Using SoDAR Wind Profiling to Characterize Winds at Hub Height and Beyond

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VAISALA

Project Summary

- Southeastern Coastal Wind Coalition, Southern Energy, Alabama Power, Santee Cooper, and Vaisala are working together to understand the wind energy potential in the Southeast United States at higher hub heights.
- The objective is to co-develop an observational network, wind resource map, and dataset at current commercial hub heights.
  - Each company provides at least one observation site, at 80m or higher, which will be contributed to the network.
  - In return for contributing, each company has access to;
    - Vaisala wind resource map of the region
    - Vaisala data cube for the region
    - Vaisala verification statistics at each contributed observation point
- Each member will be part of the public release of a wind speed resource map that incorporates the observational locations

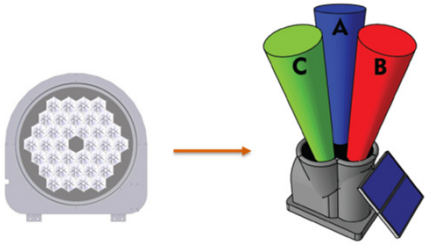
Vaisala's Role in the Project

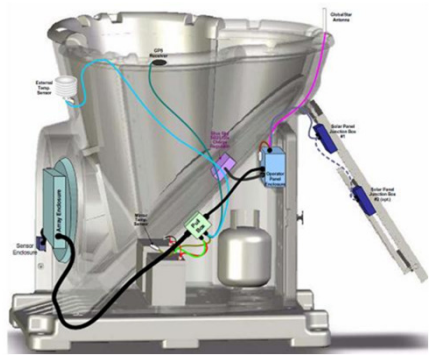
- Contribution of three Triton Remote Sensing units to directly measure the wind at 100m and above in key locations.
  - Deployment locations will be mutually agreed upon
  - Minimum of one year of observational data will be collected
  - Access to SkyServe online data portal
  - Quality control of Triton data
- Wind resource modeling, incorporating observational data contributed by members
  - Spatial wind-cube of wind speed corrected based on observations taken by the Vaisala contributed Triton units and observations contributed by the remaining network. 10-years of hourly data at a spatial resolution of 1km.
  - Public access to the annual average wind speed map image
  - Validation reports at observation locations

Triton® Wind Profiler – Key Features

- Proven accuracy and high reliability
  - ~98% uptime
- Fully autonomous operation
  - Solar powered
  - Draws just 7W average power
  - Remote diagnostics
- 40m to 200m wind speed, direction, TI, vertical wind speed (90% DR+)
- Temperature, pressure, humidity
- GPS for locational accuracy, time stamp
- Satellite or GPRS communications
- Online data access

