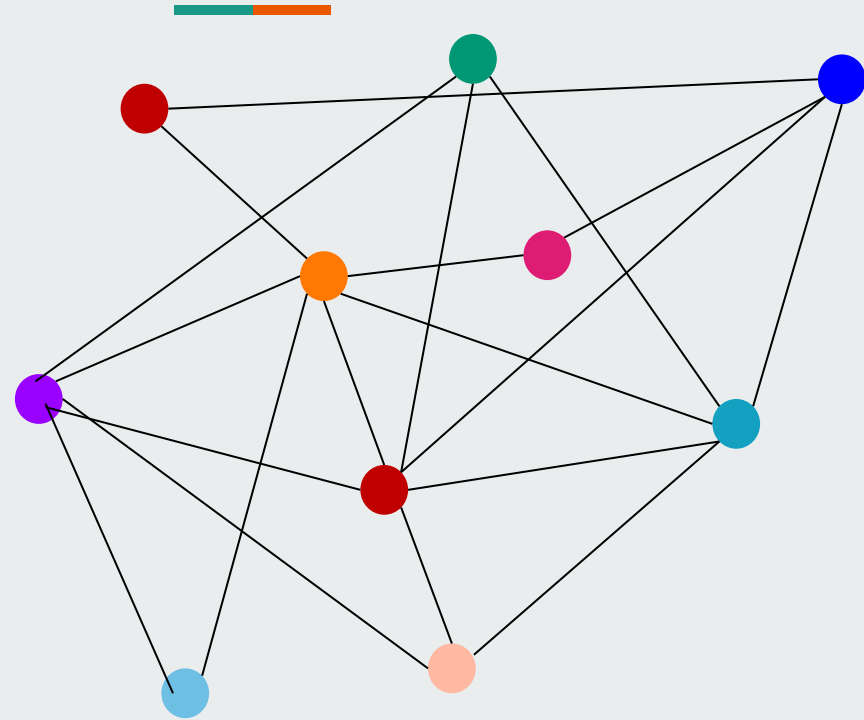




Interdisciplinary Users

What do they need?

ESIP Summer Meeting 2023

Binita KC, GES DISC

Irina Gerasimov, GES DISC

Elizabeth Joyner, ESDS

Mukul Sonwalkar, Applied Sciences

Zhong Liu, GES DISC

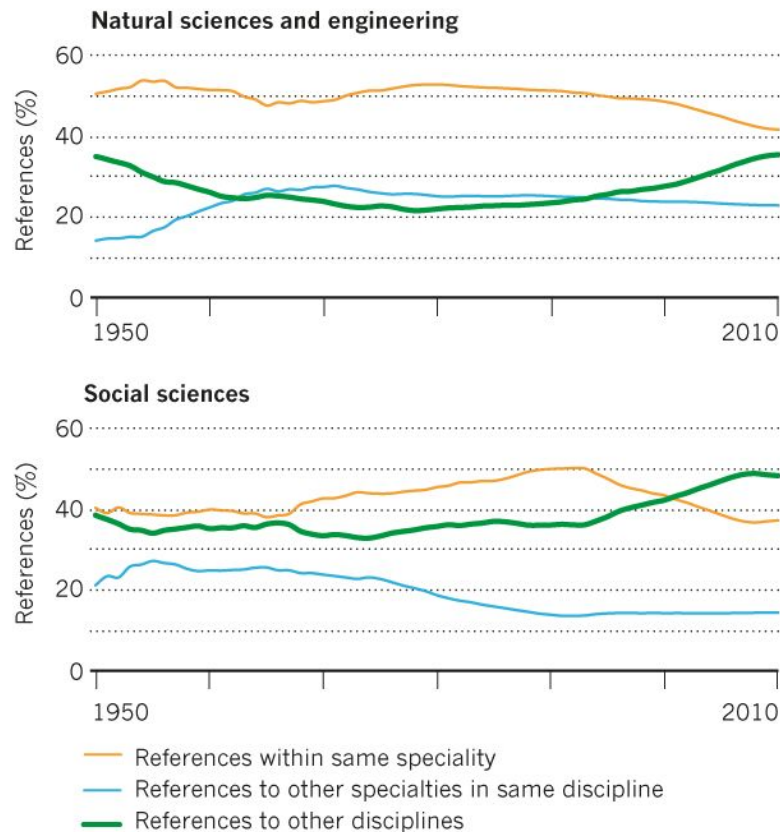
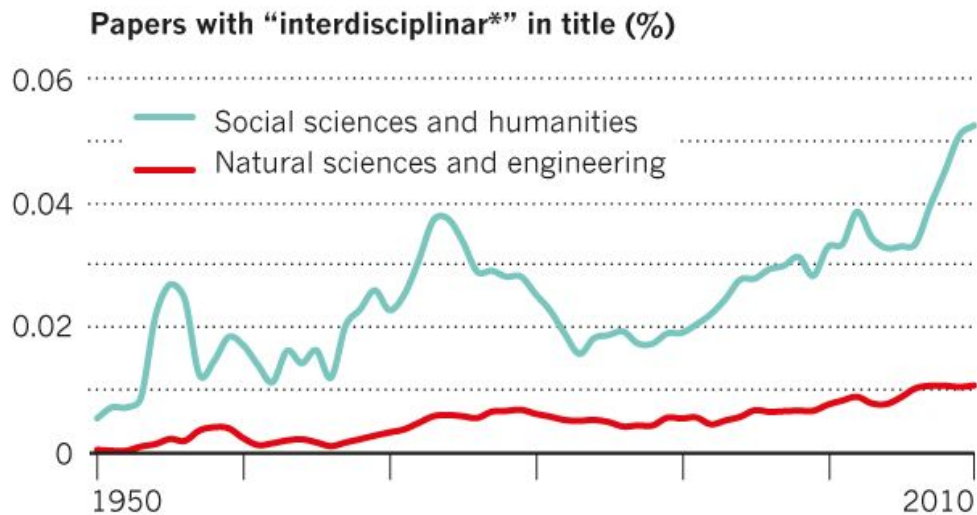


