



National Aeronautics and
Space Administration

NASA earth

NASA Earth Action Disasters Program Team
LANCE User Working Group Meeting
10 June 2024
Lori Schultz

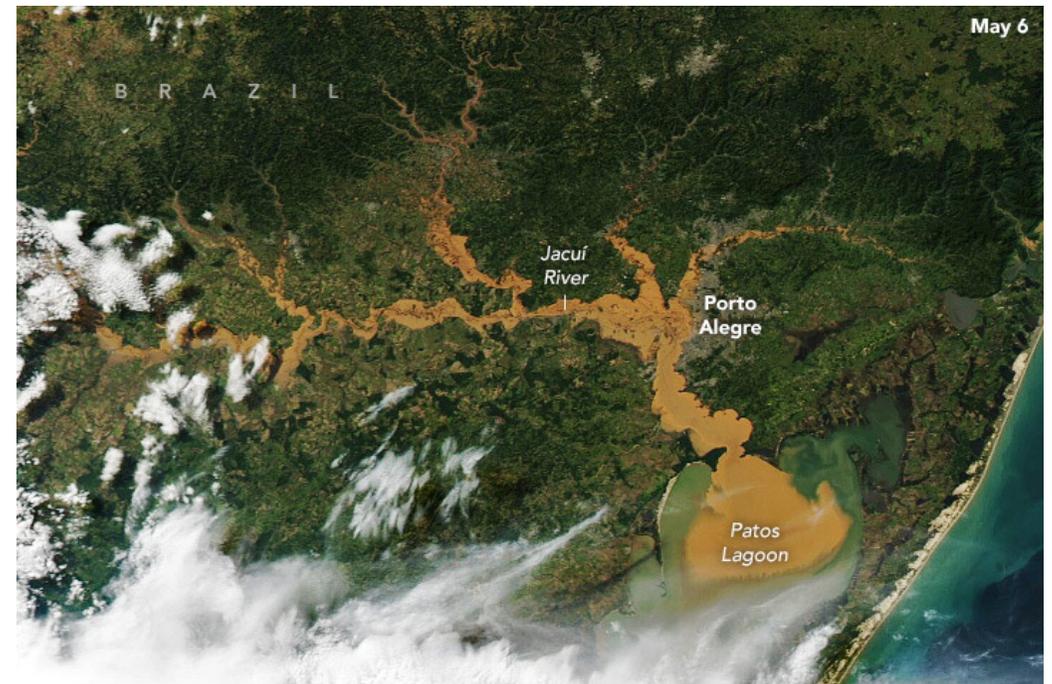


Activations



Southern Brazil Flooding April / May 2024

- Atmospheric river-type conditions drove extreme rainfall across Southern Brazil and northern Uruguay beginning in late April.
- Worst floods in 80 years killed >170, displaced >580,000, and caused billions in damages.
- DRCS team received requests from partners for imagery, data and analysis. This included US SOUTHCOM, Space Force, State of Rio Grande do Sul, and World Central Kitchen.
- DRCS coordinated a NASA-wide response effort to leverage data and assets to inform stakeholders decisions.



Earth Observatory Imagery of pre/post event for Porto Alegre, Rio Grande do Sul, Brazil. Credit: EO