www.vaisala.com/triton





Vaisala Wind Energy Modelling

Input

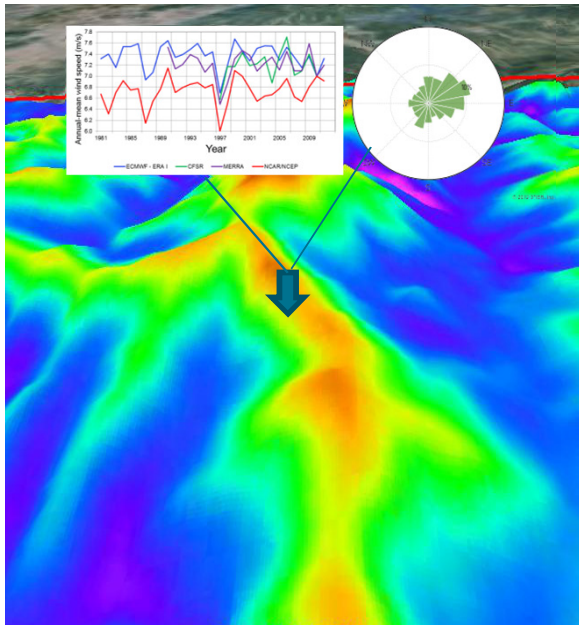
Output

Global Weather Information 1948-present

High Resolution Terrain, Soil, and Vegetation Data

On-Site Observations From Project

Vaisala Wind Energy Modeling



Requirements for Joining

- Provide Vaisala full access to observations for use in study
- Minimum 80m height and 1 year of wind resource assessment grade measurements
- For Triton Remote Sensing Locations
  - Land for the Vaisala contributed observational units
  - Pay for shipping, installation, and fixed annual maintenance costs for the Triton units.
- Marketing rights to release the results of the study. Specific marketing to include;
  - Spatial map (image) and annual mean wind speed
  - The fact that the study was done and Vaisala's contribution
  - Their involvement (company name) in the effort.

Interested in Joining?

