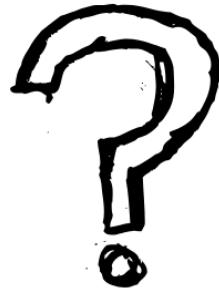
The Data Curation for Discovery (DCD) team **seeks to make open Earth science data more discoverable for both the research community and applications end users.**

## Collaborative partners include:

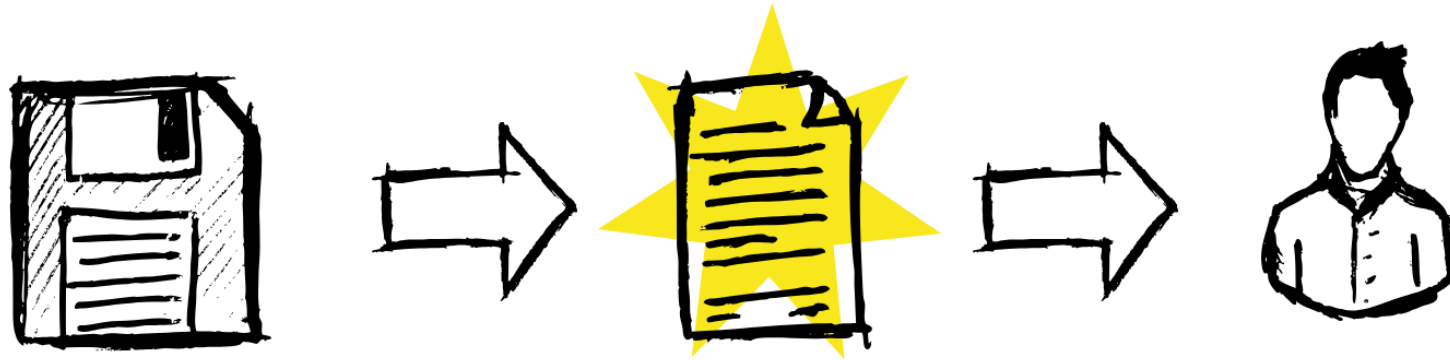
- Data.gov
- GeoPlatform.gov
- USGCRP/GCIS
- PREP
- And other Interagency working groups



What makes  
finding data  
possible?



