The NASA Earth Science Applied Sciences Disasters Program: making EO data and expertise available through the Disasters Mapping Portal to inform decision-makers throughout the disaster cycle

Ronan Lucey[1], Garrett Layne[2], Lori Schultz[3], Laura Phoebus[4]

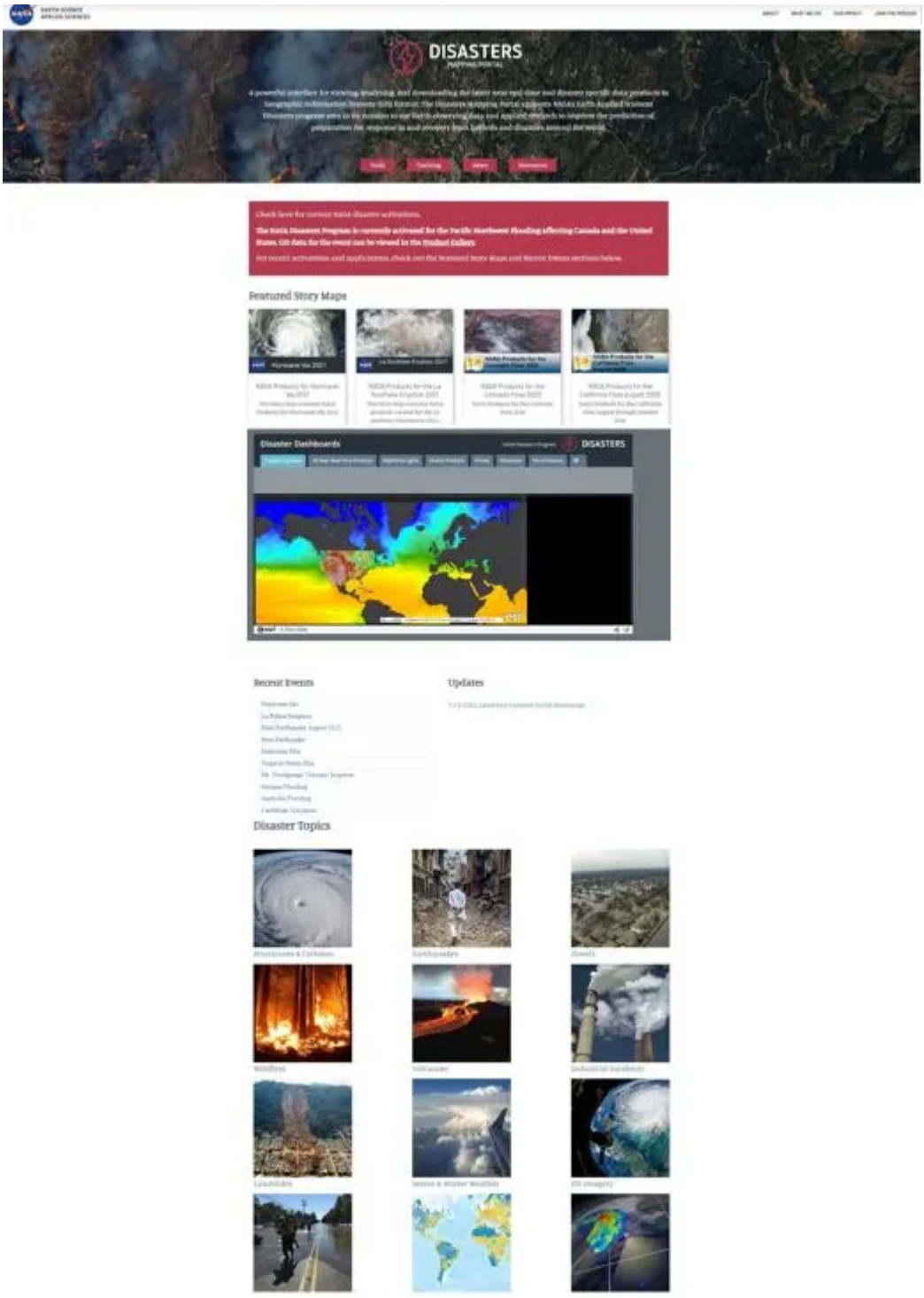
[1]University of Alabama in Huntsville [2]NASA Goddard Space Flight Center [3]NASA Marshall Space Flight Center [4]Jacobs Technology, Inc.

PRESENTED AT:

AGU FALL MEETING
New Orleans, LA & Online Everywhere
13–17 December 2021
Poster Gallery brought to you by WILEY

THE NASA DISASTERS MAPPING PORTAL

Through the **Disasters Mapping Portal**, an Esri Enterprise portal of geospatially enabled disaster products, event-based and near real-time products are hosted to provide end users with free and openly available analysis-ready data and data services in uniform formats, keeping in mind their expressed Earth Observations (EO) needs.



