Challenges and Opportunities in Geocuration for Disaster Response

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Challenges in Disaster Response

Response to natural disasters presents unique and specific challenges in terms of data collection, integration, management, and retention. Collectively, these include, but are not limited to:

- Rapid collection of event-relevant imagery
- Derivation and delivery of key products
- Attribution of products to a scientist or source
- Metadata for tracking data collections
- Citations of data for post-event scientific studies

Disaster events might be thought of as similar to a field campaign approach: in situ data sets are collected, in addition to standard NASA and other-agency holdings. These ad hoc data collections provide information during the event, but can also serve as resources for studies of physical processes after response is complete (Figure 1).

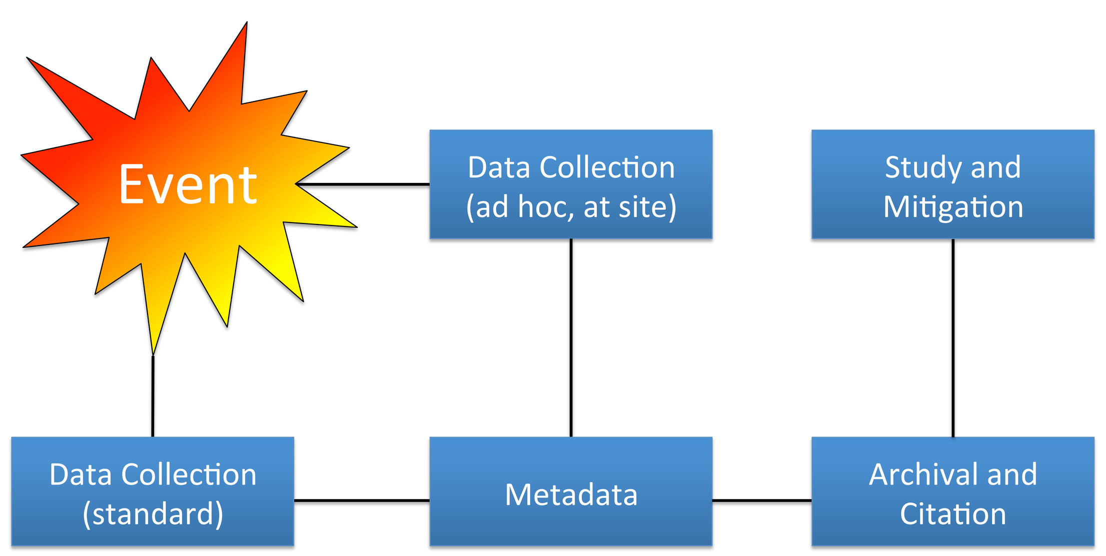

Figure 1. An overview of typical activities that occur with regard to data collection and management following a disaster event.

Preliminary Approach

To improve the management of data used and collected in response to a disaster event, we review efforts across multiple NASA Centers in response to the Nepal Earthquake and Aftershocks in April-May 2015.

These efforts included:

- Development of response-relevant data sets by various NASA Center scientists and contractors
- Sharing of data sets within a single NASA-hosted portal, along with relevant metadata
- Dissemination of data sets to end users in support of response efforts, and their feedback

Nepal Earthquakes of April and May 2015

Products were produced at multiple NASA Centers and the Jet Propulsion Lab, including, but not limited to:

- Damage, Damage Proxy, and Vulnerability Maps
- Surface Deformation Measurements and Models
- Satellite imagery to support detection of induced hazards, such as landslides and debris flows

Metadata for each product was collected, with final data sets posted in a variety of formats to a NASA web page:

- http://weather.msfc.nasa.gov/sport/disasters/gorkha/

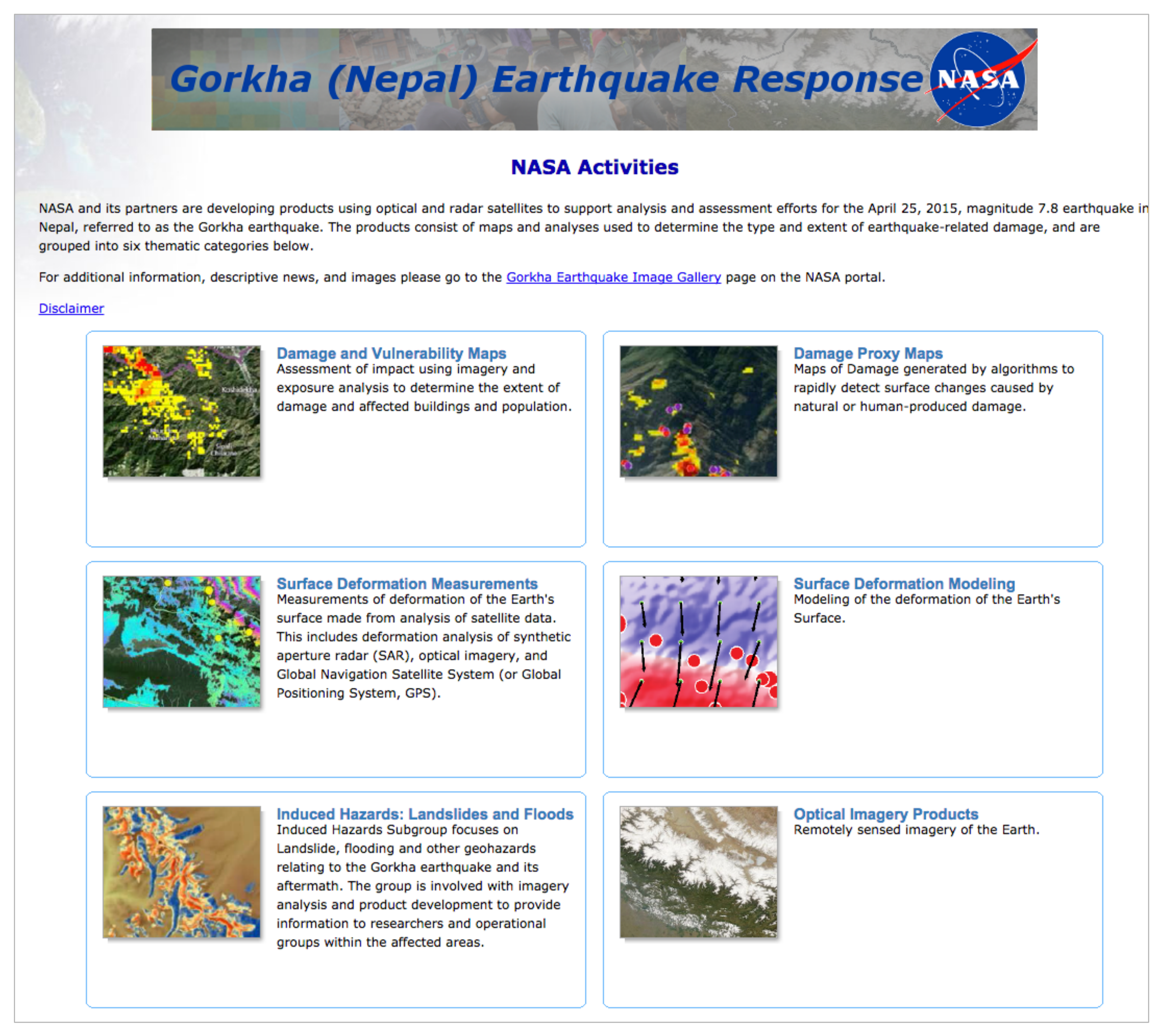

Figure 2. An example of the NASA-hosted page for products developed in response to the Nepal Earthquakes.

Evaluation of Web Portal Approach

The web-hosting solution outlined above included the following strengths and weaknesses during the support effort:

Strengths	Weaknesses
• Flexibility in type of content hosted through direct authoring of web content.	• Diverse content (KML, GeoTIFF, WMS) should be offered in a single portal.
• Staffing flexibility allowed for near real-time support of content, staff permitting.	• Significant workload for a small number of people at a single NASA Center.
• Aggregation of content among Centers provides a single point of reference for users and collaboration.	• Individual scientists must rely upon others to post content and may not be able to provide updates.

Desired Improvements and Data Management

Coordination efforts among NASA Centers in response to the Nepal Earthquakes suggested improvements to the process of collecting, managing, and sharing disaster data:

- System administration to ensure reliable access
- Flexible and functional layouts that include the display and sharing of data in common formats (e.g. WMS), data download, editing, and archival of metadata
- Options for response team colleagues to upload and manage their own contributions, including updates
- Opportunities to share data among scientists
- Publicly facing portals to communicate new results or share data with the disaster response community

The ***overall goal*** of such a portal would be to facilitate the use of NASA research and applications outcomes to support disaster response and mitigation (Figure 3).