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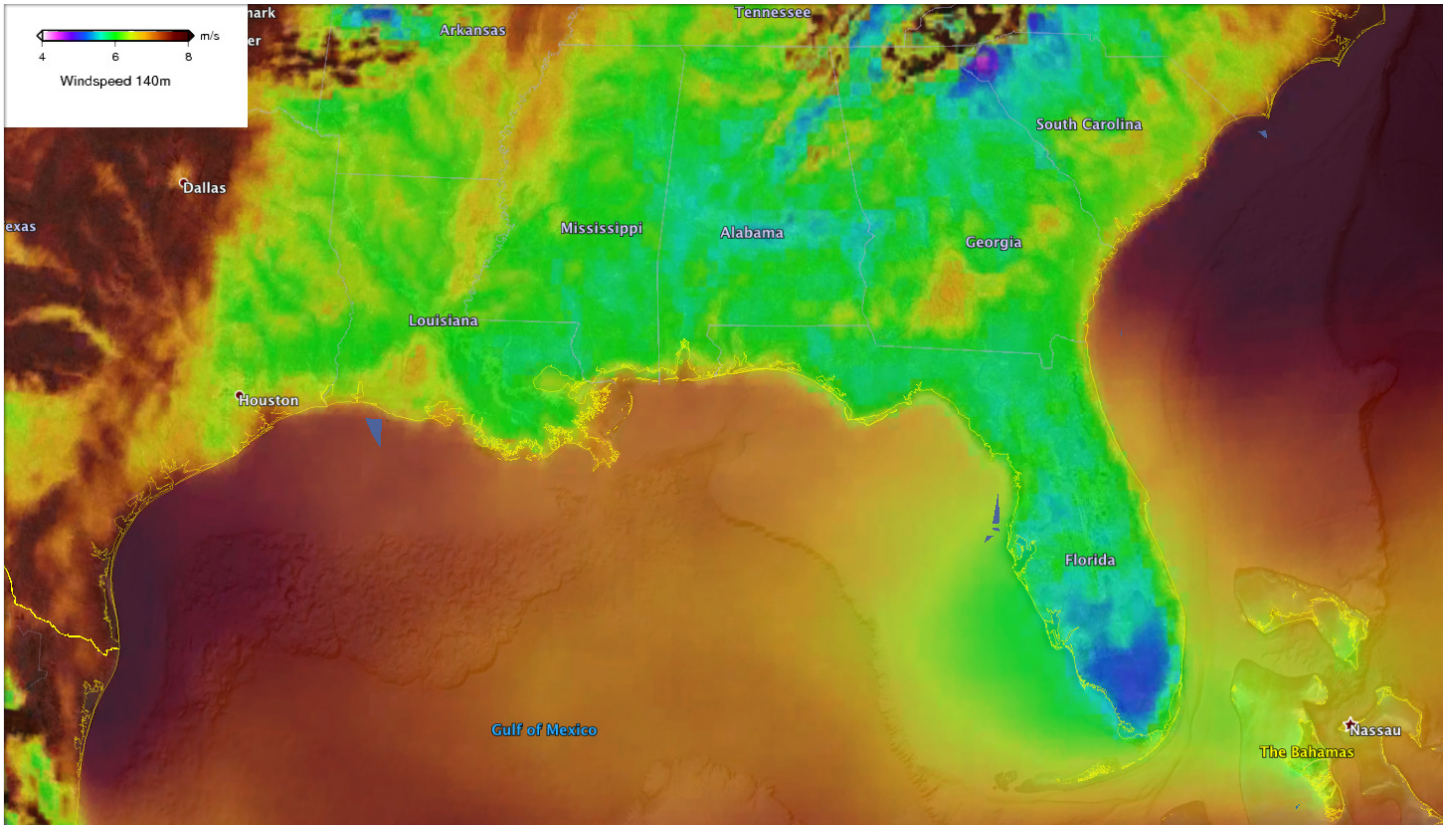
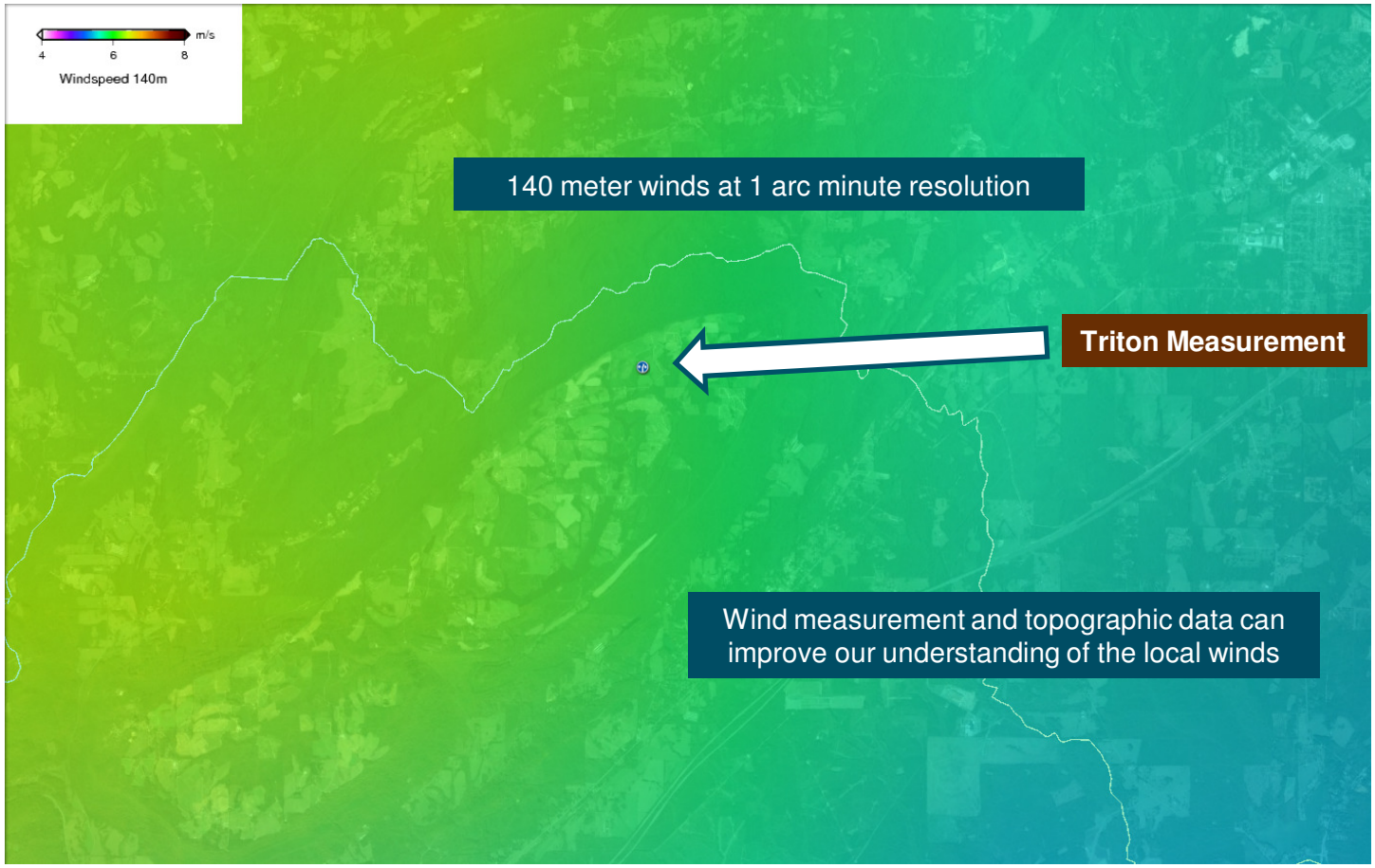