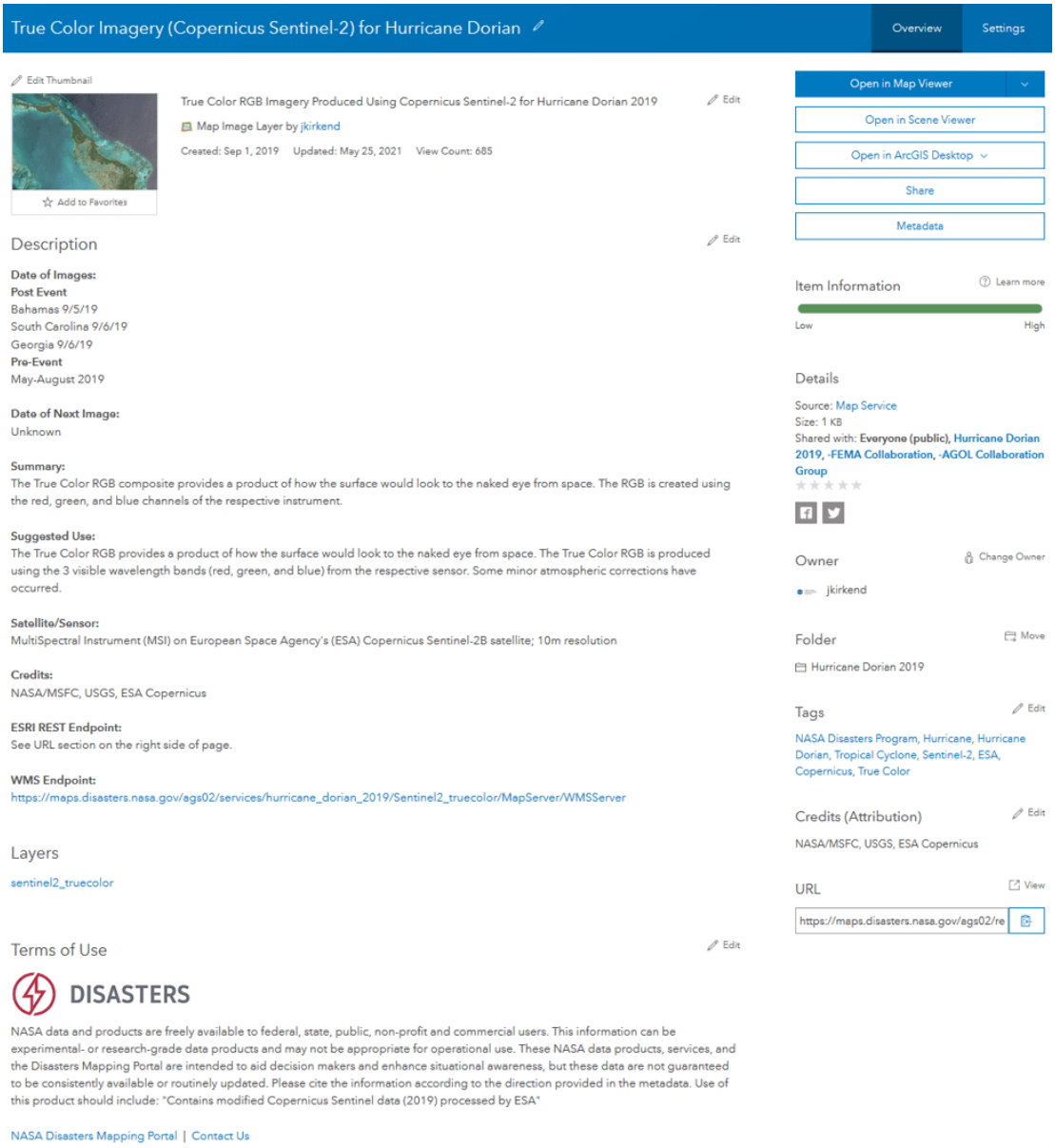
Disasters Portal Homepage

Making information more approachable and easier to navigate than other sources of EO data is a key consideration of the Disasters Program GIS team. By providing data in a web-based GIS format that does not require processing or login information to access, more users are about to utilize the data to satisfy their needs.

A plethora of geospatial information is available on the Portal, including but not limited to the following:

- Featured Story Maps which highlight event responses undertaken by the program
- Disaster category tiles, which highlight program responses by natural disaster type
- The Homepage Dashboard, which contains multiple tabs:
  - A tropical cyclone situational awareness dashboard
  - All near real-time products hosted on the Portal
  - The most recent products posted to the Portal
  - Floods, volcanoes, and fire emission dashboards
  - Disasters Program Historical Response Locations

Standard accessible data descriptions across all datasets helps users understand the technical specifications, suggested usage, and data access methods for each dataset available on the portal.



Example Data Description from Portal

The Disasters Mapping Portal is built on Esri Enterprise Portal 10.8.1, with an upgrade to 10.9.1 scheduled for 2022.

ARD / AIP SERVICES

Analysis-ready data and analysis-in-place services are made available to all users through the NASA Disasters Mapping Portal. The Portal hosts a suite of near real-time (NRT) products as well as event-based products. NRT products are routine products that are always made available on the portal, regardless of the occurrence of an event. Event-based products are created for a specific event, and are focused on the area that will be, is being, or has been affected by the event.

Users of the portal have the ability to combine these datasets with their own datasets for information or further analysis.