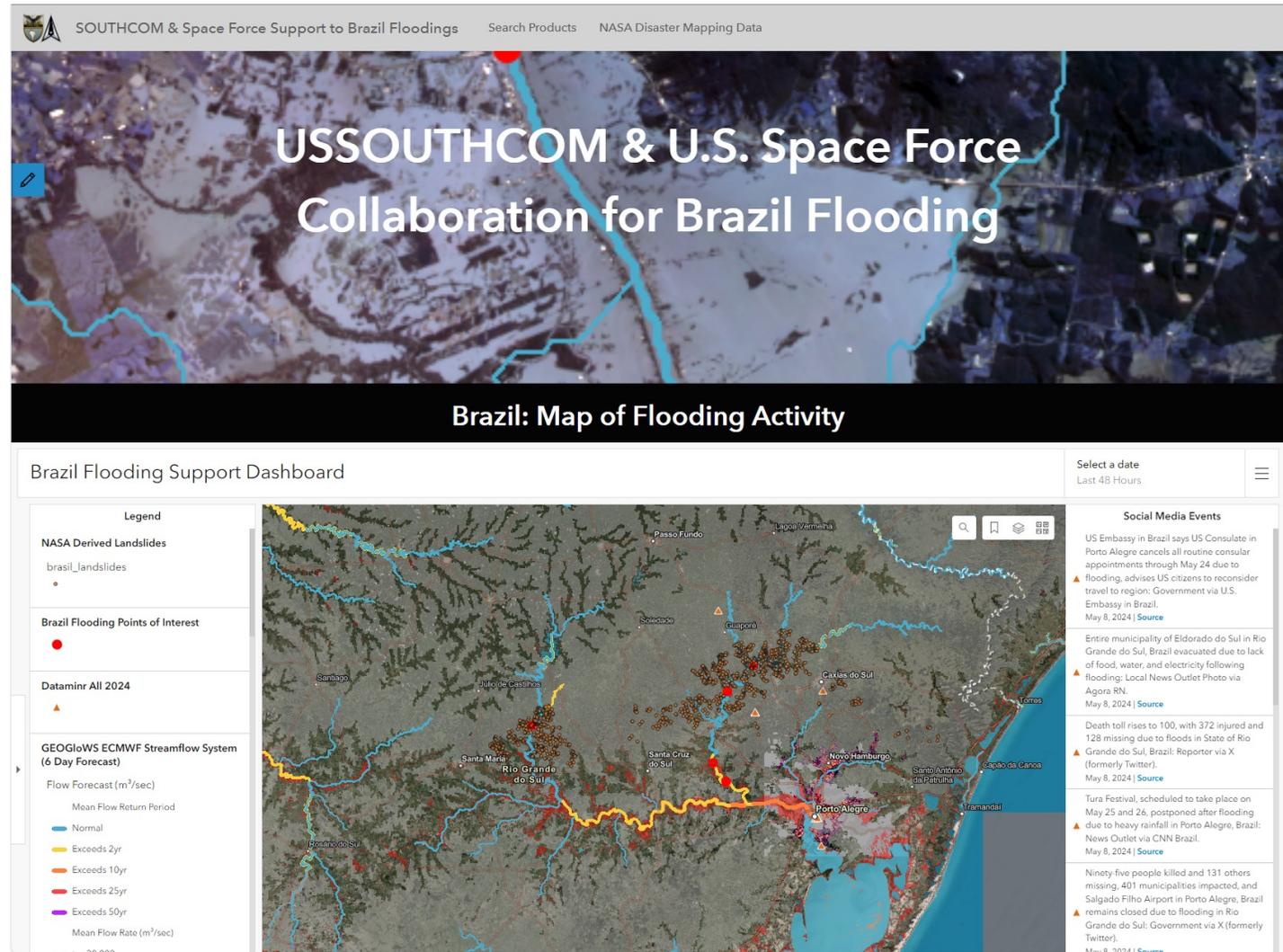


SOUTHCOM Connections

- **US Space Force / SOUTHCOM** incorporated NASA data into live *Enhanced Domain Awareness* platform (EDA) for both Brazil and Uruguay.
- In-region this allows additional partners to access data directly such as State Dept Embassy staff in Uruguay & Brazil.

Operational use of NASA data by SOUTHCOM relied upon NRT or low latency datasets:

“Received through collaboration, much appreciated. We added a tab for all your products if Brazilians wanted to get it themselves but also incorporated and working on improving the main map.”