- Background
- Datasets and services/tools used in Interdisciplinary studies
- Need Assessment



Changing Paradigm

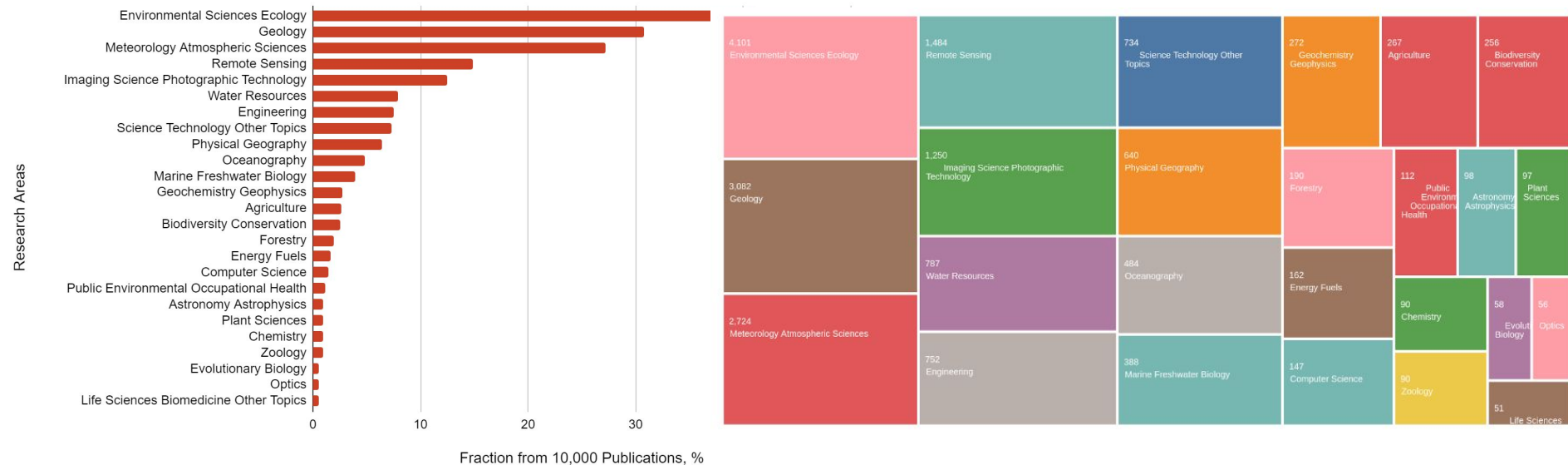
Van Noorden, R. Interdisciplinary research by the numbers.
Nature 525, 306–307 (2015). <https://doi.org/10.1038/525306a>





EOSDIS Datasets Application Areas

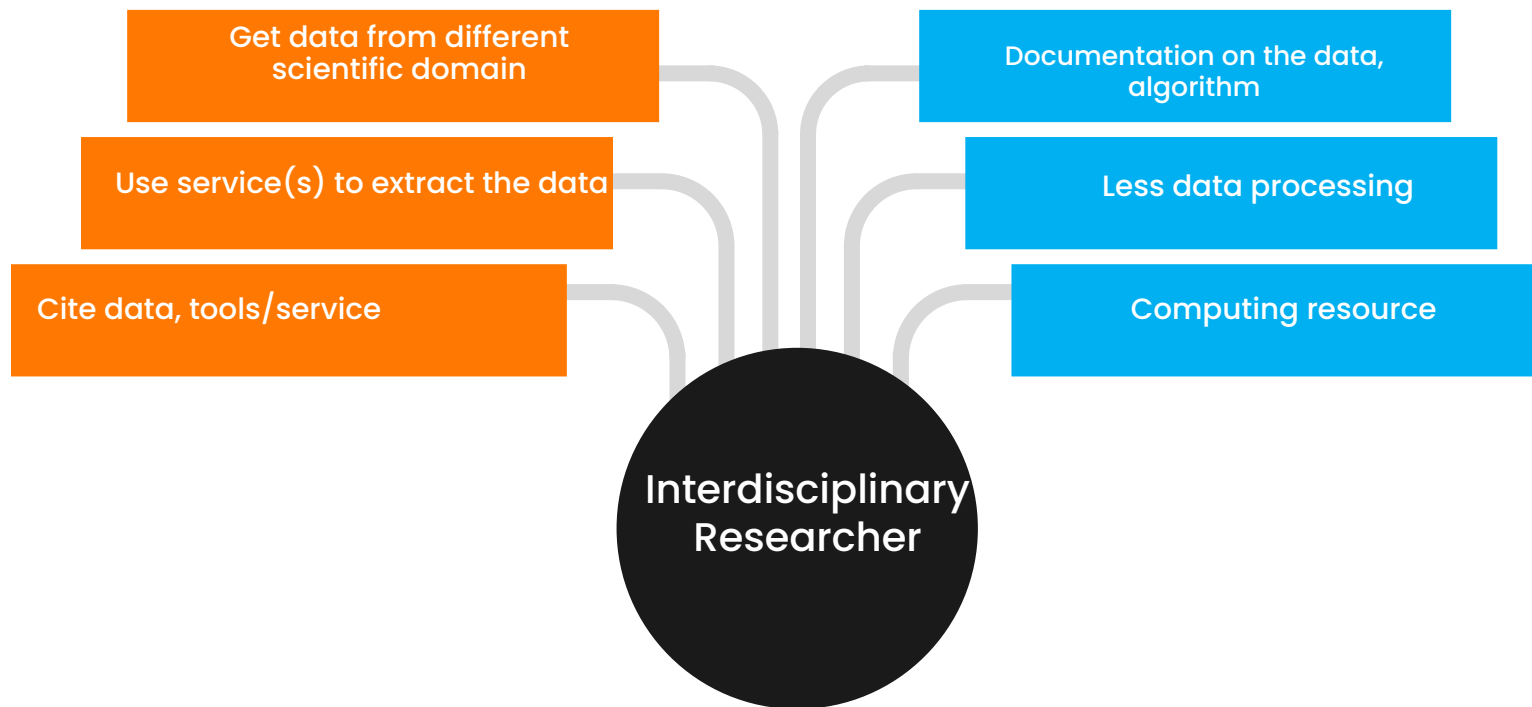
Web of Science Research Areas for Publications Referencing EOSDIS datasets