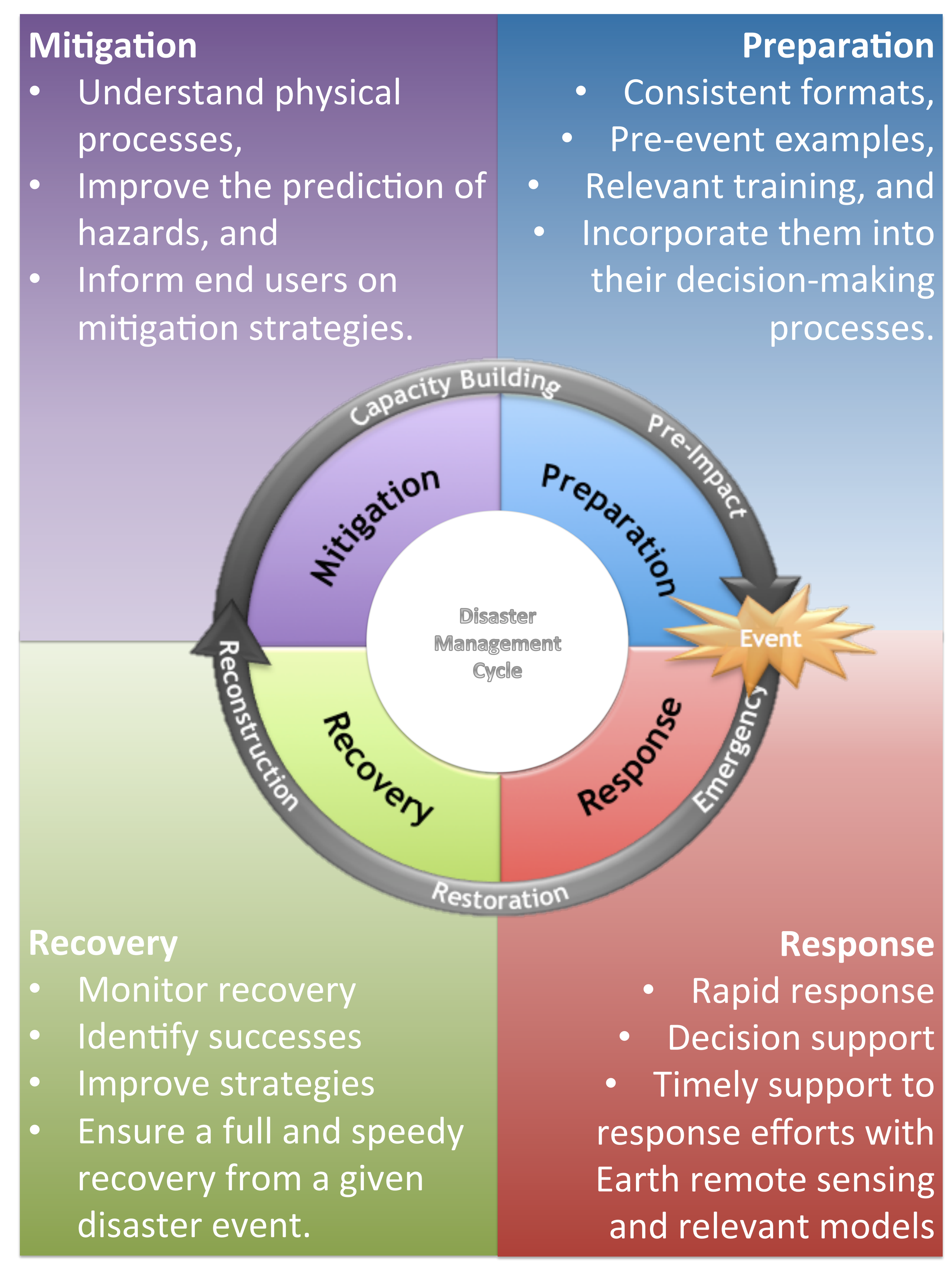

Figure 3. The proposed role of geocuration and data sharing in supporting the disaster management cycle.

Future Goals and Opportunities

Current and future NASA Earth remote sensing missions provide numerous data sets and derived products that are relevant to all aspects of the disaster management cycle.

To improve the access to and use of these products, a collaborative environment should include (Figure 4):

- Automation of relevant NASA data holdings
- Inclusion of ad hoc products from applications teams
- Facilitation of access to derived products from other-agency missions and commercial data, when available