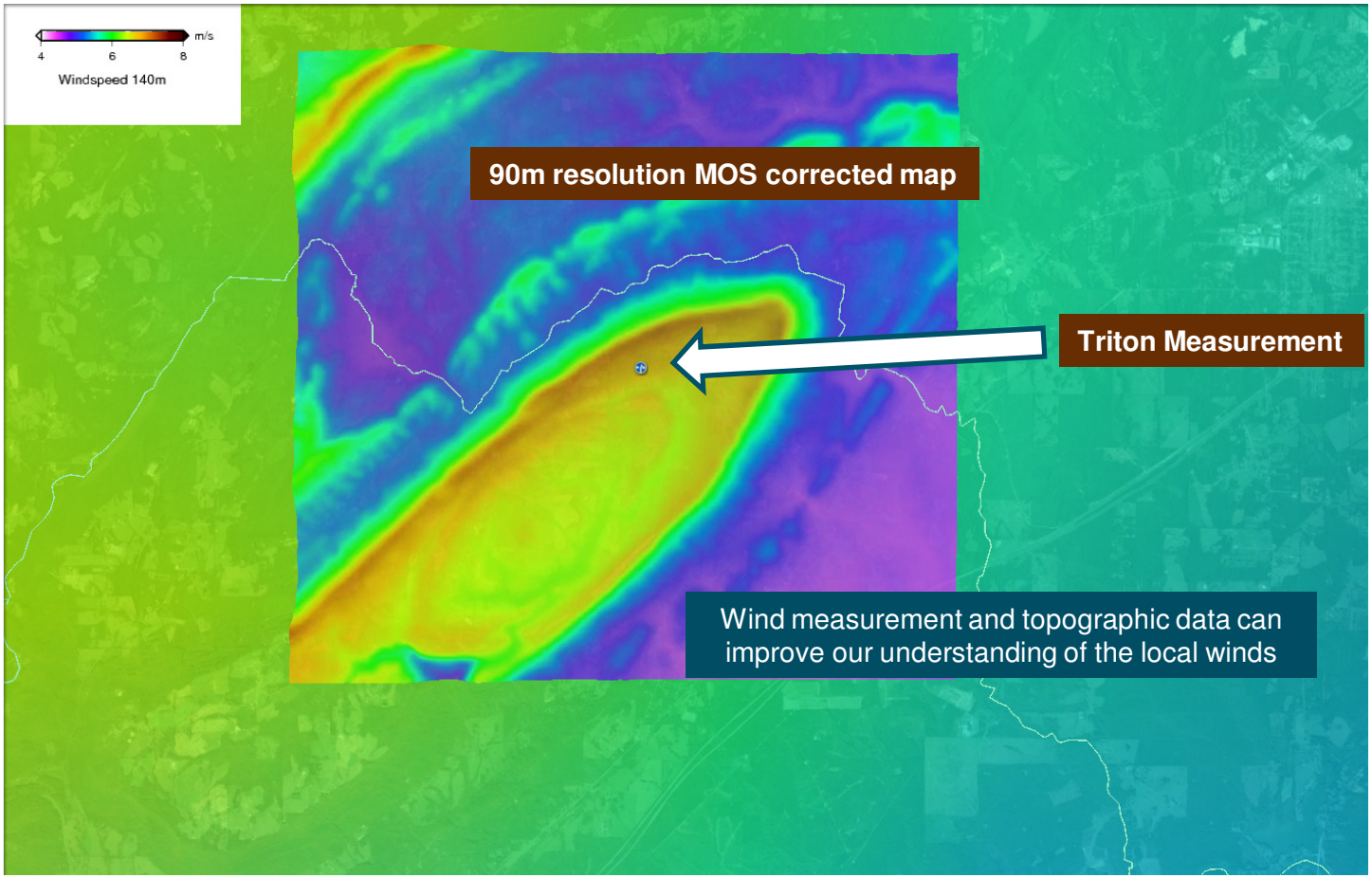