10,000 peer reviewed articles that use EOSDIS datasets by discipline from 2018-2022 classified and obtained from Web of Sciences Research areas



What do Interdisciplinary Users Need?





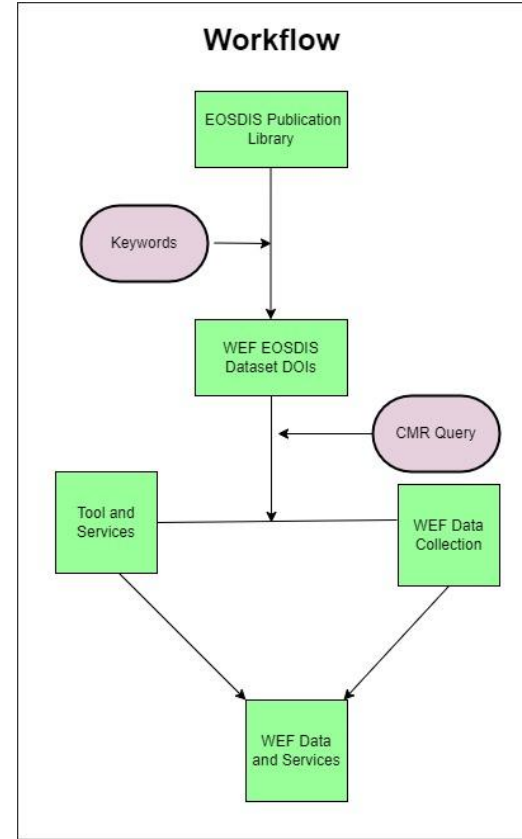
Datasets and services/tools used in Interdisciplinary studies



Interdisciplinary Community

Water-Energy-Food

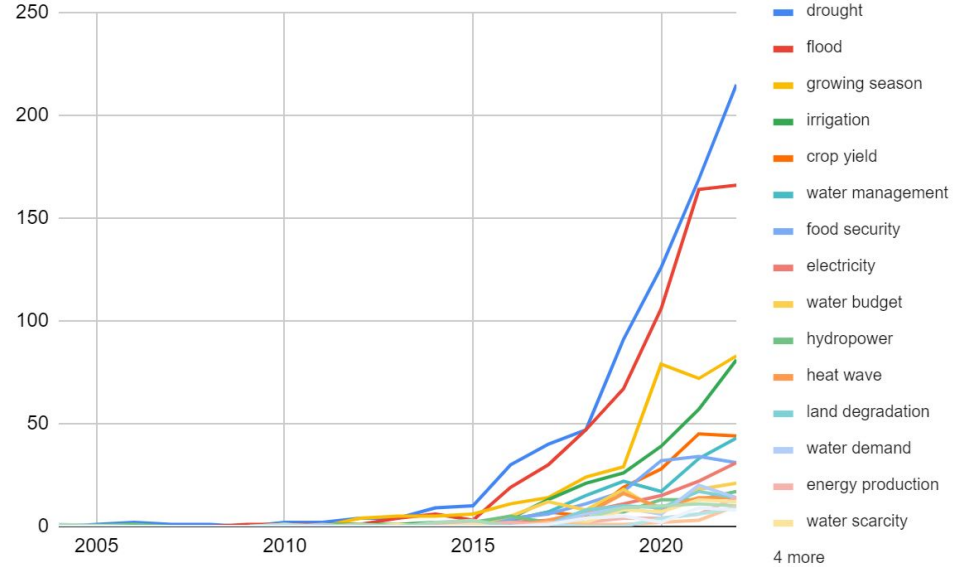
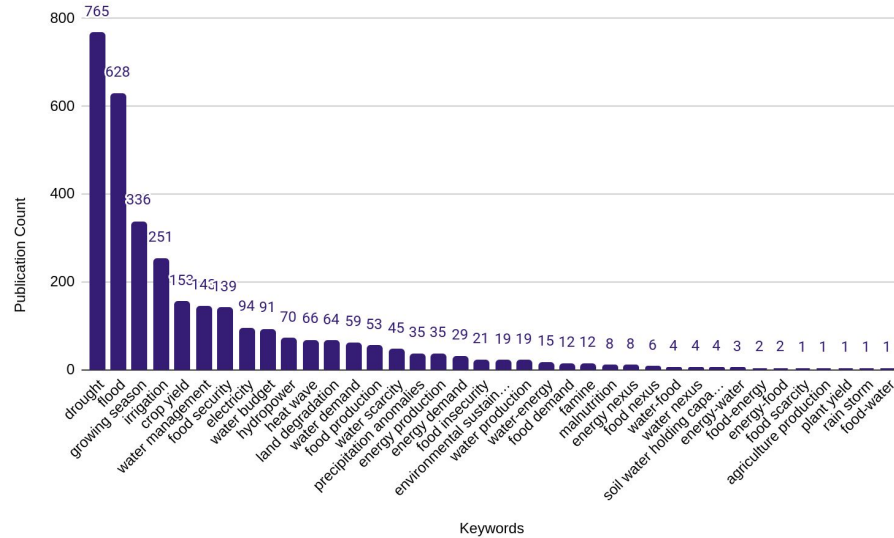
[Drought, food production, energy demand, food scarcity, famine, hydropower, water-energy-food, water-food-energy, irrigation, electricity, agriculture production, water demand, crop/plant yield, Irrigation, Soil water holding capacity, food security, malnutrition, environmental sustainability, growing season, plant commodities, energy production, energy use, precipitation anomalies, heat wave, rain storms, water management, floods, water budget]





