

THE 3 MARCH 2019 TORNADO OUTBREAK: A LOOK FROM SPACE

Jordan Bell¹

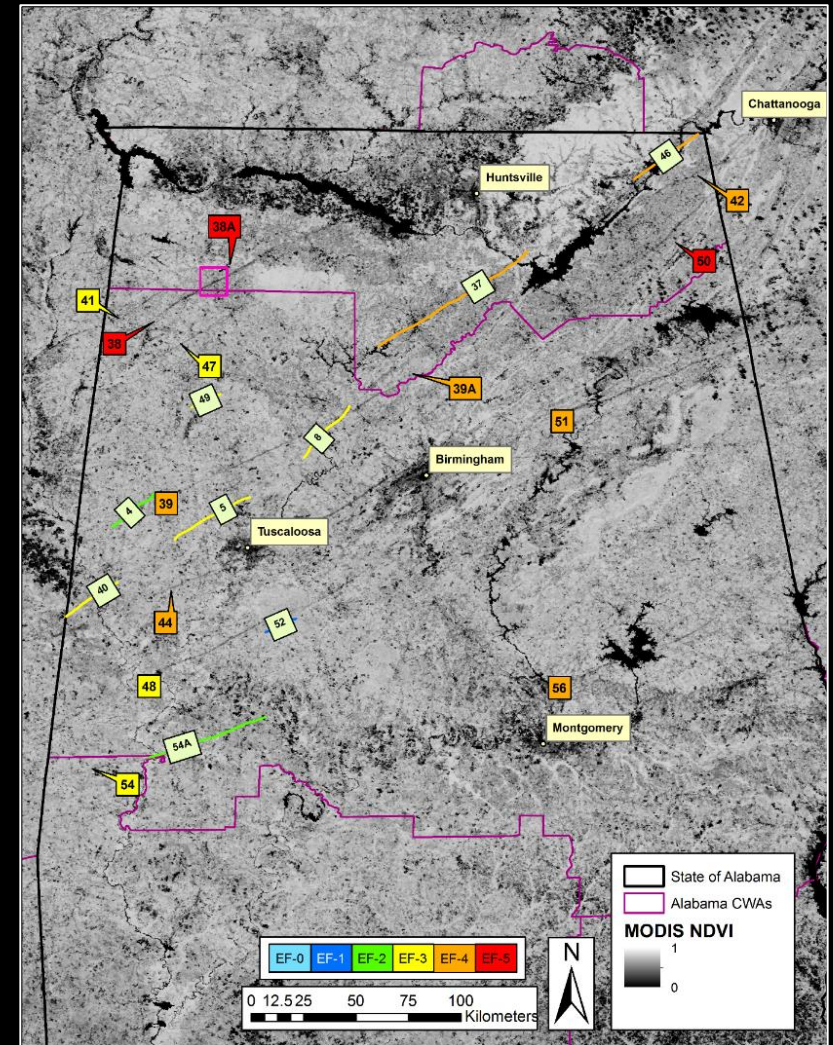
Andrew L. Molthan¹ and Lori A. Schultz²

¹Earth System Science Center, University of Alabama in Huntsville, Huntsville, AL

²Earth Science Branch, Marshall Space Flight Center, Huntsville, AL

REMOTE SENSING OF TORNADO TRACKS

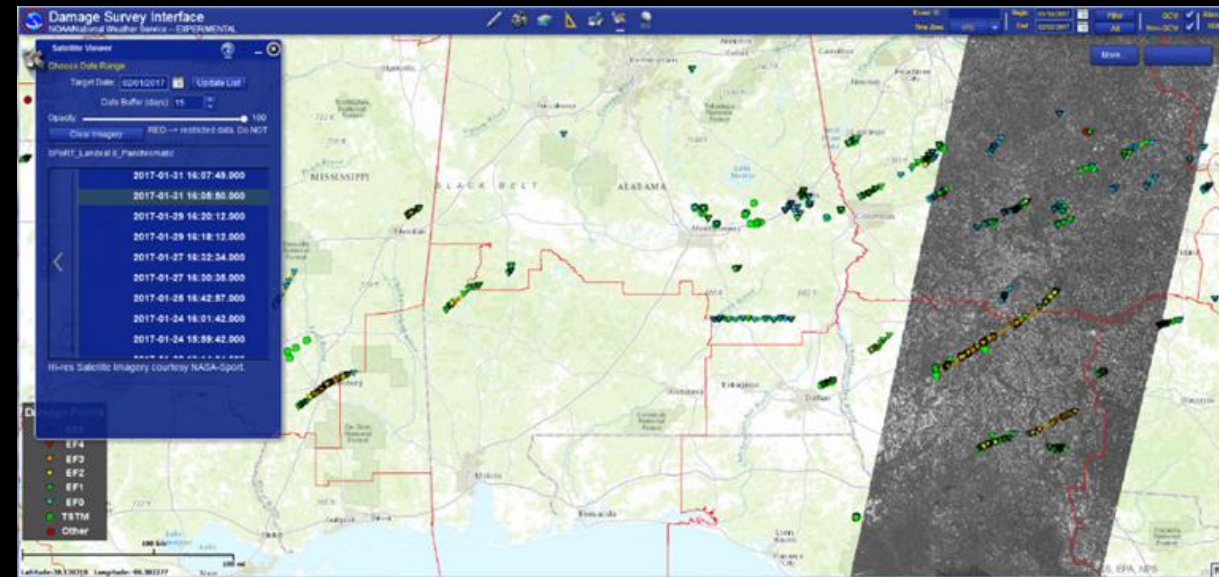
- Remote sensing has been used in high profile case studies dating back several decades.
- NASA SPoRT provided MODIS and ASTER imagery to WFOs in Alabama to support April 27th, 2011 damage assessments across the state
- SPoRT was awarded a NASA Applied Science: Disasters Feasibility award to investigate the applicability of including remote sensing imagery and derived products into the NOAA/NWS Damage Assessment Toolkit (DAT)
- Proposal team was awarded the 3 year proposal to implement a web mapping service and associate data feeds from the USGS to provide satellite imagery and derived products directly to the NWS thru the DAT.



REMOTE SENSING IN DAMAGE ASSESSMENT TOOLKIT

Mobile and Web Application developed to support NWS personnel while performing surveys.

- Reduce prep time for site deployment
- Reduce perishable damage data collection time
- Improve damage survey data collection consistency
- Improve delivery of geospatially-accurate data to core partners and to the public.

