

Unpiloted Aerial Systems: Weather Impacts and Profiling

Melissa Wagner
October 5, 2021

FPAW Technical Engagement Meeting
Low Altitude Weather and Impacts

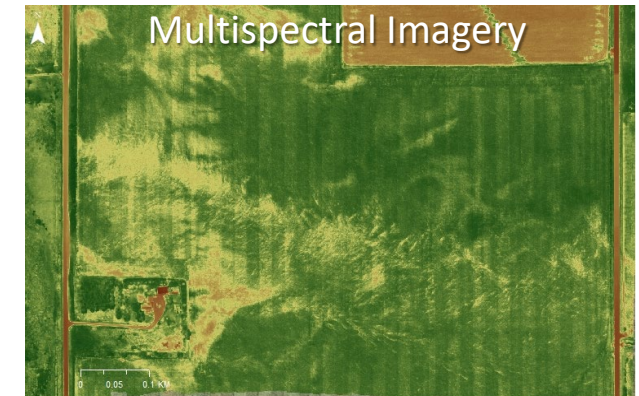
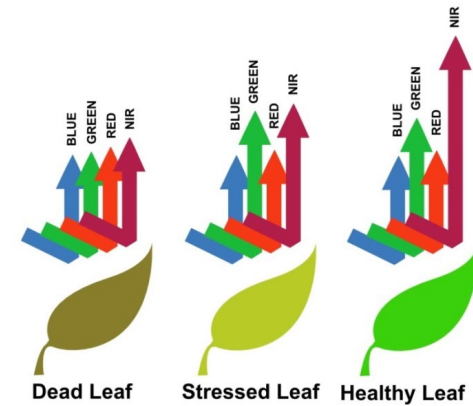
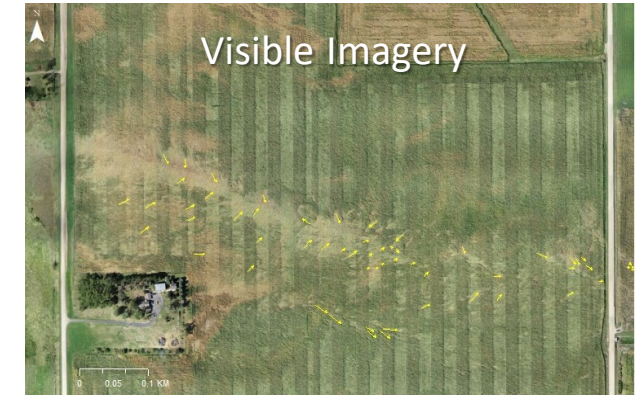


Overview

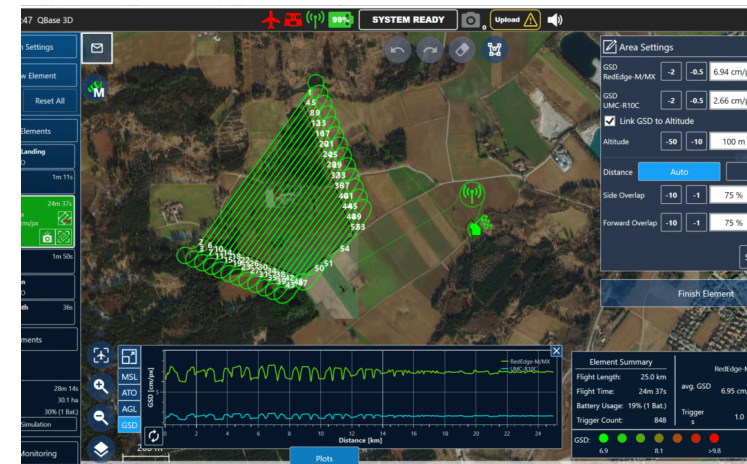
- Damage Assessments
 - Objectives
 - Platforms
 - Results
 - Data sharing
- Atmospheric Profiling
- Future Work

Damage Assessment Objectives

- Assist NWS WFOs and emergency managers
 - *Accessibility/Priority*
 - *Disaster response & recovery*
- Better characterize damage impacts
 - *Improve severe storm climatology, risk, & disaster preparedness*
- Correlate storm signatures with UAS damage information
 - *Improve understanding of severe storm dynamics in SE US*