Water-Energy-Food Publications

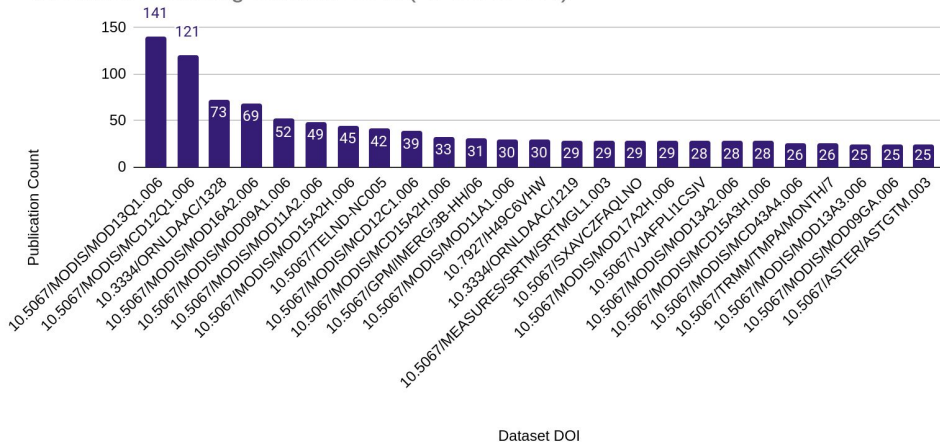
2451 publications identified



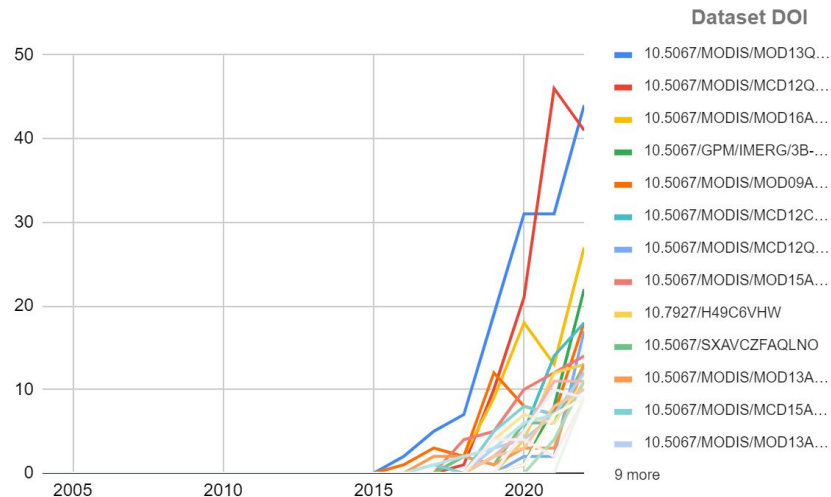
The count of publications extracted from [EOSDIS Publication Library](#) that contains keywords in the title or abstracts.



The Most Occurring Dataset DOIs (25 out of 854)



The count of publications extracted from [EOSDIS Publication Library](#) that contains above keywords in the title or abstracts.