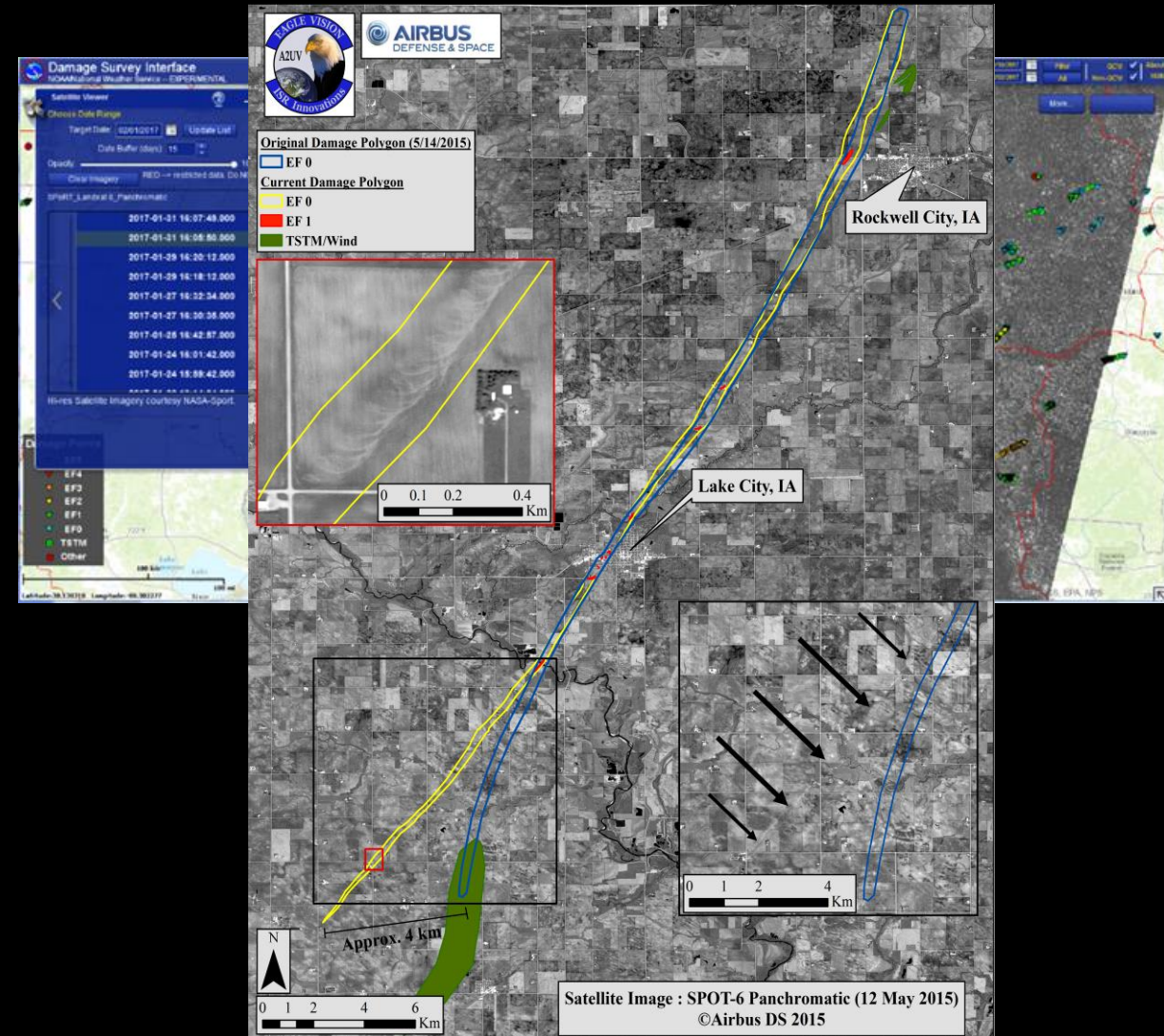


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To date over 40 severe weather events have been supported, as well as several hurricanes and flooding events.



MODIS/VIIRS

- Provide multiple daily overpasses, but trade temporal resolution for coarse spatial resolution



5 March 2019 True Color (500 m)



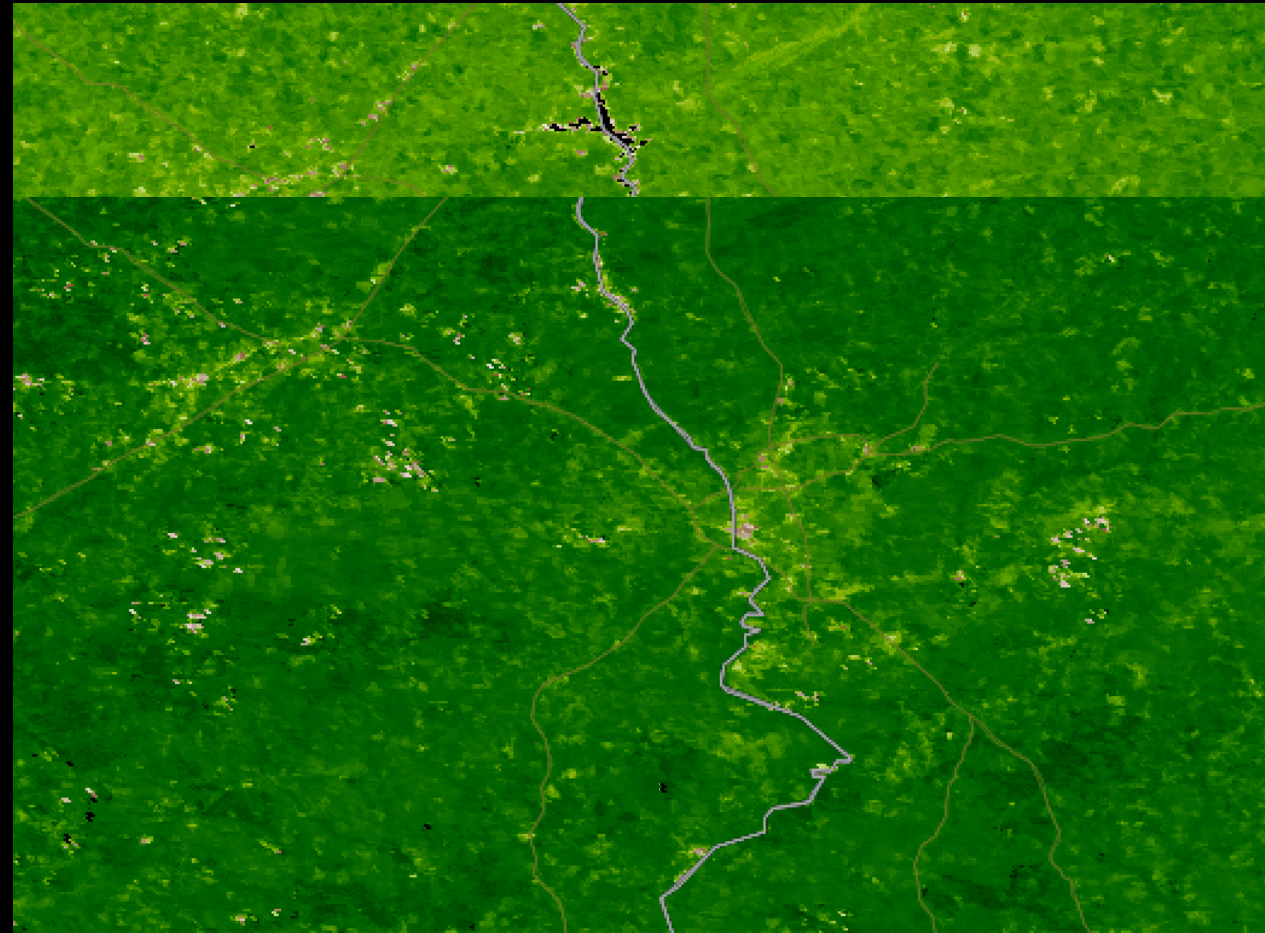
30 March 2019 8 Day NDVI (250 m)

