

Use of Satellite Imagery within the Damage Assessment Toolkit with the Des Moines Weather Forecast Office

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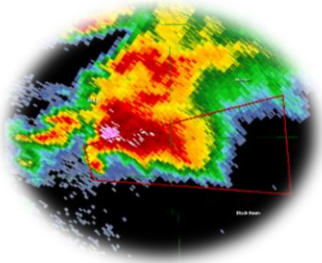
Project Background



- April 27, 2011: NASA SPoRT provides MODIS and ASTER imagery to National Weather Service (NWS) forecast offices in Alabama
 - Imagery was used to refine and adjust some tornado tracks, particularly those that crossed CWA boundaries or were in areas with limited road access
- SPoRT was awarded a NASA Applied Science: Disasters “Feasibility” award to pursue inclusion of Earth remote sensing imagery and derived products within the NOAA/NWS Damage Assessment Toolkit
 - The DAT is a smartphone, tablet, and web-based framework for acquiring, editing, and publishing storm survey information.
- 3 - Year NASA Applied Science award: SPoRT and NOAA/NWS collaborate to establish a Web Mapping Service and data feeds that provide satellite imagery and products as viewable data layers.



Time Line and Usage: Imagery in the DAT



Warning Issued



Event Occurs



Potential Damage Area Identified

NSSL WDSS-II: On Demand

Time Line and Usage: Imagery in the DAT

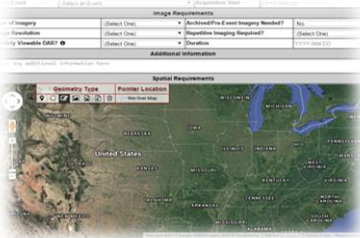
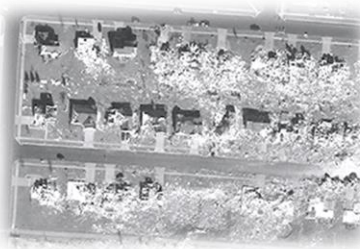
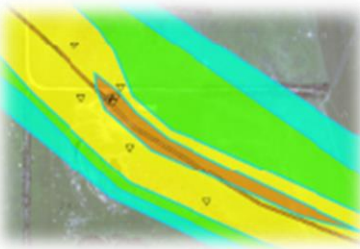


Image Request

USGS Collection Management Tool



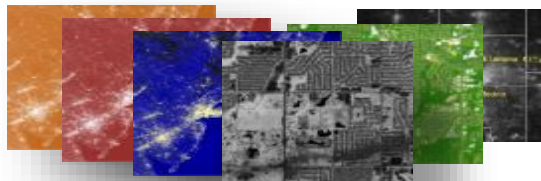
Imagery Collected and Uploaded to DAT



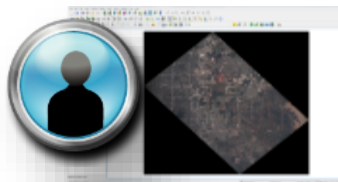
Survey Refined and Improved

Imagery Processing and Dissemination

Disaster Imagery



GIS Application



Impact-Based
Decision
Support
Services



Web Clients



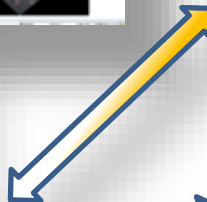
Ingest Server



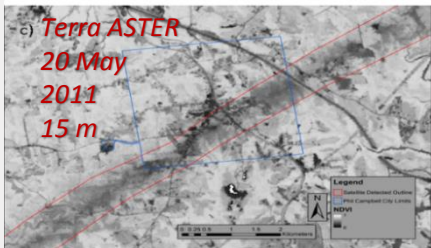
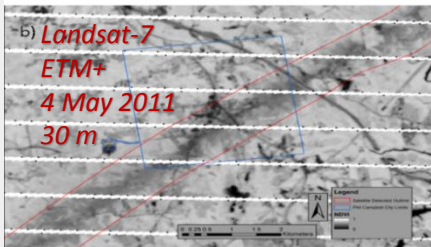
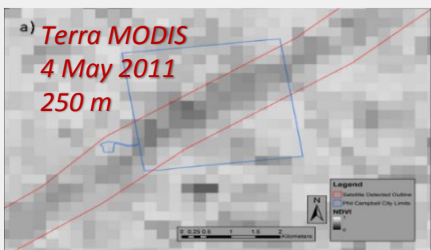
WMS and Tile Cache