Water-Energy-Food Co-citation

	-PO DAAC	-NSIDC DAAC	-LP DAAC	-ASDC DAAC	-ORNL DAAC	-SEDAC	-GES DISC	-LAADS	-OB DAAC	-GHRC DAAC	-ASF DAAC
PO DAAC	52	4	10	2	4	3	19		2		
NSIDC DAAC	4	53	34		8	4	19	1			1
LP DAAC	10	34	574	1	46	10	47	7			
ASDC DAAC	2		1				2	1			
ORNL DAAC	4	8	46		341	8	9	1			
SEDAC	3	4	10		8	78	2				
GES DISC	19	19	47	2	9	2	253	3	1	2	1
LAADS		1	7	1	1		3	15			
OB DAAC	2						1		3		
GHRC DAAC							2			4	
ASF DAAC		1					1				

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10.5067/ASTER/ASTGTM.003

LP DAAC

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ORNL

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10.5067/SXAVCZFAQLNO

GES DISC

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PODAAC

10.7927/H49C6VHW

SEDAC

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10.5067/TRMM/TMPA/MONTH/7
10.5067/GPM/IMERG/3B-HH/06
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10.7927/H49C6VHW

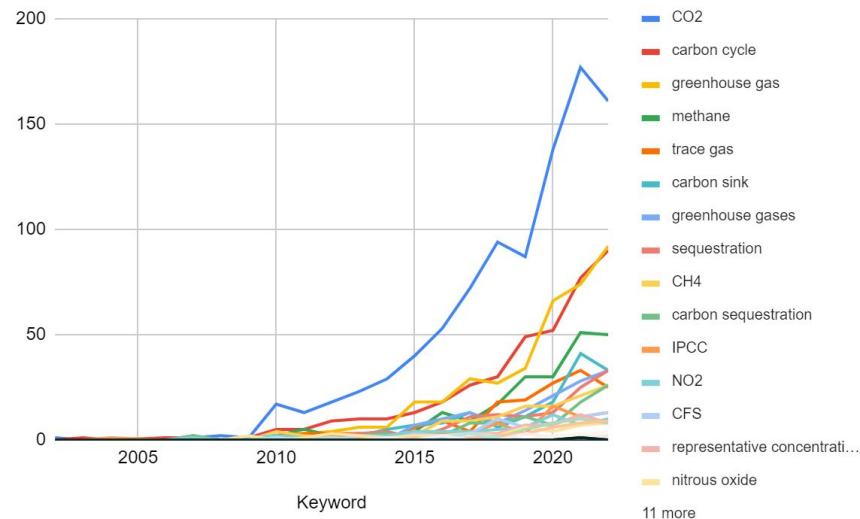
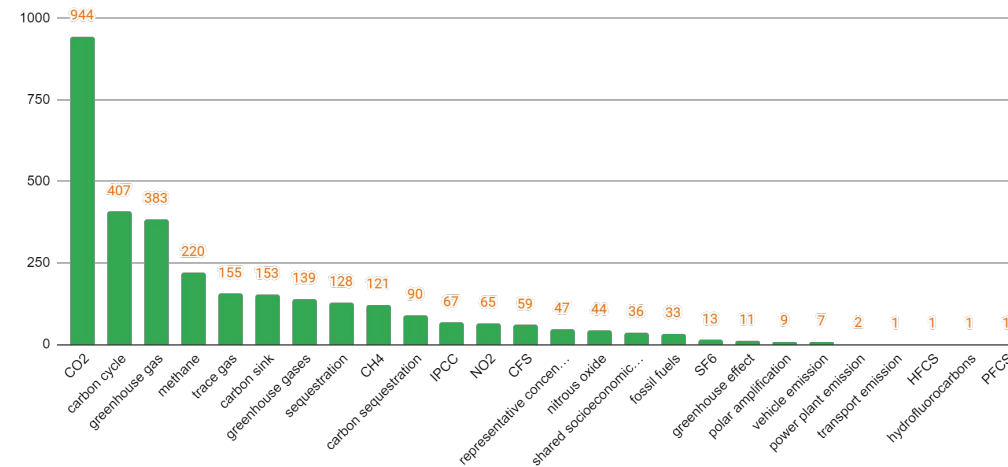
Water-Energy-Food Co-cited Datasets

Water-Energy-Food Co-cited Publications



Greenhouse Gas Publications

3191 publications identified



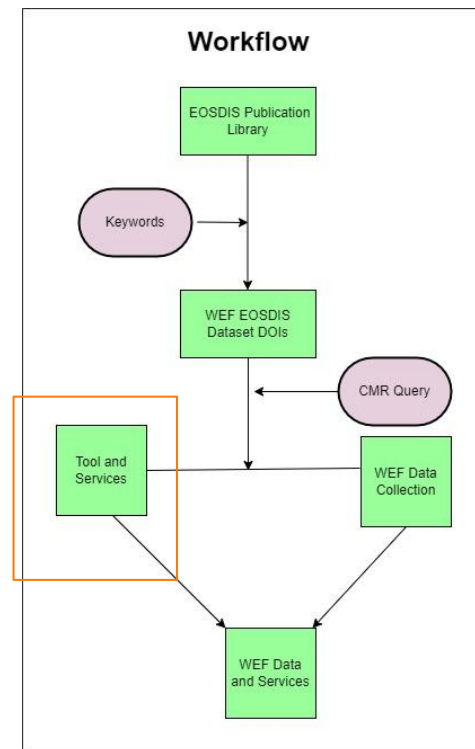
The count of publications extracted from [EOSDIS Publication Library](#) that contains above keywords in the title or abstracts.