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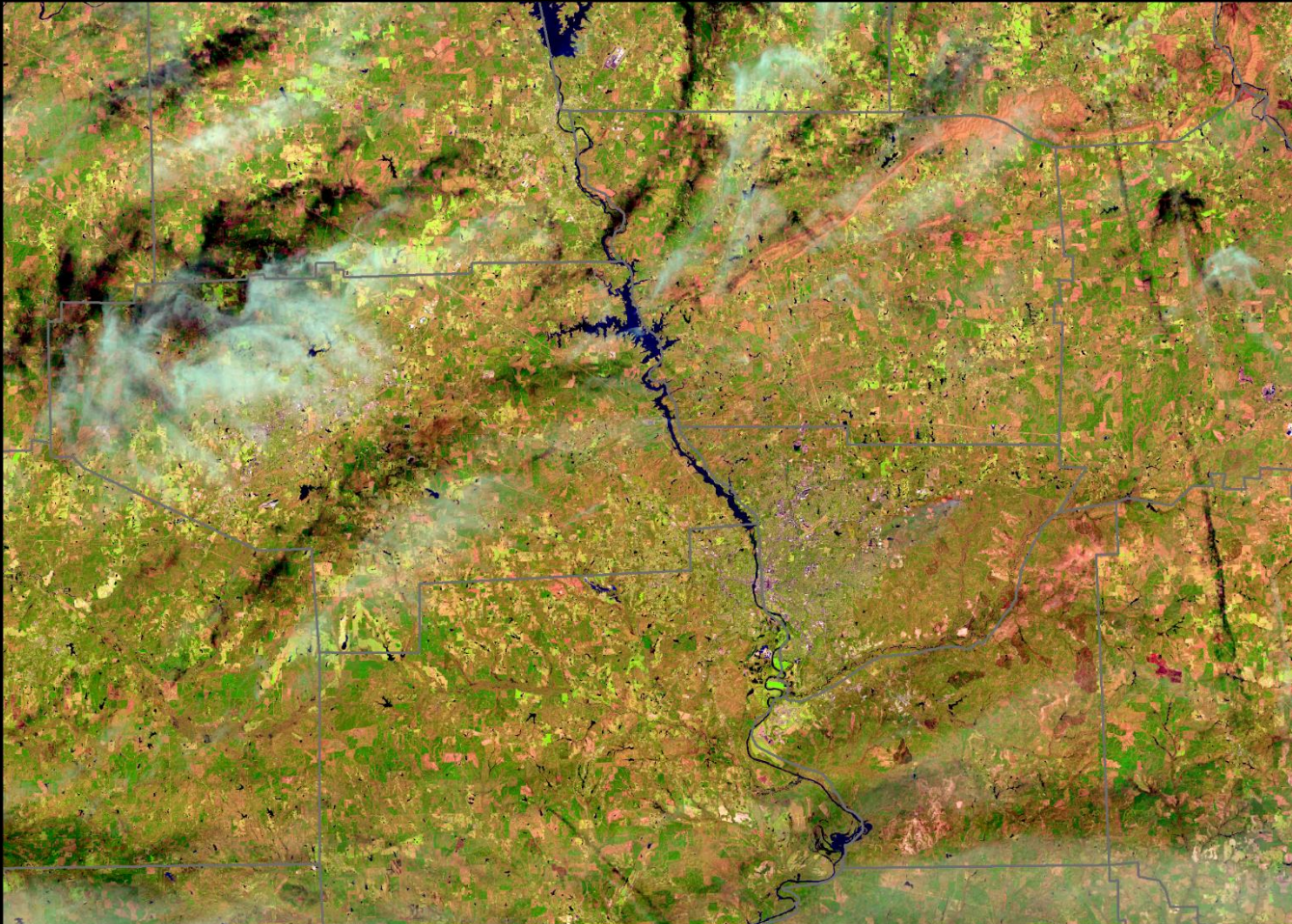
5 March 2019 True Color (500 m)



