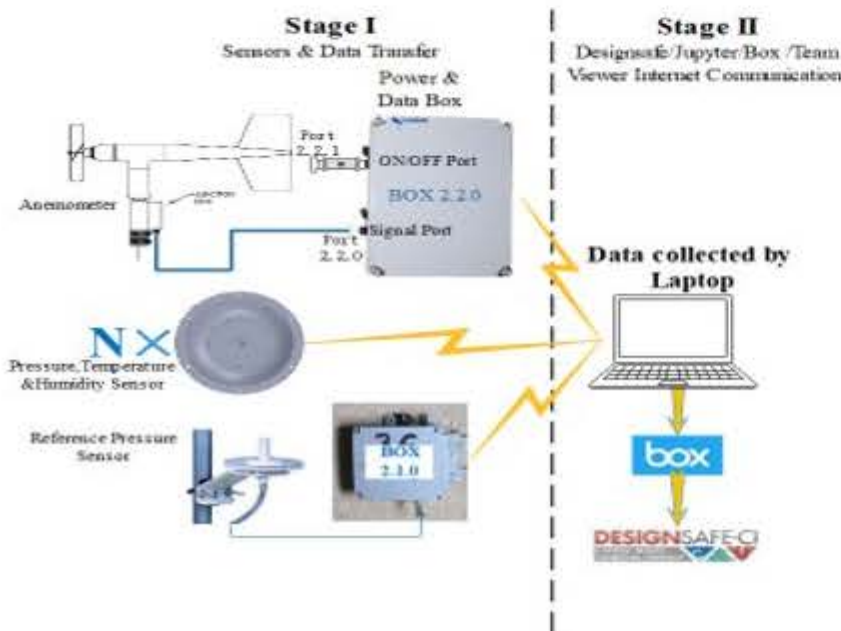


FIT Hurricane Measurement Systems



Chelakara Subramanian, Jean-Paul Pinelli, and Steven Lazarus
Florida Institute of Technology



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Sponsor: NIST DR Award # 70NANB19H088



Goals and objectives

- To better understand interaction of hurricane and or strong wind events with non-structural components of residential structures
- To characterize more accurately near-surface wind profile for different terrain conditions in moderate to strong wind conditions

Wireless Sensors Network System (WSN) Multipoint Surface Pressure/Temperature Measurements

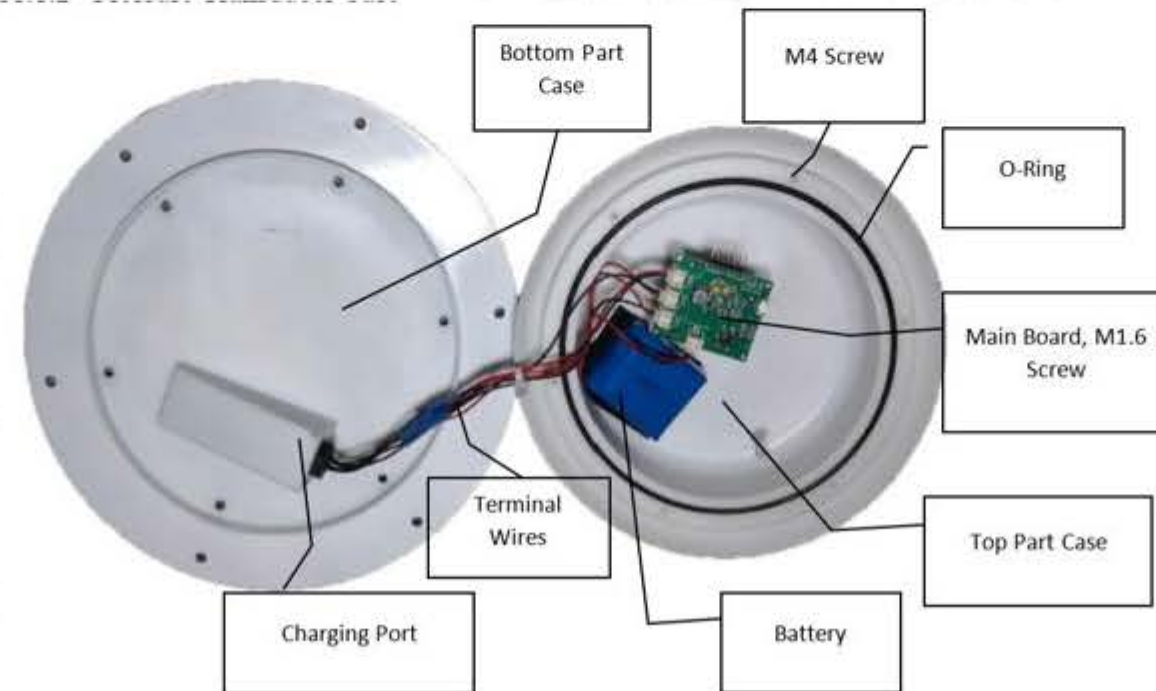
Sampling rate (raw data): 10 Hz, 55 Units, absolute pressure resolution 0.10 mb, dynamics range 800 –1100 mb

Archived frequency (local storage): all raw data is stored locally in laptop, 55 units– 10 Hz.