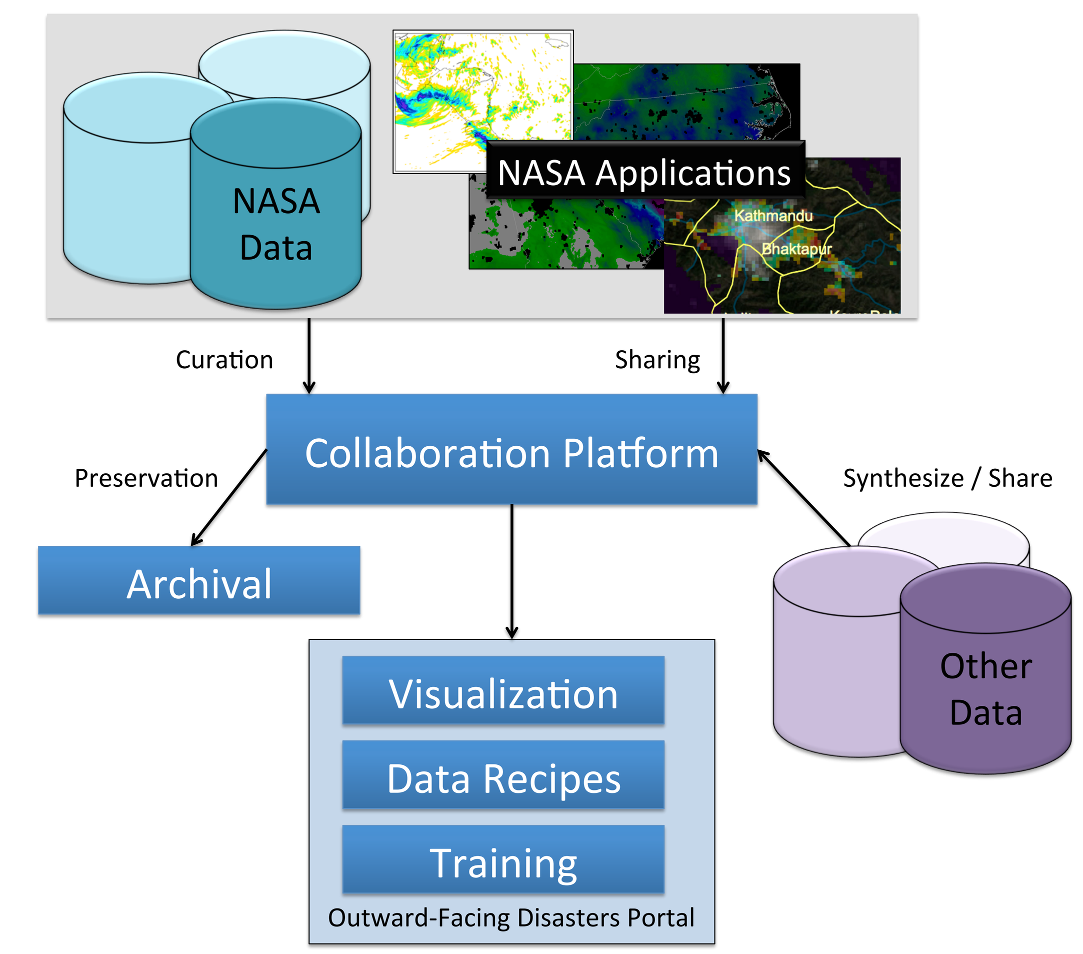

Figure 4. Idealized components of a collaborative environment and portal catering to disaster response.

Curation and Automation Techniques

Physical or virtual holdings of data among NASA DAACs can be streamlined to offer "big data" searches of key parameters relevant to a single disaster or studies of a broad category of disaster events (Figure 5).

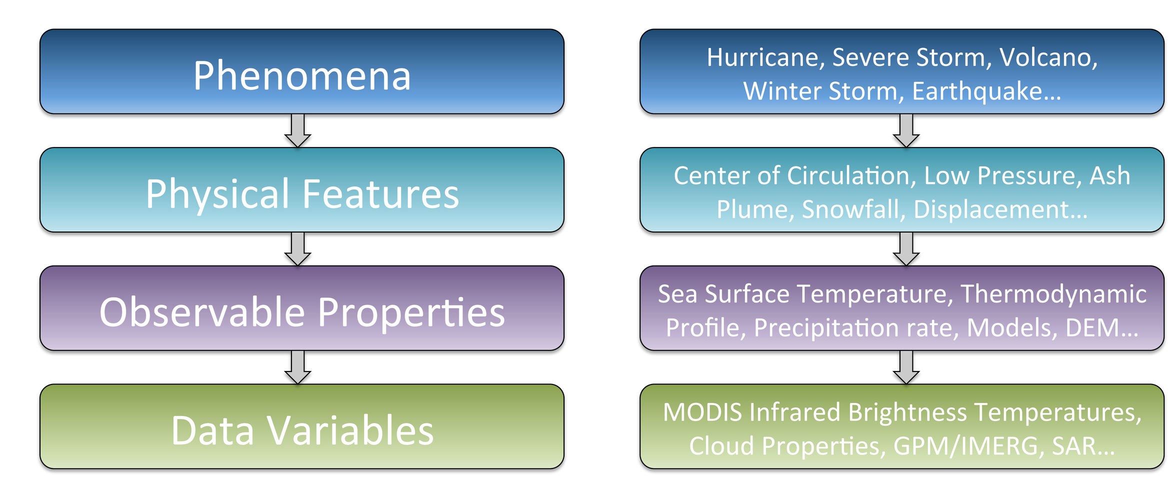

Figure 5. Proposed data curation strategy that would link specific disaster phenomena to their key physical features, observed parameters, and NASA mission data sets.