[VIDEO] https://res.cloudinary.com/amuze-interactive/video/upload/vc_auto/v1637719979/agu-fm2021/C8-B1-77-FF-4C-05-3F-5C-C6-4C-9B-4E-FC-25-C3-74/Video/smap_zubzjb.mp4

SMAP

Currently available NRT products available on the Portal include:

- SAR Hurricane Monitoring for the Gulf and East Coast (Sentinel-1, ASF) **[NEW]**
- Black Marble Nighttime Blue/Yellow Composite (VIIRS) **[NEW]**
- Sulfur Dioxide (OMPS) **[NEW]**
- FIRMS Active Fire Points (MODIS, VIIRS)
- Global Landslide Nowcast
- Flood Detection – 1, 2, 3 Observations (MODIS)
- Precipitation Accumulation – 30 min, 3 hour, 1 day (Global Precipitation Measurement)
- Relative Soil Moisture - Daily 0-10cm, 0-2m (LIS - CONUS Only)
- Soil Moisture Percentile - 0-10cm, 0-100cm, 0-200cm (LIS - CONUS Only) **[NEW]**
- Soil Moisture - 3 Day Composite & 3 Day Anomaly (SMAP)
- Evaporative Stress Index – weekly
- Global Fire Emissions – Daily (VIIRS)
- True Color Imagery – Daily (MODIS at 250m, VIIRS at 375m)
- Natural Color Imagery – Daily (MODIS at 250m, VIIRS at 375m)

Event-specific products commonly hosted on the Portal during event responses include:

- Damage Proxy Maps
- Surface Water Extent Maps
- Optical/SAR imagery
- Surface Displacement Maps

[VIDEO] https://res.cloudinary.com/amuze-interactive/video/upload/vc_auto/v1637769585/agu-fm2021/C8-B1-77-FF-4C-05-3F-5C-C6-4C-9B-4E-FC-25-C3-74/Video/dorian_spyglass_nzuxsz.mp4

Hurricane Dorian Flood Extent Map (derived from Copernicus Sentinel-1), showing the value of radar data for observing through clouds.

Additional near real-time and event-specific products are added to the portal regularly based on user feedback. NRT products marked as **[NEW]** above have been added to the portal within the last calendar year.

Scan the QR code below to view the full Disasters Portal Product Guide:

ACTIVATION EXAMPLE

Hurricane Ida - August 2021

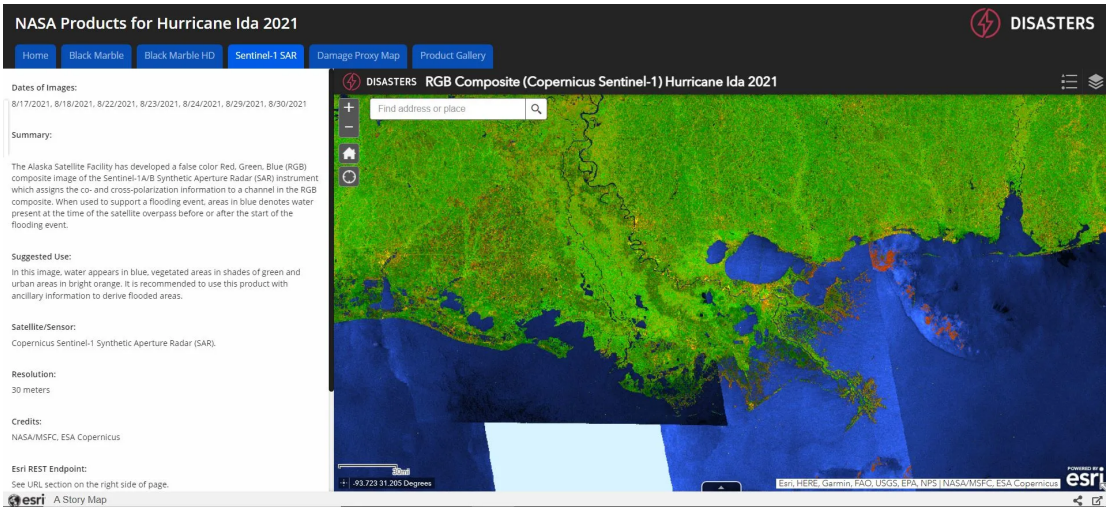
[VIDEO] https://res.cloudinary.com/amuze-interactive/video/upload/vc_auto/v1637719142/agu-fm2021/C8-B1-77-FF-4C-05-3F-5C-C6-4C-9B-4E-FC-25-C3-74/Video/Screen_Recording_2021-09-29_at_2.23.39_PM_vrtzad.mp4

Black Marble Before/After Hurricane Ida

Hurricane Ida was a Category 4 Hurricane that impacted the United States and the Caribbean in late summer 2021.

Over 300 images and data products were generated for the event and hosted on the Portal including:

- ARIA Damage Proxy Map
- Black Marble HD
- Black Marble Blue/Yellow Composite
- Copernicus Sentinel-1 RGB Composite
- Copernicus Sentinel-1 (ASF) Water Extent Maps
- Copernicus Sentinel-2 True Color & SWIR Imagery
- Watershed Alert
- Satellogic Optical Imagery
- UAVSAR Imagery
- Suite of Near Real-Time Products for Hurricanes - Soil Moisture, Ocean Sea Surface Temperature, Landslide Nowcast, Precipitation Accumulation, Streamflow Forecast, MODIS Flood Composites



Hurricane Ida StoryMap

By creating a StoryMap and hosting relevant EO data on the Portal, the Program is promoting the integration of EO into standard event workflows for users who otherwise may be unfamiliar with the value and applicability of EO into their decision making.

When the Program activates for an event, significant internal and external coordination occurs, led by the event lead. Internal coordination within the program focuses on coordination across NASA centers for technical and product support in response to requests received, as well as coordination with Program-funded research teams. External coordination also occurs with stakeholders & end users. For Hurricane Ida, this included FEMA, the National Guard, Army North Command, FEMA Region 4, and state level emergency management personnel.