UAS Platforms and Capabilities



Platform: Quadcopter
Camera: Sony IMX577 RGB

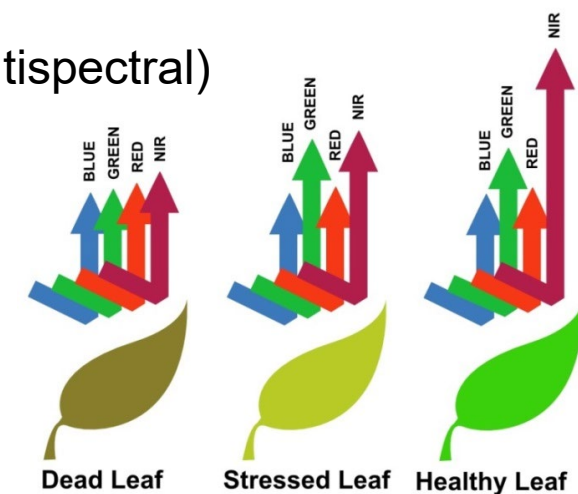
Aerial photos/videos

Flight time: 23 mins
Wind Tolerance: 25 mph

Platform: Fixed Wing with VTOL
Cameras: Micasense RedEdge-MX (multispectral)
Sony UMC R10C (visible)