Smartphones and
Tablets (e.g. DAT)



Imagery Resolution

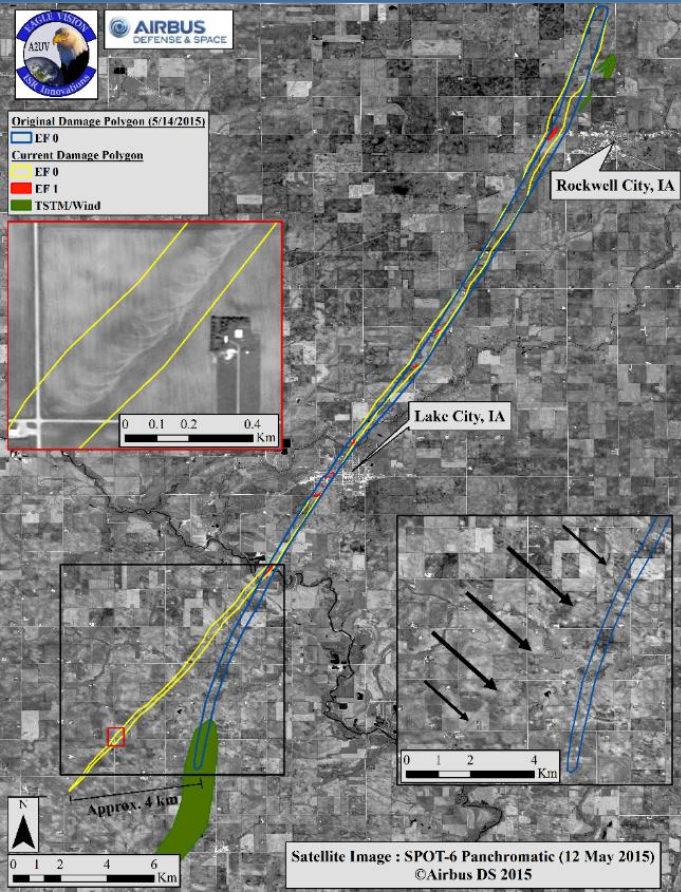


Affects Detectability of Damage Indicators

Increases in Spatial Resolution Improves
Detection Capabilities

Reference: Molthan, A. L., J. R. Bell, T. A. Cole, and J. E. Burks, 2014:
Satellite-based identification of tornado damage tracks from the 27 April
2011 severe weather outbreak. *J. Operational Meteor.*, 2 (16), 191–208.

10 May 2015: Lake City/Rockwell City EF-1



CMT request on the 10th of May 2015

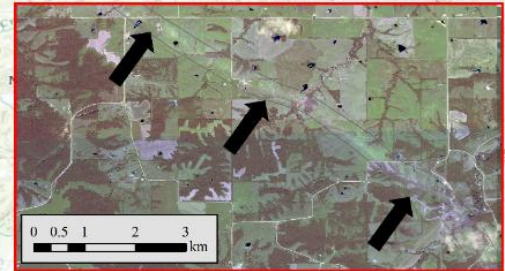
SPOT-6 Panchromatic from 12 May 15

Landsat 8 pass available on 17 May 2015, but was too cloudy to use.

