

Applying Satellite Data to Support Disaster Response and Emergency Management Decision Making



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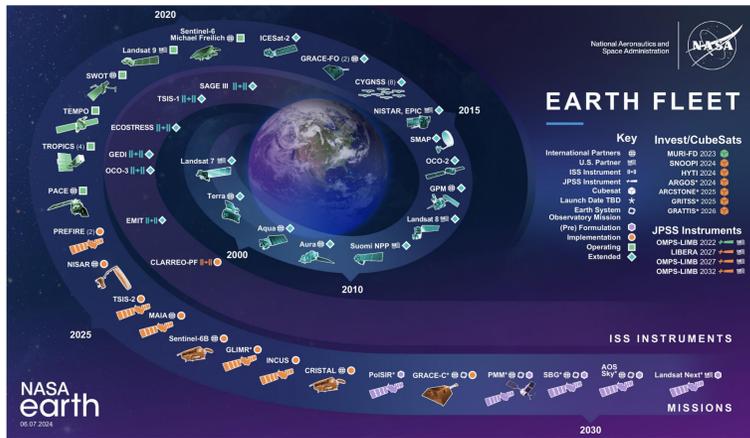
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ABSTRACT

Using the vantage point of space, satellite observations provide information about the Earth that can serve a critical role in building situational awareness and filling in data gaps during disaster response. NASA's Earth Science Division (ESD) studies the Earth as a system and develops technologies to improve the quality of life here on our home planet. Within NASA ESD, the Disasters Program and its Disasters Response Coordination System (DRCS) aims to advance Earth science data and information to support management decisions that prevent or mitigate the impacts of disasters. Using a whole-of-NASA approach to coordinate and mobilize the Agency's assets and expertise to provide geospatial information during disasters, this work brings the utility of Earth observation information to emergency management and disaster response and reduces the impacts of disasters on lives and livelihoods. This poster will introduce the utility of satellite and geospatial information to disaster response through examples of recent DRCS incident response activations and highlight the DRCS model that employs a user-centered activation framework beginning with direct requests from responders and ending with after-action assessments that feed lessons learned and process improvements.

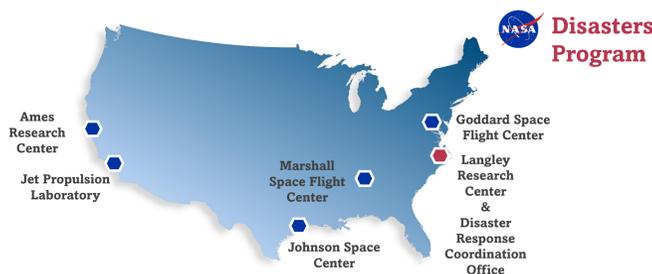
NASA EARTH SCIENCE

NASA's Earth Science Division missions help us to understand our planet's interconnected systems, from a global scale down to minute processes. ESD delivers the technology, expertise, global observations, and applications that help us map the myriad connections between our planet's vital processes and the effects of ongoing natural and human-caused changes.



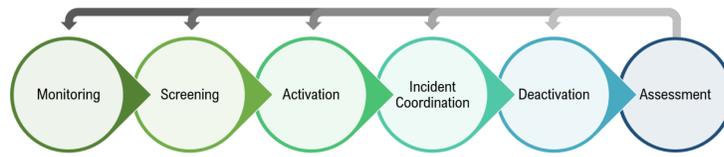
DISASTERS RESPONSE COORDINATION SYSTEM

The NASA Disasters Program's DRCS applies a whole-of-NASA approach that leverages Earth science, technology, and expertise to provide trusted and actionable information to organizations actively responding to disasters. The DRCS works with government agencies, NGOs and private sector partners to provide insights that inform decision making and reduce impacts on lives and livelihoods.



disasters.nasa.gov

DRCS RESPONSE CYCLE



Monitoring

The DRCS network maintains situational awareness of impending and actual disasters with potentially significant humanitarian, infrastructural, social, or economic impacts. Some natural hazards occur in remote or uninhabited areas and are unlikely to cause such impacts, but DRCS also maintains awareness of these events if information gleaned from observations may benefit research at NASA and partner agencies.

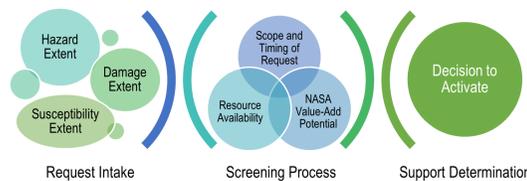
The DRCS is request driven. Requests can come from disaster response organizations in:

- State, local, Tribal, or federal government entities
- Non-profit organizations working at the national scale
- International governments
- Organizations focused on emergency management and/or disaster response.

