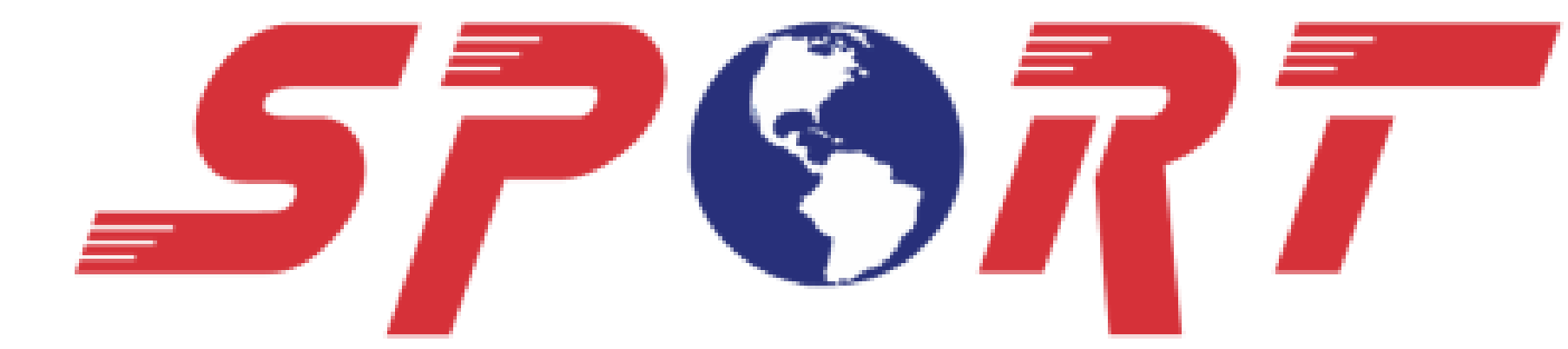


Using ISERV and Commercial Satellite Imagery to Assess and Monitor Recovery Efforts in Urban Damaged Areas

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Introduction and Motivation

- NASA's Short-term Prediction Research and Transition (SPoRT) Center supports the transition of unique NASA and NOAA research activities to the operational weather forecasting community.
- SPoRT continues to support and expand disaster activities to support end users such as the National Weather Service (NWS) to help respond and assist with the disaster assessment process.
- SPoRT partners with the NASA SERVIR Project, which focuses on capacity building activities for the use of remote sensing data in developing countries.
- High resolution commercial imagery and **International Space Station SERVIR Environmental Research and Visualization System** (ISERV) data provide imagery of damaged areas. Additionally, imagery can provide details about damage to areas that are beyond the accessibility of damage assessment teams.

Commercial and ISERV Data

- High resolution commercial satellite imagery is obtained with support from USGS, who coordinates the acquisition of the satellite data with partnerships with federal agencies and the commercial vendors (Figure 1).
- USGS distributes the imagery through their Hazards Data Distribution System (HDDS) portal. Depending on the sensor the resolution can range from **0.5 m to 5 meters**.
- ISERV is a **5 meter** resolution camera system that is aboard the International Space Station used to monitor the impacts of disasters and to provide decision support to officials.
- ISERV and commercial data latency periods are all dependent on orbits, cloud cover and sun angles.

Moore, Oklahoma EF-5 Tornado

May 20, 2013

- Commercial satellite imagery was first available on May 22. Imagery showed damage in great detail, especially in heavily damaged area (Figure 2).
- SPoRT explored to what extent that the damage could be assessed from high resolution imagery. Figure 3 and 7 shows one exploratory damage assessment methodology that categorizes damage based on roof damage and the whether or not walls remain standing:
 - Green dots: No visible damage
 - Yellow dots: Damage to the roof, but still intact
 - Orange dots: Parts of roof missing, only walls standing
 - Red dots: No visible parts of the structure are standing
- ISERV was not first available until late June (Figure 5) because of ISS orbit and cloud cover, however the damage scar was still very apparent.



Figure 1. Pleiades imagery acquired on 29 April 2013. Resolution is 0.50 x 0.50 meters.



Figure 2. Pleiades imagery acquired on 22 May 2013. Resolution is 0.50 x 0.50 meters.