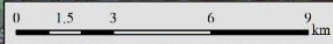
22 June 2015: Columbia, Albia Eddyville, IA



Post-Event Tornado Damage Survey Assessment:
Inclusion of High Resolution Satellite Imagery

Columbia, IA EF-3

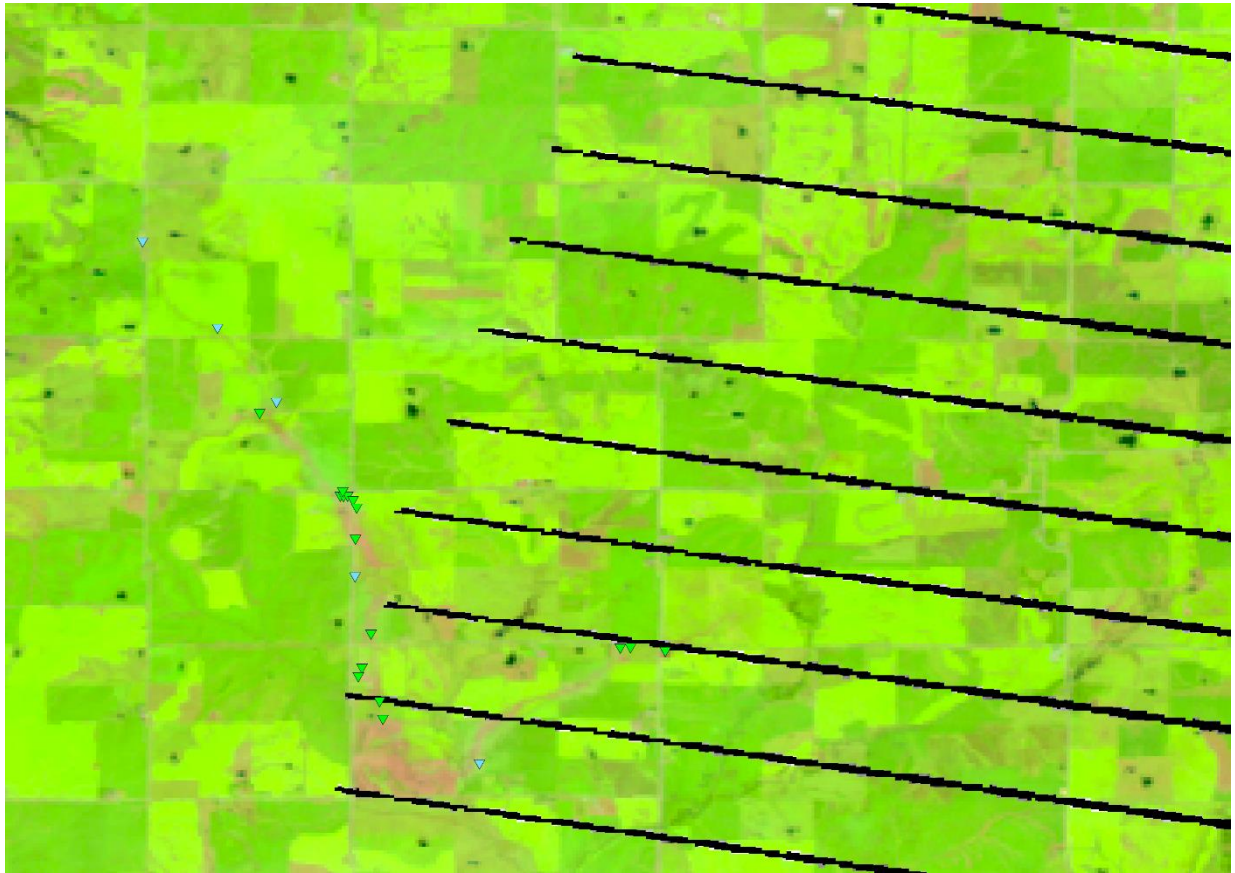


Albia, IA EF-2

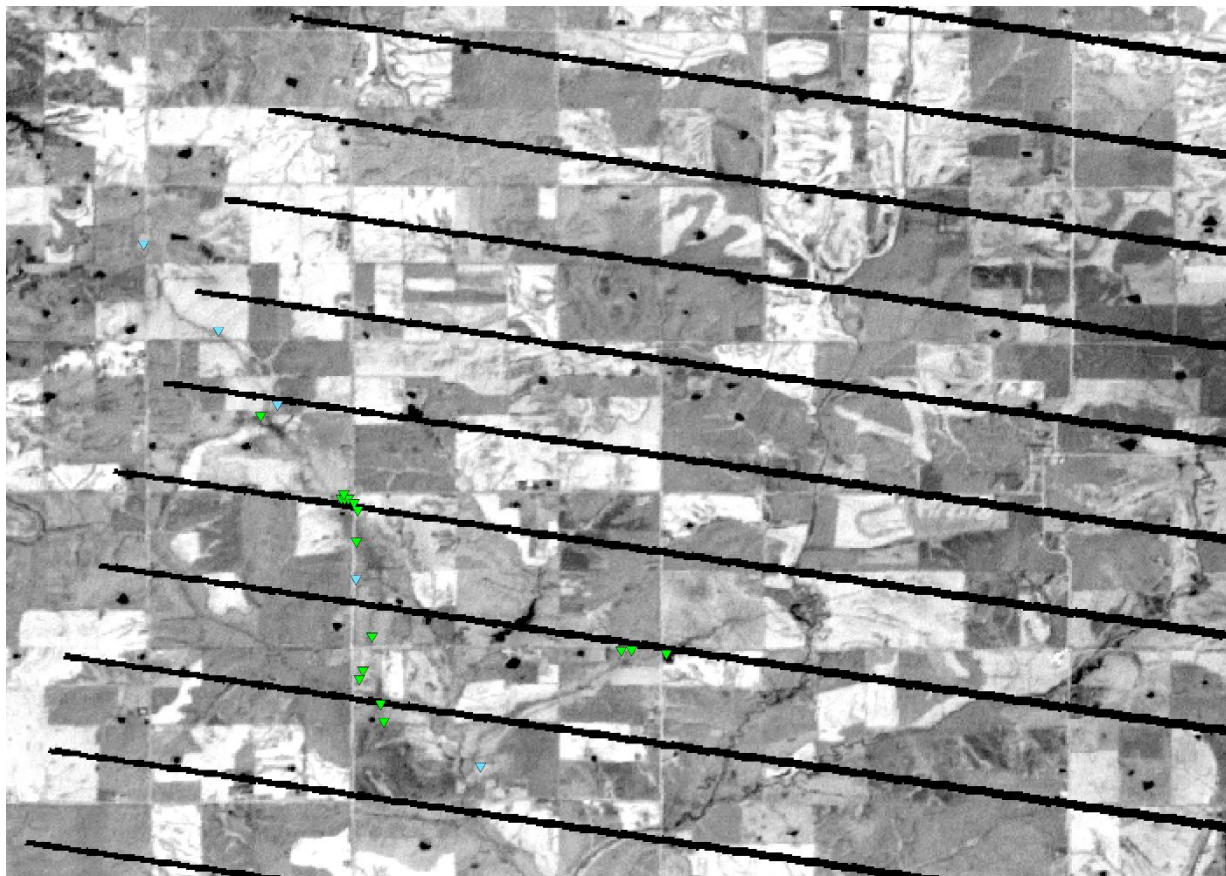


Final Tornado Damage Survey: 13 July 2015
 Final
Preliminary Tornado Damage Survey: 6 July 2015
 Prelim