Mapping Service and Tools

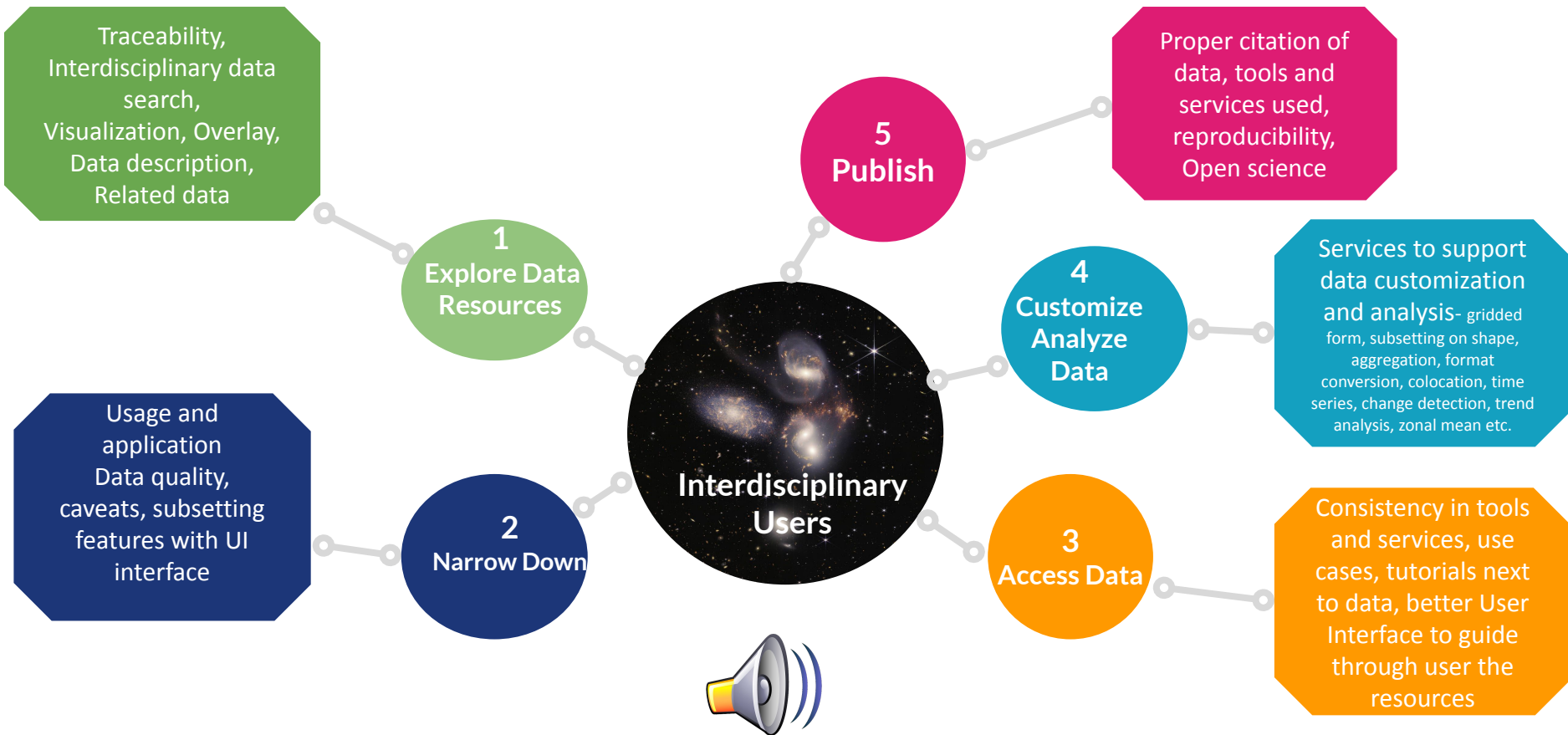
Functionality	GES DISC	GHRC DAAC	LAADS	LP DAAC	NSIDC DAAC	OB.DAAC	ORNL DAAC	PO.DAAC	SEDAC
Search (search for data using keywords)	- Giovanni How-To - L3 and L4 Subsetter Regridded L4R3 - L2 subsetter Subsetter - GIS How-To - Data Rods For Hydrology DataRods - OPeNDAP search/subset - API - API-L34R3 - API-TDS	- HyDRO - HEV Subsetter - SPOT - ADaM - WPT	- LAADS DAAC (How to Navigate the LAADS Online Archive to Download Data) - LAADS DAAC Find Data (How to Search and Order Data with the LAADS Find Data Interface) - LAADS DAAC View Data (How to Use LAADS DAAC View Data) - LDOPE LDOPE has in-house developed GUI for its own tools but they are the add-on interface to EHVI. So user will have to have ENVI software and then has to download LDOPE's add on. LDOPE also has web based GUI for some of the tools. Effectively user can use the tools at command line or inside ENVI. LDOPE User Guide	- AppEARS How-To API - Earth Explorer Help - Land Processes Data Pool - OPeNDAP webinar - OSACoGIS Utility User Guide	- NSIDC Data Search (https://nsidc.org/data/search) - Operation IceBridge Data Portal (https://nsidc.org/icebridge/portal/map) - GLIMS Viewer (http://www.glims.org/maps/glims) - OpenAltimetry (https://openaltimetry.org/) - Data Access Jupyter Notebook (https://github.com/nsidc/NSIDC-Data-Access-Notebook) - IceFlow (https://github.com/nsidc/NSIDC-Data-Tutorials/tree/main/notebooks/iceflow) - Snow Depth and Snow Cover Data Tutorial (https://github.com/nsidc/NSIDC-Data-Tutorials/tree/main/notebooks/SnowEx_ASO_MODIS_Snow)	- File Search Tool https://iceanddata.scf.gsfc.nasa.gov/infra_search/ - Search and Download Help: https://iceanddata.scf.gsfc.nasa.gov/data/download_methods/	- MODIS Fixed Sites Subsetting and Visualization Tool - MODIS Land Product Subsets (Global Tool) - ORNL DAAC Website Search - SDAT	- GLIDER - HTIDE - OPeNDAP (PO DAAC) - PO DAAC Live Access Server - SOTO	- SEDAC Map Viewer - SEDAC Map Client - PopGrid Viewer
Visualize (quick visualization of the data using the interface)	- Giovanni - GIS - Data Rods For Hydrology	- HyDRO - HEV Subsetter - SPOT - ADaM - WPT	- LAADS DAAC (How to Navigate the LAADS Online Archive to Download Data) - LAADS DAAC Find Data (How to Search and Order Data with the LAADS Find Data Interface) - LAADS DAAC View Data (How to Use LAADS DAAC View Data) - LDOPE LDOPE has in-house developed GUI for its own tools but they are the add-on interface to EHVI. So user will have to have ENVI software and then has to download LDOPE's add on. LDOPE also has web based GUI for some of the tools. Effectively user can use the tools at command line or inside ENVI. LDOPE User Guide	- AppEARS - Earth Explorer - Land Processes Data Pool	- Operation IceBridge Data Portal (https://nsidc.org/icebridge/portal/map) - GLIMS Viewer (http://www.glims.org/maps/glims) - OpenAltimetry (https://openaltimetry.org/) - Data Map Services API (https://nsidc.org/support/howto/guide-nsidc-data-map-services-api) - IceFlow (https://github.com/nsidc/NSIDC-Data-Tutorials/tree/main/notebooks/iceflow) - NASA Land, Vegetation, and Ice Sensor (LVIS) Data Readers (https://github.com/nsidc/lvis-tools) - NSIDC-0447 Read, Visualize, Convert Scripts (https://github.com/nsidc/0447-read-visualize-convert-scripts)	- Level 1 and 2 Browser: https://iceanddata.scf.gsfc.nasa.gov/cgi/browse.pl - Level 3 Browser: https://iceanddata.scf.gsfc.nasa.gov/l3/	- MODIS Fixed Sites Subsetting and Visualization Tool - MODIS Land Product Subsets (Global Tool) - SDAT - Daymet Single Pixel Extraction Tool	- GLIDER - HTIDE - PO DAAC Live Access Server - SOTO	- SEDAC Map Viewer - SEDAC Map Client - PopGrid Viewer - SEDAC Global COVID-19 Viewer - GIS and HBASE Data Visualization and Access Tool - SEDAC Hazards Mapper - HazPop (HazPop) for iOS & Android