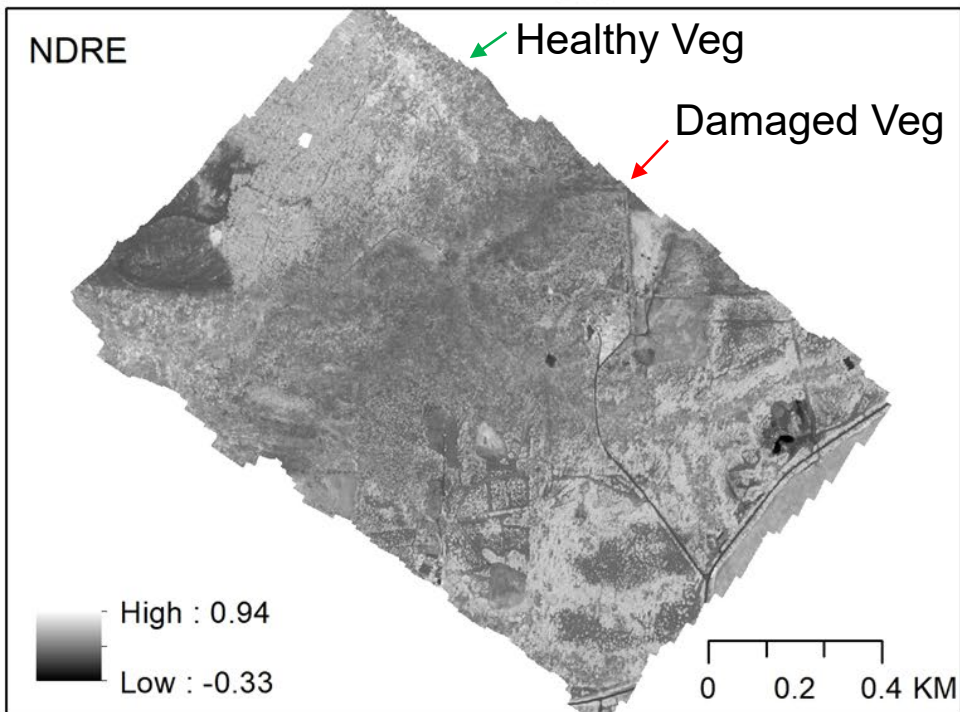
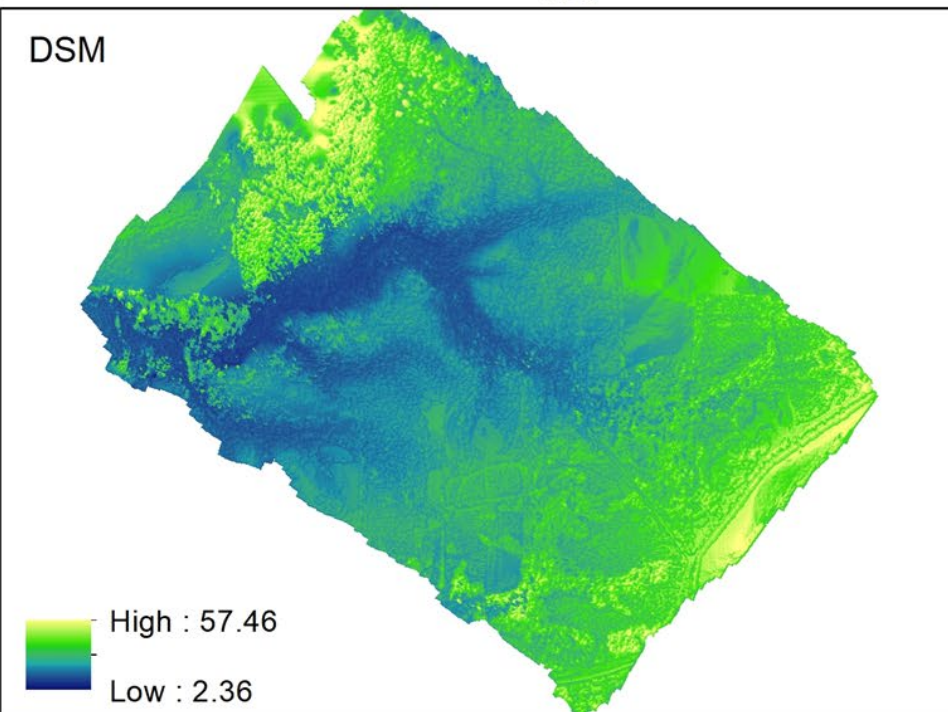
