What Happened?

A Preliminary Study on the Nocturnal Evolution of IOP3's Supercells to QLCS Development

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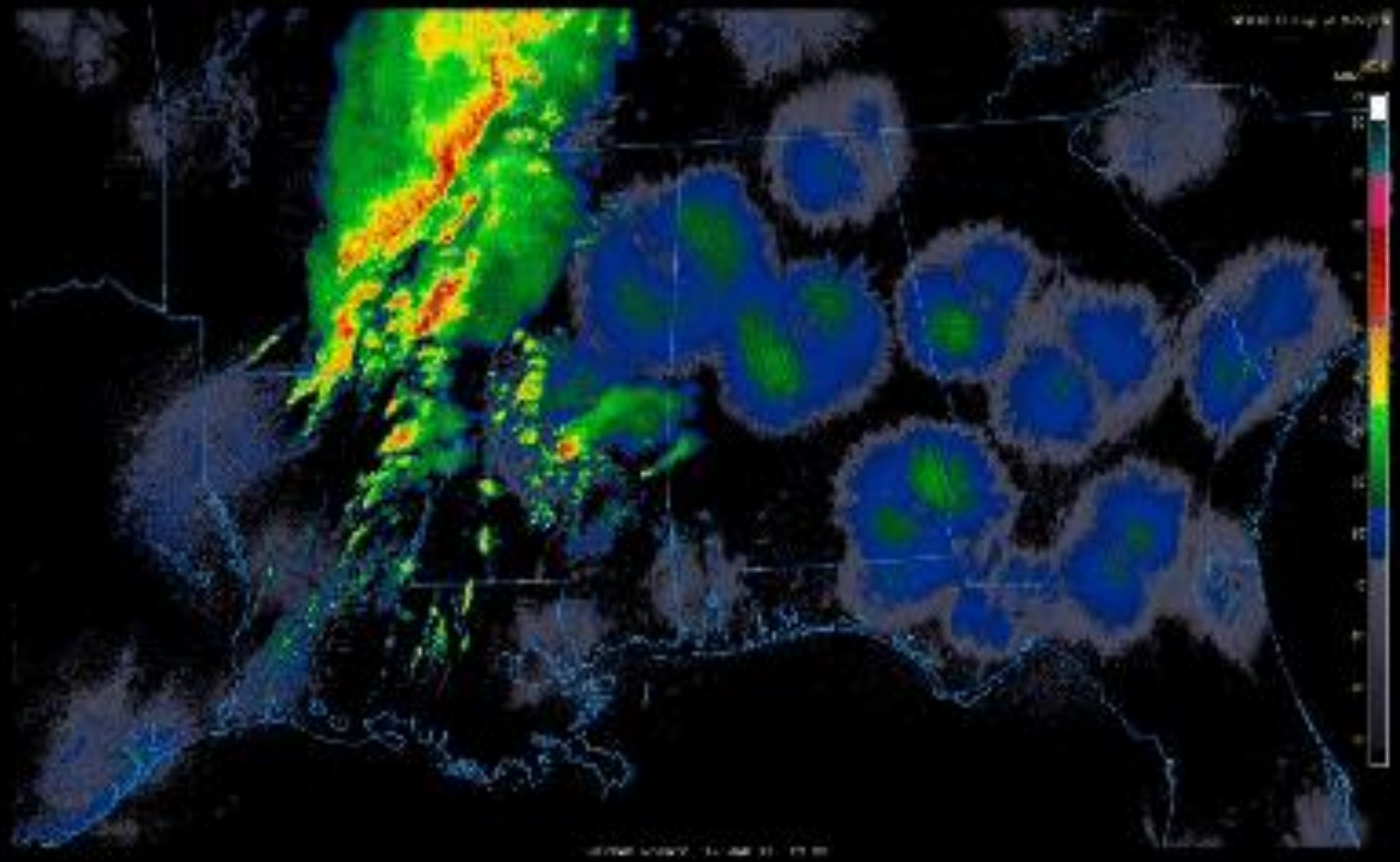
Picture description: Lightning illumination at Wilmont, MS. RaDAPS site.