In addition to event activations, long term relationships with end users assist them in understanding and preparing for the utilization of EO data from the Portal to inform their decision-making throughout the disaster cycle, while the Program learns directly about their science and decision making research, current capabilities, and needs.

The program continues to expand the legacy of using EO to answer questions, provide situational awareness, and monitor recovery, building on the advances in remote sensing applications.

NASA EARTH SCIENCE APPLIED SCIENCES DISASTERS PROGRAM

The **NASA Earth Science Applied Sciences Disasters Program** promotes the use of Earth Observations (EO) to inform disaster risk reduction and resilience throughout the disaster cycle, from local to global scales, by harnessing NASA science and technology capabilities, through engagement with end users to demonstrate the value and impact of EO to support decision-making, and by supporting end users in their use of EO in decision-making while developing relationships to grow as a trusted source of relevant science and useful results.

Program Goals Include:

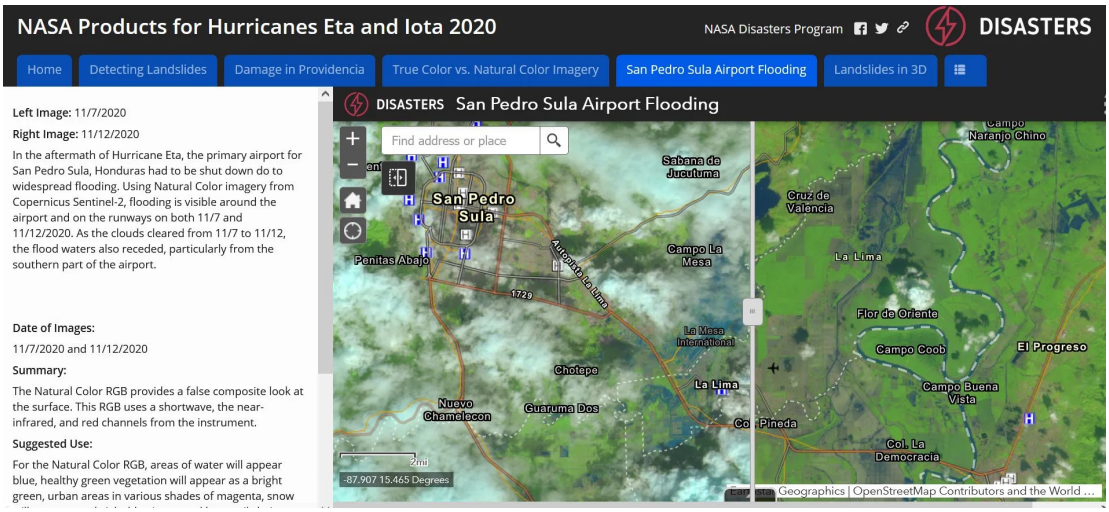
- Harness NASA Capabilities for Disaster Risk Reduction and Resilience
- Engage Stakeholders in the use of EO throughout the disaster lifecycle
- Demonstrate the value and impact of EO to support decision-making and actions
- Grow as a trusted source for delivering useful results

WHY A GIS PORTAL?

GIS helps to explain complex ideas to users of varying familiarity with Earth Observation (EO) data and how to apply it. The Portal helps to bridge the gap between NASA scientists and the emergency management community by hosting free and openly available datasets that can be brought directly into the GIS systems and/or decision-making procedures of end users.

Portal users have different levels of GIS and EO data knowledge, and therefore different needs related to NASA data. Some users simply need to be able to visualize data, whereas other users need a GIS service that allows them to utilize the data in their own analyses.

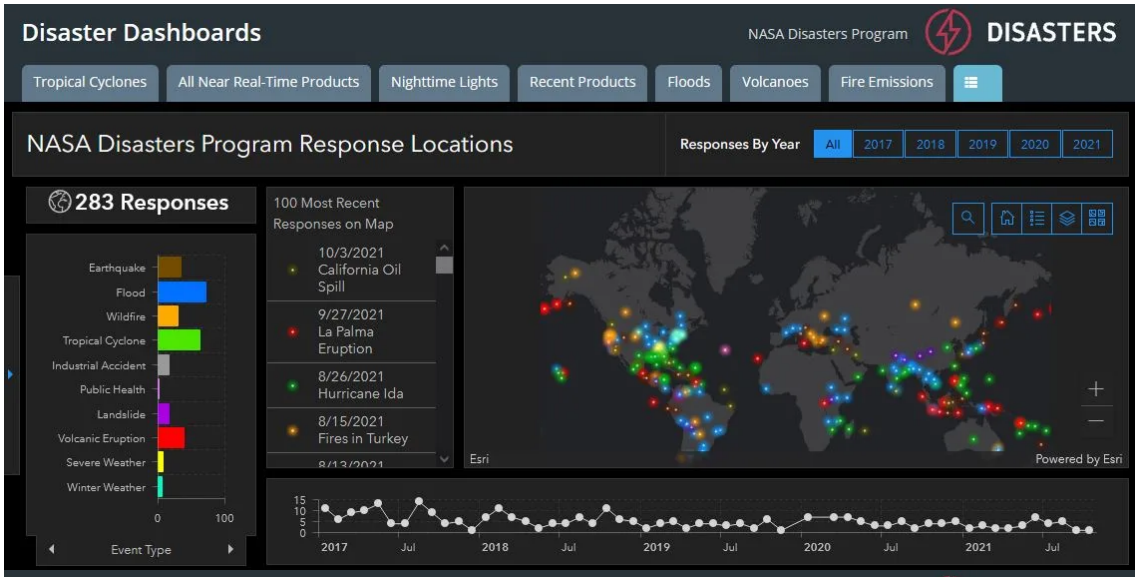
StoryMaps are created and hosted on the Portal, which showcase the data and science the Program provided for a given response effort, and highlights ways that the data and science can be used by end users.