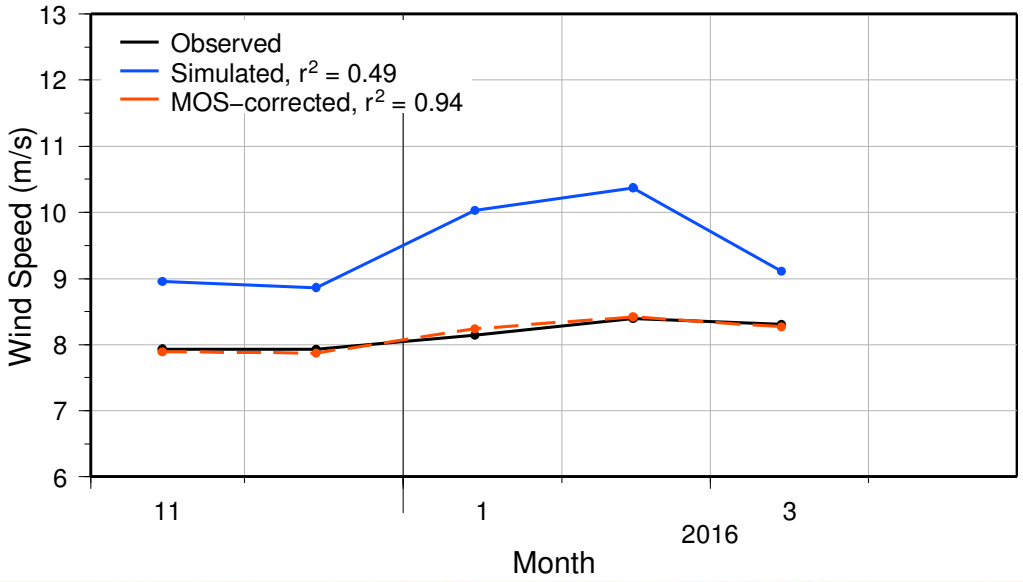
From 1-arc Minute global simulation

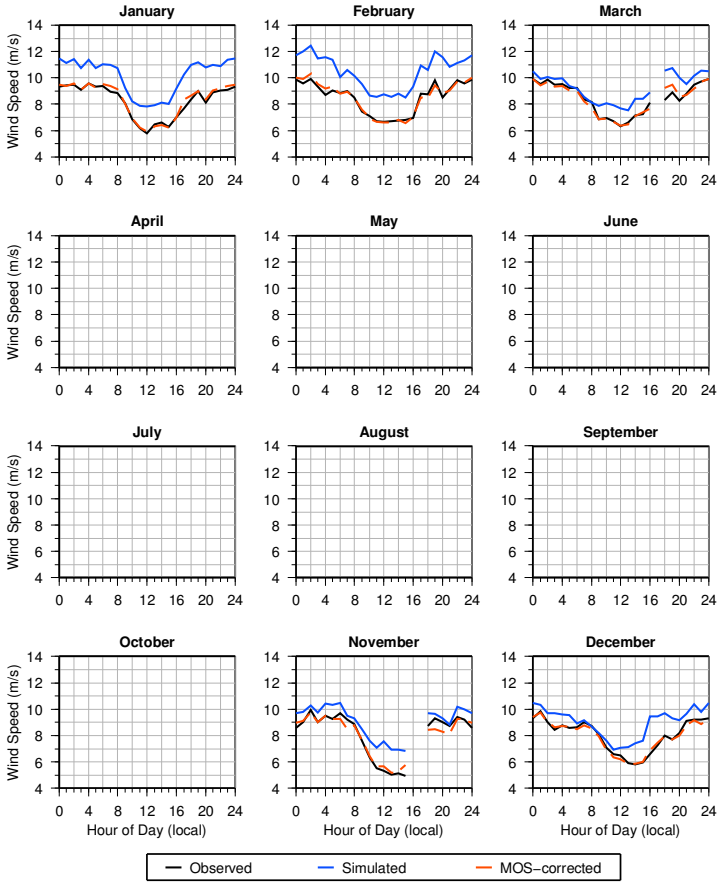

m/s
4
6
8
Windspeed 140m
140 meter winds at 1 arc minute resolution
Triton Measurement
Wind measurement and topographic data can improve our understanding of the local winds

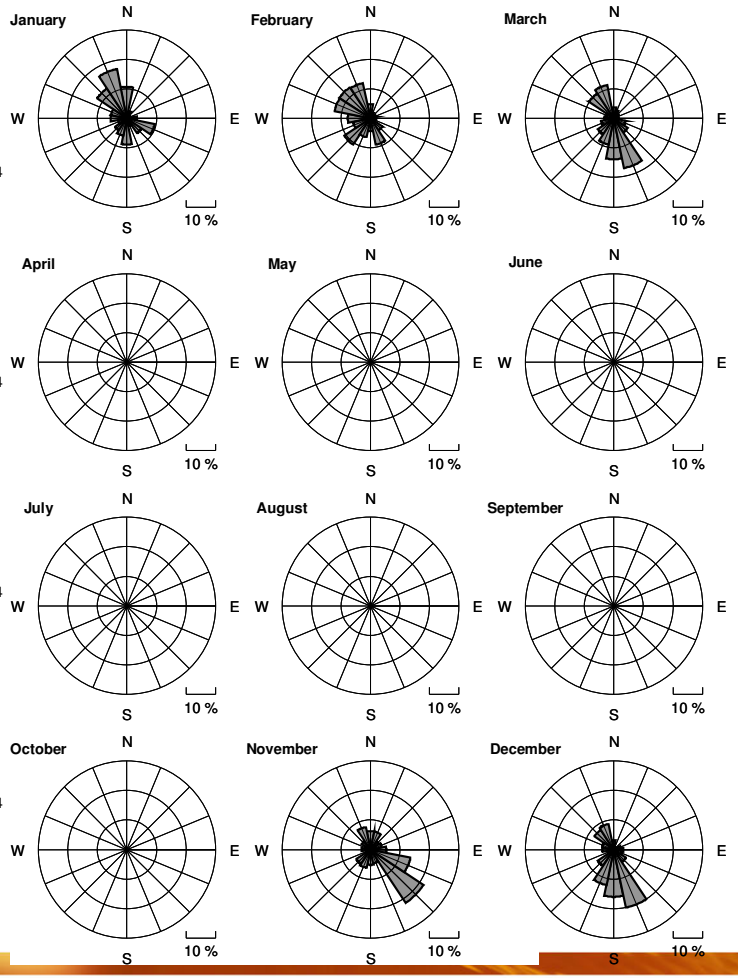

m/s
4
6
8
Windspeed 140m
90m resolution MOS corrected map
Triton Measurement
Wind measurement and topographic data can improve our understanding of the local winds

T448 – Southern Company

Month	Observed	Simulated	Bias	MOS-corrected	Availability(\%)
Nov-15	7.93	8.96	1.02	7.89	64.3
Dec-15	7.93	8.86	0.93	7.87	79.0
Jan-16	8.14	10.03	1.89	8.24	85.2
Feb-16	8.39	10.37	1.97	8.42	82.2
Mar-16	8.30	9.11	0.81	8.27	75.8
Apr-16	8.40	10.67	2.27	8.33	4.7
All	8.15	9.51	1.36	8.15	65.2