Objective

To document and understand the changes in environmental parameters (and associated MCS structure) as the system evolves from its supercell inception in South/Central Mississippi to its QLCS ending in North Alabama



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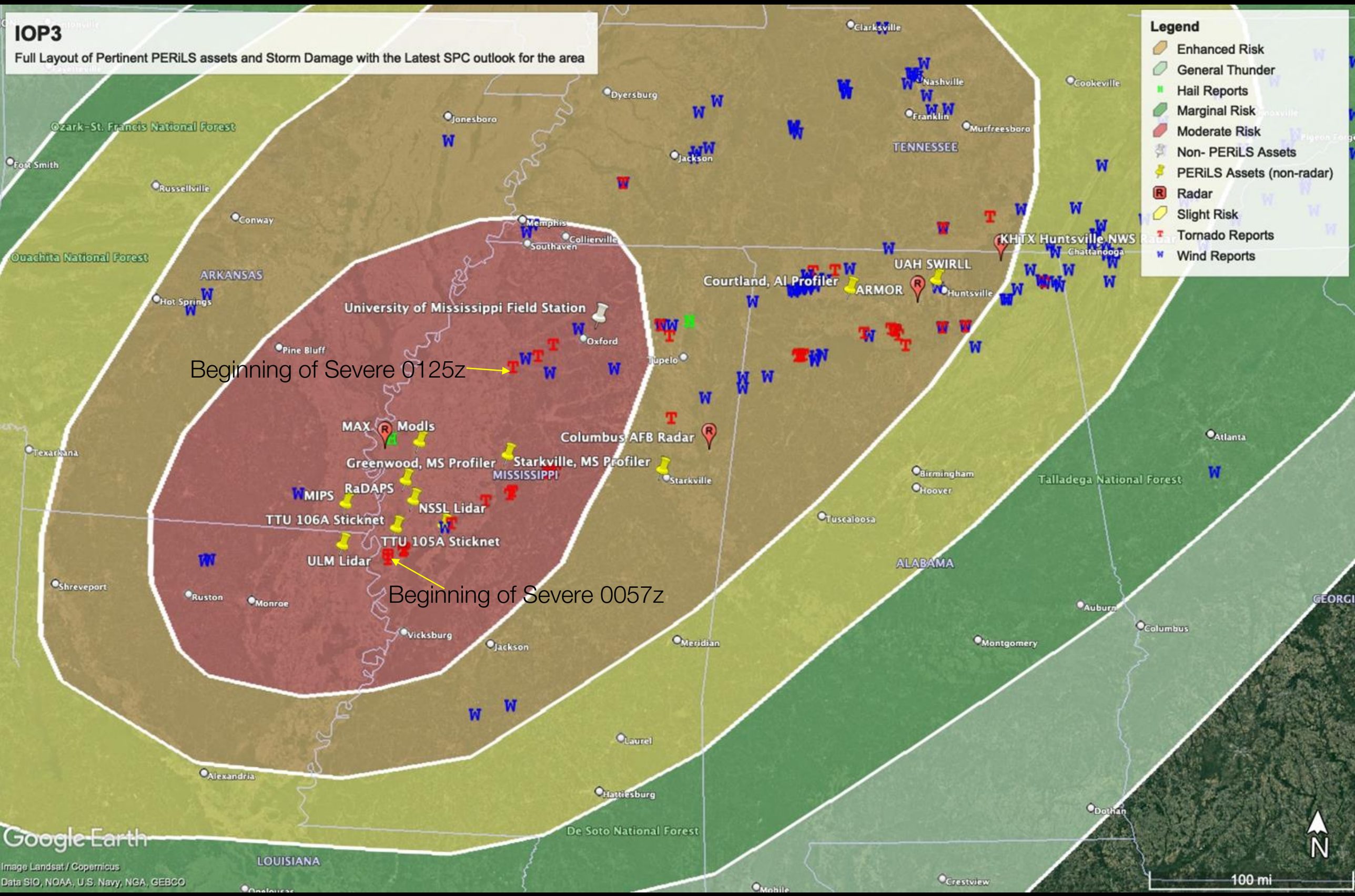
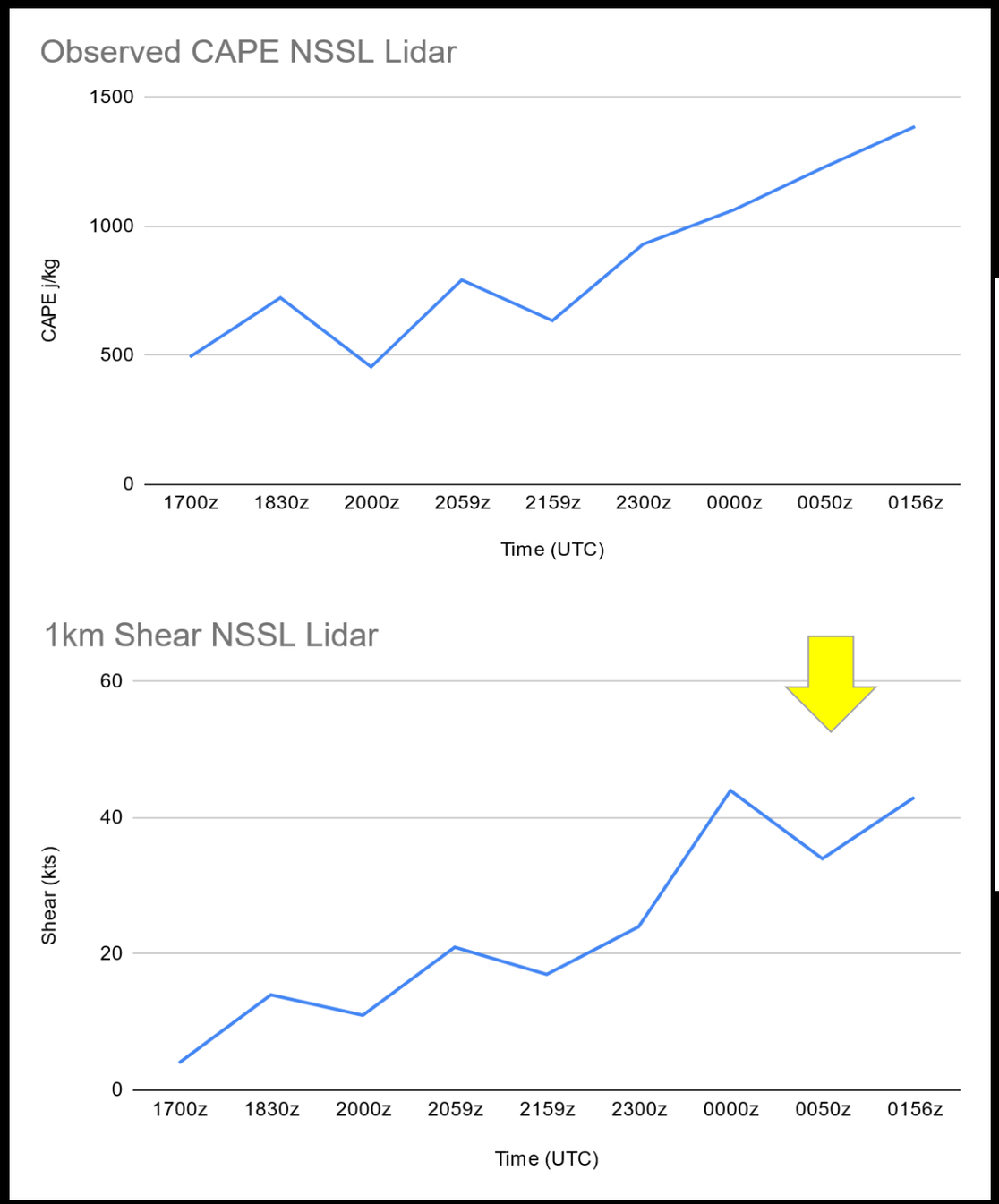
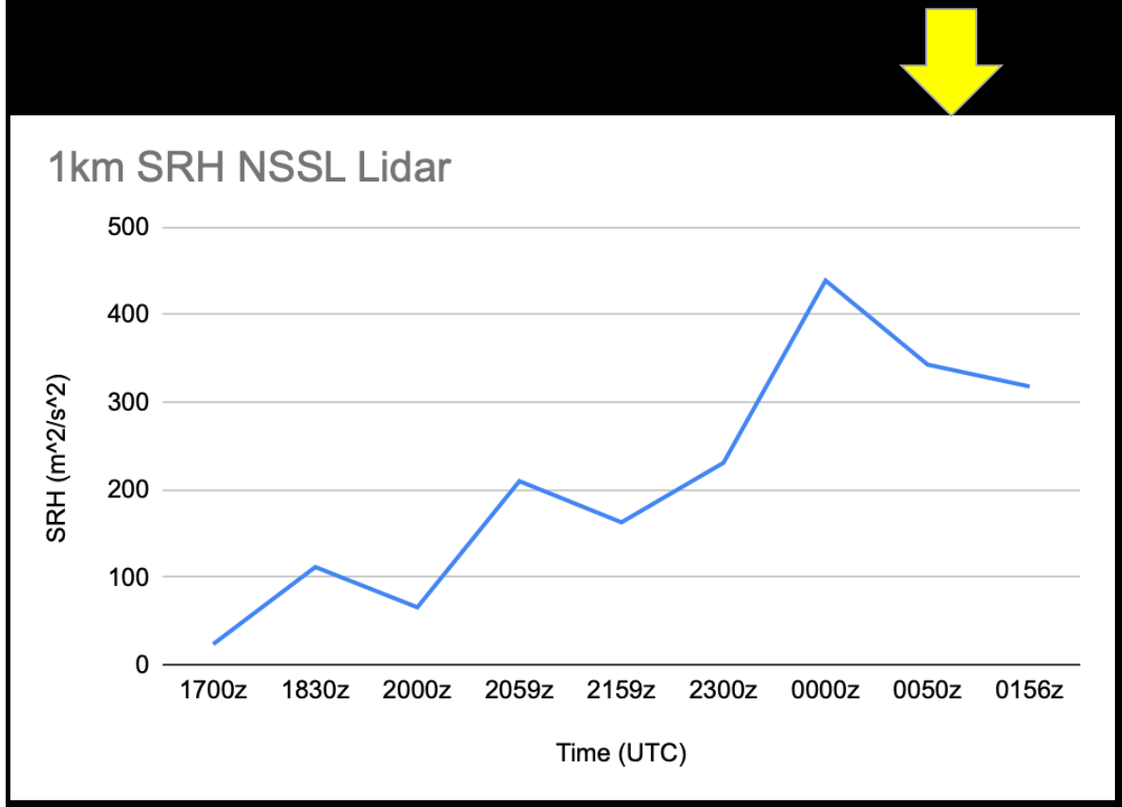