Running time series pressure and temperature data displayed in 5-minute blocks

Report frequency (if communicated in real-time(5-min delayed) from platform to NSF

NHERI DesignSafe): Summary statistics relayed interactively as user-defined time averages in Jupyter Notebooks



[illegible]

Wind measurement height(s): 10 -12 m

WSN Other Measurements

Relative humidity measurement height(s) (part of WSN): 2 units – 5 m,

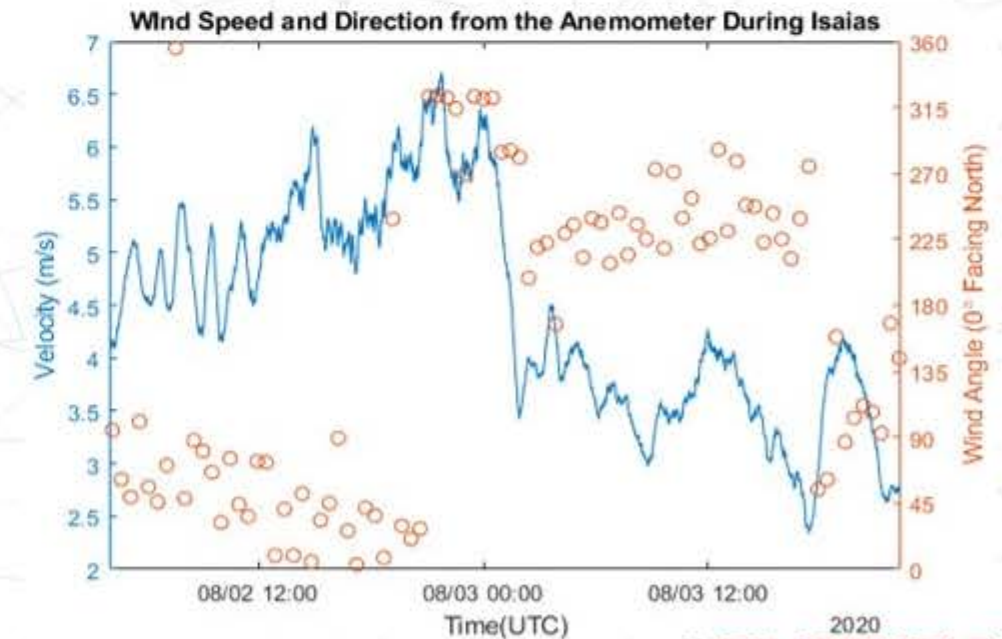
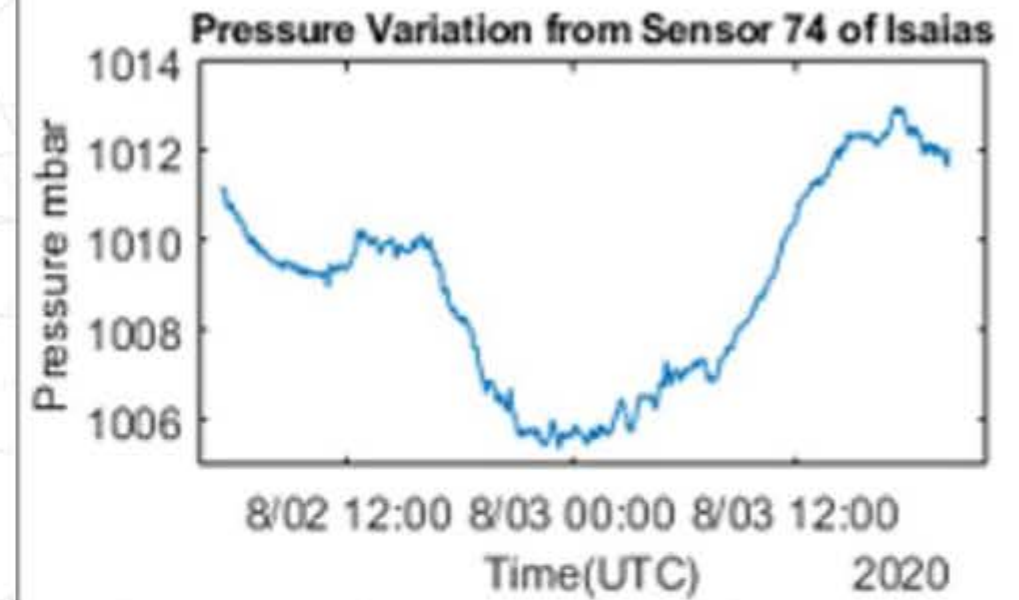
Measurement height(s) (if applicable): 4 units – 0.5 m