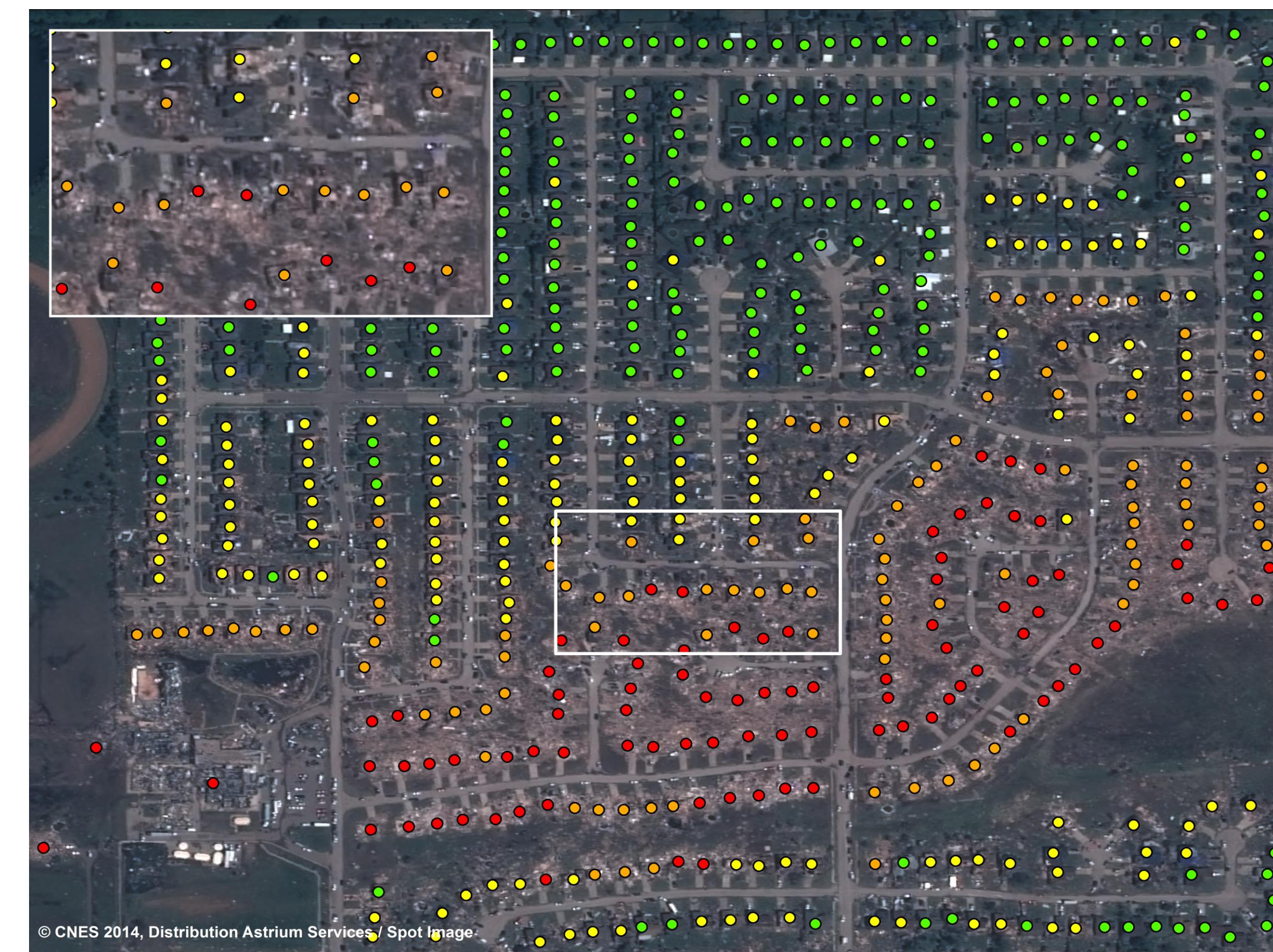


Figure 3. Result of damage assessment methodology as applied to Figure 2.