IOP3
Full Layout of Pertinent PERiLS assets and Storm Damage with the Latest SPC outlook for the area
Legend
Enhanced Risk
General Thunder
Hail Reports
Marginal Risk
Moderate Risk
Non- PERiLS Assets
PERiLS Assets (non-radar)
Radar
Slight Risk
Tornado Reports
Wind Reports
Beginning of Severe 0125z
Beginning of Severe 0057z
University of Mississippi Field Station
Courtland, Al Profiler
UAH SWIRLL
ARMOR
KHTX Huntsville NWS Radar
MAX
Modls
Columbus AFB Radar
Greenwood, MS Profiler
Starkville, MS Profiler
MIPS
RaDAPS
NSSL Lidar
TTU 106A Sticknet
TTU 105A Sticknet
ULM Lidar
Ozark-St. Francis National Forest
Ouachita National Forest
Talladega National Forest
De Soto National Forest
TENNESSEE
MISSISSIPPI
ALABAMA
ARKANSAS
LOUISIANA
Clarksville
Nashville
Cookeville
Dyersburg
Jonesboro
Franklin
Murfreesboro
Jackson
Fort Smith
Russellville
Conway
Memphis
Collierville
Southaven
Hot Springs
Pine Bluff
Oxford
Tupelo
Huntsville
Chattanooga
Starkville
Birmingham
Hoover
Atlanta
Tuscaloosa
Shreveport
Ruston
Monroe
Vicksburg
Jackson
Meridian
Montgomery
Auburn
Columbus
Laurel
Alexandria
Hattiesburg
Dothan
Crestview
Mobile
Texarkana
Google Earth
Image Landsat / Copernicus
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
100 mi
N

