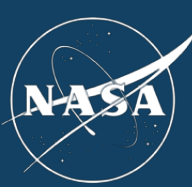


Improving Malaria Decision Support with Earth Observations

*Health and Air Quality Project Review
September 21, 2020*

*John M. Beck
The University of Alabama in Huntsville*



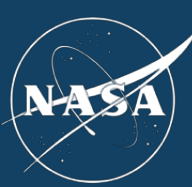
Our Project



NASA Earth Observations for Health Information Systems (NEOH)



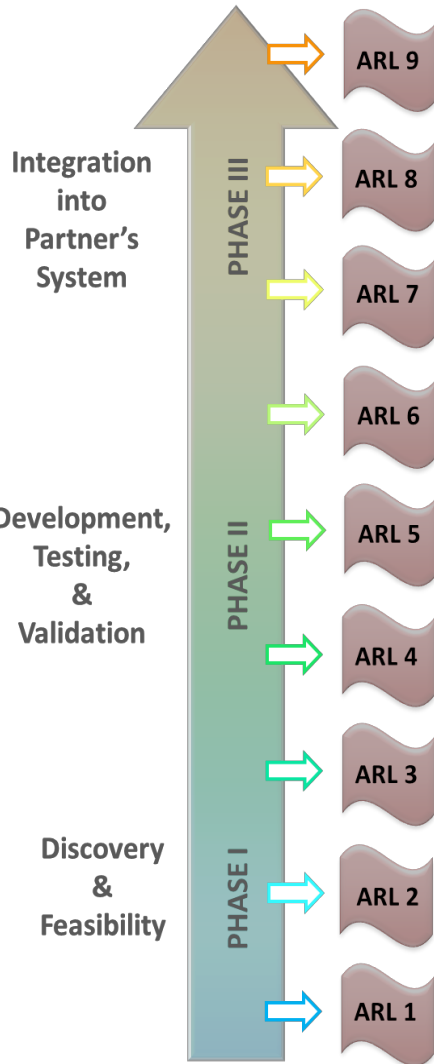
Researchers at the University of Alabama in Huntsville (UAH) in collaboration with the Centers for Disease Control and Prevention (CDC) and NASA are developing and deploying a technology for incorporating the latest NASA Earth observations for surface temperatures, precipitation, and vegetation health into the District Health Information Software 2 (DHIS2) to enhance malaria control decision making in sub-Saharan Africa.



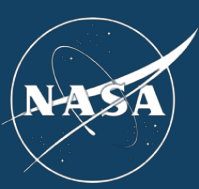
Our Team



Role	Name	Affiliation Organization	Organization Type
Co-I	Jeffrey Luvall	NASA/MSFC	Federal Agency
Co-I	John Painter	CDC	Federal Agency
Co-I	Udaysankar Nair	UAH	State Agency
Co-I	Todd Berendes	UAH	State Agency
Collaborator	Walt Petersen	NASA/MSFC	Federal Agency



- Start-of-Project ARL = 3 (11/16/2018)
 - We estimate that starting ARL for this project is a 3. We base this evaluation on three factors: 1) Components of DHIS2 have already been tested and validated by independent users, 2) we have conducted a simple feasibility study that assessed the potential viability of modifying the DHIS2 software and we established a proof a concept for the application, and 3) we have a convincing case for the viability of our application concept.
- Goal ARL = 9
- Currently Reported ARL = 5 (08/17/2020)
- *Current ARL = 6*
 - We estimate that current ARL for this project is a now a 6. Beta testing in a simulated operational environment started in mid August.