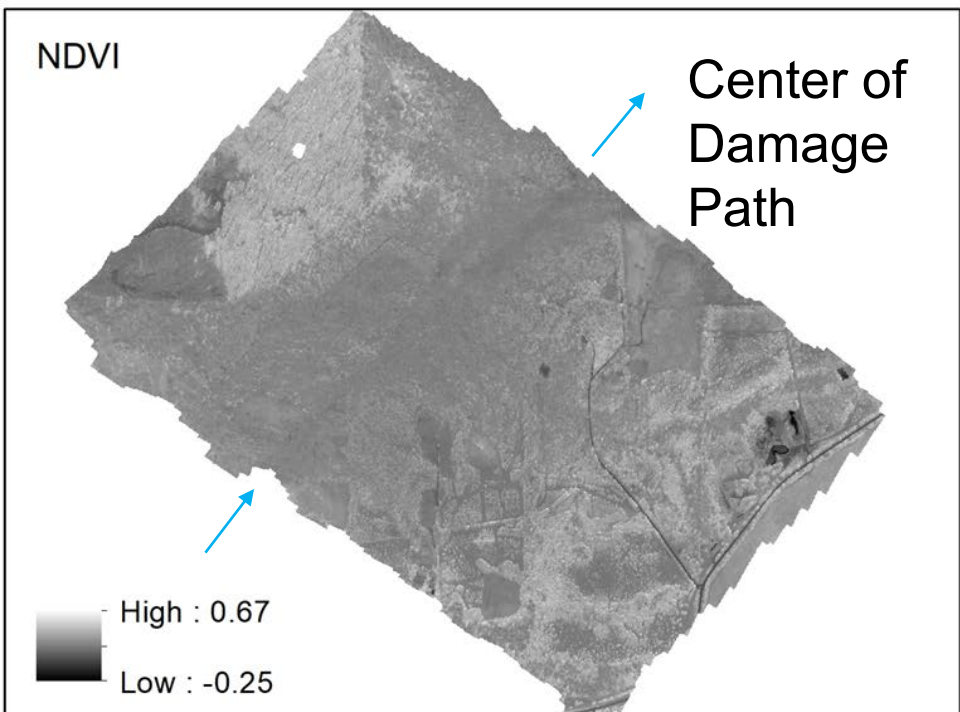
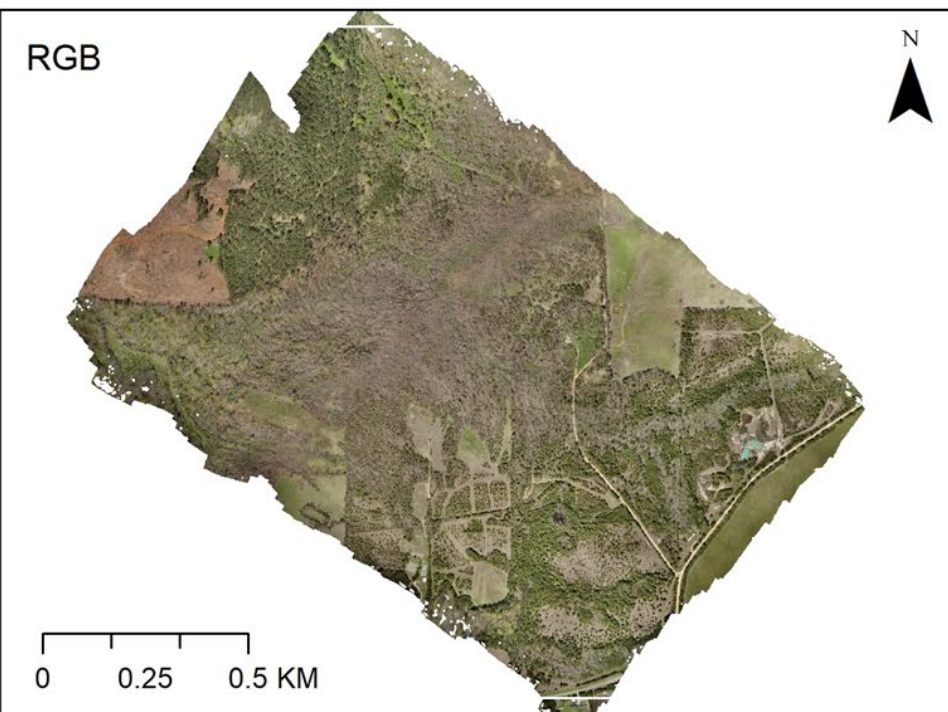
Large-scale mapping & 3D Modeling