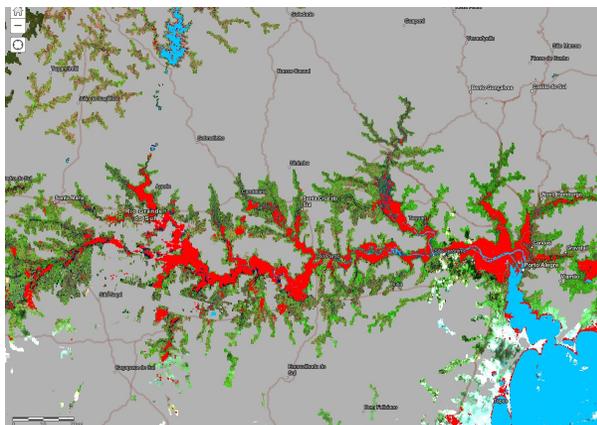
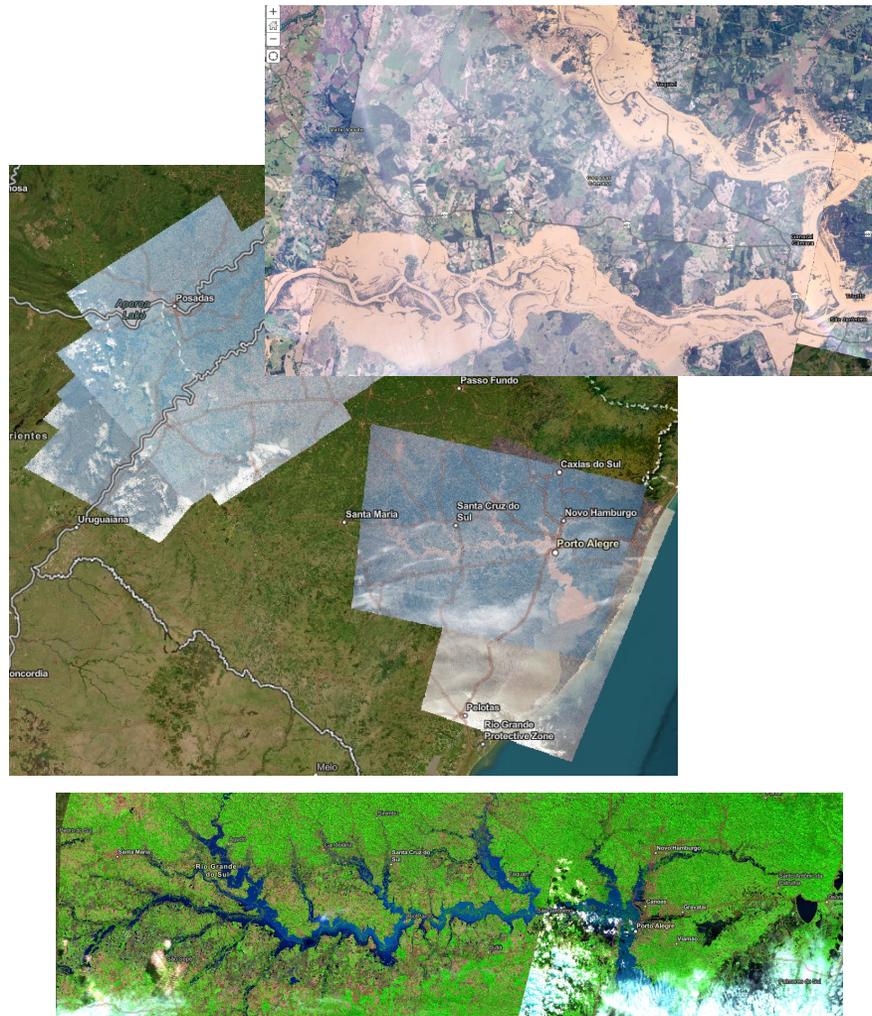


SOUTHCOM Enhanced Domain Awareness platform for Brazil. EDA is a shared system allowing for a single common operating picture and is built with SOUTHCOM's regional country partners. Above is the event page showing NRT data from GEOGLOWS streamflow forecast, Landslide location data from NASA DRCS, and MODIS NRT flood data.