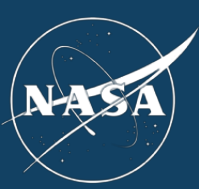


Project Schedule



Project Steps by Project Year Quarter	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Phase 1 - NASA Earth Observation (EO) Data Identification/Acquisition and Integration with District Health Information Software (DHIS2)												
Install and test DHIS2 with demonstration data	X	X	X									
Identify EO datasets, select common format, and develop scripts to automate the aggregation of data into DHIS2 Health District Boundaries		X	X	X								
Create appropriate DHIS2 fields, categories, data elements, etc. for EO data integration			X	X	X							
Use DHIS2 Web API and develop scripts for populating the DHIS2 database with EO data			X	X	X	X						
Build charts, tables, and maps for use by the CDC and NASA partners for testing and validation			X	X	X	X	X					
Phase 2 – Develop DHIS2 Plugin, Conduct NASA Data Analysis, and Perform Initial Deployment and Testing												
Expand DHIS2 metadata object models		X	X	X	X	X						
Develop and deploy EO data plugin for DHIS2				X	X	X	X					
Conduct data analysis with historical data				X	X	X	X	X				
Initial deployment, evaluation, and feedback												
Phase 3 - Adaptation into Decision Making Activity												
Establish data sharing agreements with countries				X	X	X						
Define EO data subscriptions to support future NASA data access for users												
Assist decision makers with environmental trends for precipitation, temperature, and vegetation					X							
Provide training, documentation, seek additional users												
ARL Level	3			4		5		6		7	8	9

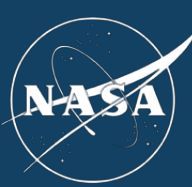
X = Completed



Challenges and Risks



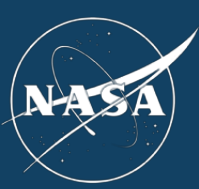
Rank	Type*	Risk	Mitigation Action
1	ES/PM	Overseas travel restrictions for the foreseeable future due to COVID-19	UAH team members and the CDC will have to utilize Video Teleconference (VTC) and produce a Video to demonstrate and deploy the technology to partner countries in Africa. Future travel to partner countries will need to be compressed in the final stages of the project (if possible). We will need to reallocate budget dollars from travel to other categories of need.
2	ES	Security of Web App within different DHIS2 instances	Coordinate with the CDC and partner countries to design the Web App with security concerns at the forefront.



End User / Stakeholder Engagement



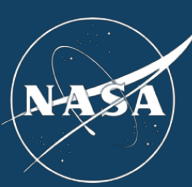
- Conducted initial stakeholder engagement with Ministry of Health officials from three sub-Saharan countries (Sierra Leone, Uganda, Burkina Faso).
- Conducted a visit to the CDC. This visit included a capabilities and project briefing to members of the CDC Malaria Branch.
- Received positive feedback from the poster presentations at the AGU and AMS Annual Conference.
- Working on writing and submitting a Journal Article about the project. A possible journal would be the Journal of Infectious Diseases of Poverty.
- UAH team members and the CDC will have to utilize Video Teleconference (VTC) to demonstrate and deploy the technology to partner countries in Africa.
- Working with the CDC to obtain a sample of actual Malaria data from a partnering country so we can begin data analysis using the Earth Observations.
- Gave a presentation at the BAO DHIS2 Symposium on September 15th, 2020.
- Submitted an abstract to the 2021 AMS Annual Conference