30 July 2019 8 Day NDVI (250 m)

LANDSAT-8 & SENTINEL-2

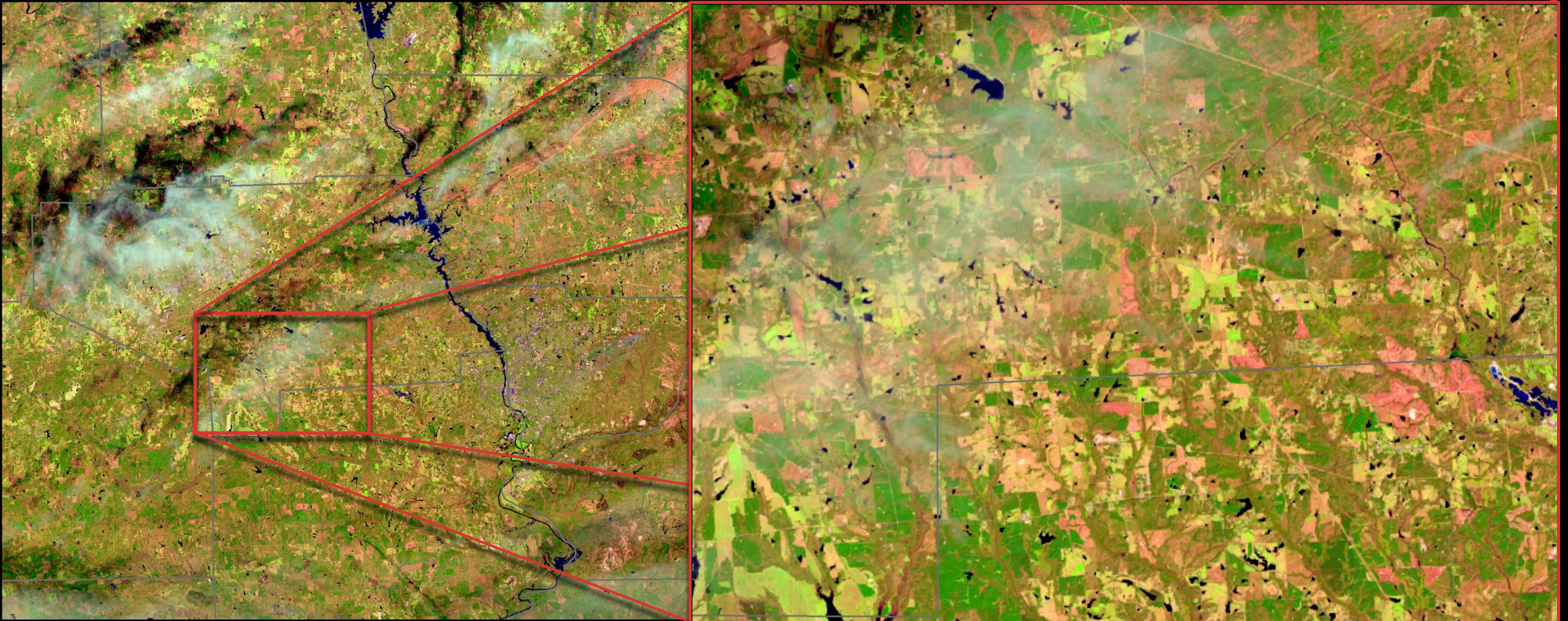
- Medium resolution (10 – 30 m) but temporal resolution is 5 to 16 days



