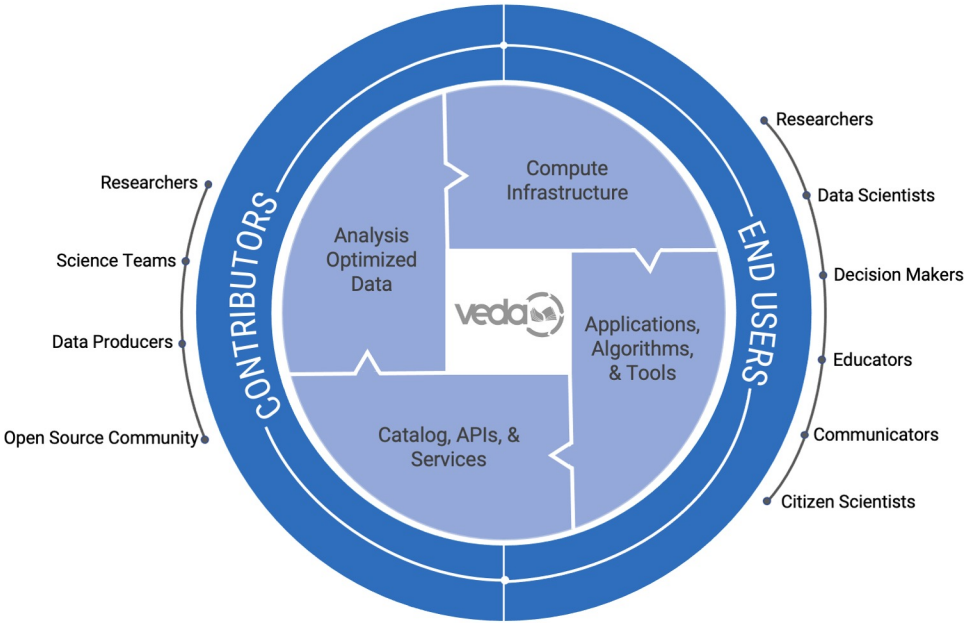
veda
Visualization Exploration & Data Analysis

Visualization, Exploration, and Data Analysis Platform

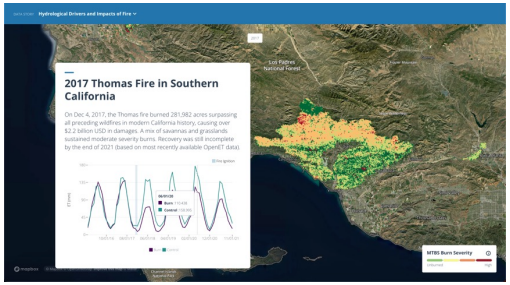
Why?

- Interdisciplinary science depends on large amount of Earth science data and computational resources
- Working with these datasets is non-trivial
- Big data science requires advanced distributed computing knowledge

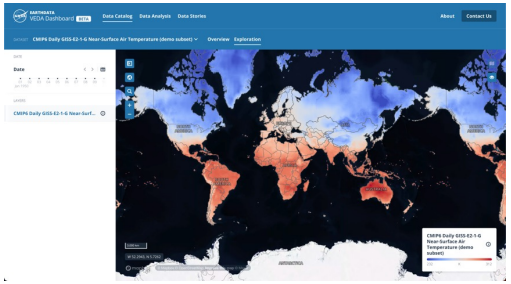


What?

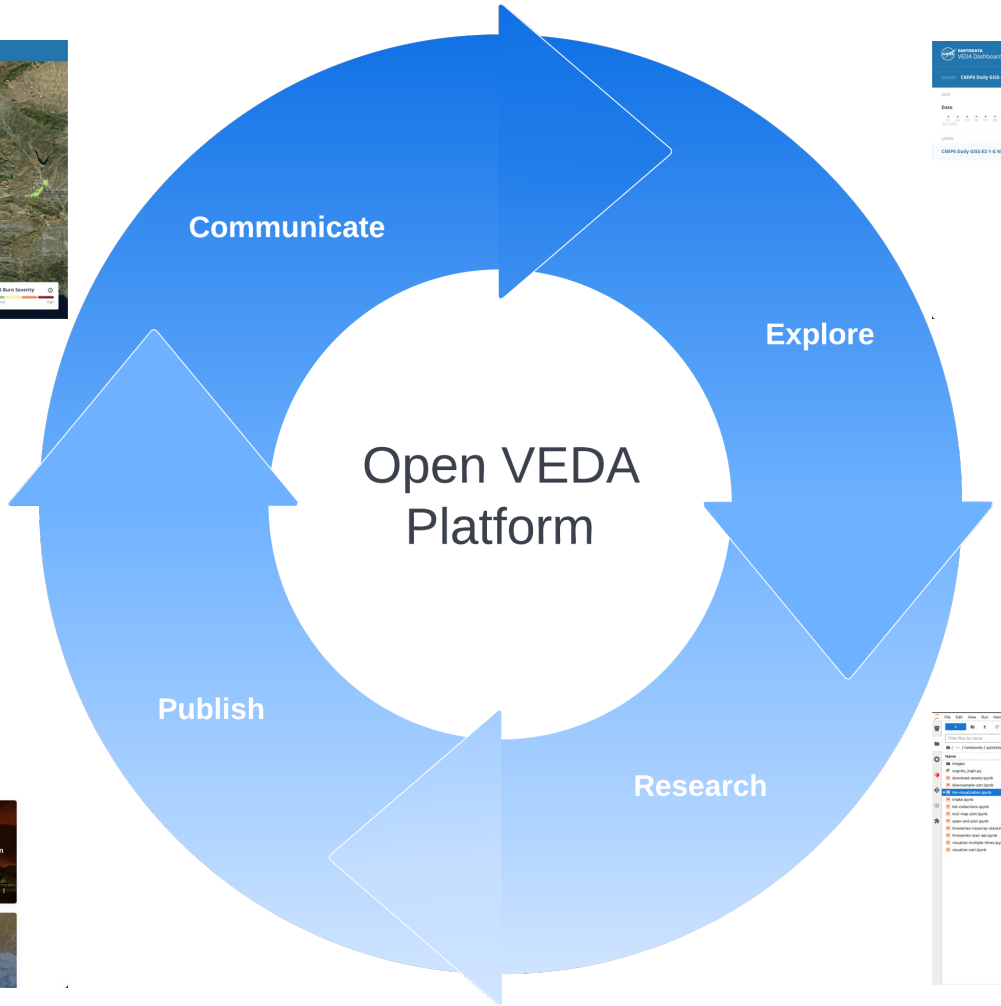
VEDA is an open platform that brings key Earth science datasets next to open source tools for data processing, analysis, visualization, and exploration in a NASA-managed and more accessible computing environment