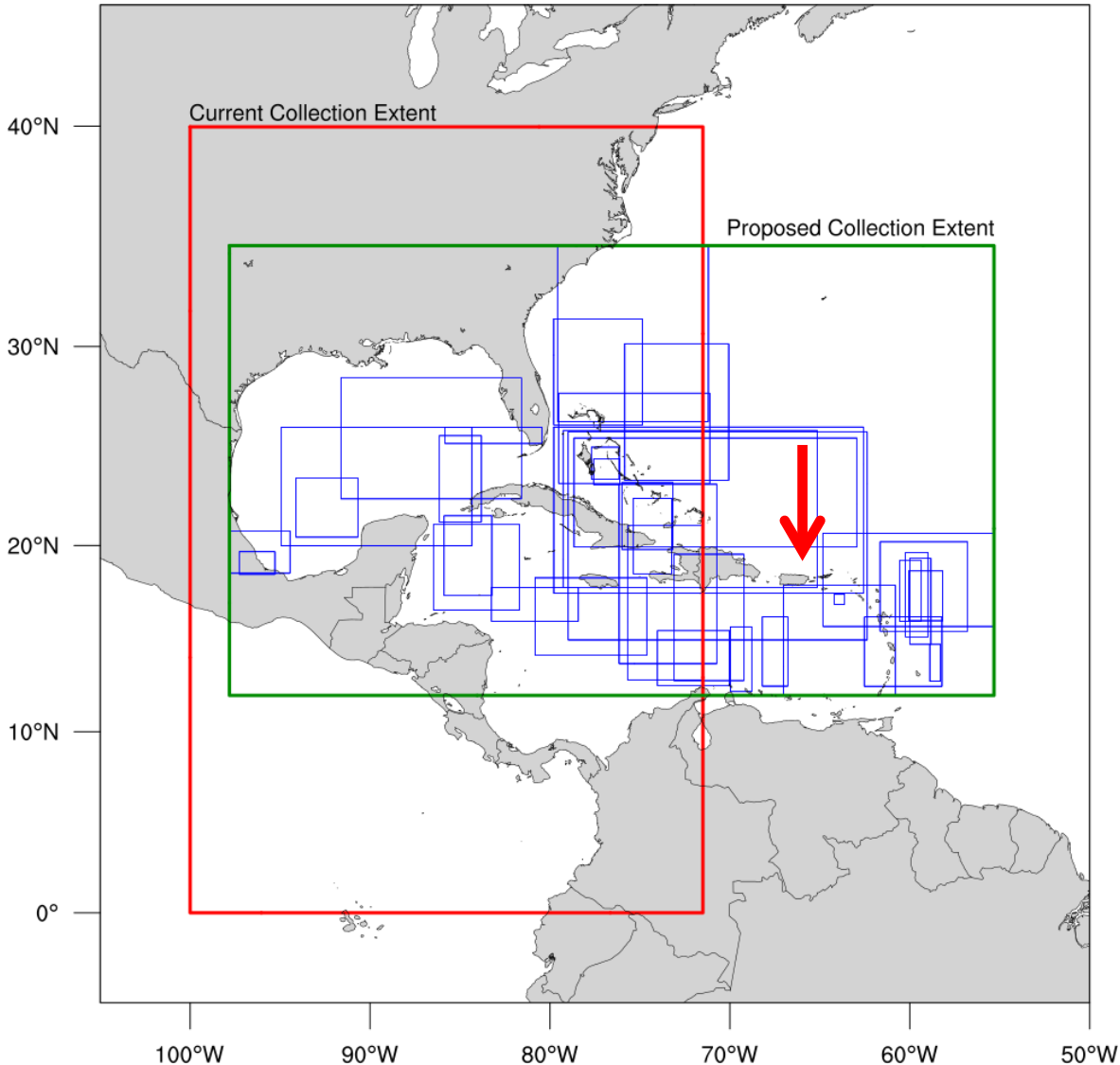
# Metadata



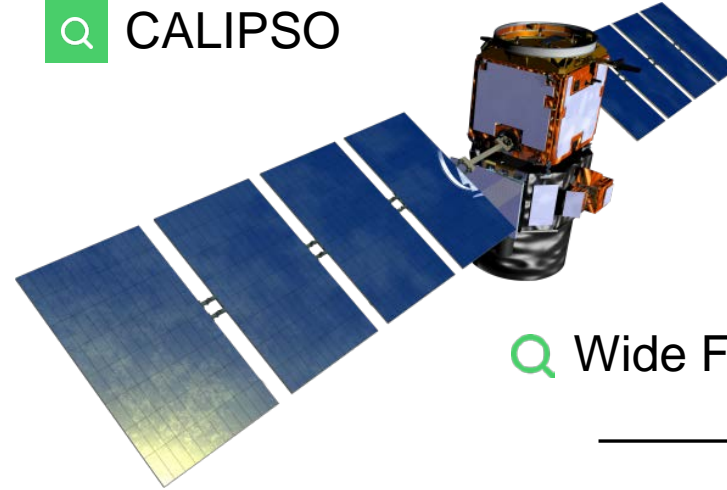
Metadata acts as a proxy for data,  
making search possible.  
Metadata limits and focuses  
attention to the relevant  
information about a dataset.

# When Metadata Doesn't Work...

## 🔍 Spatial Coverage



## 🔍 CALIPSO



🔍 Wide Field Camera (WFC)

—————> 170K granules

🔍 Imaging Infrared Radiometer (IIR)

—————> 449K granules

🔍 Cloud-Aerosol Lidar with Orthogonal Polarization (CALIOP)

—————> 1 granule

**LIDAR 2M granules**



# When Metadata Doesn't Work...

- Faceted search for 'NDVI' in Earthdata Search returns 14 datasets
- MODIS datasets are missing from the search results including:
- MODIS Level 3 vegetation indices datasets which include NDVI as a vegetation layer