17 March 2019 Natural Color (30 m)

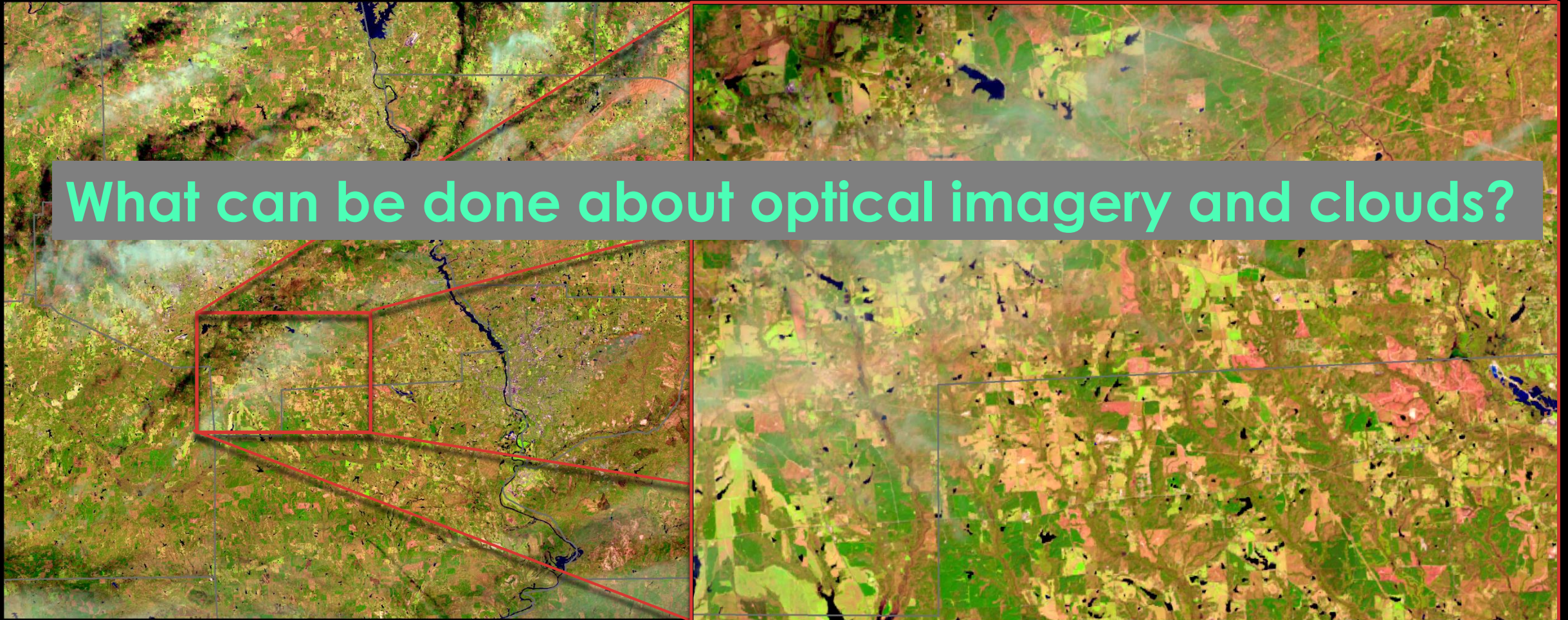
LANDSAT-8 & SENTINEL-2

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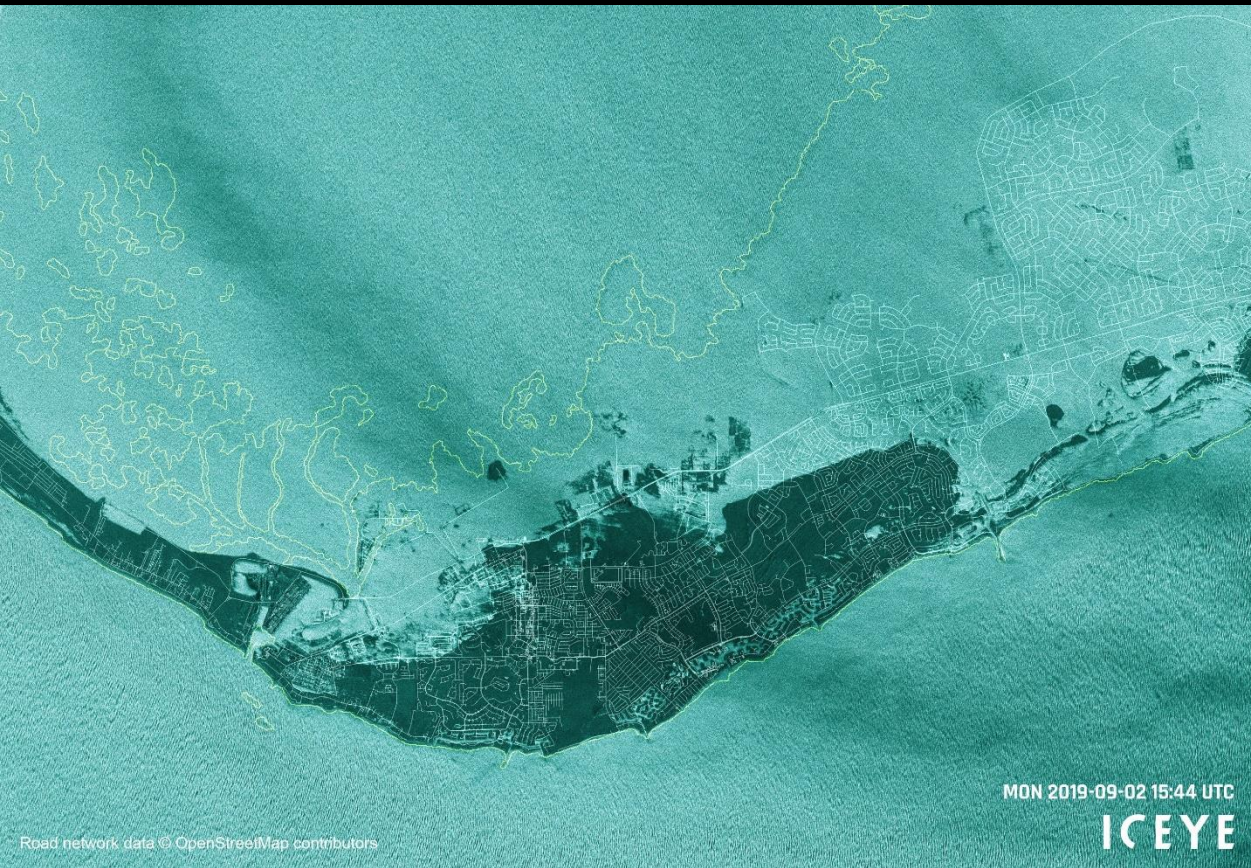


LANDSAT-8 & SENTINEL-2

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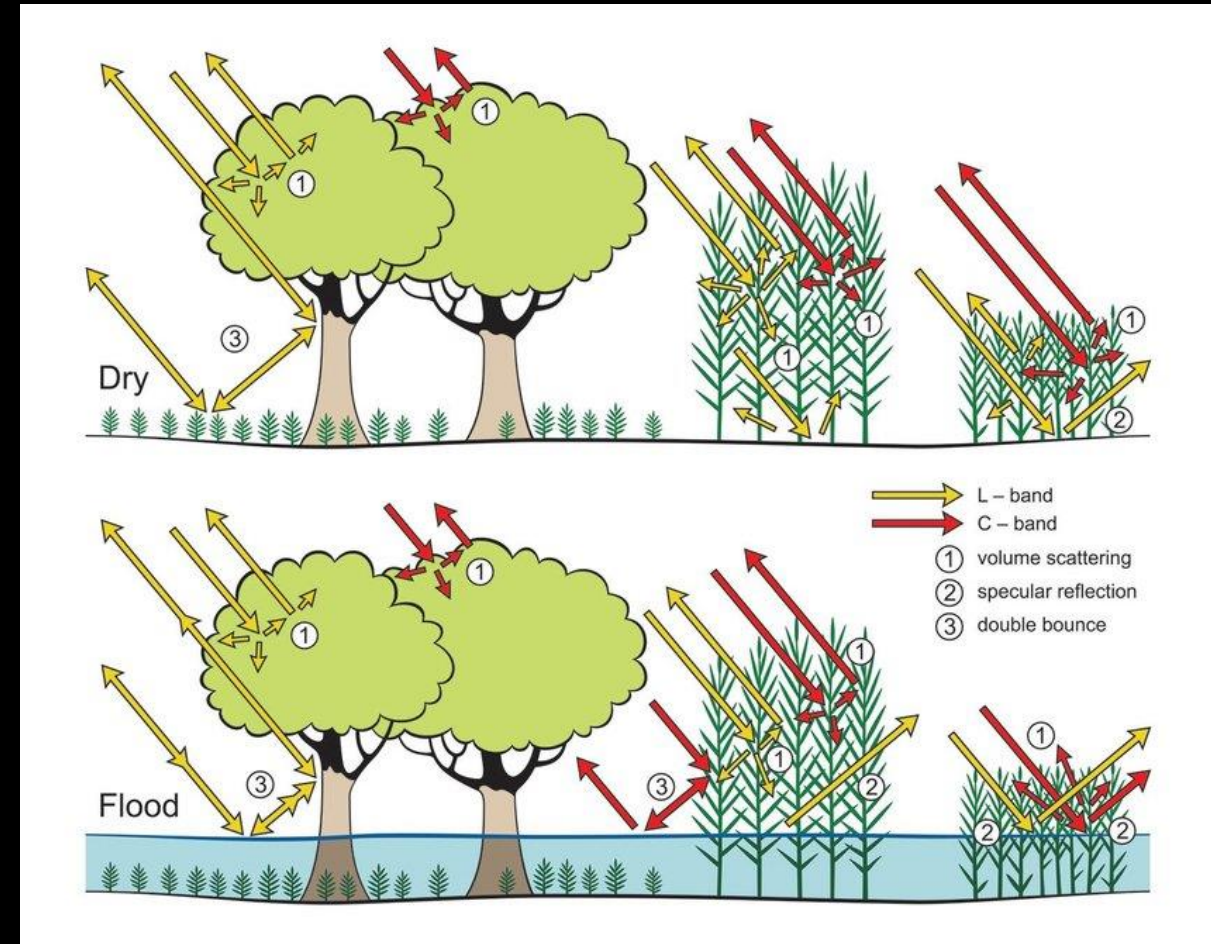