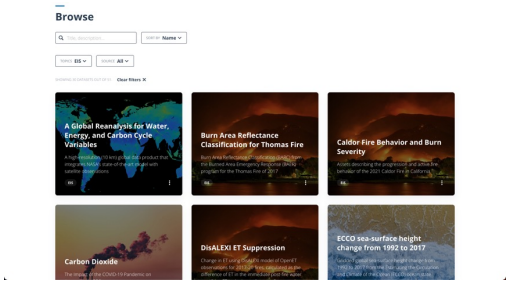
Data Driven Storytelling



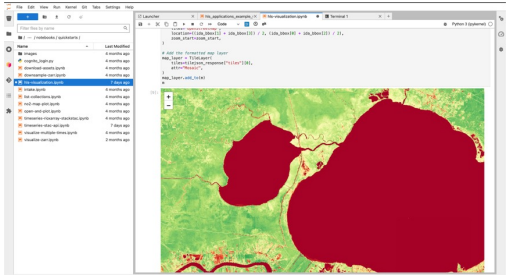
Map Exploration



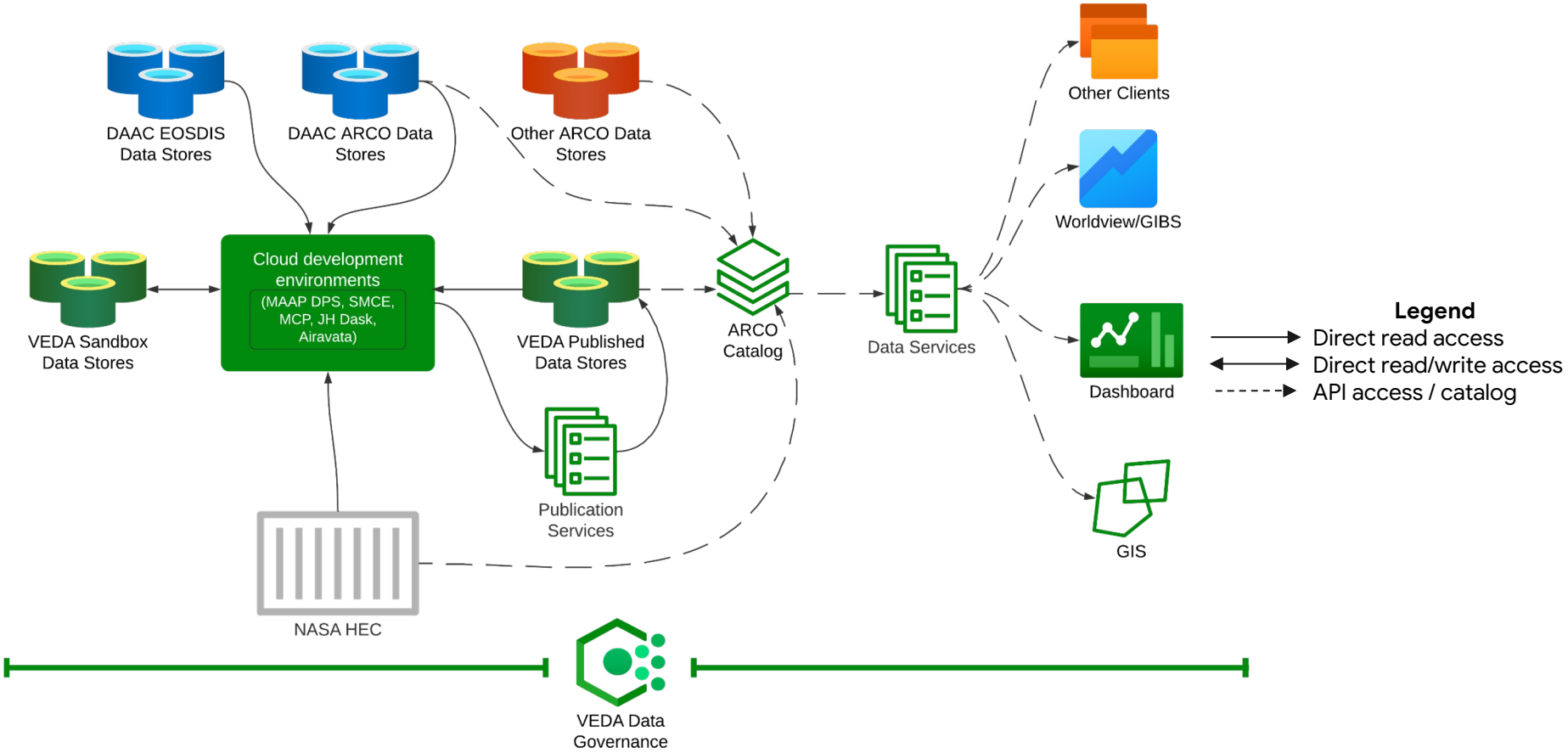
Data Catalog



Analysis Hub



Data Architecture



VEDA User Engagement

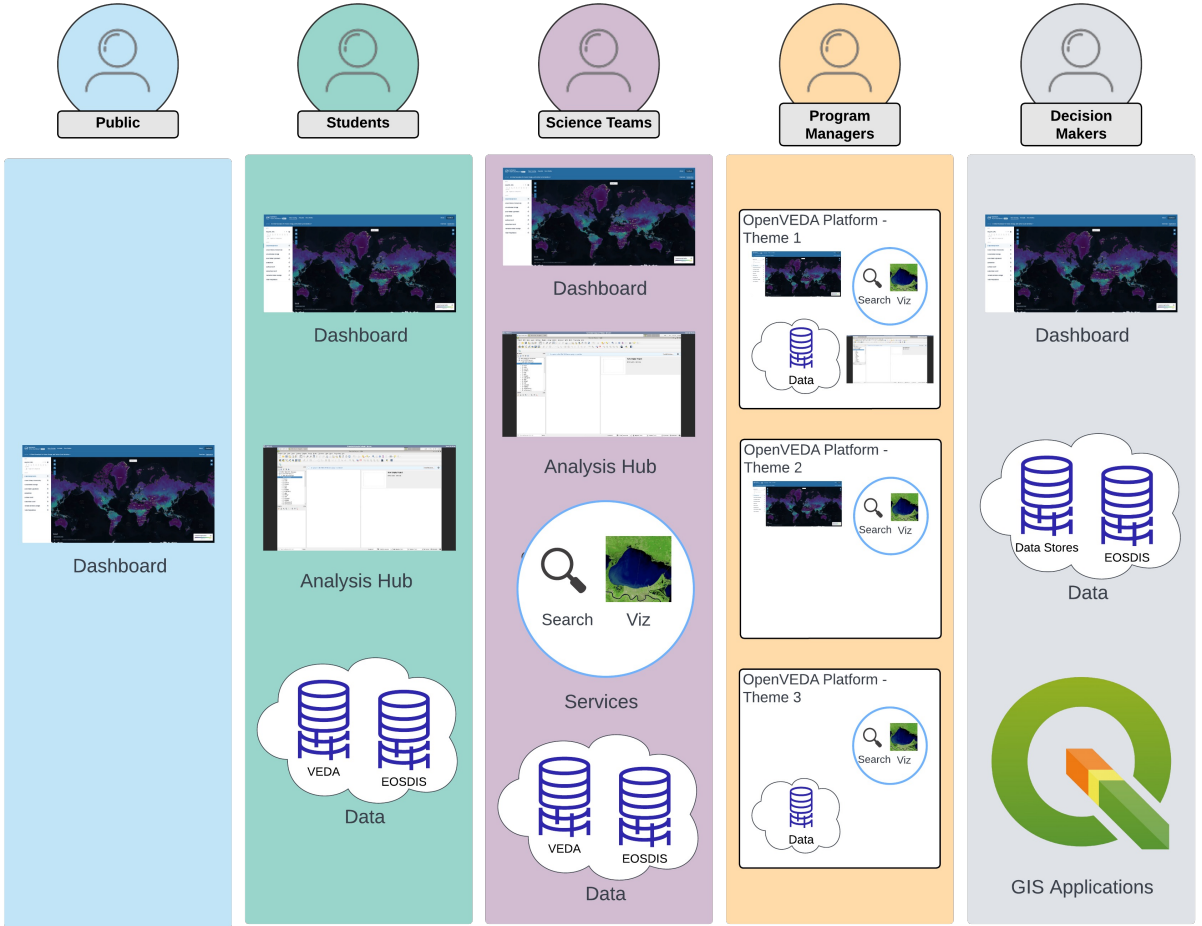
Service Components

Dashboard: Map Explore, Dynamic Time-series analysis, Data Insights, Catalog Search Interface

Analytics Hub: Jupyter Notebooks (Python, R, Matlab (?)) and QGIS

Services: Search and Ingestion APIs, Raster APIs including statistics endpoint, and Features API

OpenVEDA Platform: Dashboard + Analytics Hub + Services + Data Stores + Catalog



General Public

Dashboard

Who?

Science Enthusiasts, Communicators, Educators, Press

Interaction with VEDA Platform?