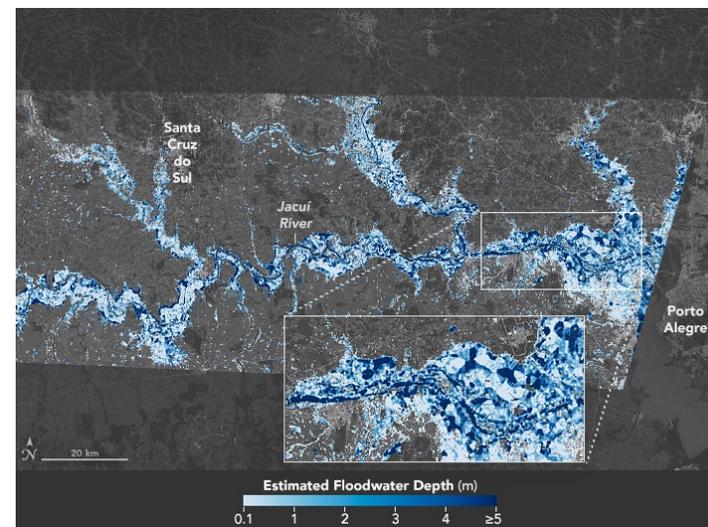
Flood extent mapping & analysis

Sentinel 2 (middle bottom) and CSDA-derived PlanetScope high-res imagery (middle upper) were processed concurrently as they became available. ISS crew observations (middle) were also acquired in response to International Disasters Charter Activation at same time and made available as collected.



MODIS NRT 1-day flood product, operationally delivered at LANCE daily through GIBBS ArcGIS service

Multiple flood datasets produced and delivered provide mutually supportive analysis from across NASA



SNWG-funded OPERA flood extent and depth analysis for the region with city of Porto Alegre in the inset.



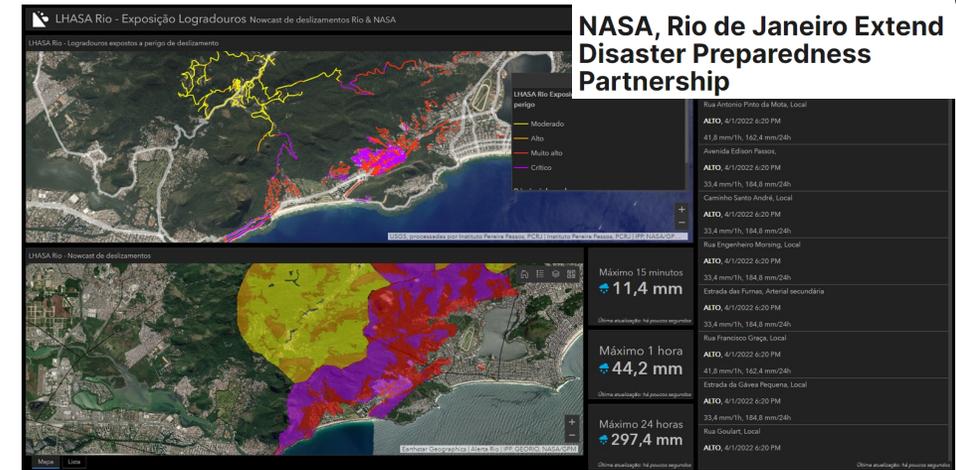
Time after event activation



Landslide Mapping

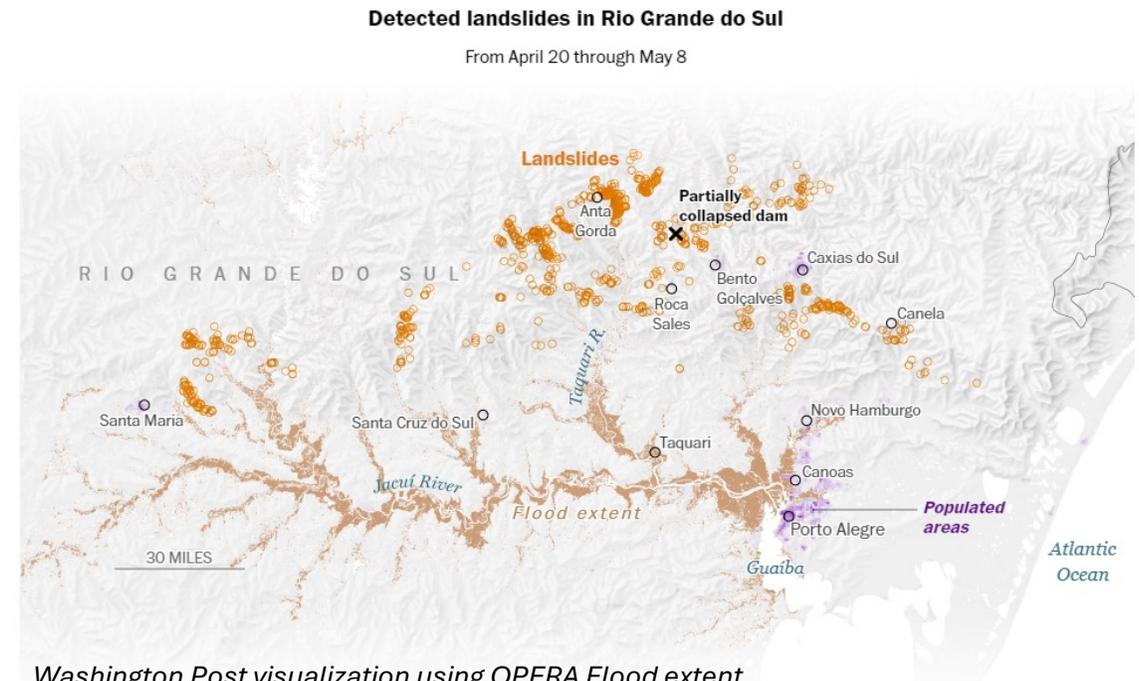
- Rainfall triggered landslides are a critical hazard across Southern Brazil. Since 2015, NASA has worked with the city government of Rio de Janeiro to inform landslide preparedness activities.
- Existing connections via Rio enabled regional connections with those impacted in Rio Grande do Sul this May.
- **DRCS team members mapped ~4000 landslides** in the days following the rainfall **using CSDA data**, a unique analysis covering the entire AOI that informed emergency response.
- Washington Post used data from the Disasters Portal to visualize the extent of landslide impacts.