SYNTHETIC APERTURE RADAR



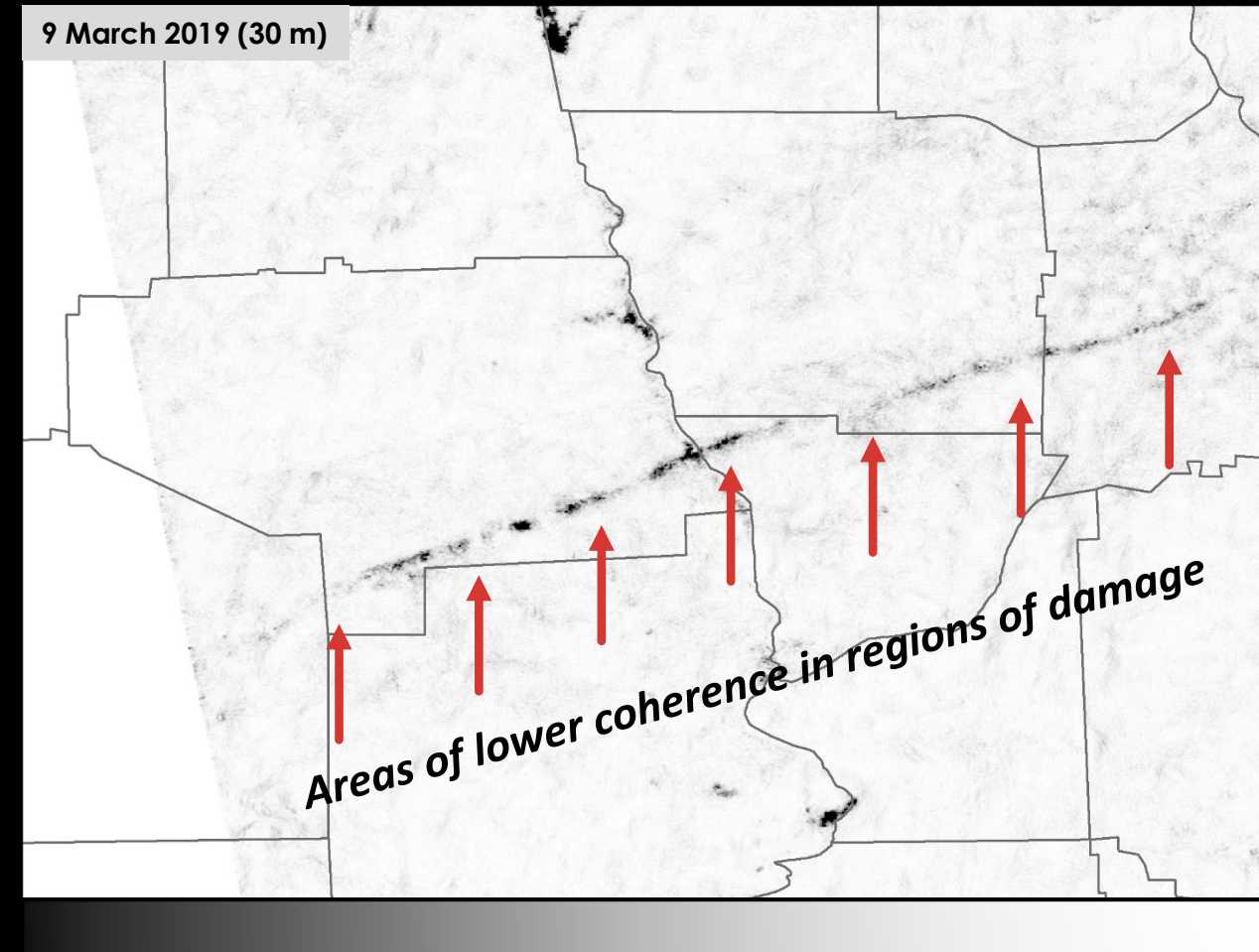
SYNTHETIC APERTURE RADAR

- Synthetic aperture radar (SAR) is another way to view Earth's surface through the use of active remote sensing and allows for imaging regardless sky condition or time of day
- Amplitude or intensity images from SAR of a vegetated or crop covered area is affected by the wavelength of the sensor (how deep the radiation can penetrate the top surface (leaves and branches)), geometry of the object (structure and orientation in the case of vegetation), surface roughness, and water content on the surface.



SENTINEL-1

- Coherence compares the **change in phase** of pixels on two images obtained from the same sensor and viewing geometry: **a measure of the similarity between two images**
- Ranging from 0 (low, or complete decorrelation) to 1 (high coherence)
- **High coherence** is expected for things with **little change** such as permanent structures such as buildings, roads, consistent vegetation
- **Low coherence** is likely in areas of intermittent change: defoliated or damaged vegetation, structural damage, and land surface change