Map exploration and data insights

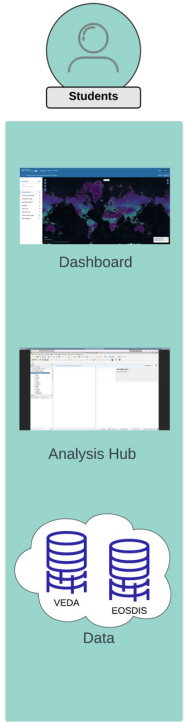
Takeaway?

Knowledge of how NASA data is used to understand the Earth System. Earth science information relevant to their specific location (e.g. total rainfall after a disaster, number of fires within 100 miles, etc.)

Contribution?

None

Students



Who?

Student Researchers working on capstone, thesis, and dissertation work.
Workshop participants

Interaction with VEDA Platform?

Map exploration, data insights, dynamic time-series analysis, jupyterhub environment for detailed analysis on cloud-hosted data

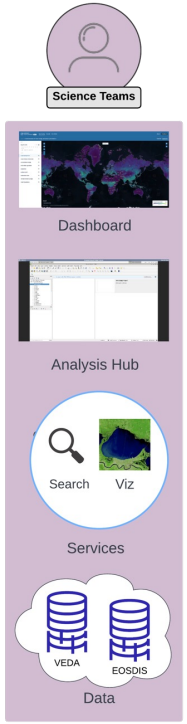
Takeaway?

Enhanced scientific understanding of a particular topic or set of topics and modernized workflow leveraging compute in same region where data is hosted

Contribution?

Datasets, data insights, notebook examples

Science Teams



Who?

NASA science teams developing a new algorithm or developing new data products

Interaction with VEDA Platform?

Map exploration, data insights, jupyterhub environment for collaborative compute environment, ingestion APIs, raster APIs, features APIs

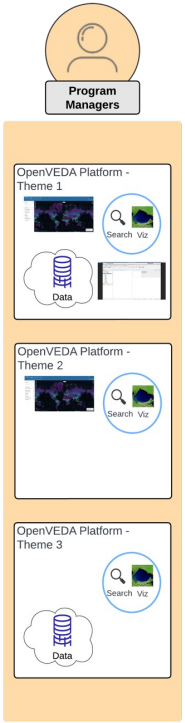
Takeaway?

How collaborative compute environments in the cloud can accelerate scientific contributions and enhance mission success

Contribution?

Funding (cloud resources), datasets, data insights, notebook examples

Program Managers



Who?

Program Managers managing Earth science applications

Interaction with VEDA Platform?

Limited map exploration and data insights

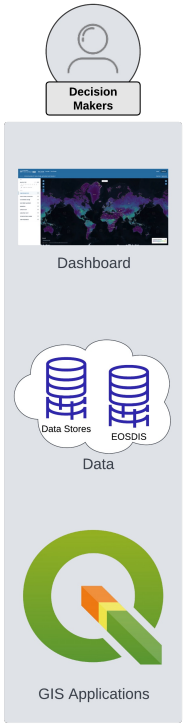
Takeaway?

How VEDA capabilities can be leveraged within their program to address user needs, accelerate science, and communicate complex scientific concepts in an interactive, engaging manner

Contribution?

Unknown – Hopefully development teams contributing back to OpenVEDA platform components

Decision Makers



Who?

Decision makers who need to leverage Earth observations to quickly assess rapidly evolving events

Interaction with VEDA Platform?

Map exploration, dynamic time-series analysis, external data catalog (external = non-NASA data *if necessary), GIS applications

Takeaway?

How map exploration can be used to quickly assess a situation

Contribution?

Datasets/Data catalog

Others

Who?

FIRMS, Worldview/GIBS, Application Developers

Interaction with VEDA Platform?

