COLLEGE OF SCIENCE
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

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Field Data Collection and Analysis of Tornadic Environment Enhancement by Topography Along the Sand Mountain Plateau

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Fig.1 UPSTORM members, Preston Pangle, Joy Marich, and Emily Kinkle, are prepping a weather balloon ahead of an approaching storm.

Method

Fig.2 Soundings were launched from Scottsboro, AL (red balloon) and From Powell, AL (blue balloon) at coordinated times to accurately compare data from the difference in elevation.

- After collecting field data, gathering and quality controlling (QC'ing) the data is necessary to prepare for analysis.
- Using Python, computer code were written to output weather balloon sounding data in one general research-ready format for analysis.
- One of the sounding systems used by UAH contained noisy wind data.
- Another code was written to recalculate wind speed and wind direction from latitude and longitude.

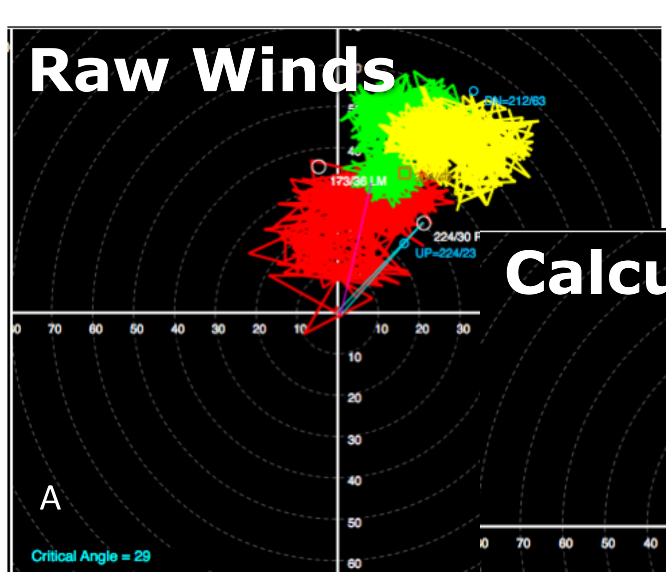

Fig.3 Hodographs from 25 March 2017. Hodograph A is the raw winds plotted using SHARPpy.

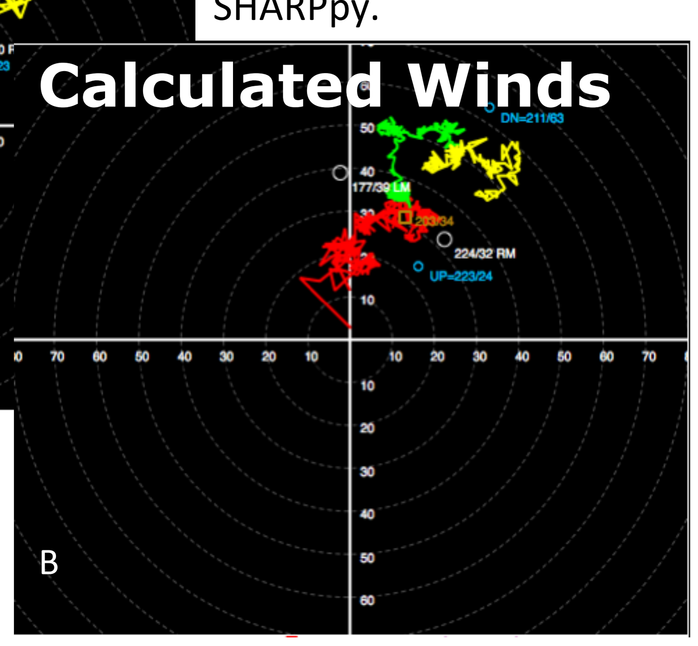

Fig.4 Hodograph B is the same sounding, but the winds have been recalculated using a Python script.