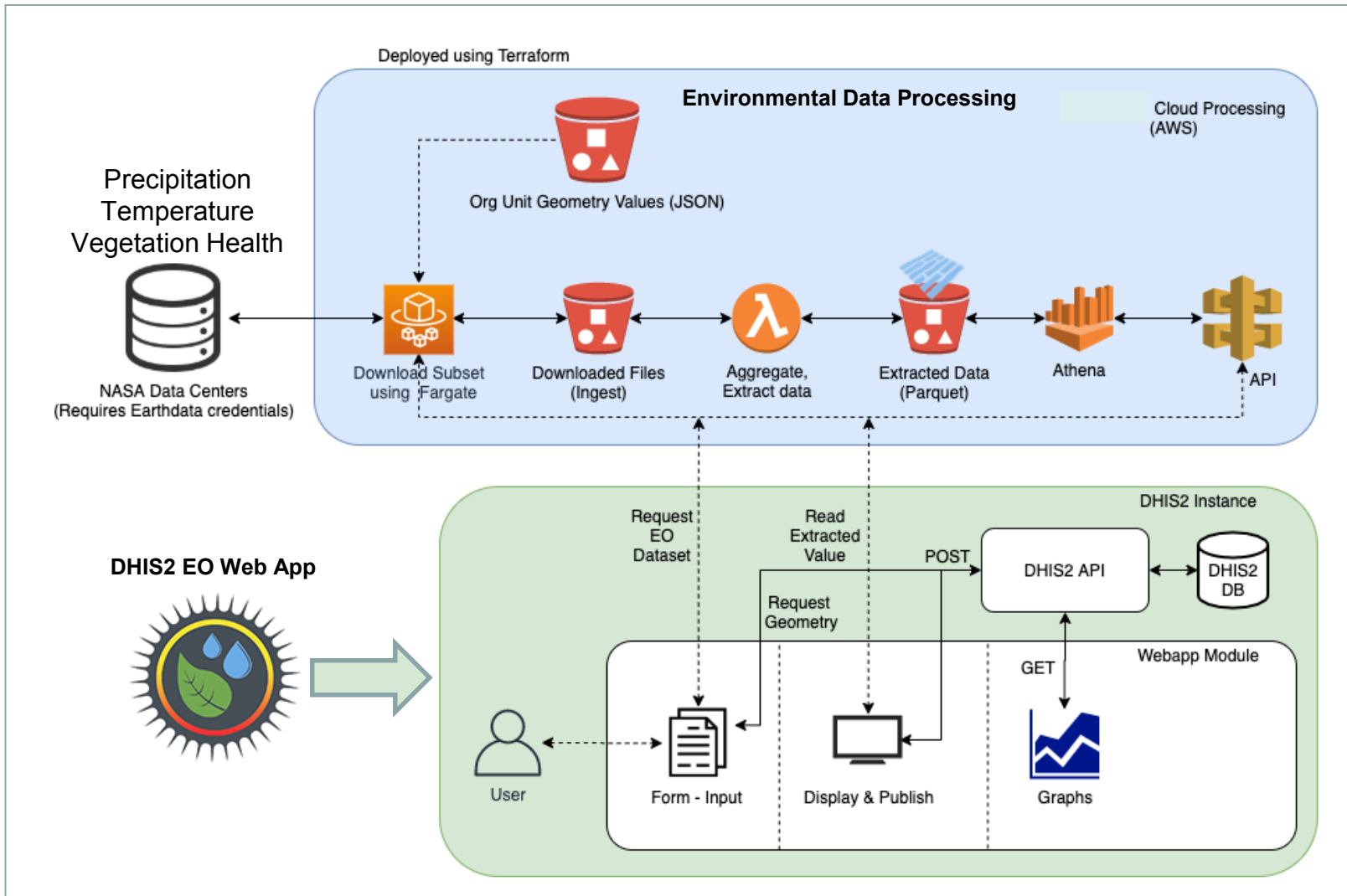
Accomplishments / Results

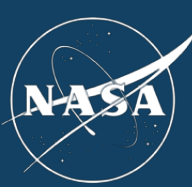


- Finalized cloud-based process for aggregating MODIS Surface Temperatures and MODIS Vegetation Health data from the LPDAAC over input health districts boundaries
- Updated the Graphic User Interface (GUI) for the DHIS2 Earth Observation (EO) Web Application (Web App) to include adding an administration section and updated security features
- Developed packaging procedures for distribution of the Web App among partners
- Finished updating the Web App to conduct multiple processes simultaneously
- Started working on a Journal Article detailing the project and its methodology
- Co-Is Nair and Painter researching methods of analyzing EO data to help in making informed decisions for potential Malaria prevention strategies
- Finalized process for aggregating ECOSTRESS surface temperature data over input health districts



Accomplishments / Results





DHIS2 Web Application



NASA Earthdata Importer

Datasets

Precipitation

Org Unit

District

Agg Period

Daily

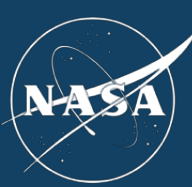
Start date

1/1/2015 01:00:01

End date

6/30/2015 23:59:59

Submit



DHIS2 Web Application



NASA Earthdata Importer

Get Data

Status

NASA Earthdata Importer


Dataset:

- Precipitation
- Temperature
- Vegetation

Agg Period: **Daily**

Start date: **1/1/2015 01:00:01** End date: **6/30/2015 23:59:59**

Submit



NASA Earthdata Importer

Dataset	Status	Function	Message	Date created	View/Publish
precipitation	working	download	GES DISC downloaded file 15 of 181	08-10-2020T17:10:16Z	