Current Methodology

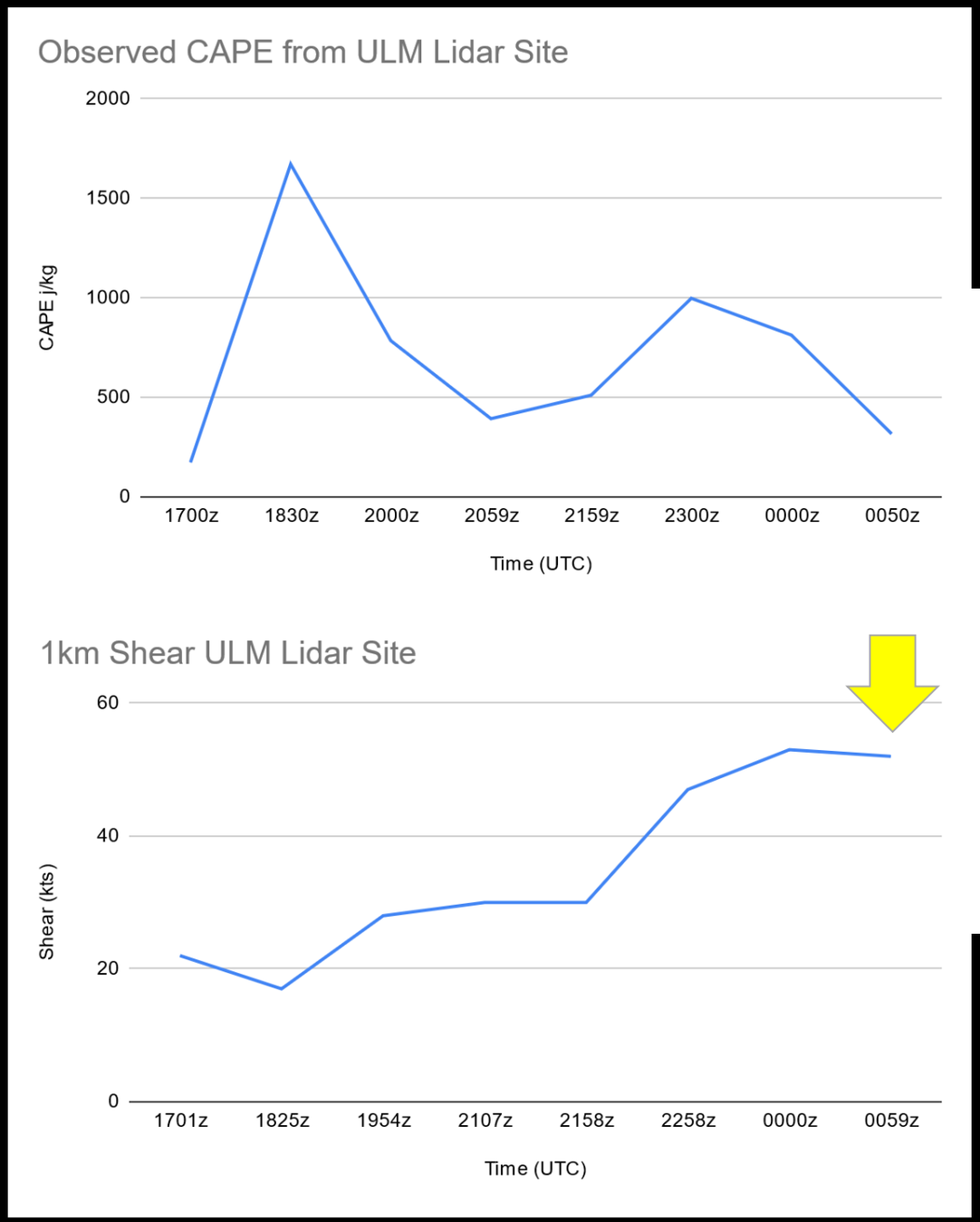
- Targeting the “South Cell” inception
  - Using Ground Based PERiLS assets such as Lidars, Profilers, Soundings, and Meteograms
  - SRH, CAPE, Shear (1km and 3km), 
    - Compare with 16z HRRR forecast values at one hour intervals
- Target “North Cell” inception
  - Repeat previous Methodology
- Follow Both Cells to North Alabama
  - Repeat Methodology but use any available field stations, profilers etc
- Repeat Methodology for QLCS in North Alabama