Rio de Janeiro uses NASA models developed at GSFC to inform road exposure planning and community impacts in their emergency planning division.



NASA, Rio de Janeiro Extend Disaster Preparedness Partnership

The Washington Post
Democracy Dies in Darkness



Washington Post visualization using OPERA Flood extent data and GSFC / DRCS landslide mapping locations



Houston Extreme Heat Event - May 2024

Severe weather resulting in a Derecho moved through the southeast from the 16-17th of May, generating damaging straight-line winds, producing wind gusts up to 100 mph. It is notable that these regions had just experienced damaging flooding. Areas in and around Houston experienced damage to buildings and power transmission lines resulting in over 1M power outages. The following days when power was slow to return to the area, [extreme heat was forecasted](#), putting residents at risk for heat injury while repairs were slowly being made to the power infrastructure in the region.



SPC's Day 1 convective outlook for May 16, 2024, issued at 2000Z, indicating an enhanced risk for severe weather from southeast Texas into southwest Louisiana.

Severe Weather – Texas/Louisiana

Situation: The severe storm system traversed southeast Texas and southwest Louisiana causing straight-line wind damage, primarily in the Houston metro area. Wind speeds reaching up to 78 mph affected numerous downtown skyscrapers, shattering windows, and caused a crane to collapse. Damage to power lines resulted in widespread power outages peaking over 1M and is currently trending downward. Additional reports from the Storm Prediction Center included a combined total of two tornado reports resulting in multiple trees and power poles down. Reports also show wind gust and hail reports across Texas and Louisiana resulting in damage to several homes and businesses. There have been no requests for FEMA assistance. (Region VI DSAR, as of 1:42 p.m. ET, May 17)

Lifelines Impacts:

Safety and Security:

- TX:
 - Damage to skyscraper windows; numerous trees and transmission/power lines down
 - Minor damage reported to homes
 - Houston school district closed all public schools on Friday
- LA: Minor damage reported (downed trees/power lines)

Food, Hydration, and Shelter: (ARC Shelter Report, as of 6:00 a.m. ET, May 18)

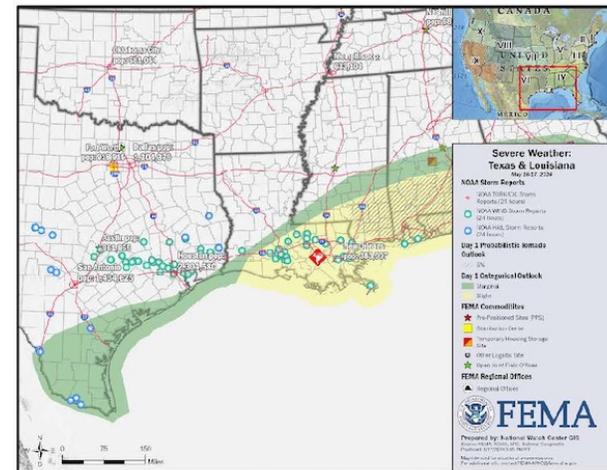
- TX: 6 (+1) shelters open / 132 (+7) occupants