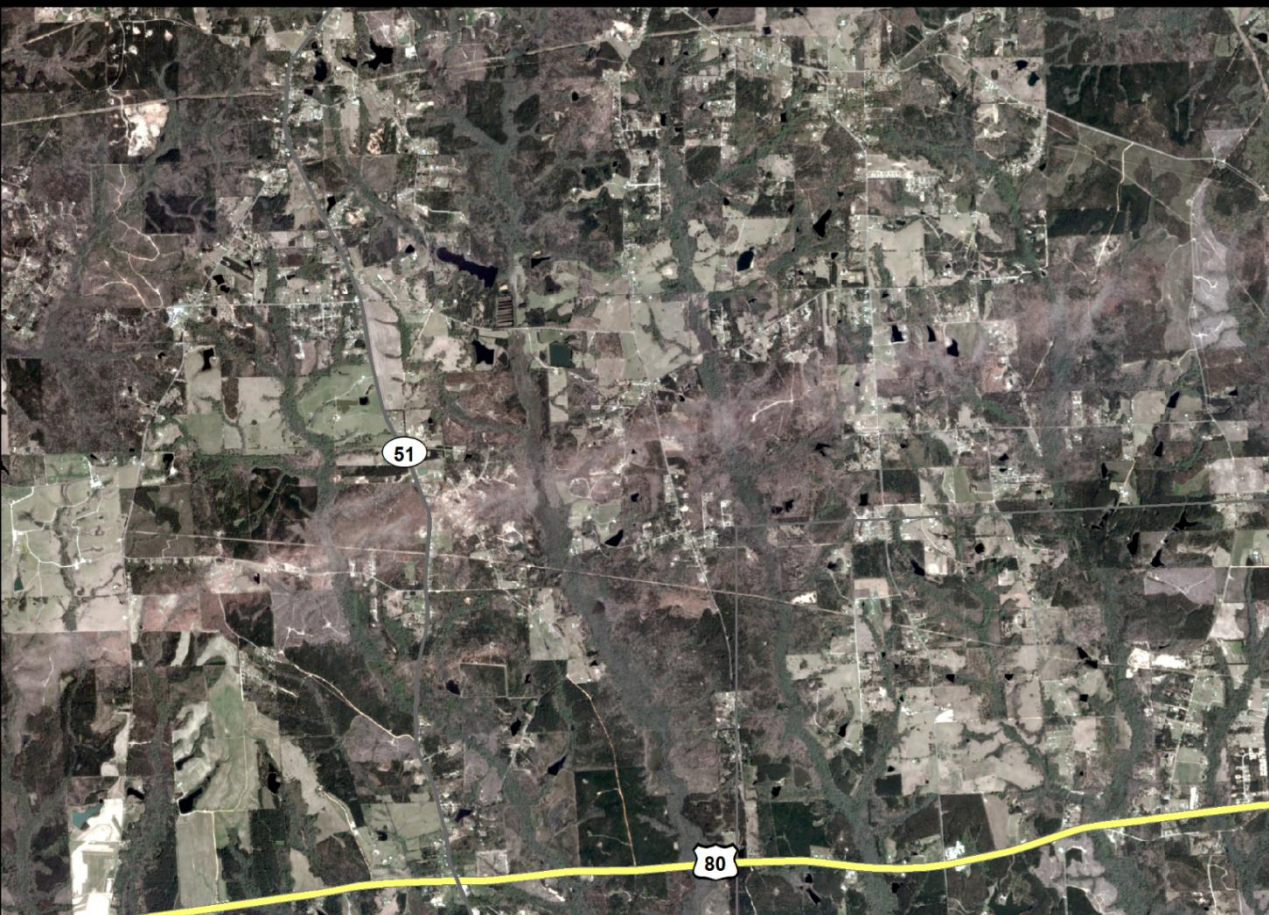


Low
Coherence

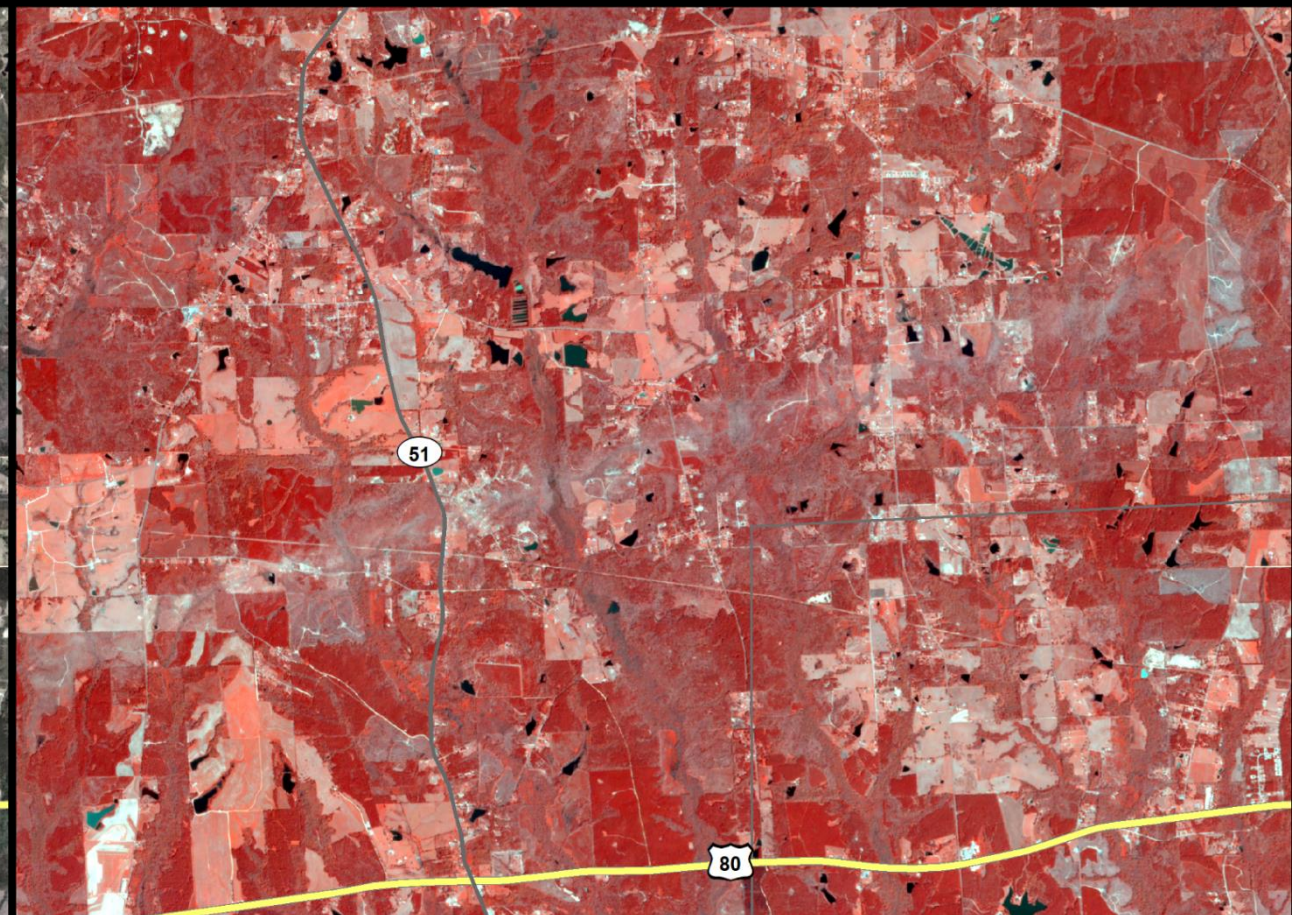
High
Coherence

PLANET LABS

- Constellation of 200+ smallsats with spatial resolutions of 3-5 meters



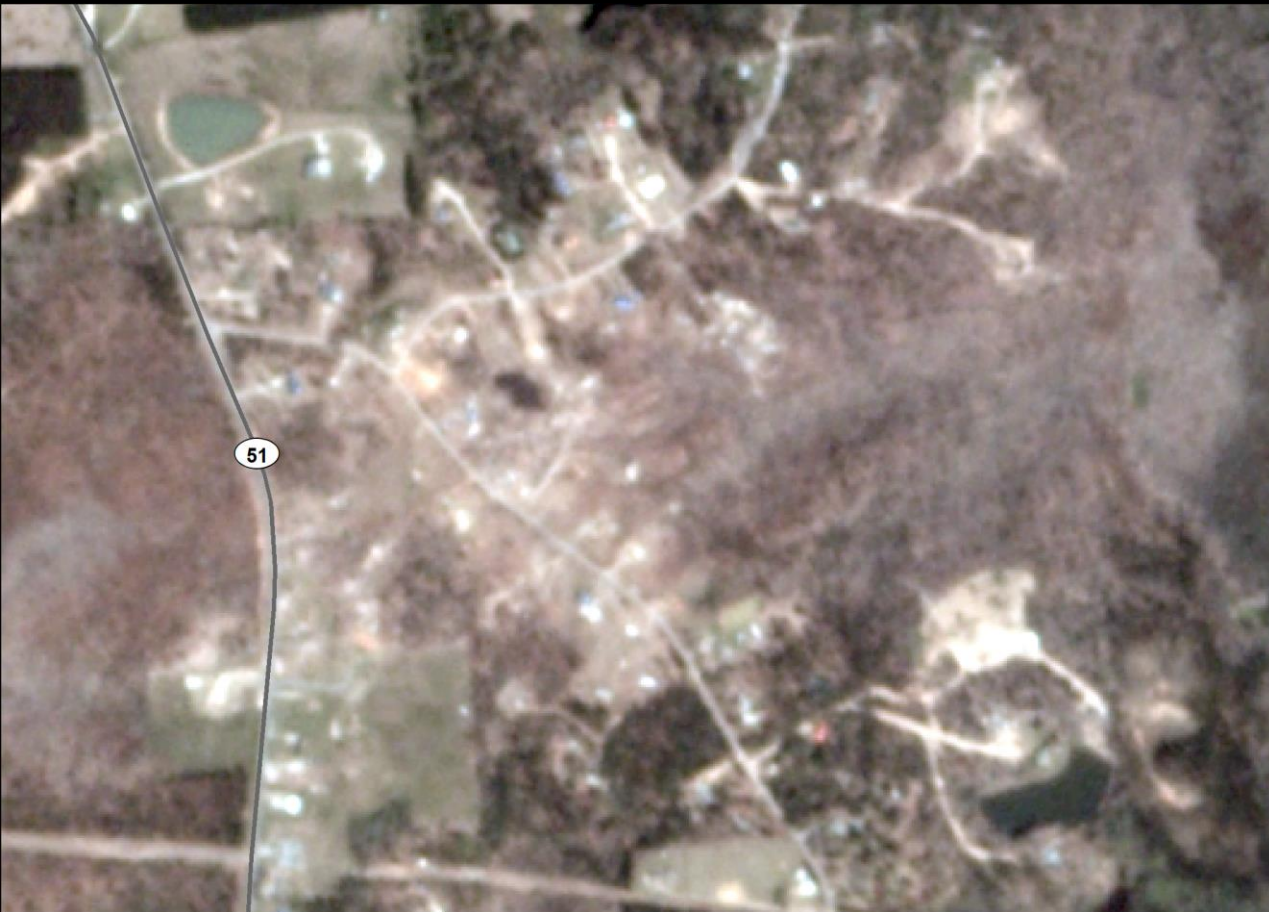
27 March 2019 (30 m)



Planet Team (2019)

PLANET LABS

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27 March 2019 (30 m)



Planet Team (2019)

WORLDVIEW IMAGERY

- Worldview 3 provide imagery provide multispectral (1.24 m) and panchromatic (0.31)