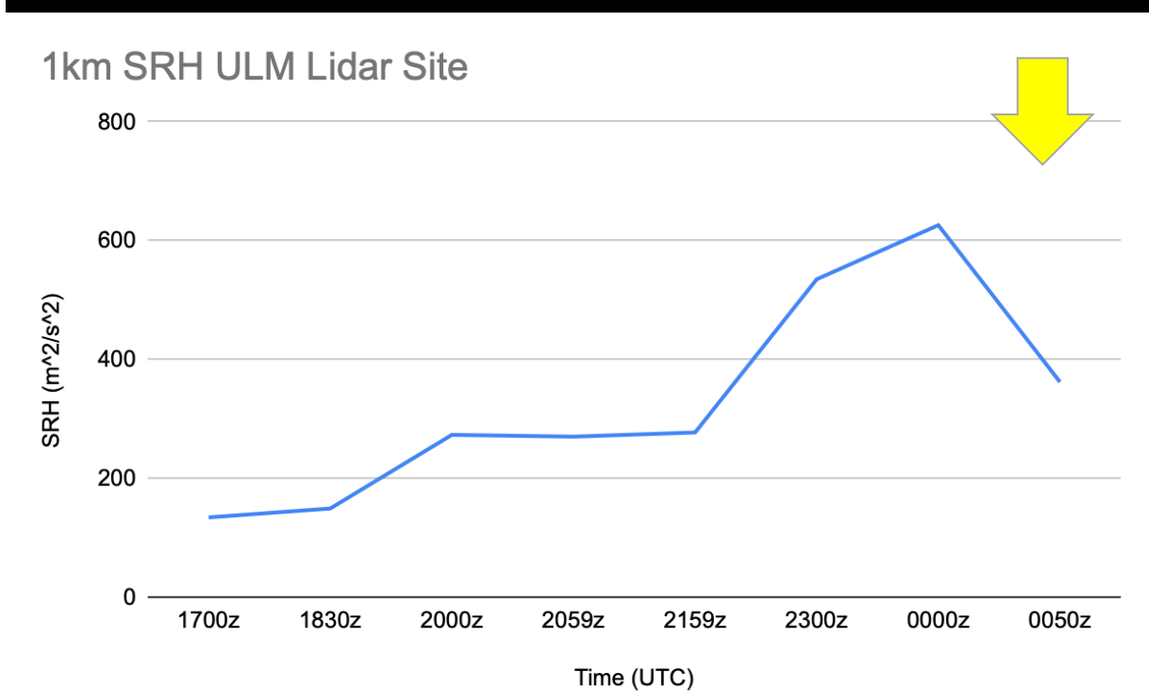
Preliminary Results
Surface NSSL Lidar Site