Flight time: 90 mins
Wind Tolerance: 25 mph

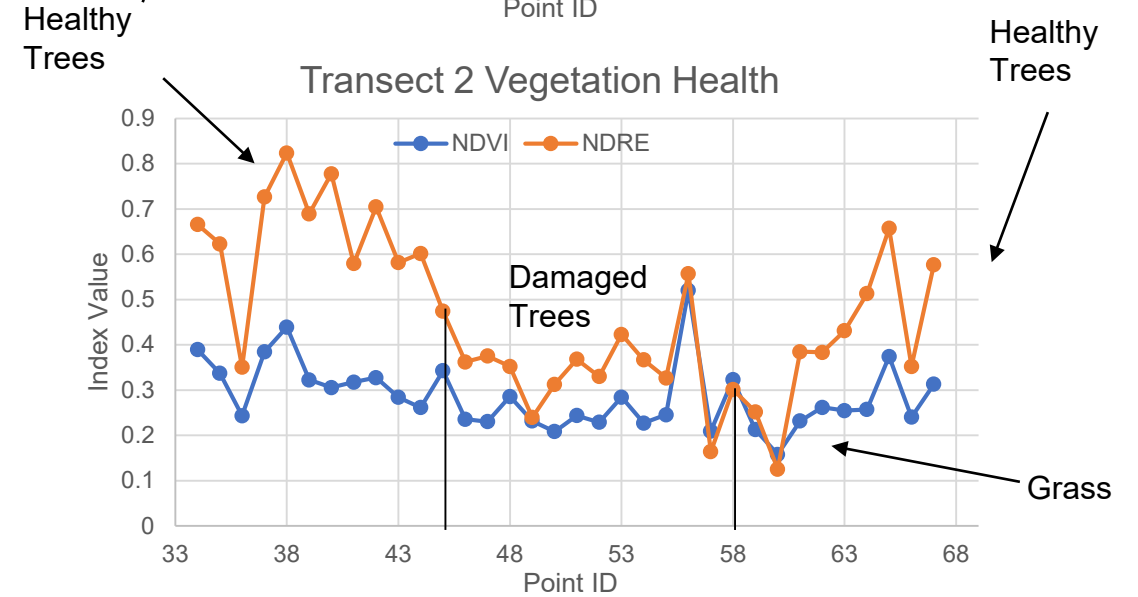
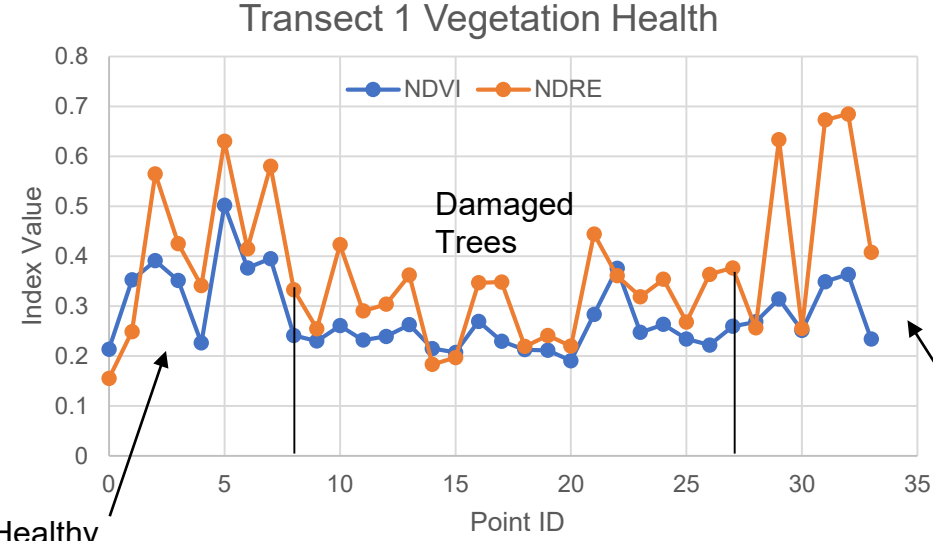
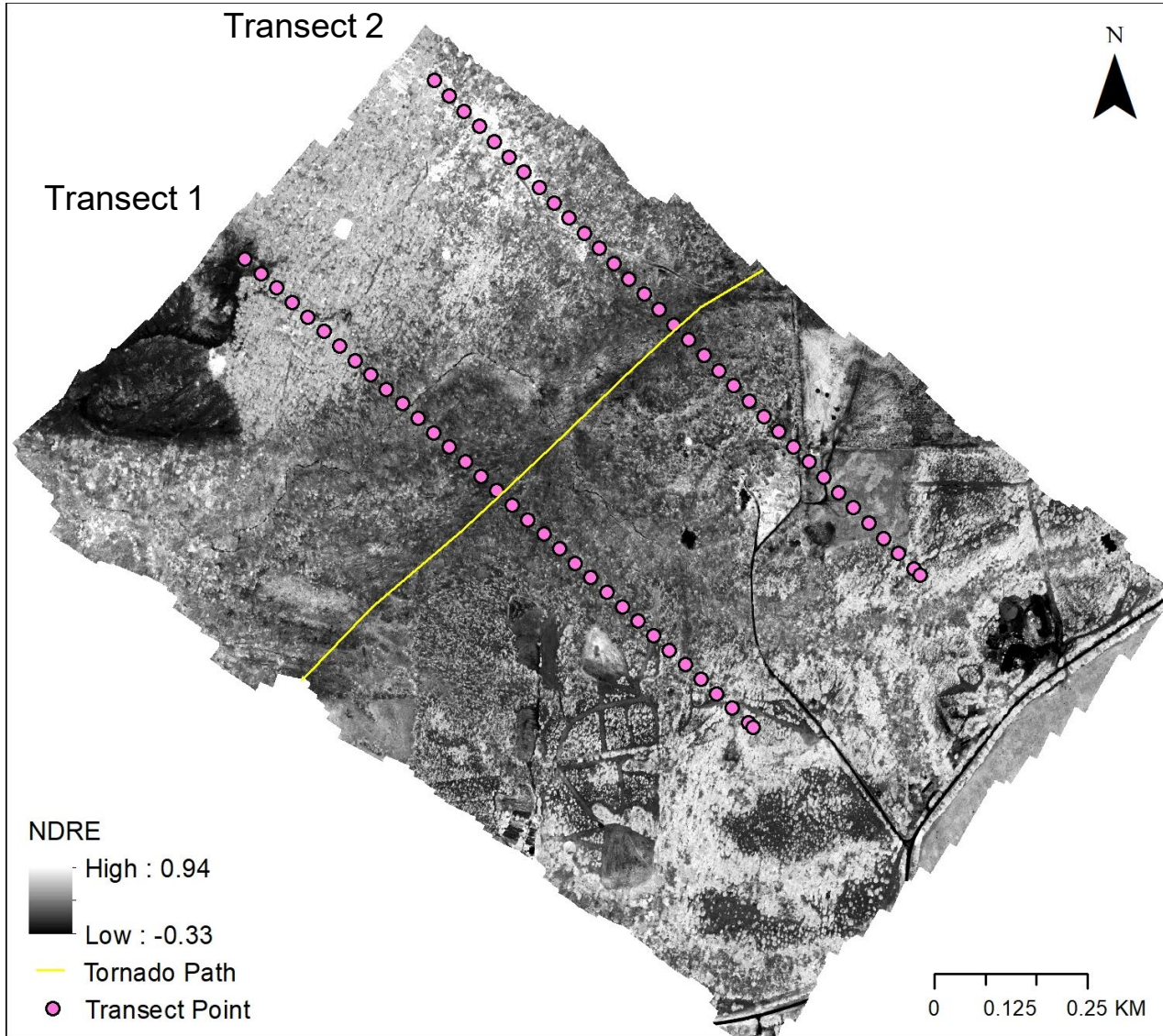