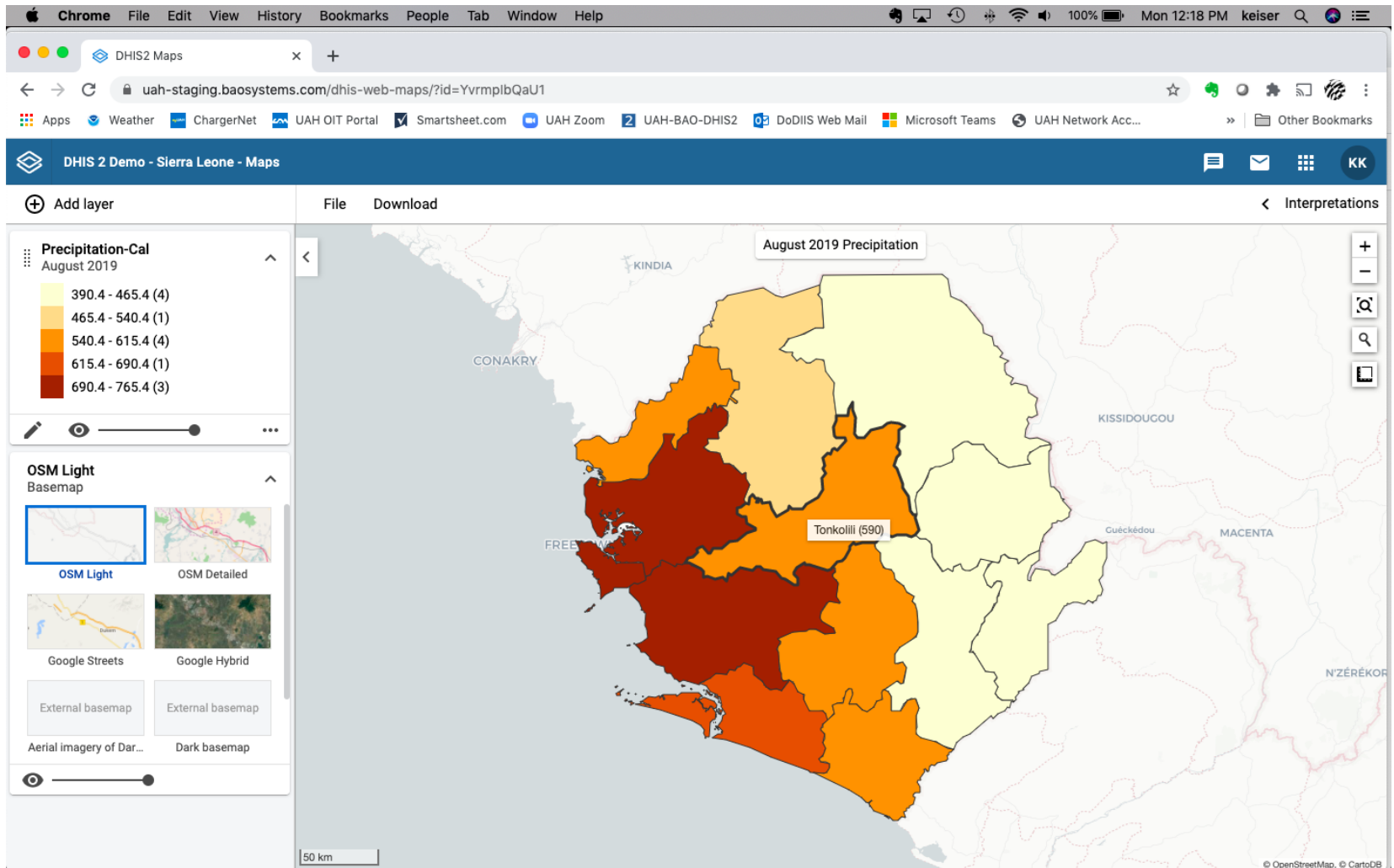
Items per page: 5 0 of 0 |< < > >|

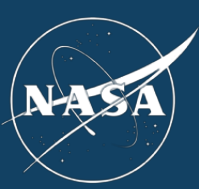
Data Status Page NASA Earthdata Importer for DHIS2.