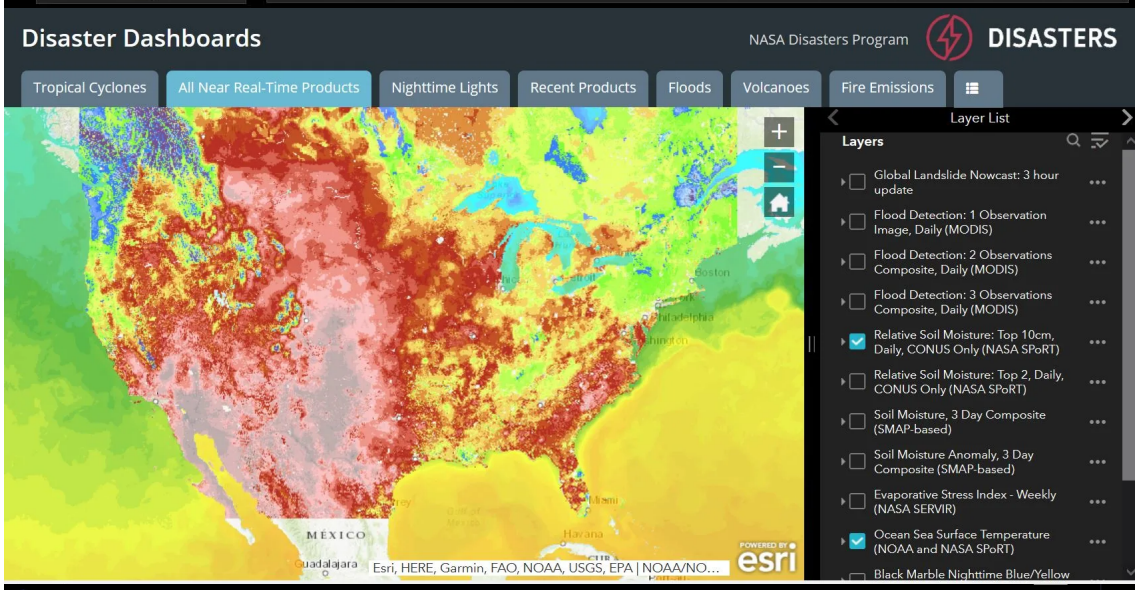


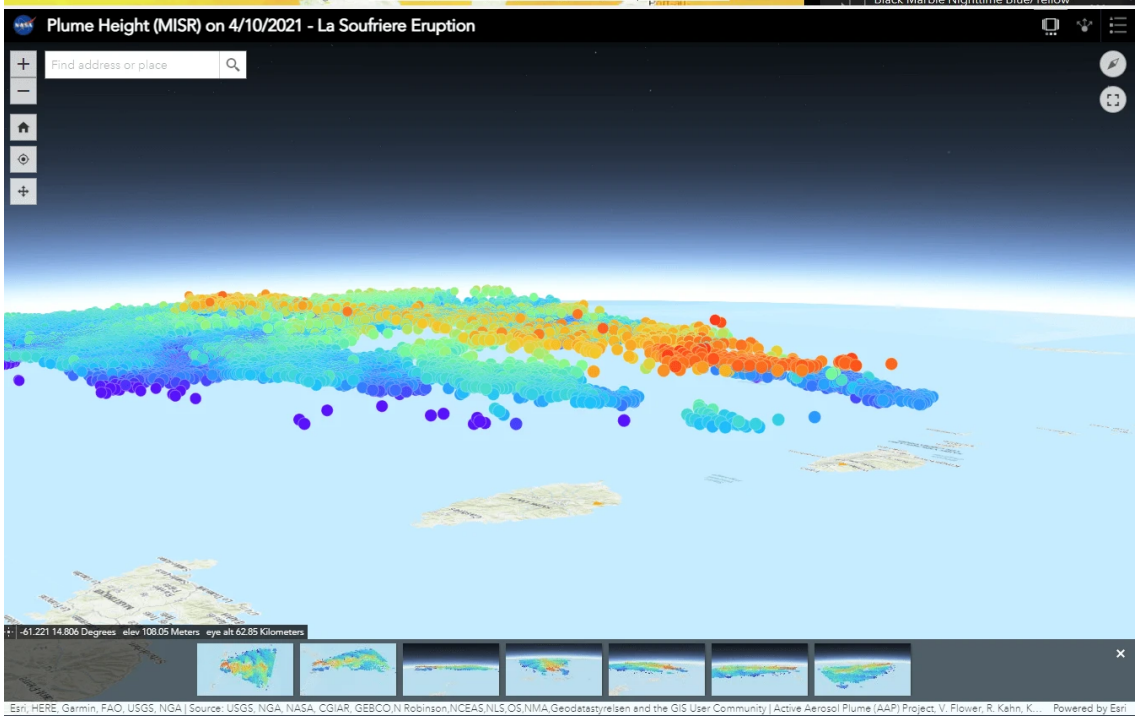
Hurricanes Eta & Iota StoryMap

For more advanced users, GeoTIFFs and shapefiles are available for download, so users can bring the data into their own GIS for analysis. GIS services are also published as Esri REST endpoints and WMS endpoints, to ensure data access for GIS users using commercial or open source GIS software.