Data services and visualization APIs

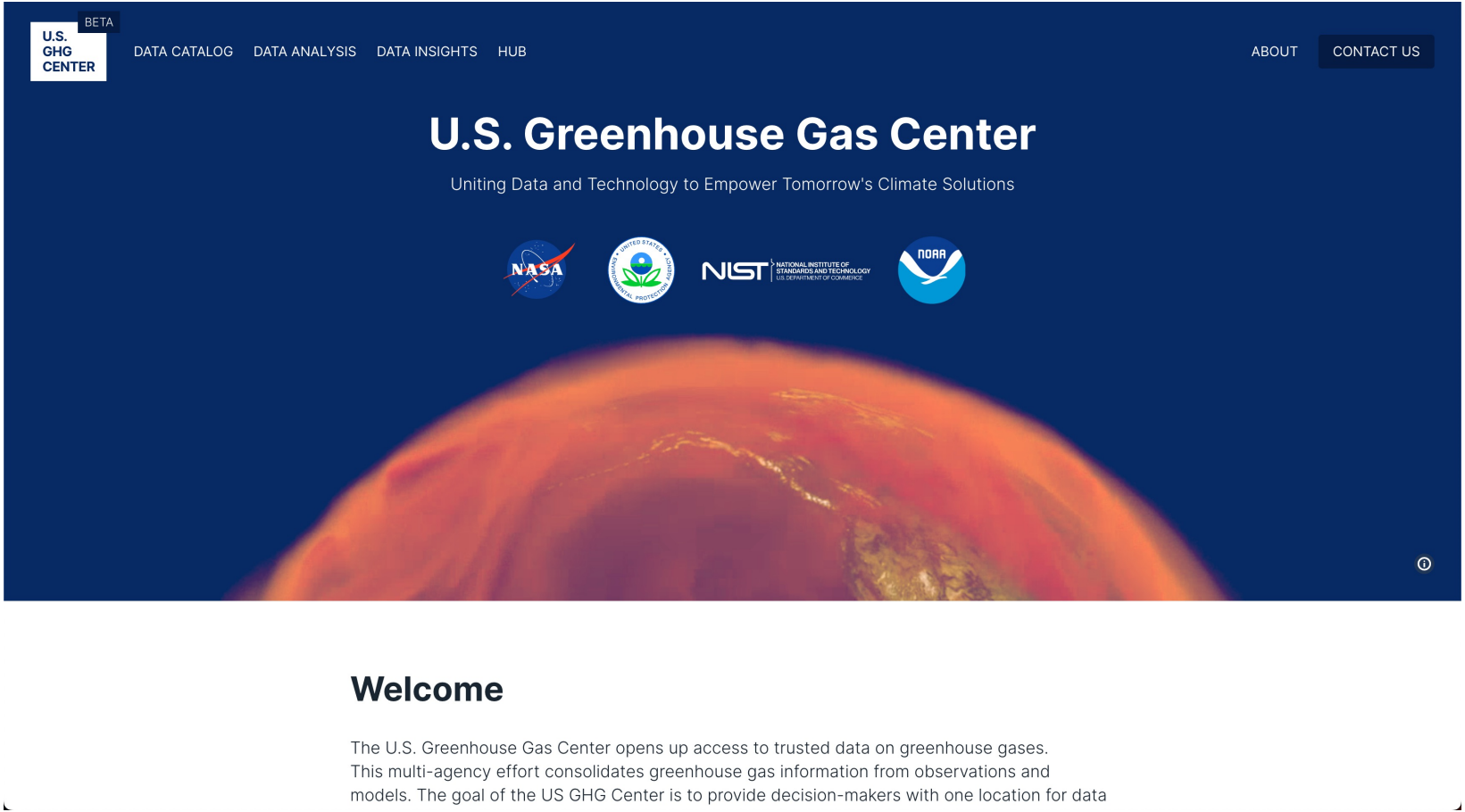
Takeaway?

How VEDA APIs can be used to serve data and visualization (as needed) needs for their applications

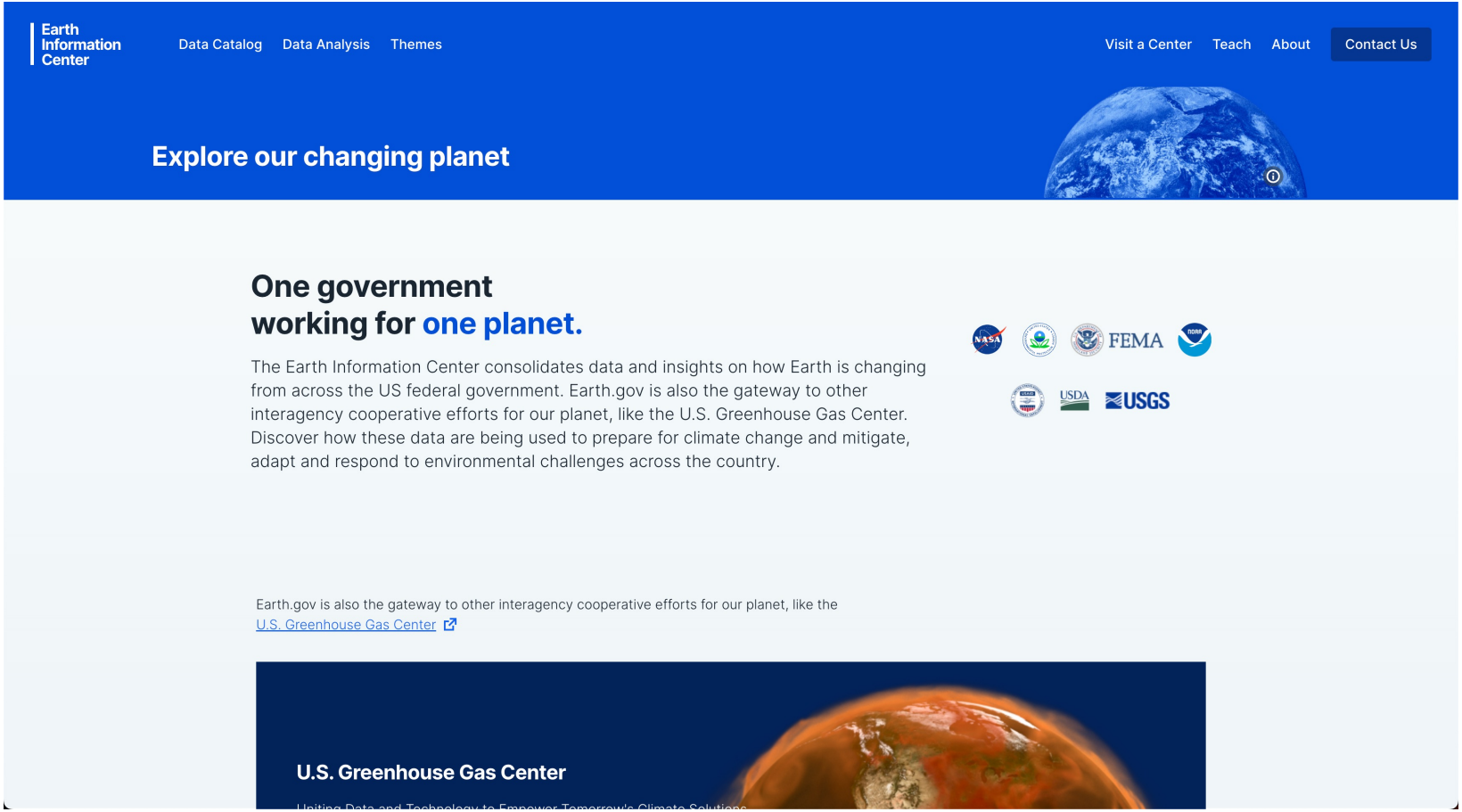
Contribution?