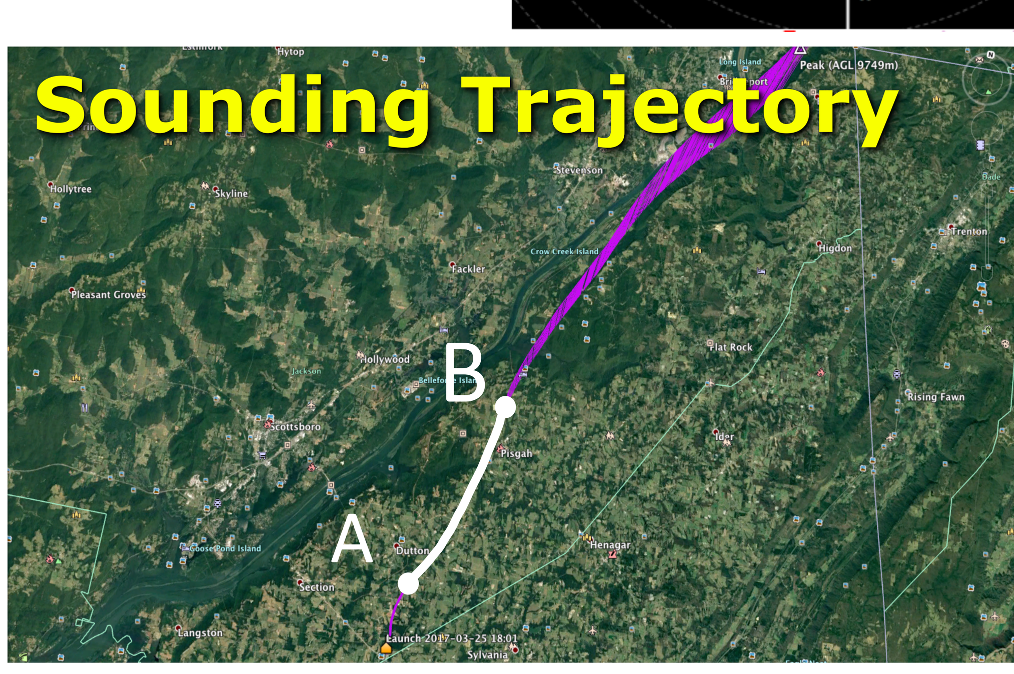

Fig.5 This a Google Earth view of the sounding path from 25 March. Using the latitudes and longitudes of point A and B, the Haversine Equation was used to calculate the distance between the points. This was then divided by the time it took to go that distance to calculate wind speed.

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Summary & Background

- Verification of the Origins of Rotation in Tornadoes Experiment-Southeast (VORTEX-SE) began to better understand tornado formation in Southeast.
- UAH, along with other universities and organizations, deployed mobile radars, wind profilers, and weather balloon teams to collect high temporal resolution data across the Tennessee Valley and Sand Mountain Plateau.
- The data will be used to quantify the role varying boundary layer flow and moisture within complex terrain to understand what affect it has on the tornadic environment.

Impacts

- Storm Relative Helicity (SRH) is the measure of helical flow in the atmosphere and is used to better understand the tornadic environment.
- SRH is calculated using the wind speed and direction. If the wind speeds and wind directions are noisy, incorrect SRH values can be produced.

Raw Data

	SRH (m2/s2)	Shear (kt)
SFC-1km	593	29
SFC-3km	649	36
Eff Inflow Layer	10	1
SFC-6km		49
SFC-8km		49
LCL-EL (Cloud Layer)		39
Eff Shear (EBWD)		43

Fig.6 This is the raw 25 March sounding. Looking at the SRH here, notice the high values for 0-1Km and 0-3Km.

Calculated Data

	SRH (m2/s2)	Shear (kt)
SFC-1km	194	21
SFC-3km	247	32
Eff Inflow Layer	--	--
SFC-6km		49
SFC-8km		50
LCL-EL (Cloud Layer)		22
Eff Shear (EBWD)		--

Fig.7 This is the recalculated 25 March sounding. Looking at the SRH here, notice the values for 0-1Km and 0-3 Km are significantly lower.

Future Work

- With correct SRH values, comparison of soundings from 5 April began and revealed an increased 0-1km SRH across the plateau shown below, indicating that the region has a more favorable tornadic environment than adjacent areas in the valley.
- The code written will be used for VORTEX-SE year 3 and other projects to come.