We implemented multiple processing

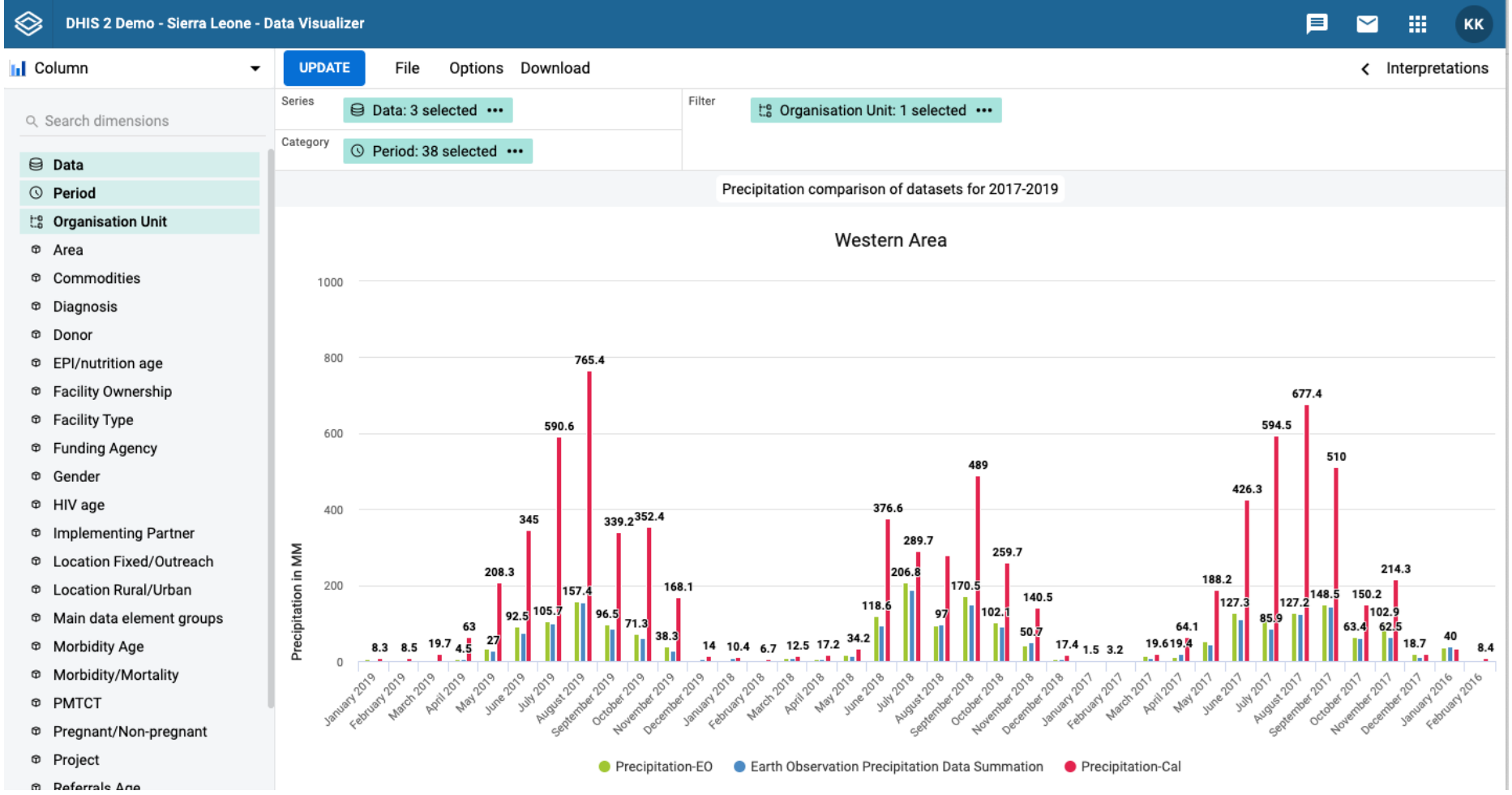
Precipitation

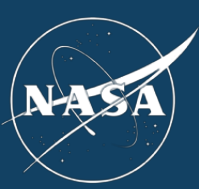
NASA's GPM IMERG Product





Precipitation



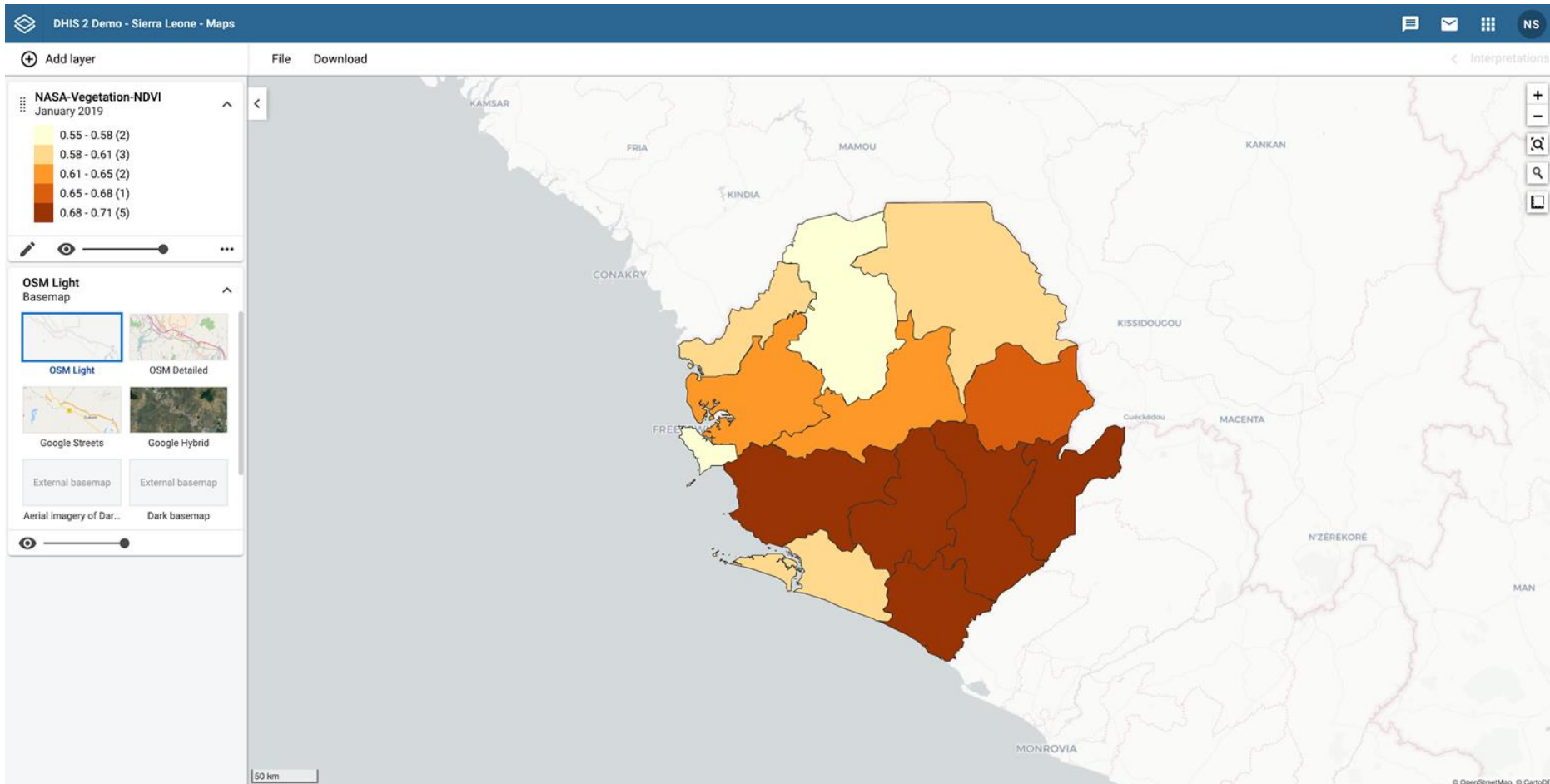


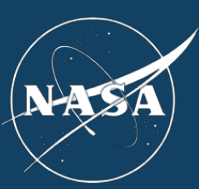
Surface Temperature



Vegetation Health

NASA's MODIS Instrument

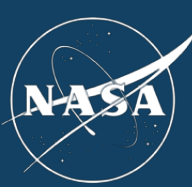




Future Plans



- Developing an Administration Interface
- Evaluating NASA AppEEARS
 - The Application for Extracting and Exploring Analysis Ready Samples (AppEEARS) offers users a simple and efficient way to perform data access and transformation processes.
(<https://lpdaac.usgs.gov/tools/appeears/>)
- Work with the CDC to establish relationships with countries for using the web application.



Questions