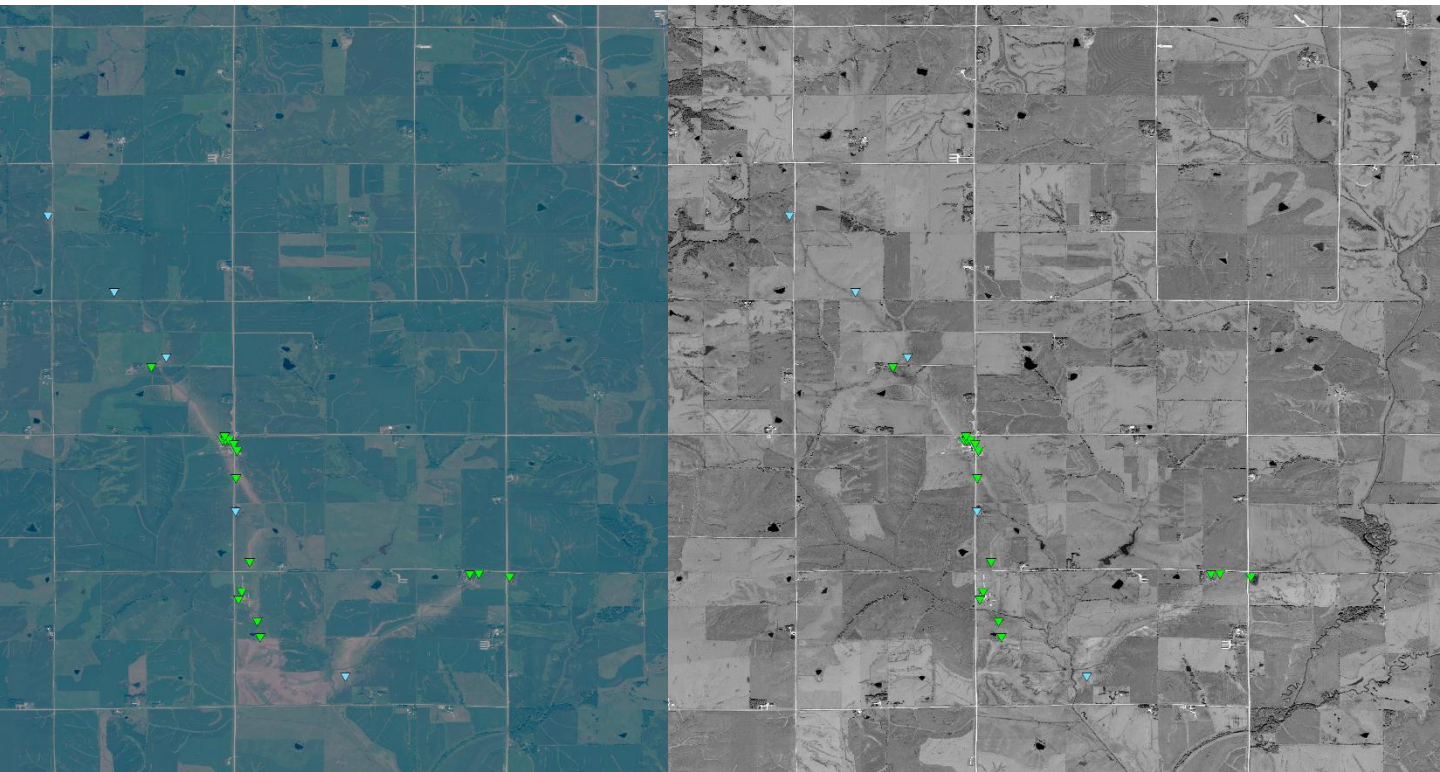
2 August 2015: Williamson, IA EF-1



2 August 2015: Williamson, IA EF-1



2 August 2015: Williamson, IA EF-1



WorldView imagery collected 21 August 2015

Caveats



- Landsat, EO-1, ASTER, MODIS and VIIRS are freely available, yet latencies exist
 - Landsat 7/8 16 day repeat cycle
 - Swath width
 - ASTER/EO-1 are targetable, yet must be requested
 - MODIS/VIIRS: reduced resolution can hinder damage detection
- Restricted datasets requested by USGS
 - High resolution increases the chances of damage detectability yet availability of imagery is limited by satellite orbits, priority of targets
- Optical imagery can be blocked by haze, clouds, snow, etc., obscuring any visible damage

Summary



- Optical satellite imagery has been successfully used to help locate and refine tornado tracks across the full EF spectrum
 - Resolution and storm behavior affect detectability
 - Need cloud free conditions
- Landsat, MODIS, VIIRS, ASTER, EO-1 sensor data are freely available and uploaded to the DAT automatically after processing
- Restricted, high resolution imagery must be requested through the USGS using the Collection Management Tool (cmt.usgs.gov)
 - Once received, uploads automatically to the DAT after processing
 - Cannot be shared publically

Contact Information



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For more information, please visit:

General: <http://weather.msfc.nasa.gov/sport/disasters/>

NOAA Personnel: <https://sites.google.com/a/noaa.gov/nws-crh-roc/home/emergency-satellite-support>

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