Improvements to backend services in OpenVEDA platform

VEDA Deployments – U.S. Greenhouse Gas Center (Platform)

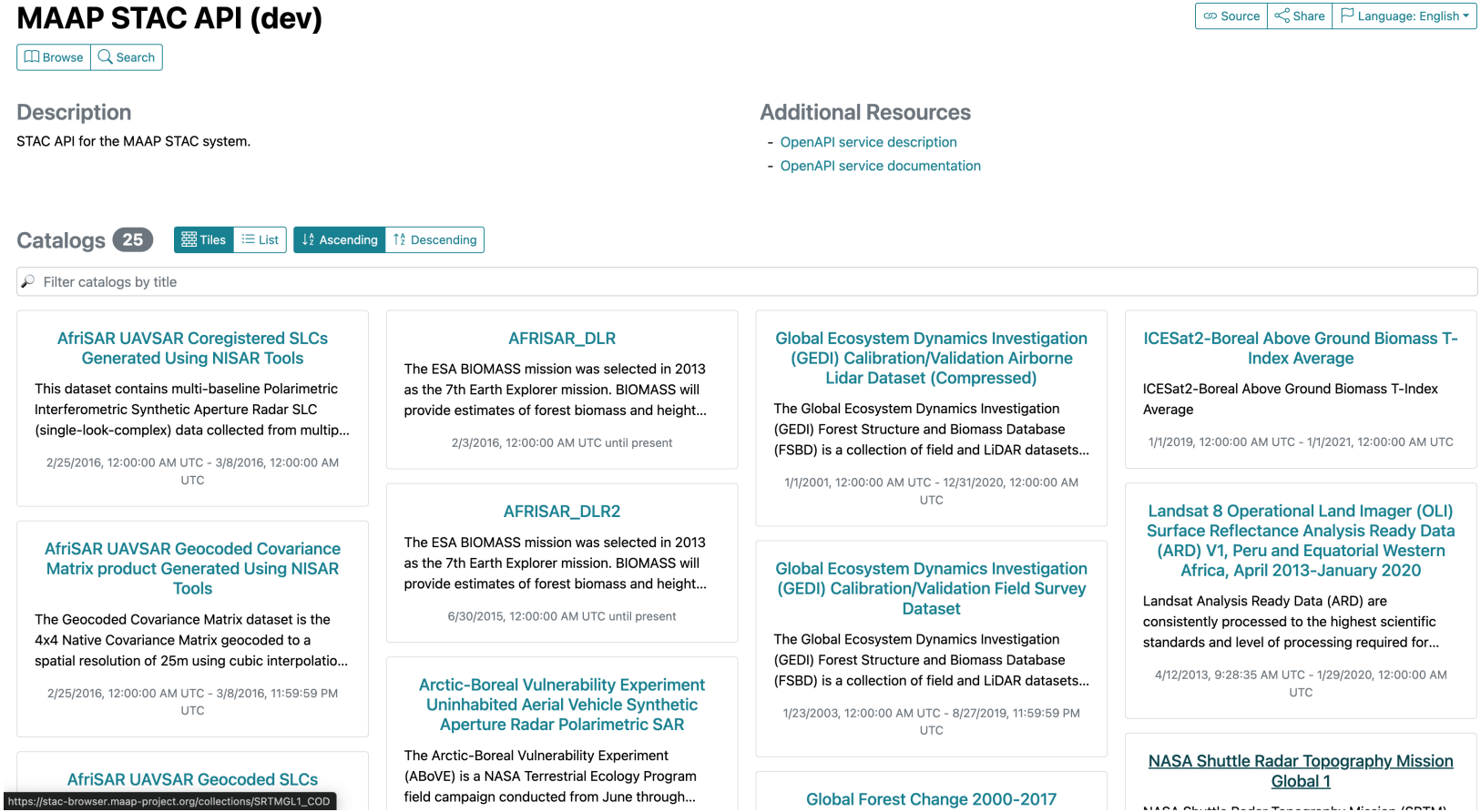


VEDA Deployments – Earth Information Center (Dashboard)



VEDA Deployments – NASA FIRMS (Visualization Services)

VEDA Deployments – ESA/NASA MAAP (Data Services)