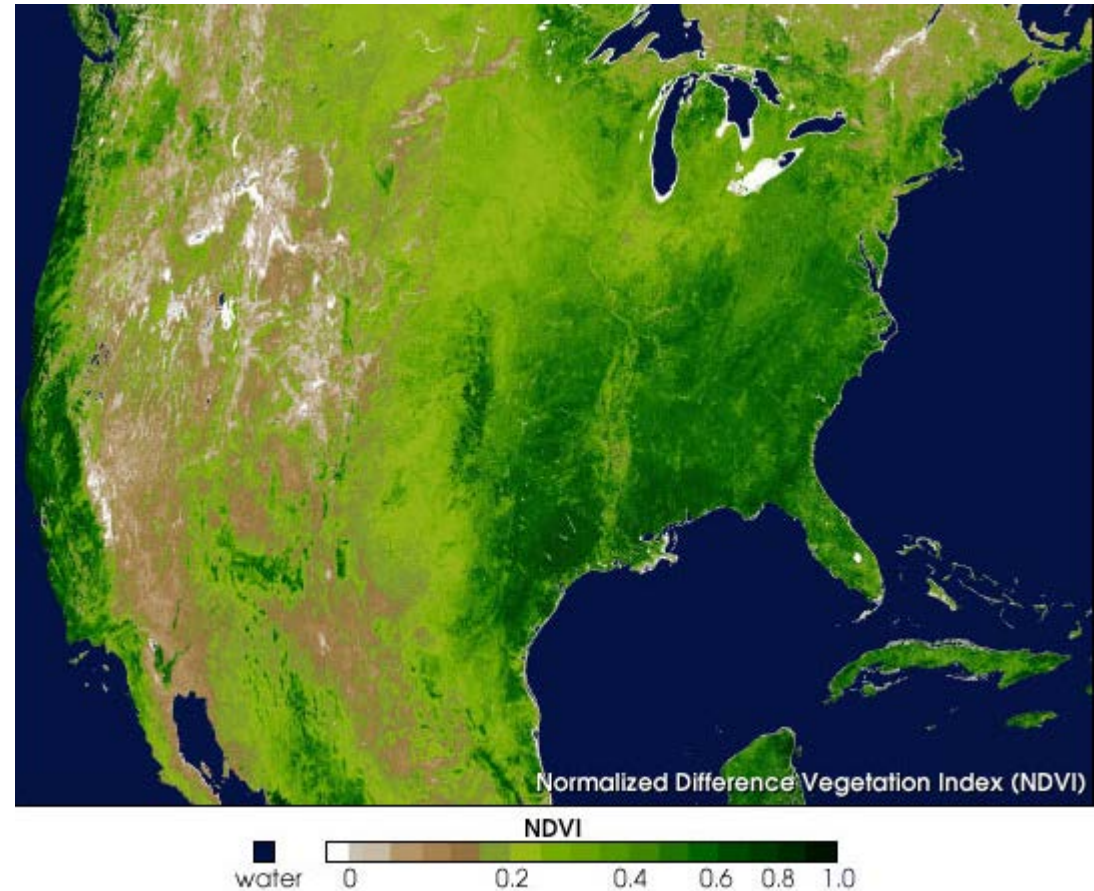


Image Credit: <https://earthobservatory.nasa.gov/images/696/spring-vegetation-in-north-america>

# How Does IMPACT Help?

- The Analysis and Review of CMR (ARC) Team:
  - Reviews Earth science metadata for completeness, correctness and consistency
  - The team is made up of Earth system scientists and atmospheric scientists
  - Defines the needs of the Earth science community of practice and makes metadata recommendations that address those needs
  - Collaborates with data centers to improve metadata quality as needed
  - *End goal: Improved discovery of data for users*

“technology can stimulate and streamline the applied research process as well as lower barriers of entry for all users to effectively leverage complex scientific datasets.

”



Slides Below Have Not Been Touched



# Airborne Data Management Group (ADMGM)

The Airborne Data Management Group (ADMGM) has been established to ensure that airborne science data are discoverable and usable to the broader community by developing systematic approaches to airborne data management and stewardship. The ADMGM will achieve this goal by acting as a knowledge base for airborne campaigns and by developing best practices for airborne data management and stewardship.

# Airborne Data Management Group (ADMG)

The Airborne Data Management Group (ADMG):

- Assess
- Assess timeliness of airborne data transfer including obstacles to data transfer, data processing needs and scheduling.
- Assess data formats being used by the airborne science teams and formats that are distributed by the DAACs
- Assess existing UMM models (UMM-C, UMM-Var, UMM-S) for describing airborne data.
- *End goal: Increase discovery and use of NASA's airborne Earth science data*

# Satellite Needs Working Group (SNWG)

The U.S. Group on Earth Observations Satellite Needs Working Group (SNWG) partners with Federal agencies every two years to identify high-priority needs for both sustained and unmet satellite Earth observation measurements or products.

The MSFC data team has been tasked to assist the SNWG by:

- Serving as data liaisons between the SNWG and ESDIS
- Creating an inventory of agency needs and data that meet those needs
- Developing agency data need profiles.

Deliverables:

- Community Involvement and Reporting
- User Assessments
- Data Curation

# Satellite Needs Working Group (SNWG)

The goal of the SNWG is to develop a database that can be queried to populate a list of databases that meet interagency needs. Interagency needs will be obtained through surveys administered by the SNWG.

## Participating agencies include:

- EPA
- FEMA
- USGS
- NOAA
- NSF





# World Wide Web Consortium (W3C)

The World Wide Web Consortium (W3C) is an international community where Member organizations, a full-time staff, and the public work together to develop Web standards. The W3C develops protocols and guidelines that ensure the long-term growth and sustainability of the Web. W3C's standards define key parts of what makes the World Wide Web work by encouraging cooperation in the industry through the promotion and development of standard interfaces.