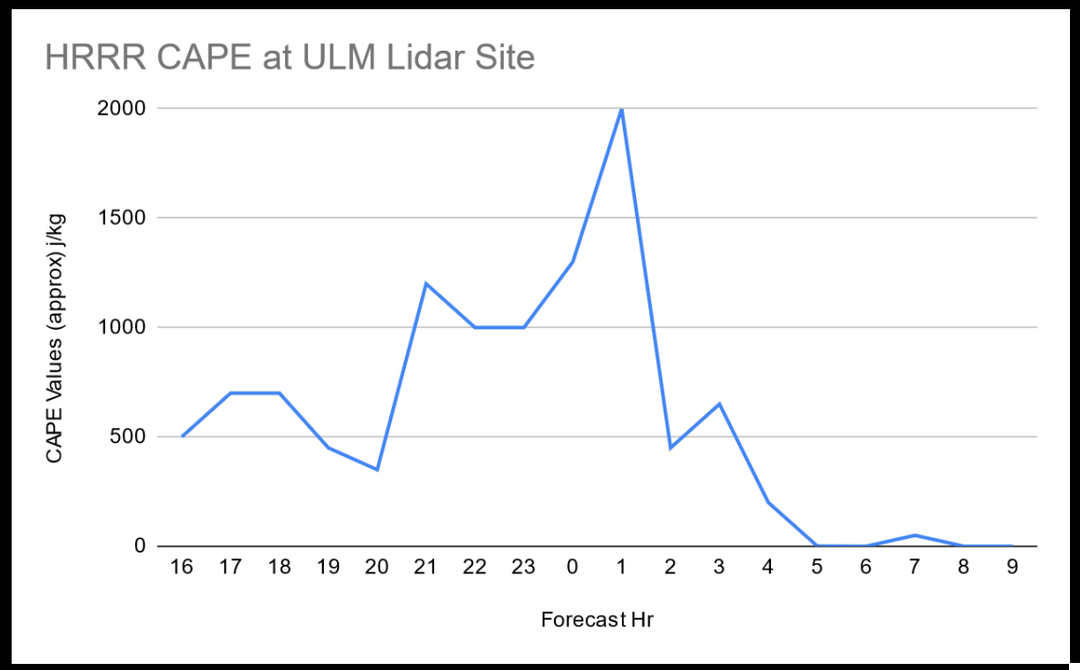


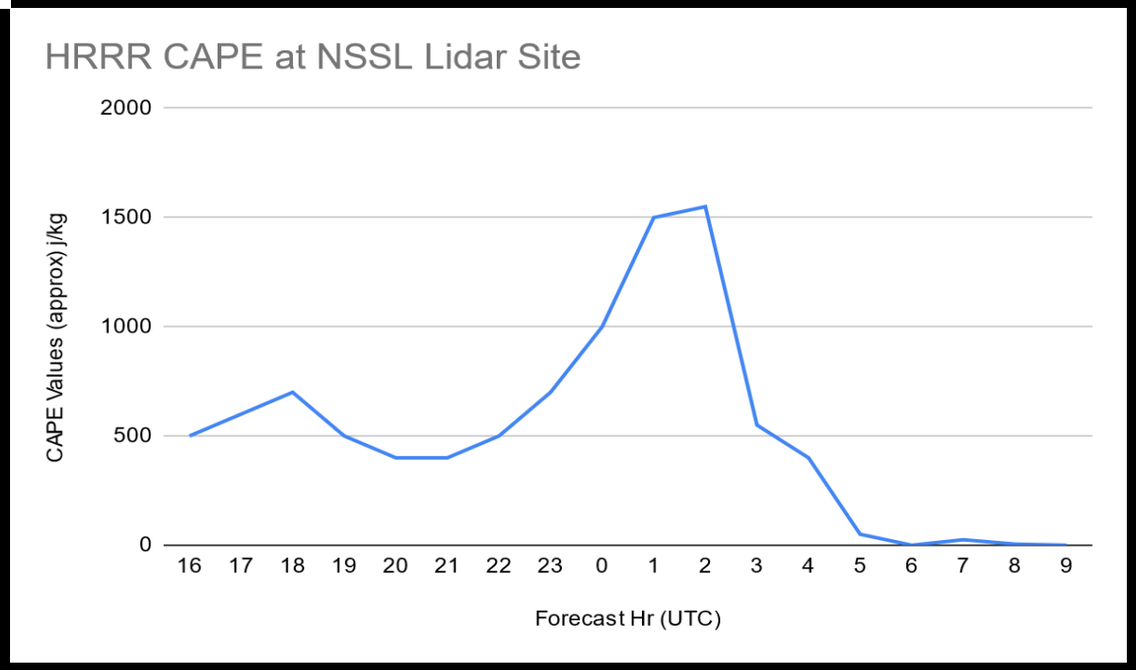
Preliminary Results
Surface ULM Lidar Site