Requests should be sent by email to DRCS@nasa.gov.

Screening

The DRCS requires a request or invitation from an organization involved in disaster response and/or emergency management to elevate from the Monitoring to the Screening step.



Activation

Once a request is made and an event meets established criteria, the DRCS assigns a team to lead collaboration and response and incident coordination begins.

Incident Coordination

Incident Coordination includes timely and organized information and data sharing, streamlined communications across DRCS and within NASA, communications with requestors and partners, data acquisition, product development (as appropriate), and handoff of data/products to requestors. Incident Coordination involves a cyclical process of receiving requests, developing products, and supporting partners.

Deactivation

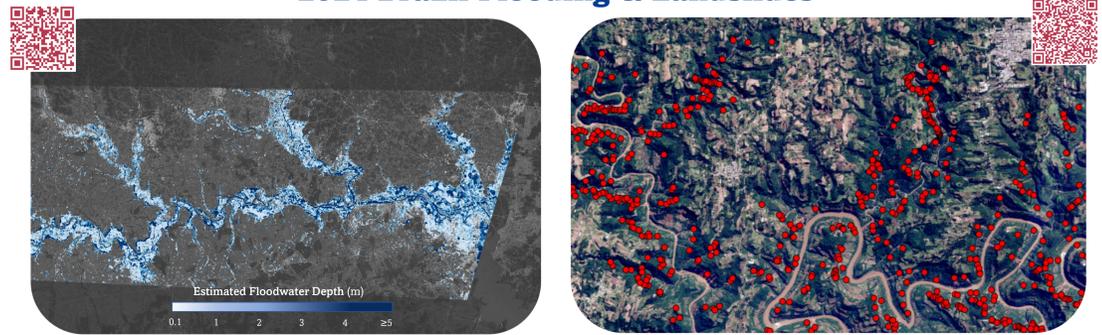
Once the request is fulfilled or there are no further products that can be provided, the DRCS makes the decision to proceed to the deactivation of the response.

Assessment

The DRCS pursues a systematized approach to monitoring, evaluation, and learning (MEL) to drive adaptation and efficacy. MEL activities include tracking of metrics and performance indicators, along with a robust after-action assessment process centered around collection of lessons learned with a review cycle to take these inputs and feed them back into the DRCS processes.

ACTIVATION EXAMPLES

2024 Brazil Flooding & Landslides



Storms and torrential rain battered southern Brazil beginning in late April 2024, causing deadly, destructive flooding that persisted through much of May. Toward the end of the month, parts of Rio Grande do Sul state remained underwater, and the scope of the damage became increasingly evident. Maps of floodwater extent are one way to assess a flooding event. But information about the depth of that water is also useful, potentially aiding rescue and relief operations, informing decisions about road closures and accessibility, and contributing to analyses of damage and flood risk.

The map on the left shows estimates of flood depth in areas west of Porto Alegre, the state's capital city, on May 6, 2024. The darkest blue areas are where floodwater that day was at least 5 meters deep. But much of the inundated floodplain is light blue, which equates to depths of between 0.1 and 1 meter (4 and 40 inches). The flood extent data for this map are from the OPERA Dynamic Surface Water Extent from Harmonized Landsat Sentinel-2 (OPERA DSWx-HLS) product, and ground topography data are from the Shuttle Radar Topography Mission (SRTM).

The image on the right landslide initiation points manually mapped by the NASA GSFC landslides team. The points were derived from PlanetScope imagery

2024 Houston Power Outages



On May 16, 2024, an especially strong and long-lasting band of storms—a derecho—charged across Central Texas and struck Houston. The storm unleashed tornadoes and destructive winds that reached 100 miles (160 kilometers) per hour. It shattered windows, tore roofs off homes, and toppled trees and power lines. Nearly one million homes and businesses in the Greater Houston area lost power, according to news reports.

Power outages were widespread enough to be noticeable in nighttime satellite images. The maps are based on data from the Visible Infrared Imaging Radiometer Suite (VIIRS) sensor on the NASA-NOAA Suomi NPP satellite. The maps come from the Black Marble HD product, provided by the NASA Black Marble science team.

For the full suite of Houston response products, visit:



DISASTERS MAPPING PORTAL

The Disasters Mapping Portal is a free and open **geographic information systems (GIS)** portal hosting a wide array of disaster products and near real-time dashboards. It serves as the primary interface for sharing maps, data, and analysis with response stakeholders.

- Standardized GIS format allows easy integration into decision-support tools.
- No login requirements
- Every product has REST and WMS endpoints
- Most services discoverable on ArcGIS Online
- Most imagery files can be downloaded
- Two types of products:
 - Event-based Products
 - Near Real-Time Products



maps.disasters.nasa.gov



disasters.nasa.gov/response