Demos

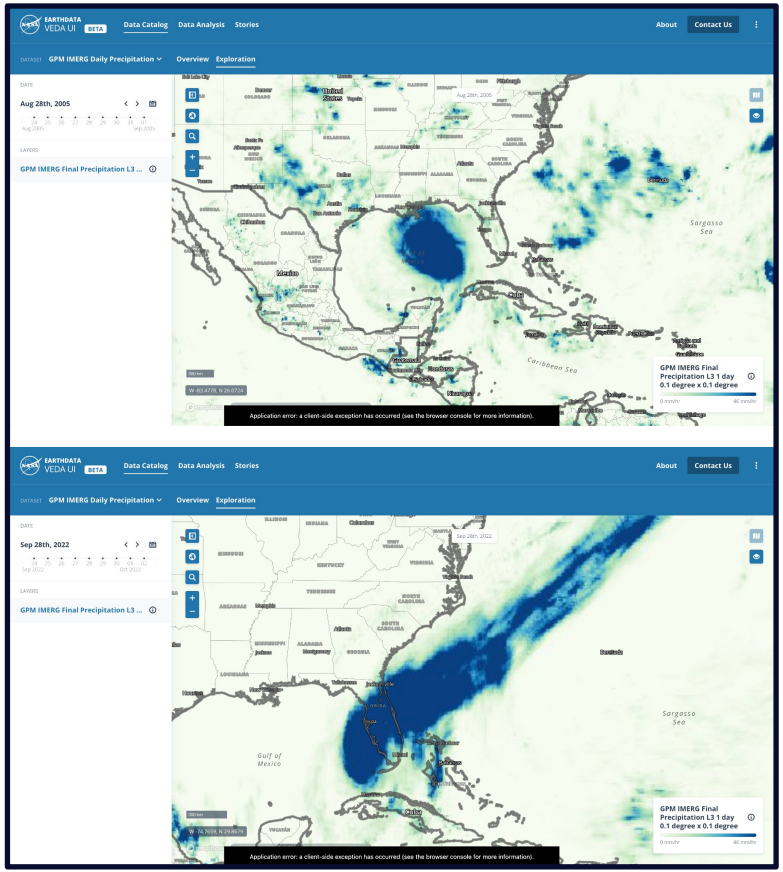
VEDA Moving Forward – NASA Archive Integration

Current

- VEDA data store supports targeted use cases with data transformed to COGs

Future

- Dynamic rendering of NASA data archives for cloud-hosted data in non-cloud-optimized formats without need for intermediate data stores



Prototype using TRMM

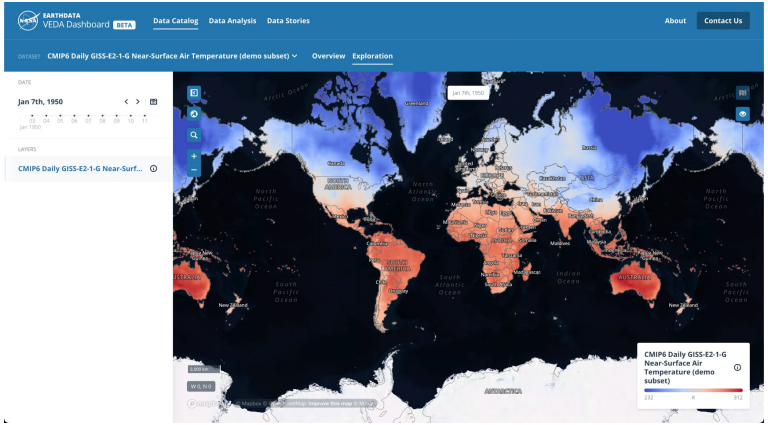
VEDA Moving Forward – Zarr/Kerchunk/NetCDF Visualization

Current

- Data Visualization currently supports COGs only

Future

- Web-based visualization supporting NetCDF (example on previous slide) Zarr, Kerchunk, COPC data formats



Dashboard example with Kerchunk metadata on NetCDF

VEDA Moving Forward – Integrated Explore/Analysis

Current

- Explore and Analysis on separate tabs so users must toggle to see underlying data being used to generate analysis)

Future

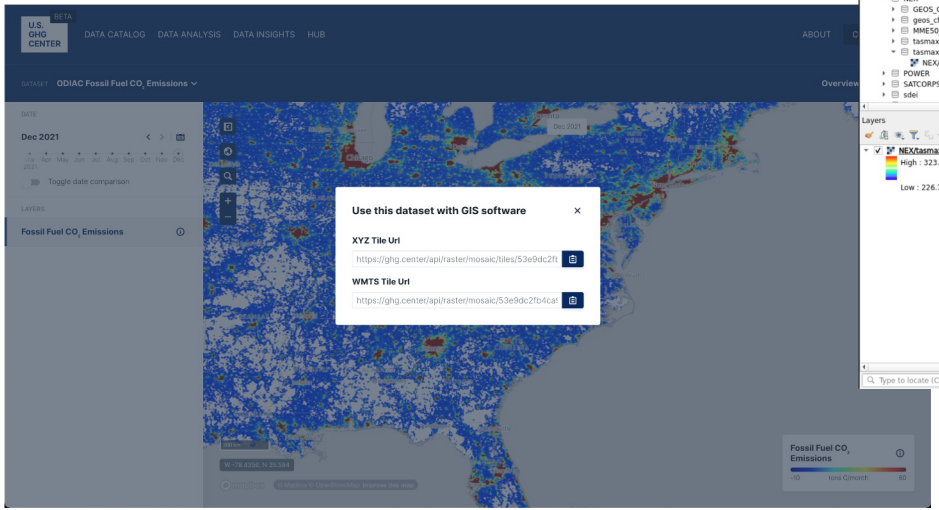
- Fully integrated explore and analysis capabilities with area-weighted statistics
- Capability to compare two datasets spatially and two locations of same dataset with time-series