25 March 2021 Sawyerville-Brent-Centerville, AL Tornado



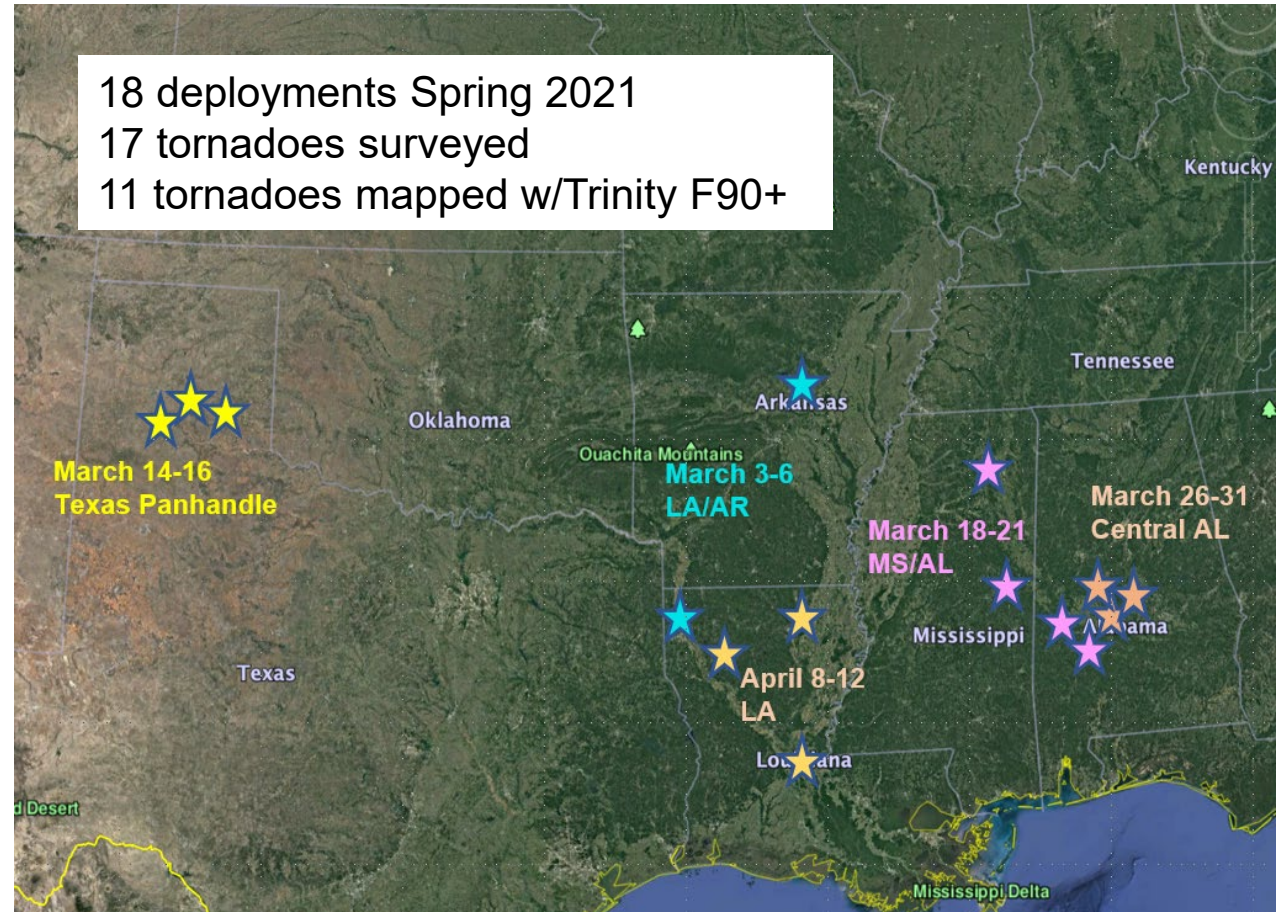


25 March 2021 Sawyerville-Brent-Centerville, AL Tornado



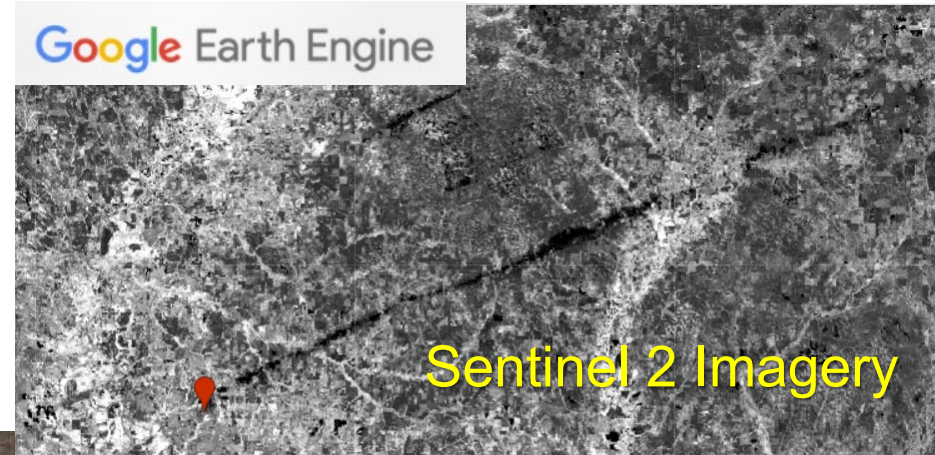
Institutional Collaboration

- Collaborate with NWS WFOs
 - Coordinated w/ AMA, SHV, LZK, MEG, LCH, JAN, BHM
 - 11 tornadoes identified or refined
 - Fill in the gaps & detailed assessment