subset by variable (subset the data by a variable/variables of interest)	- Giovanni - L3 and L4 Subsetter Regridded - L2 subsetter - Data Rods For Hydrology - OPeNDAP - API	- HyDRO - HEV Subsetter - SPOT - ADaM - WPT	- LAADS DAAC (How to Navigate the LAADS Online Archive to Download Data) - LAADS DAAC Find Data (How to Search and Order Data with the LAADS Find Data Interface) - LAADS DAAC View Data (How to Use LAADS DAAC View Data) - LDOPE LDOPE has in-house developed GUI for its own tools but they are the add-on interface to EHVI. So user will have to have ENVI software and then has to download LDOPE's add on. LDOPE also has web based GUI for some of the tools. Effectively user can use the tools at command line or inside ENVI. LDOPE User Guide	- AppEARS - Earth Explorer - Land Processes Data Pool	- Customized Programmatic Data Access Service (https://nsidc.org/support/howto/how-do-i-programmatically-request-data-service) - Data Subscription and Customization Services (https://nsidc.org/support/howto/how-do-i-access-data-using-openapi) - Data Access Jupyter Notebook (https://github.com/nsidc/NSIDC-Data-Access-Notebook) - Data Map Services API (https://nsidc.org/support/howto/guide-nsidc-data-map-services-api) - OPeNDAP (https://nsidc.org/support/howto/how-do-i-access-data-using-openapi)	N/A	- MODIS Fixed Sites Subsetting and Visualization Tool - MODIS Land Product Subsets (Global Tool) - ORNL DAAC Website Search - SDAT - Daymet Single Pixel Extraction Tool	- GLIDER - HTIDE - PO DAAC Live Access Server - SOTO	- SEDAC Map Viewer - SEDAC Map Client - PopGrid Viewer
subset by area (box) (subset the data by a bounding box)	- Giovanni - L3 and L4 Subsetter Regridded - L2 subsetter - OPeNDAP - THREDDS	- HyDRO - HEV Subsetter - SPOT - ADaM - WPT	- LAADS DAAC (How to Navigate the LAADS Online Archive to Download Data) - LAADS DAAC Find Data (How to Search and Order Data with the LAADS Find Data Interface) - LAADS DAAC View Data (How to Use LAADS DAAC View Data) - LDOPE LDOPE has in-house developed GUI for its own tools but they are the add-on interface to EHVI. So user will have to have ENVI software and then has to download LDOPE's add on. LDOPE also has web based GUI for some of the tools. Effectively user can use the tools at command line or inside ENVI. LDOPE User Guide	- AppEARS - Earth Explorer - Land Processes Data Pool	- Customized Programmatic Data Access Service (https://nsidc.org/support/howto/how-do-i-programmatically-request-data-service) - Data Subscription and Customization Services (https://nsidc.org/support/howto/how-do-i-access-data-using-openapi) - Data Access Jupyter Notebook (https://github.com/nsidc/NSIDC-Data-Access-Notebook) - Data Map Services API (https://nsidc.org/support/howto/guide-nsidc-data-map-services-api) - OPeNDAP (https://nsidc.org/support/howto/how-do-i-access-data-using-openapi)	- Order or Subscribe to Data: https://iceanddata.scf.gsfc.nasa.gov/data_dashboard/ - Level 1 and 2 Browser: https://iceanddata.scf.gsfc.nasa.gov/cgi/browse.pl	- MODIS Fixed Sites Subsetting and Visualization Tool - MODIS Land Product Subsets (Global Tool) - ORNL DAAC Website Search - SDAT	- GLIDER - HTIDE - PO DAAC Live Access Server - SOTO	- SEDAC Map Viewer - SEDAC Map Client - PopGrid