Health and Medical:

- TX: 7 fatalities; 4 confirmed / 3 unconfirmed
- 4 area medical treatment centers operating on emergency power; discussing deployment of patients to another facility
- LA: 2 hospitals and 1 nursing home remain on generator power

Water Systems:

- TX: 6 water systems are on boil water notices; with 2 of these systems currently completely inoperable
- LA: 10 boil water advisories in place across 6 Parishes affecting 540 customers



Energy: (EAGLE1, as of 8:00 a.m. ET, May 18)

- TX: 515k (-291k) Statewide
 - Harris Co.: 282k (-140k)
 - Austin Co.: 76k (-31k)
 - Waller Co.: 66k (-33k)
- LA: 21k (-145k) Statewide
 - Beaugard Parish: 2k
 - Jefferson Parish: 2k

Communication:

- Numerous Telecom nodes are currently running on backup electrical power

Transportation:

- Ground stops were issued and lifted at Bush Intercontinental Airport and William P. Hobby Airport

State / Local Response:

- Region VI:
 - TX EOC: Partial Activation (Severe Weather)
 - OK EOC: Monitoring (Severe Weather/Wildfires)

Federal / FEMA Response:

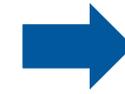
- Region VI:
 - RWC at Monitoring; RRCC is rostered
 - R-IMAT 1 remains deployed to OK
 - R-IMAT 2 deployed (Texas Dept. of Emergency Management; TDEM)

HQ:

- The NWC continues to monitor in coordination with FEMA Regions VI and VII; with continued reporting twice daily in the FEMA National Situation Report (5:00 p.m. ET / 3:00 a.m. ET) and the FEMA Daily Operations Briefing (8:30 a.m. ET)

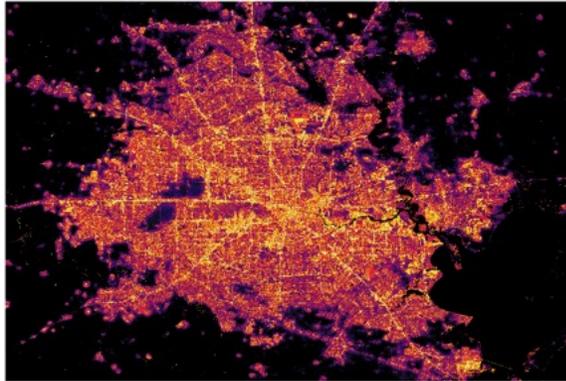


FEMA Response Geospatial Office reached out to ask for support to assess the regions suffering from power outages at the census tract level, possibly coinciding with areas that have more special needs.