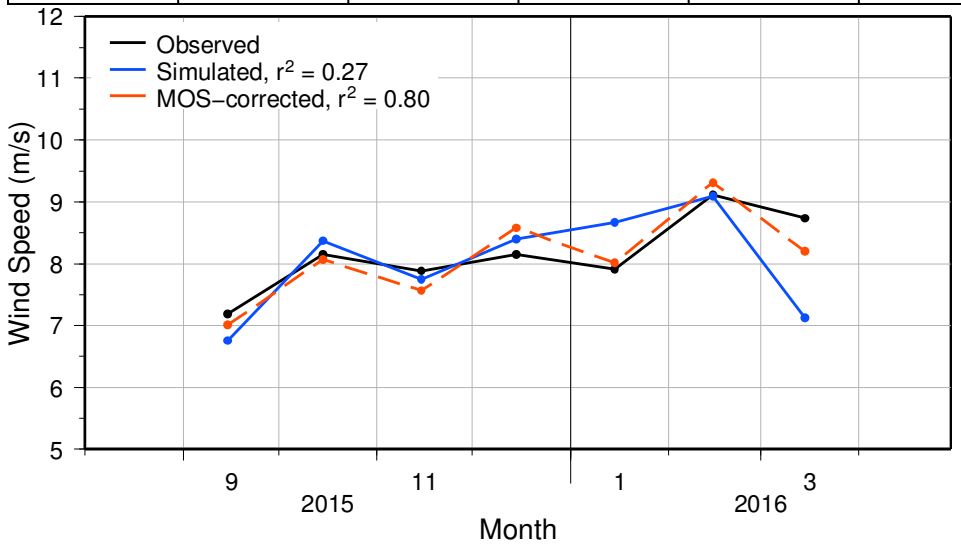



January
February
March
April
May
June
July
August
September
October
November
December
Wind Speed (m/s)
Hour of Day (local)
Observed
Simulated
MOS−corrected


January
February
March
April
May
June
July
August
September
October
November
December
N
E
S
W
10 %

T142-14 : Santee Cooper

Month	Observed	Simulated	Bias	MOS-corrected	Availability(\%)
Aug-15	5.41	5.43	0.02	5.81	44.4
Sep-15	7.19	6.76	-0.43	7.01	69.3
Oct-15	8.15	8.37	0.22	8.07	54.3
Nov-15	7.89	7.75	-0.14	7.56	58.6
Dec-15	8.15	8.40	0.25	8.58	60.8
Jan-16	7.91	8.67	0.76	8.02	69.5
Feb-16	9.11	9.09	-0.02	9.31	69.3
Mar-16	8.74	7.13	-1.61	8.20	60.1
Apr-16	11.47	11.31	-0.16	12.02	5.0
All	7.93	7.82	-0.11	7.93	54.6

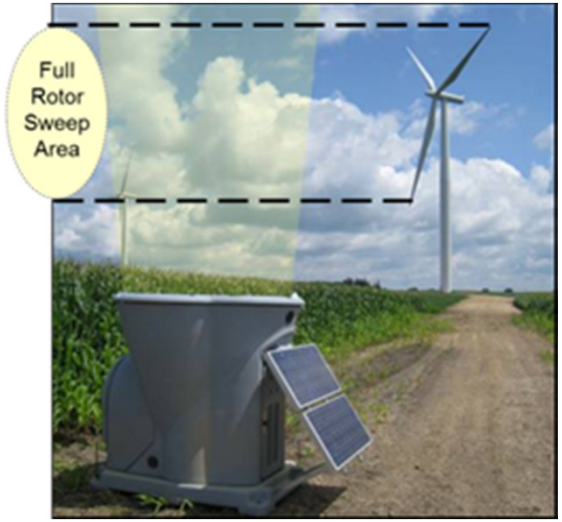


Conclusions

- Triton SoDAR Wind Profiler is being used to better characterize winds at 140 m above ground level to prove that wind energy is viable in the southeastern USA

- Measurements are combined with met tower data and numerical weather prediction models to improve the wind resource maps and analysis

- Opportunity is still available to participate in the study



Questions

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