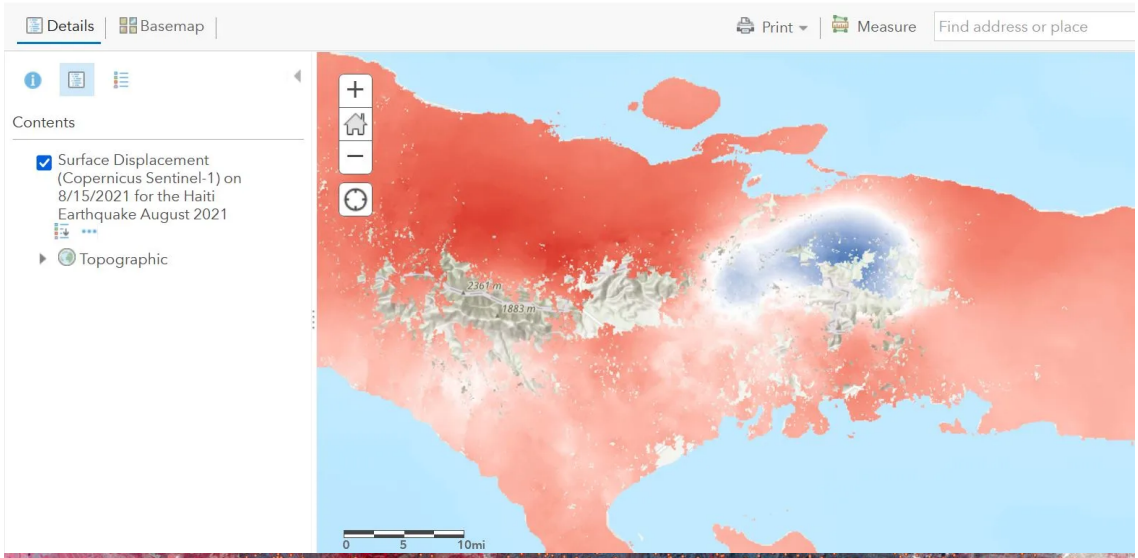
The Portal utilizes Map Services for visualization of large amounts of EO data, and Image Services to allow for analysis-ready GIS services.

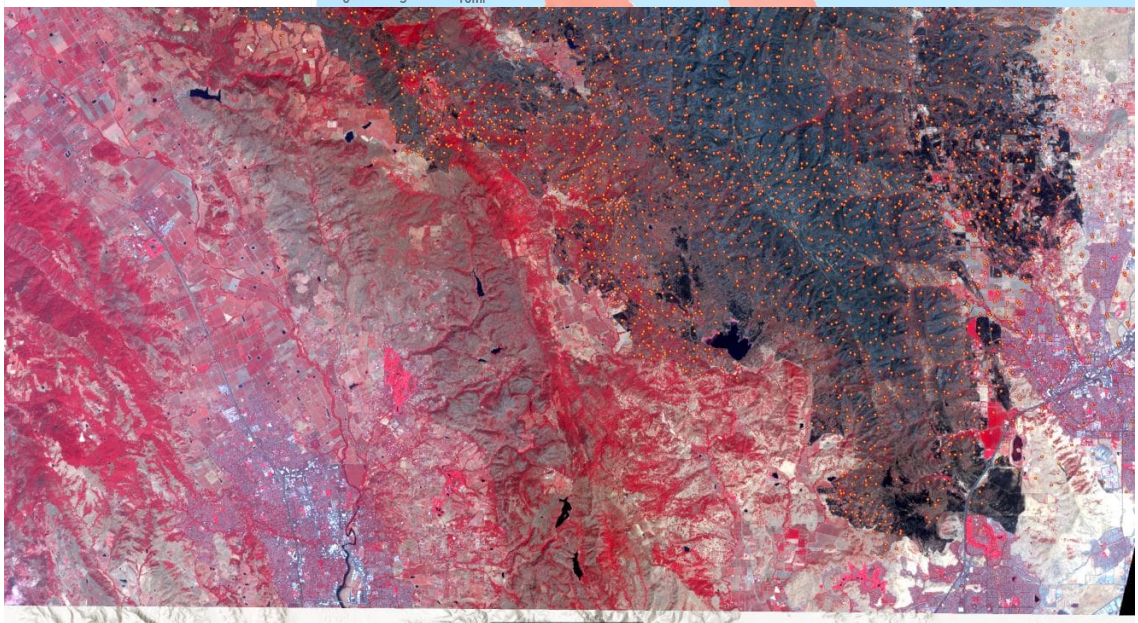

Disaster Dashboards
NASA Disasters Program
DISASTERS
Tropical Cyclones
All Near Real-Time Products
Nighttime Lights
Recent Products
Floods
Volcanoes
Fire Emissions
NASA Disasters Program Response Locations
Responses By Year
All
2017
2018
2019
2020
2021
283 Responses
Earthquake
Flood
Wildfire
Tropical Cyclone
Industrial Accident
Public Health
Landslide
Volcanic Eruption
Severe Weather
Winter Weather
0
100
Event Type
100 Most Recent Responses on Map
10/3/2021 California Oil Spill
9/27/2021 La Palma Eruption
8/26/2021 Hurricane Ida
8/15/2021 Fires in Turkey
Esri
Powered by Esri
15
10
5
0
2017
Jul
2018
Jul
2019
Jul
2020
Jul
2021
Jul