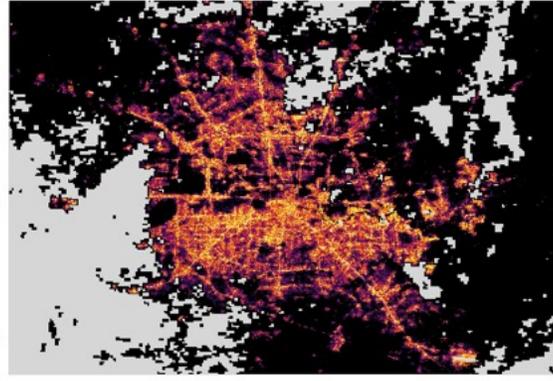


To enable FEMA leadership to find ways to deliver assistance to the most at risk

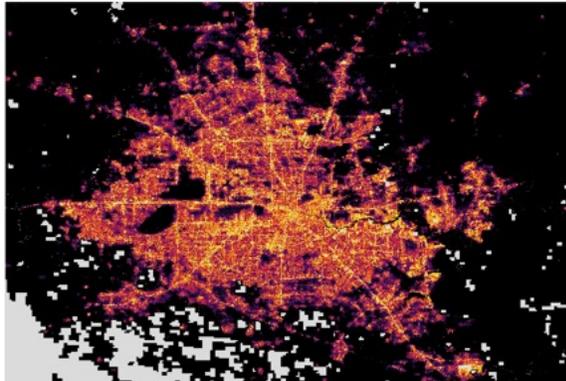
April 2024



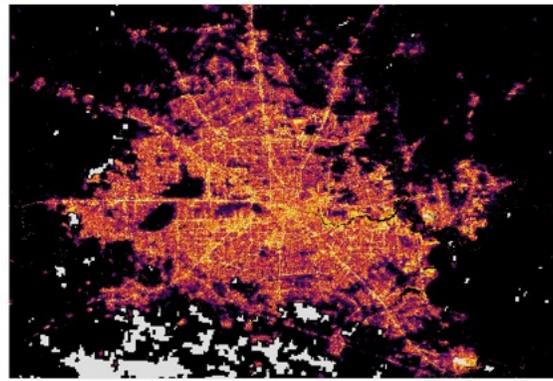
May 18, 2024



May 19, 2024



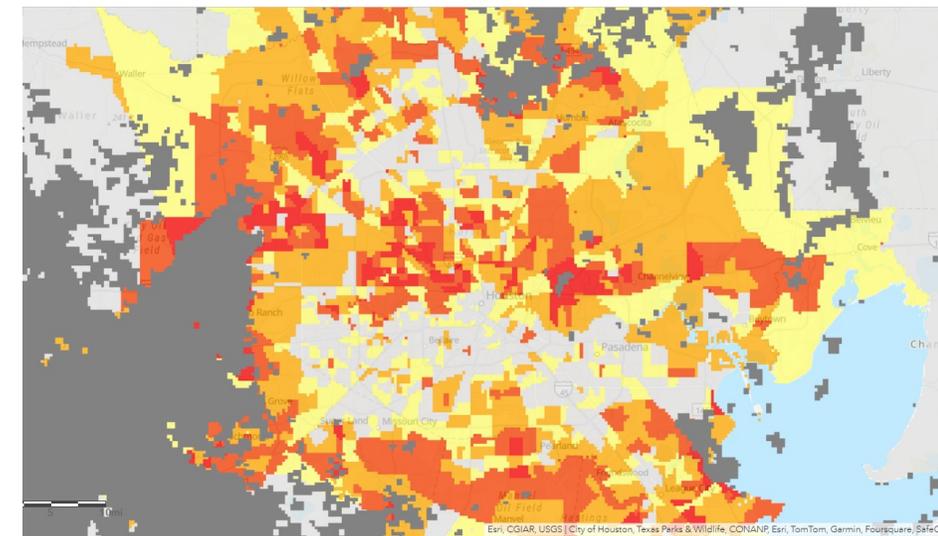
May 20, 2024



Black Marble HD Imagery of pre/post event Houston, TX. Credit: GSFC

NASA's Black Marble team had already produced their high-definition product over the city and surrounding areas to support a request from [Earth Observatory](#).

The Disaster Program staff leveraged the Black Marble imagery and intersected it with Census tract data and social vulnerability information to better assess where power outage levels were higher *AND* examined how the power outage levels may be exacerbated by highly socially vulnerable areas as calculated from FEMA's National Risk Index (NRI) data.



Polygon map of census tracts with SVI assessment of areas where vulnerable populations experienced sustained power loss on May 18th.



- A similar analysis using the Health and Human Service’s [emPOWER Program](#) was also generated. This toolset assesses populations (by ZIP Code) that rely on electrically dependent durable medical and assistive equipment/services in their daily lives.
 - When integrated with qualitative power loss maps derived from the Black Marble data, the map highlights ZIP Codes where these populations most affected by the power outages are located (Figure 2).
- Additional feedback from the RGO resulted in a series of daily pre/post change maps, that showed the daily difference from pre/post event imagery (Figure 3).
 - Potentially useful in assessing recovery by area at high resolution
 - Provides an independent assessment of potential power outages over a region that can be compared with proprietary outage information which can have gaps, depending on the region.