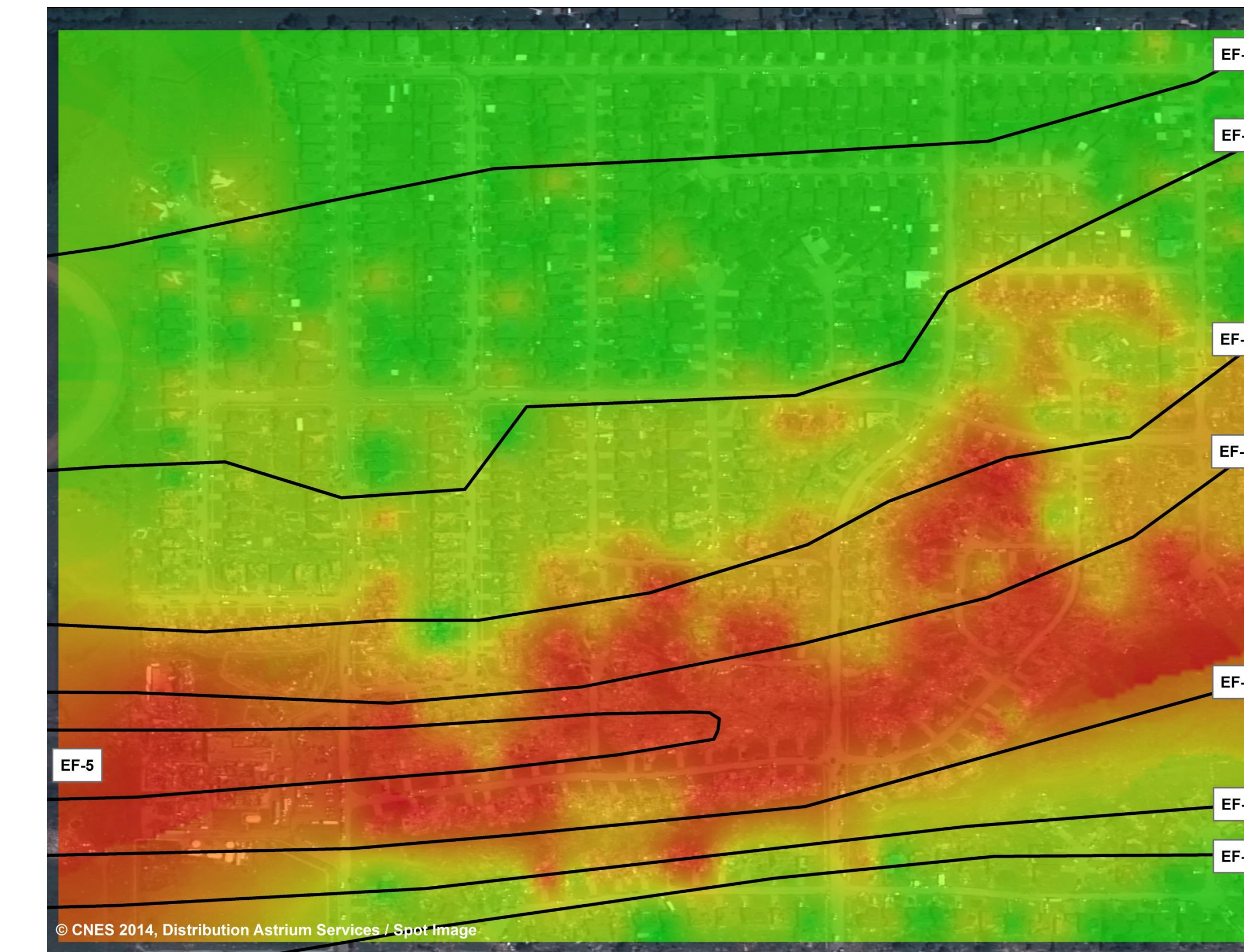


Figure 4. Kriging interpolation of damage points from Figure 3 compared with official damage survey from Norman WFO.

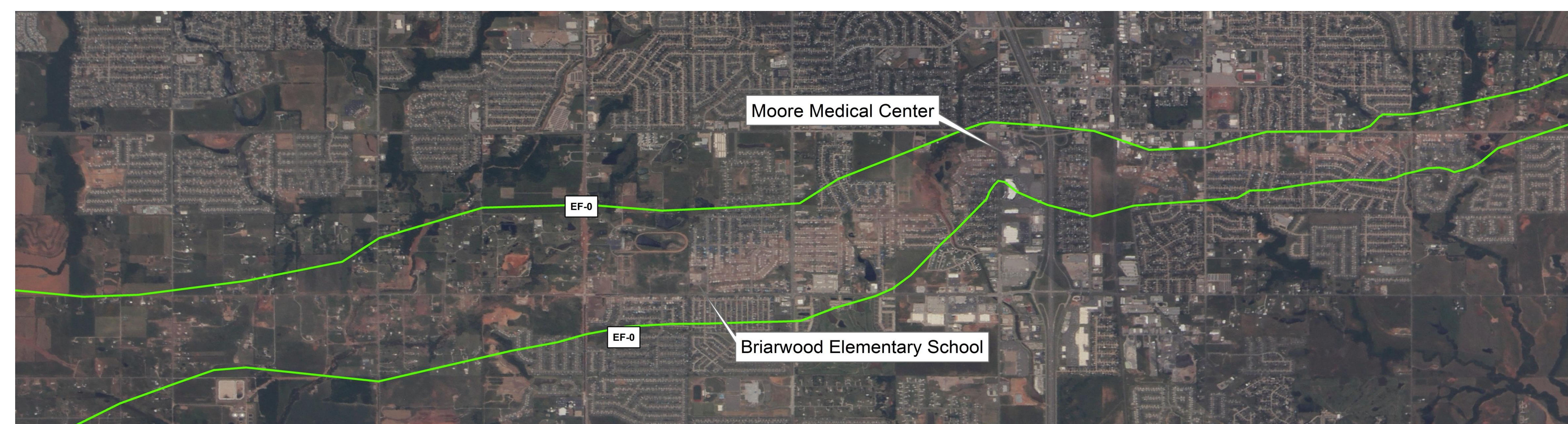


Figure 5. ISERV Imagery acquired on 27 Jun 2013. The EF-0 outline of the damage survey from the Norman WFO is overlaid on the map with two points of reference. Resolution is ~5 meters.

Washington, Illinois EF-4 Tornado

November 17, 2013

- Late year severe weather outbreak over the Midwest. Imagery was available the day after the event (Figure 6).
- Tornado started SE of Peoria and tracked through Washington and eventually lifted near Long Point



Figure 6. Worldview 1 image from November 18, 2013. Resolution is 0.50 x 0.50 meters.



Figure 7. Same as image as in Figure 6, but with SPoRT's damage analysis overlaid.

Data Integration

- SPoRT has developed a Web Mapping Service (WMS) to serve up these data sets as part of NASA Applied Science Proposals. The WMS will make this data available to the Damage Assessment Toolkit (DAT) to provide additional data for surveys.