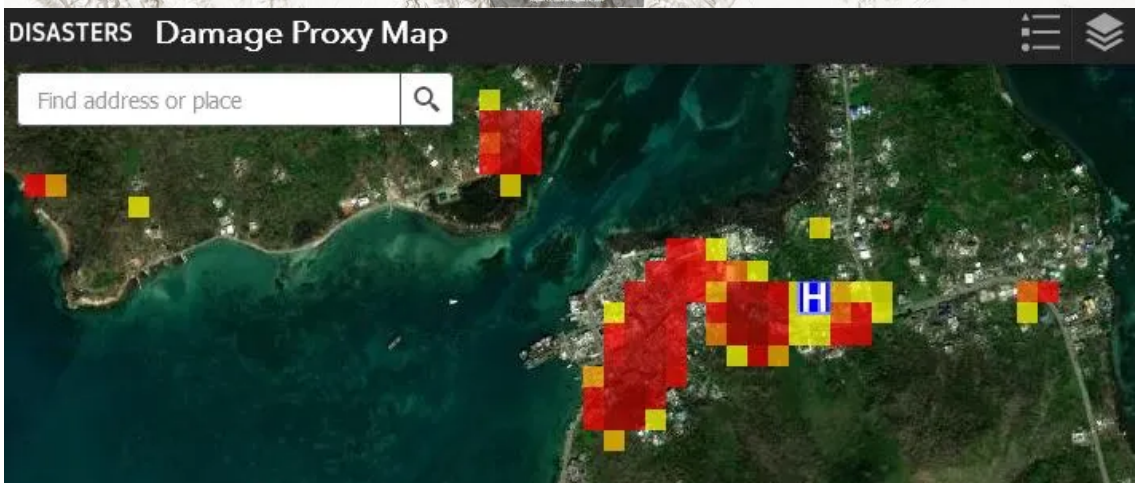

Disaster Dashboards
NASA Disasters Program
DISASTERS
Tropical Cyclones
All Near Real-Time Products
Nighttime Lights
Recent Products
Floods
Volcanoes
Fire Emissions
Layer List
Layers
Global Landslide Nowcast: 3 hour update
Flood Detection: 1 Observation Image, Daily (MODIS)
Flood Detection: 2 Observations Composite, Daily (MODIS)
Flood Detection: 3 Observations Composite, Daily (MODIS)
Relative Soil Moisture: Top 10cm, Daily, CONUS Only (NASA SPoRT)
Relative Soil Moisture: Top 2, Daily, CONUS Only (NASA SPoRT)
Soil Moisture, 3 Day Composite (SMAP-based)
Soil Moisture Anomaly, 3 Day Composite (SMAP-based)
Evaporative Stress Index - Weekly (NASA SERVIR)
Ocean Sea Surface Temperature (NOAA and NASA SPoRT)
Black Marble Nighttime Blue/Yellow
MÉXICO
Esri, HERE, Garmin, FAO, NOAA, USGS, EPA | NOAA/NO...
esri