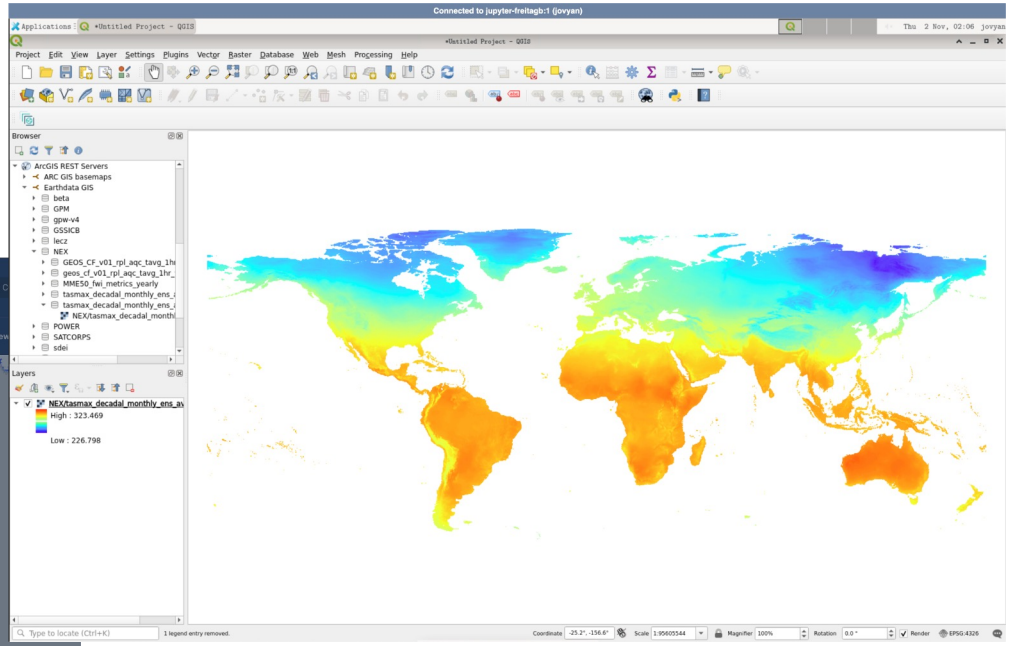
Current prototype

VEDA Moving Forward – GIS applications

Tighter integration of hub-based QGIS with NASA GIS services

- EGIS Rest API,
- GIS-compatible tile layers in VEDA dashboard

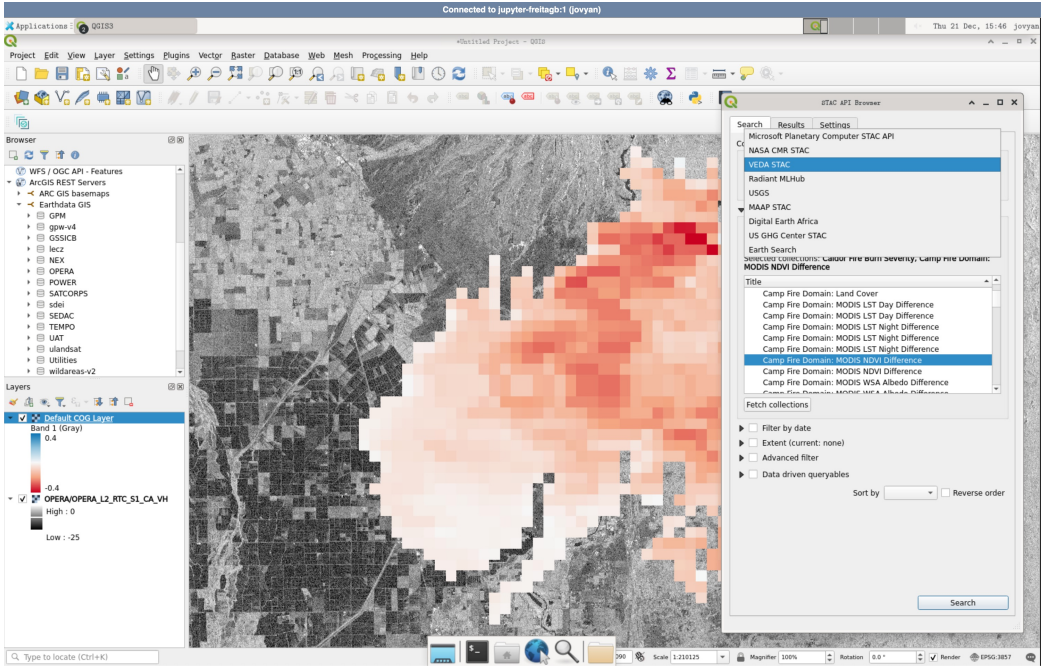




VEDA Moving Forward – GIS applications

Current

- STAC-based data catalog allows for interoperability with GIS applications and STAC API Browser in GIS allows for searching VEDA data catalog

Future

- Example QGIS/ArcGIS projects linked to the dashboard (similar to current notebook examples in the documentation)