Lessons Learned:

- First NASA Disaster activation for the extreme heat hazard.
- First integration of socio-economic risk information and EO data to provide timely support to FEMA’s disaster assistance delivery decision-making.
- First integration of public health data with EO data to highlight populations of increased risk.
- Continued iterations with FEMA on this type of analysis will allow the program to streamline required workflows and deliver timely results that can more easily be integrated into the decisions being made. *This effort will continue as both teams prepare for the upcoming hurricane season.*

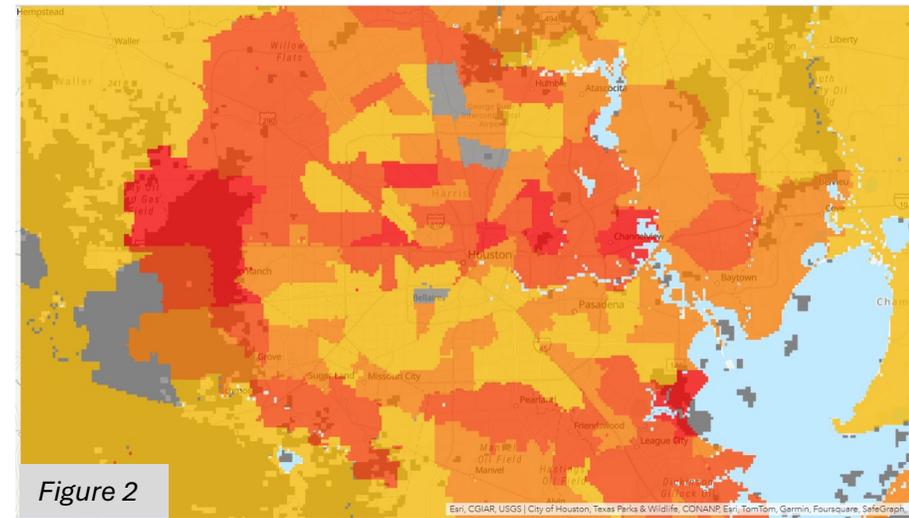


Figure 2

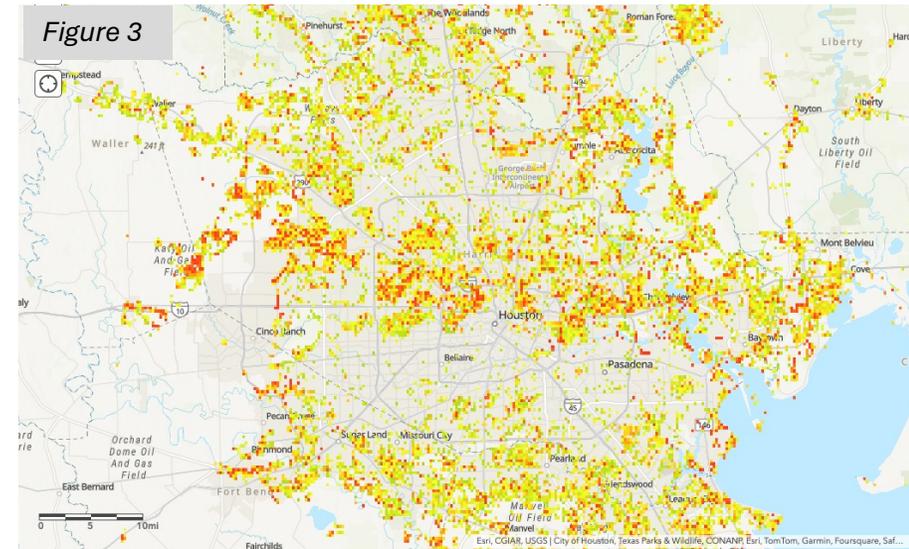


Figure 3

Figure 2: Black marble daily power loss information from May 18th intersected with the emPOWER data layer

Figure 3: Black marble difference map showing the change from the April baseline and the loss of light as seen on May 18th



Summary of Products Used

- MODIS Flood Product
- MODIS/VIIRS RGBs
- VIIRS Day Night Band – Blue Yellow and with help from the team, the Black Marble HD
- Landsat 8/9, Sentinel 2, Sentinel 1, Opera DSWE, CSDA
- Near Real Time needs → Analysis Needs

- Other Asks: More information on NRT Fire products



Upcoming Events



Upcoming Events

Launch of the Disaster Response Coordination System (DRCS)

- 13 June 2024 – Event in the Webb Auditorium at HQ 1300-1430

Center Response Coordinators Training – 12-13 June 2024

- Opportunities for the members of the DRCS to get familiar with the data used across the program, share best practices, etc.