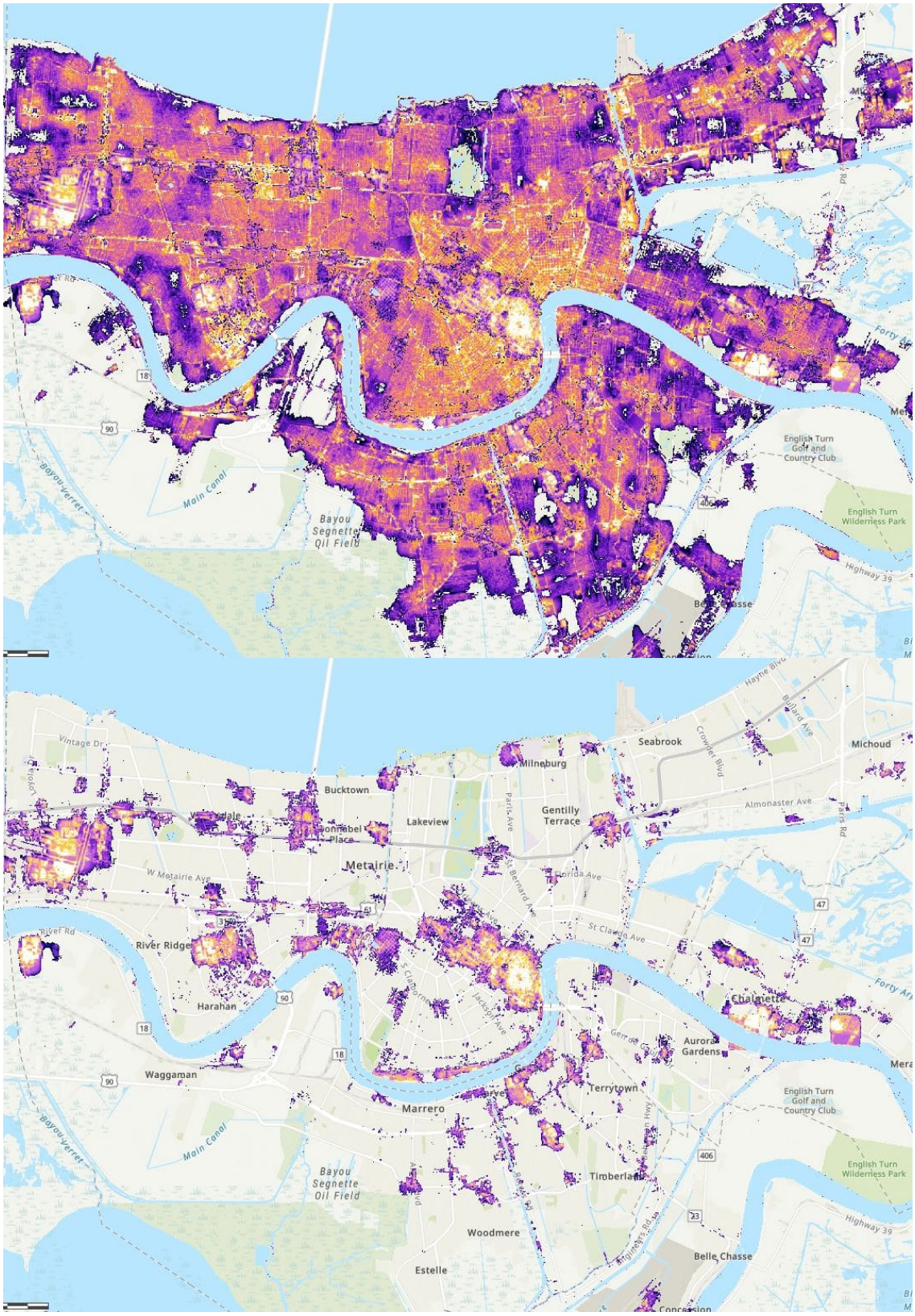

Plume Height (MISR) on 4/10/2021 - La Soufriere Eruption
Find address or place
-61.221 14.806 Degrees elev 108.05 Meters eye alt 62.85 Kilometers
Esri, HERE, Garmin, FAO, USGS, NGA | Source: USGS, NGA, NASA, CGIAR, GEBCO,N Robinson,NCEAS,NLS,OS,NMA,Geodatastyrelsen and the GIS User Community | Active Aerosol Plume (AAP) Project, V. Flower, R. Kahn, K...
Powered by Esri

Home Surface Displacement (Copernicus Sentinel-1) on 8/15/2021 for the Haiti Earthquake August 2021








Bayou Segnette Oil Field
Main Canol
Bayou Verret
English Turn Golf and Country Club
English Turn Wilderness Park
Highway 39
Seabrook
Michoud
Milneburg
Bucktown
Lakeview
Gentilly Terrace
Metairie
River Ridge
Harahan
Waggaman
Marrero
Terrytown
Aurora Gardens
Timberlane
Woodmere
Estelle
Belle Chasse
Concession


Black Lake
Hackberry
Sweet Lake
Lacassine National Wildlife Refuge
Wild Cow Lake
Browns Lake
Sweet Lake
Gibbstown
Lake Misere
Grand Lake
27
Sabine National Wildlife Refuge
Creole
Mud Lake
Cameron
27
Oak Grove
82
Upper Mud Lake
Holly Beach
Grand Chenier
82
North Island
Black Lake
Waterway
Sweet Lake
Hackberry
Lacassine National Wildlife Refuge
Wild Cow Lake
Browns Lake
Sweet Lake
Gibbstown
Lake Misere
Grand Lake
27
Sabine National Wildlife Refuge
Creole
Mud Lake
Cameron
27
Oak Grove
82
Upper Mud Lake
Holly Beach
Grand Chenier
82
North Island

LINKS & CONTACT INFO

For Questions related to the Disasters Mapping Portal, email us at:

hq-disasters-gis@mail.nasa.gov

Visit the Disasters Mapping Portal:

For Questions related to the Disasters Program, email us at:

hq-disasters-em@mail.nasa.gov

Visit the Disasters Program Website:

ABSTRACT

The NASA Earth Science Applied Sciences Disasters Program promotes the use of Earth Observations (EO) to inform disaster risk reduction and resilience throughout the disaster cycle, from local to global scales, by harnessing NASA science and technology capabilities, through engagement with end users to demonstrate the value and impact of EO to support decision-making, and by supporting end users in their use of EO in decision-making while developing relationships to grow as a trusted source of relevant science and useful results. Through the NASA Earth Science Applied Sciences Disasters Program Mapping Portal, an Esri-backed hub of geospatially enabled disaster products, event-based and near-real-time products are hosted to provide end users with analysis-ready data and data services, keeping in mind their expressed EO needs. In this presentation, case studies of past events will be highlighted, showcasing how EO data and services were provided by the Program and utilized by end users during the disaster cycle. Additionally, this presentation will highlight some of the Program's ongoing collaboration activities to assist end users in understanding and preparing for utilization of EO data from the Mapping Portal to inform their decision-making throughout the disaster cycle. Ongoing efforts to advance the science provided by the Program on the Mapping Portal through new developments and capabilities will be highlighted, and common challenges and data needs end users often encounter when using EO data and our Program's innovative solutions to these challenges will be addressed. Furthermore, this presentation will touch on the challenges faced and the solutions created by the Mapping Portal team in managing and hosting a plethora of EO data for end users across various disciplines.