Other sensors and measurement height(s) (if applicable): **can be used for vibration and strain sensors**

Field deployments: Dorian; Isaias

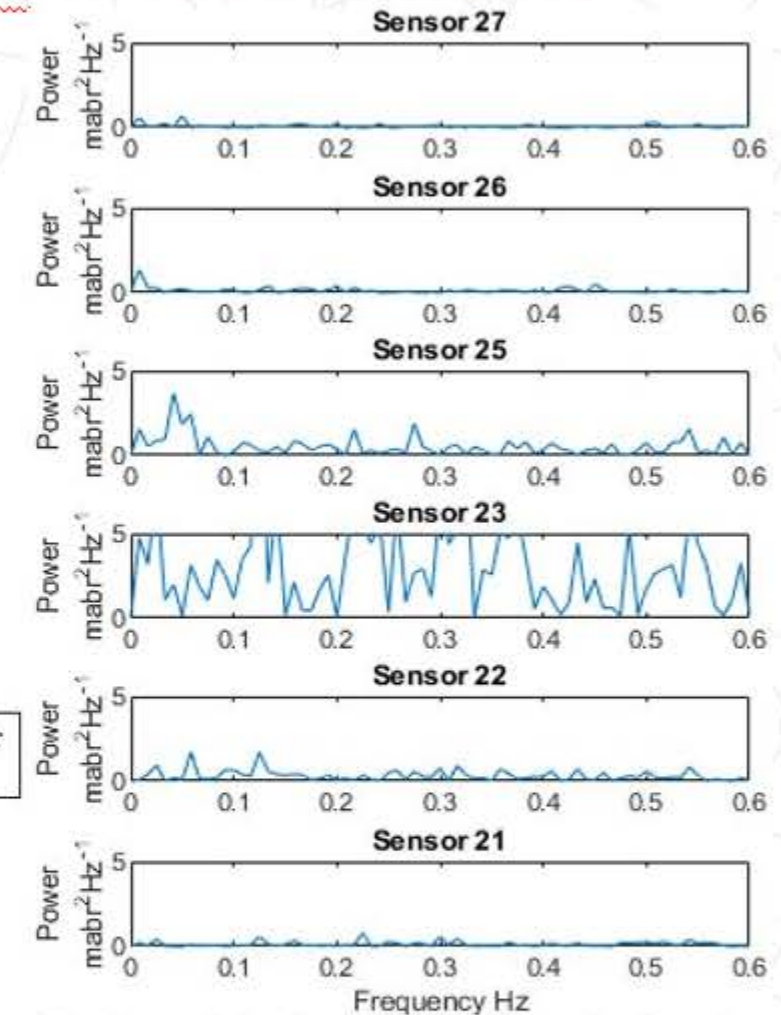
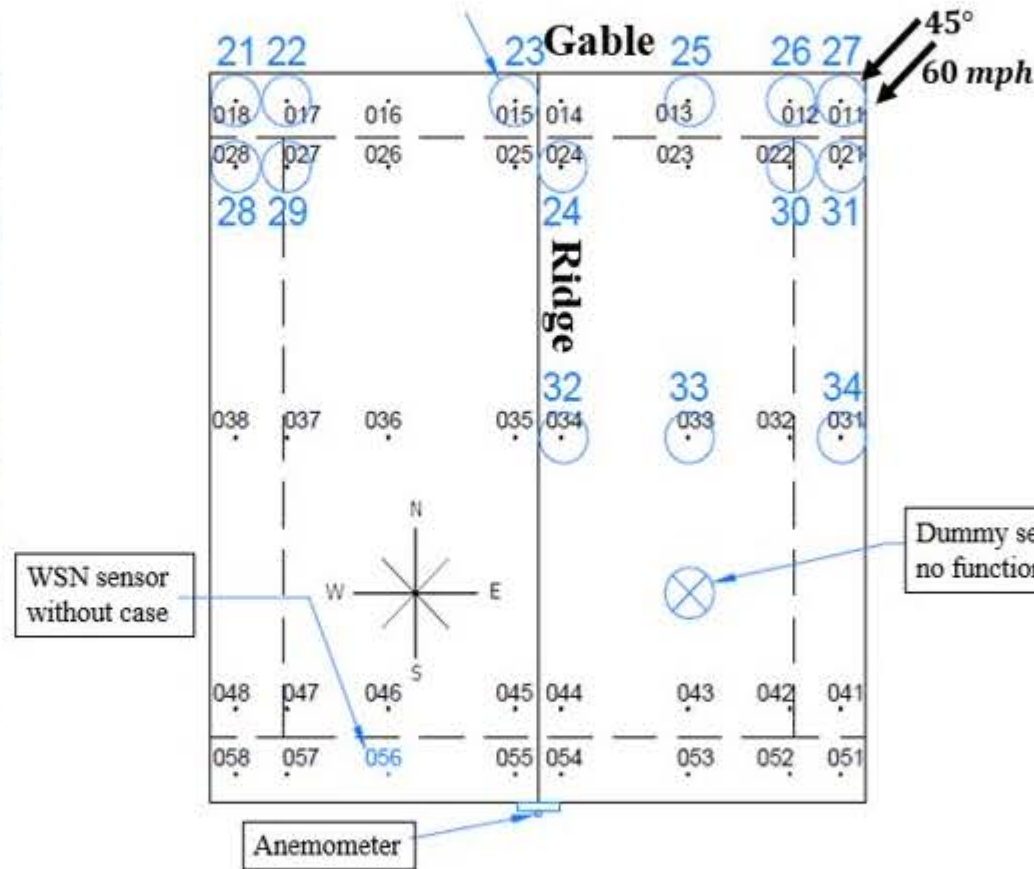