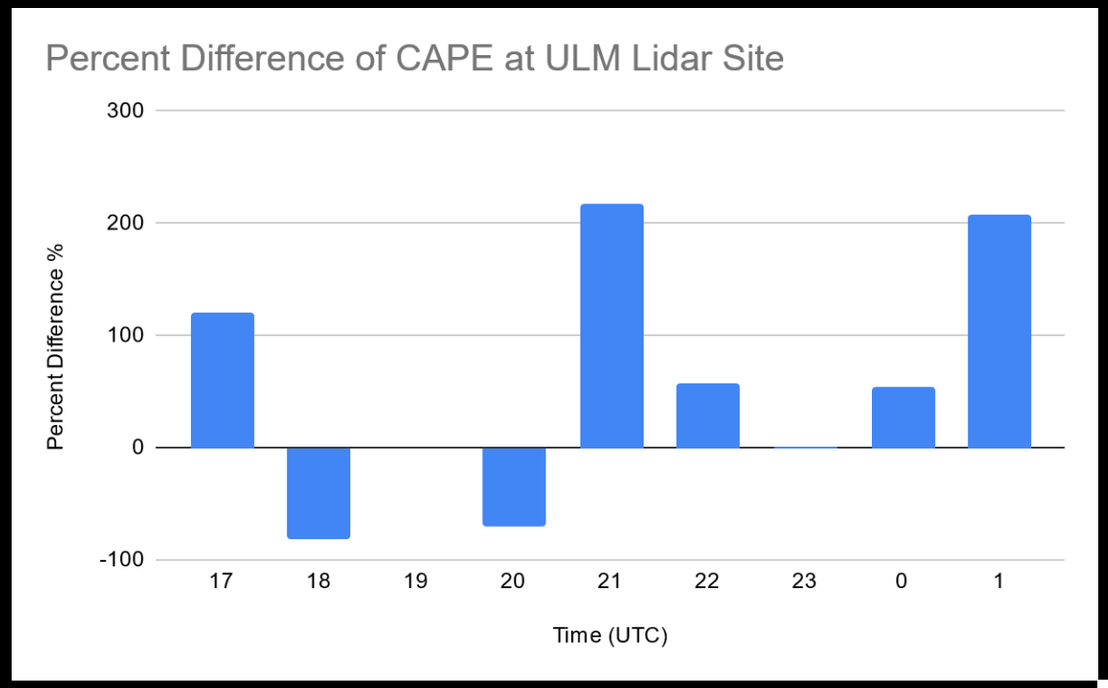


Preliminary Results
HRRR (Approximate)

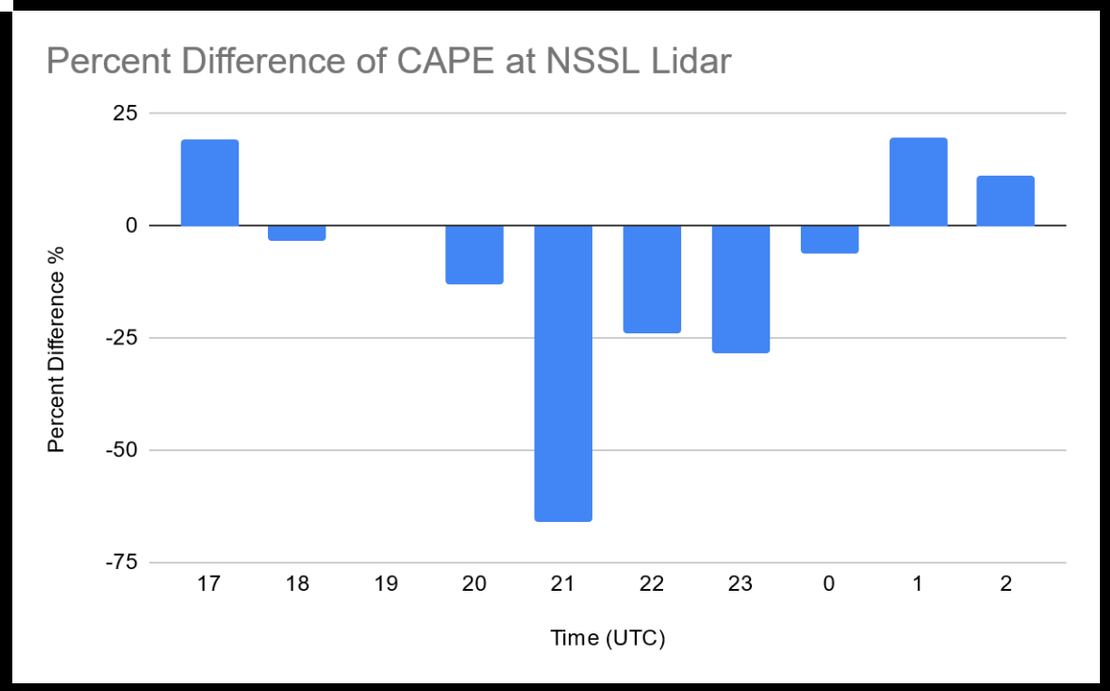




Preliminary Results Comparison



$$\%diff = (\frac{C_H - C_O}{\frac{C_H + C_O}{2}}) * 100$$



Preliminary Conclusions

- Variability in Surface variables over a relatively short distance (approx. 40 miles)
  - Some feature occurs around 0z
  - Suspect AET plays a part
- HRRR underestimates CAPE for NSSL site and overestimates CAPE for ULM Site
  - Potential for over/under estimates with other variables

Immediate Future of Project

- Complete Analysis with the other surface variables
- Confirm HRRR Estimations using ZARR/HRRR soundings
- Add more target sites to Analysis
- Look for HRRR bias patterns

Picture description: Clouds before sunset at Wilmont, MS. RaDAPS site.

End Goal

To answer the "*What Happened?*"
both from observations and the HRRR model and finally be able to state "How this happened".

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Picture description: Sunrise in Greenville, MS morning after ops.

Far into the future

- Performing VADs
  - MAX or other PERiLS radar(s)
  - Columbus AFB (KGWX)
  - ARMOR
  - Hytop (KHTX)
- Introduce thermodynamic variables such as Theta-e
- Lightning Density context