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geogra
CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and
Community

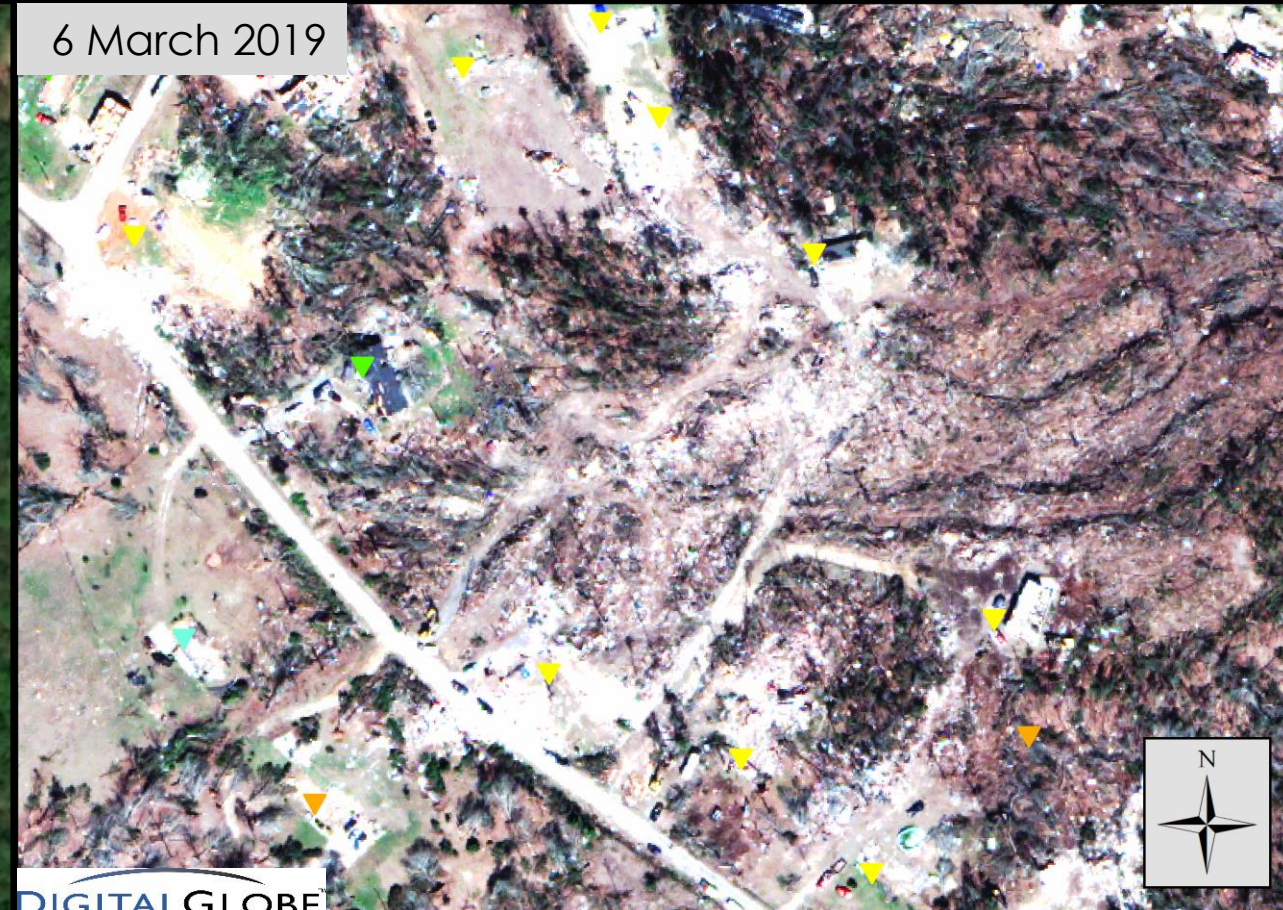
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Jordan Bell

jordan.r.bell@nasa.gov or jrb0042@uah.edu

@muwxman

Evans, T. L. (2013). Habitat mapping of the Brazilian Pantanal using synthetic aperture radar imagery and object based image analysis (Doctoral dissertation)

Planet Application Program Interface: In Space for Life on Earth. San Francisco, CA. <https://api.planet.com>