## Deliverables:

- Monitor Spatial Data on the Web Interest Group activities
- Identify best practices from the Spatial Data on the Web Interest Group to contribute back to ESDS
- Monitor Dataset Exchange Working Group activities
- Identify best practices from the Dataset Exchange Working Group to contribute back to ESDS
- Develop a process for reporting relevant W3C recommendations back to ESDIS.

# Multi-Mission Analysis Platform (MAP)

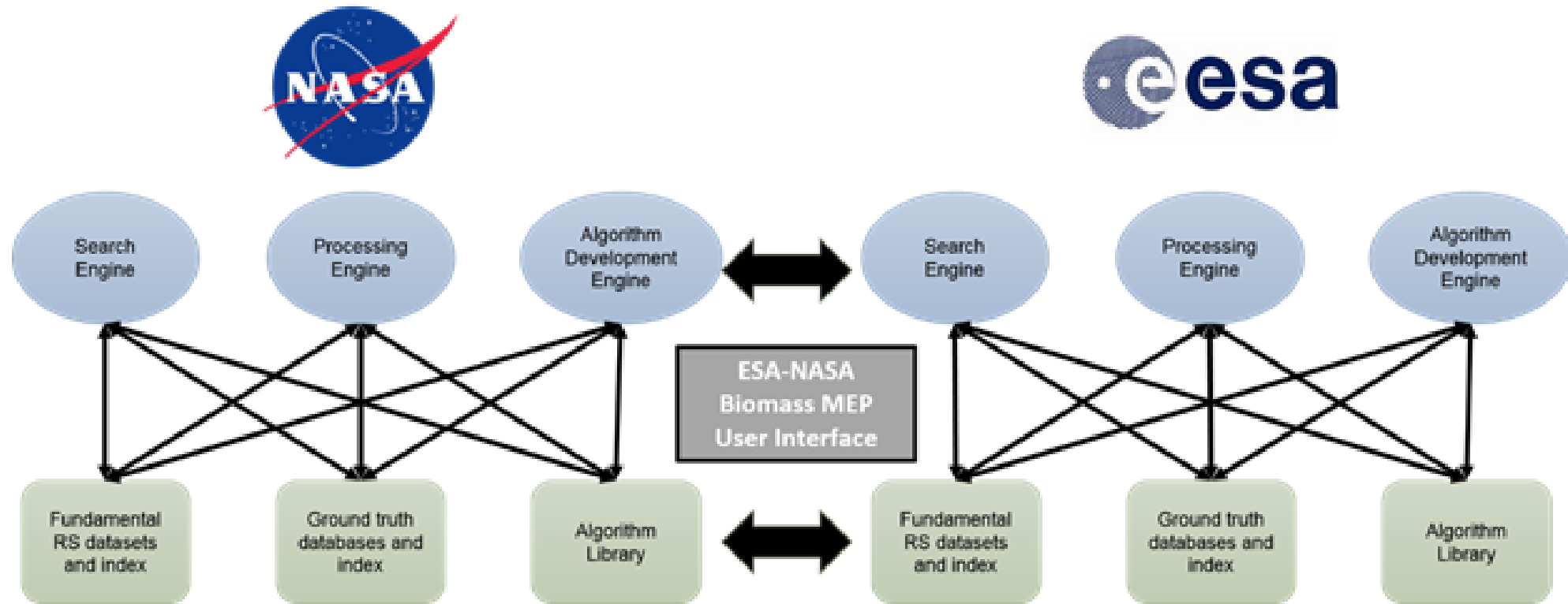
The goal for the Multi-Mission Analysis Platform (MAP) is to establish a collaboration framework between ESA and NASA to share data, science algorithms and compute resources in order to foster and accelerate scientific research conducted by NASA and ESA scientists.

The MSFC MAP data team will ensure the ongoing quality of the data, metadata and other information provided in the MAP. The MSFC MAP data team will collaborate on the curation of relevant data to the MAP across both ESA and NASA with support from the MAP user working group as needed. Additionally, the MSFC data team will support the ingest and archive of identified data to the MAP platform.

## Deliverables:

- Data Curation and Stewardship
- Data Ingest
- Metadata (MAP CMR)
- Data Analysis

# ESA-NASA Multi-Mission Analysis Platform Approach



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- Image and caption courtesy of NASA Goddard Photo and Video photostream. Credit: USGS/NASA/Landsat 7.
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