Use of NASA Near Real-Time and Archived Satellite Data to Support Disaster Assessment

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Introduction and Motivation
- NASA's Short-term Prediction Research and Transition (SPoRT) Center partners with the NWS to provide near real-time data in support of a variety of weather applications, including disasters.
- SPoRT supports NASA's Applied Sciences Program: Disasters focus area by developing techniques that will aid the disaster monitoring, response, and assessment communities.
- SPoRT has explored a variety of techniques for utilizing archived and near-real-time NASA satellite data.
- An increasing number of end-users – such as the NWS Damage Assessment Toolkit (DAT) – access geospatial data via a Web Mapping Service (WMS).
- SPoRT has begun developing open-standard Geographic Information Systems (GIS) data sets via WMS to respond to end-user needs.

Data
- SPoRT has investigated the use of a variety of NASA, NOAA, and commercial satellite resources.
- LANCE (Land Atmosphere Near-Real-time Capability for Eos) provides MODIS data.
- Collaborating with the USGS to request data collection and data access via Earth Explorer and the Hazards Data Distribution System (HDDS), including ASTER.
- VIIRS data from SNPP have been useful, particularly the day-night band for identifying power outages.
- High-resolution imagery from the recently available International Space Station SERVIR Environmental Research and Visualization System instrument (JSERV).
- The USGS Web-Enabled Landsat Data (WELD) Project provides 30-meter composites of Landsat 7 imagery at weekly, monthly, seasonal, and annual periods. These are used to compare pre- and post-disaster conditions and are more useful than single-pass imagery, which may suffer from cloud contamination.
- A summary of the NASA data sets explored to date is shown in Table 1.

Severe Weather Applications: April 27, 2011
Sixty-two tornadoes occurred in AL that affected over 1% of the landmass. Examples of tornado damage track detection from various sensors are shown in the figures below. These were used extensively by the Huntsville WFO to guide their storm assessment teams.

Severe Weather Applications: May 20, 2013
Analysis of the Moore, OK EF-5 tornado was incorporated into the NWS DAT and supported the damage survey process.

Data Dissemination Strategy: WMS
SPoRT began developing a WMS during the summer of 2013 based on GeoServer.

Benefits:
- Flexibility: less labor-intensive solution
- Expedientious delivery (no delays associated with pre-tiling)

Issues:
- Delays associated with re-projecting
- Performance requirements can be less predictable

Integration into the NWS Damage Assessment Toolkit
- The NWS DAT is a GIS-based iOS/Android app to better organize storm damage surveys.
- Allows users to log location and intensity of damage
- SPoRT examined the feasibility of integrating NASA imagery and datasets to help with storm surveys and developed:
  - Imagery to help identify damaged areas
  - WMS infrastructure to deliver the data to the DAT
  - Collaborated with the DAT team to provide offline access to the data in a cached mode

Table 1: NASA satellites utilized in SPoRT’s disaster response activities

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Satellite</th>
<th>Resolution</th>
<th>Products</th>
<th>Repeat Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTER</td>
<td>Terra</td>
<td>15 m</td>
<td>NDVI, False Color, Natural Color</td>
<td>16 days</td>
</tr>
<tr>
<td>ETM+</td>
<td>Landsat</td>
<td>30 m</td>
<td>NDVI, True Color</td>
<td>16 days</td>
</tr>
<tr>
<td>JSERV</td>
<td>ISS</td>
<td>~5 m</td>
<td>True Color</td>
<td>&lt; 1 day to &gt; 21 days</td>
</tr>
<tr>
<td>MODIS</td>
<td>Aqua/Terra</td>
<td>250 m - 1 km</td>
<td>NDVI, Vis. Diff</td>
<td>12 hours</td>
</tr>
<tr>
<td>VIIRS</td>
<td>SNPP</td>
<td>750 m</td>
<td>DNB, Lights-Out</td>
<td>12 hours</td>
</tr>
</tbody>
</table>

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