 - Address arbitrary assignment of damage ratings in rural locations
- Work with Emergency Managers
- Disaster information to those affected



Data sharing and Visualization

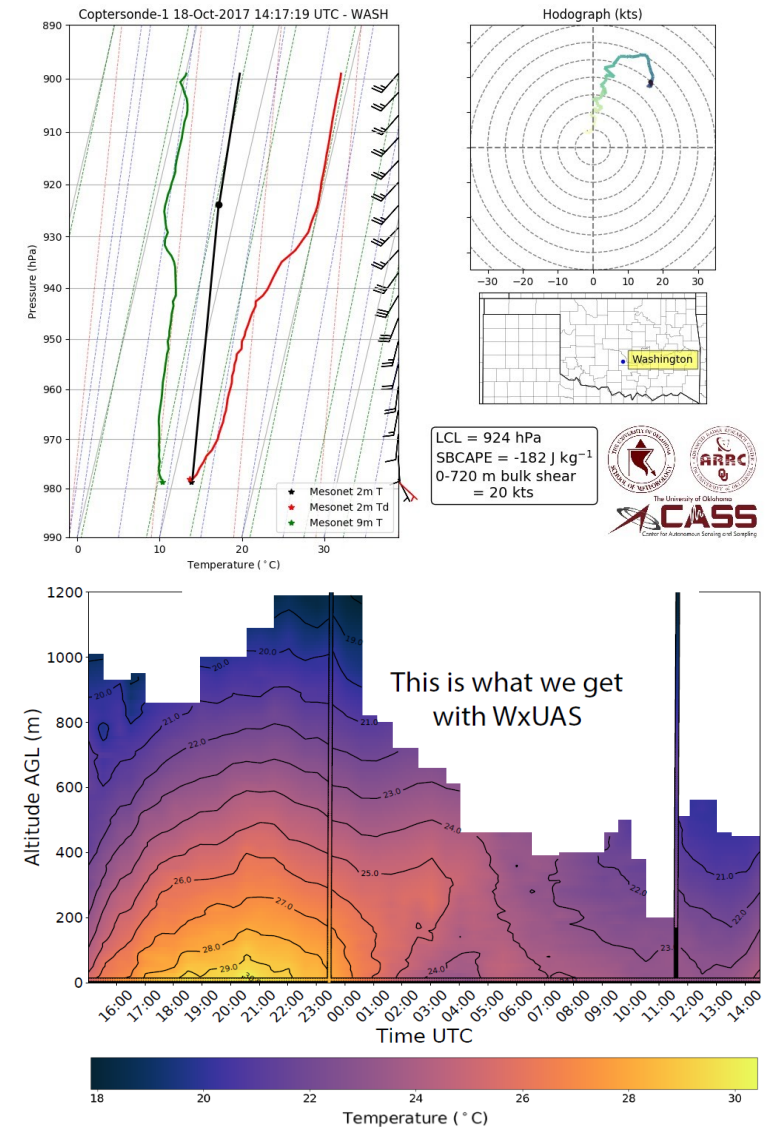
- Developed near-real time image processing using Amazon AWS Cloud Services
- Data sharing via NOAA ESRI products & Google Earth Engine