Tools and Services across DAACs



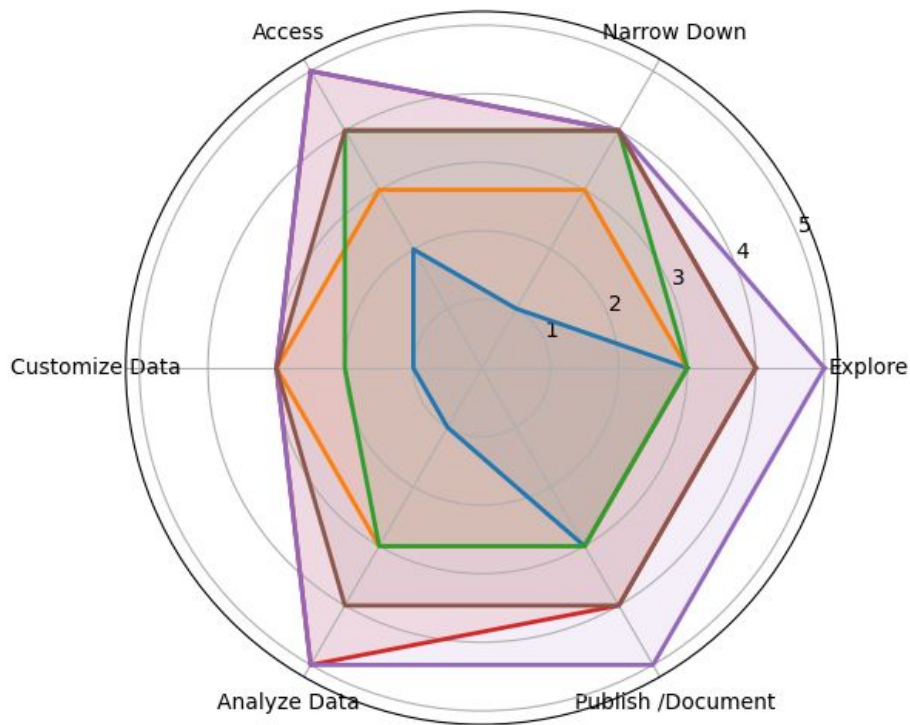


Data and Information Needs





What are the existing gaps?



- Explore:**
 - Review Literature (publications)
 - Identify the major variable of interest and search for data
 - Quickly visualize the primary variable and co-locate
 - Find introductory information that describes the data
 - Explore available resources- tools, service
 - Inspect Data Quality
 - Explore related data through publication
 - Search for data and documentations cross-DAAC
- Narrow Down**
 - Determine spatial, temporal, resolution, time span, coverage, latency, processing level, platform
 - Determine data quality, limitations
 - Subset and download sample data
- Access data**
 - Use Services and tools provided
 - Computing resources available
 - Determine data volume/granules needed
 - Tools, software available
 - Use case/tutorials
- Customize Data**
 - Processing to convert to grid (for non gridded)
 - Data format conversion
 - Regrid/reproject
 - Fill missing data
 - Bias Correction
- Analyze:**
 - Co-location
 - Time series
 - Change Detection
 - Correlation
 - Regression
 - Machine learning/AI
 - Trend Analysis
 - Zonal mean
- Publish /Document**
 - Cite the data (DOI), documents, service/ tools
 - Mention data limitations and caveats
 - Data quality checks
 - Publish research with data



What worked, what did not

Earth Science Data

- 1) Access data from the Earthdata cloud.
- 2) EarthAccess - Spatial and temporal subset
- 3) Available in HDF5, HDF, NetCDF
- 4) xarray, h5py, rioxarray



Data Customization

- 1) Geopandas to extract geometry
- 2) Created shape mask
- 3) Aggregate data



Cloud Processing

- 1) Not all data are same!
- 2) Unable to process HDF in cloud environment
- 3) Download it to local cloud instance



Data services

- 1) Few parameters available in Giovanni in Cloud (GiC)- extract time series by point
- 2) Data Not available through Harmony or other API Services



Openscapes Champion Cohort 2023

Team:

Ranjay Shrestha, Black Marble Science Team,
Xiaohua Pan, GES DISC and
Binita KC, GES DISC

Extracted
data by
defined
shape

Generate
Time-series

Looking Forward



- Continue Mapping WEF Data and Services
- Explore Interdisciplinary use cases
- Refine Gap Analysis, produce Recommendations and Standard Practices
- Disseminate the findings to the target audience at meetings and seminars

Earth Science Data Systems Working Group (ESDSWG)

Interdisciplinary Community Needs (ICN)

esdswg-icn@lists.nasa.gov
binita.kc@nasa.gov