

Using Satellite Imagery to Identify Tornado Damage Tracks and Recovery from the April 27, 2011 Severe Weather Outbreak

Tony A. Cole^{1,4}, Andrew L. Molthan^{1,2}, Jordan R. Bell^{1,3}

¹NASA Short-term Prediction Research and Transition (SPoRT) Center, Huntsville, Alabama

²Earth Science Office, NASA Marshall Space Flight Center, Huntsville, Alabama

³University of Alabama in Huntsville, Huntsville, Alabama

⁴University of Southern Maine, Gorham, Maine

Emergency response to natural disasters requires coordination between multiple local, state, and federal agencies. Single, relatively weak tornado events may require comparatively simple response efforts; but larger “outbreak” events with multiple strong, long-track tornadoes can benefit from additional tools to help expedite these efforts. Meteorologists from NOAA’s National Weather Service conduct field surveys to map tornado tracks, assess damage, and determine the tornado intensity following each event. Moderate and high resolution satellite imagery can support these surveys by providing a high-level view of the affected areas. Satellite imagery could then be used to target areas for immediate survey or to corroborate the results of the survey after it is completed. In this study, the feasibility of using satellite imagery to identify tornado damage tracks was determined by comparing the characteristics of tracks observed from low-earth orbit to tracks assessed during the official NWS storm survey process. Of the 68 NWS confirmed centerlines, 24 tracks (35.3%) could be distinguished from other surface features using satellite imagery. Within each EF category, 0% of EF-0, 3% of EF-1, 50% of EF-2, 77.7% of EF-3, 87.5% of EF-4 and 100% of EF-5 tornadoes were detected. It was shown that satellite data can be used to identify tornado damage tracks in MODIS and ASTER NDVI imagery, where damage to vegetation creates a sharp drop in values though the minimum EF-category which can be detected is dependent upon the type of sensor used and underlying vegetation. Near-real time data from moderate resolution sensors compare favorably to field surveys after the event and suggest that the data can provide some value in the assessment process.