Atmospheric Profiling

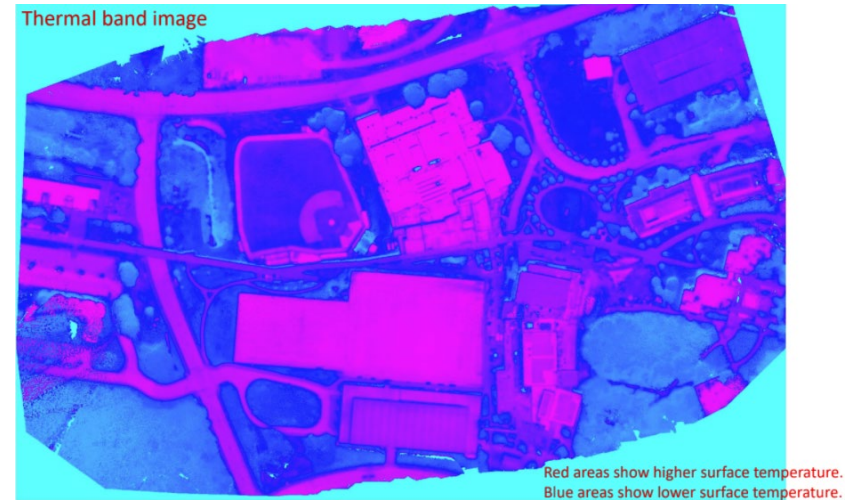


- Coptersondes
- Sample boundary layer
 - Vertical profiling
 - Temp, RH, pressure, Wsp, Wdir
- Observational data
 - Forecast models
 - Situational awareness

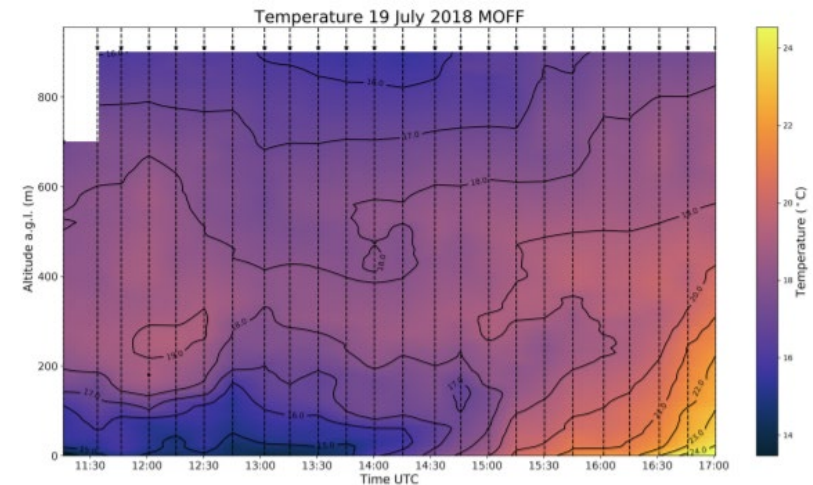


Future Work

- PERiLS Field Campaign
- Understand land cover impacts
- Assess land-atmosphere interactions
 - land surface characteristics
 - modeling
- Atmospheric profiling
 - boundary-layer dynamics
 - modeling & weather forecasting
 - Observation network



Source: Wang 2021



Source: Segales et al. 2020

Acknowledgements & Contact Information

Email: melissa.a.wagner@noaa.gov



Mike Coniglio, Tyler Bell, Elizabeth Smith, Doug Kennedy,
Sean Waugh, Zach Barney, Tony Lyza, Tony Segales*