- **WSN** installation heights:
single story house roof top,
soffit, fascia, window, door,
shutters, PV panels,
maximum sensing range
1200m
- Time duration for
deployment: ~75 – 120
minutes per house
- Continuous data collection
time between charge: 2-3
days



Tests at NHERI Wall of Wind EF

Validation and calibration of the WSN against scanivalve measurements

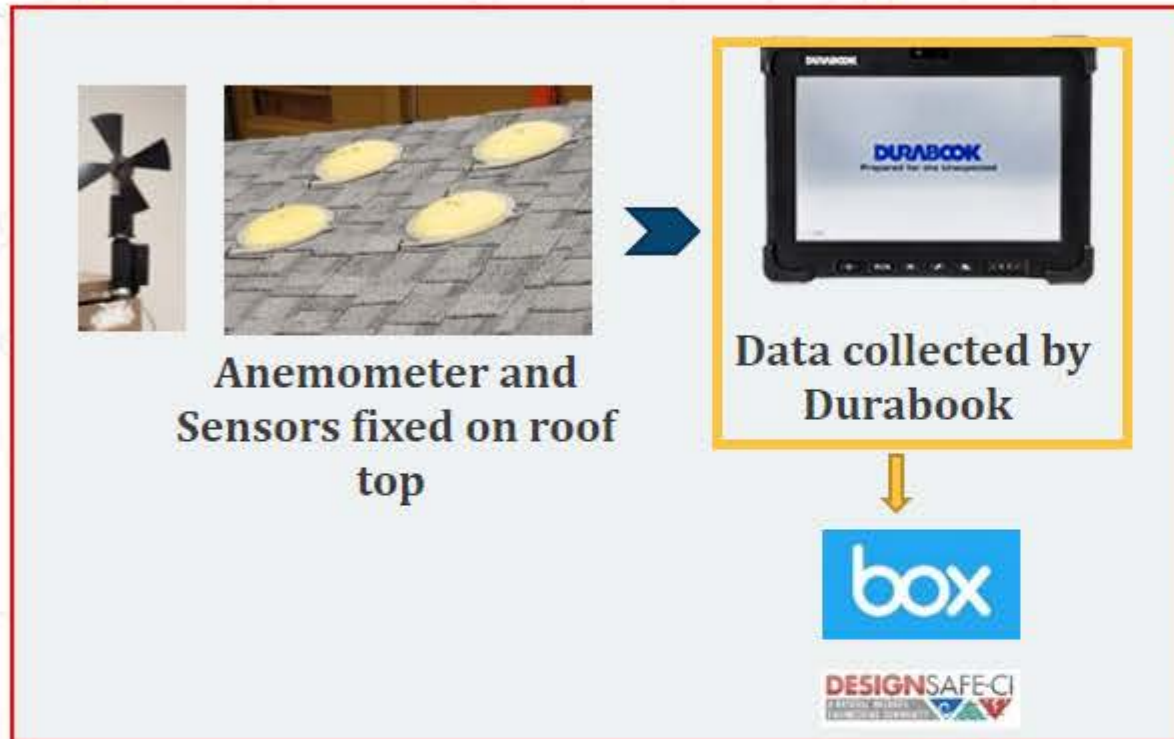


Pressure spectral plots of sensors 27 to 21

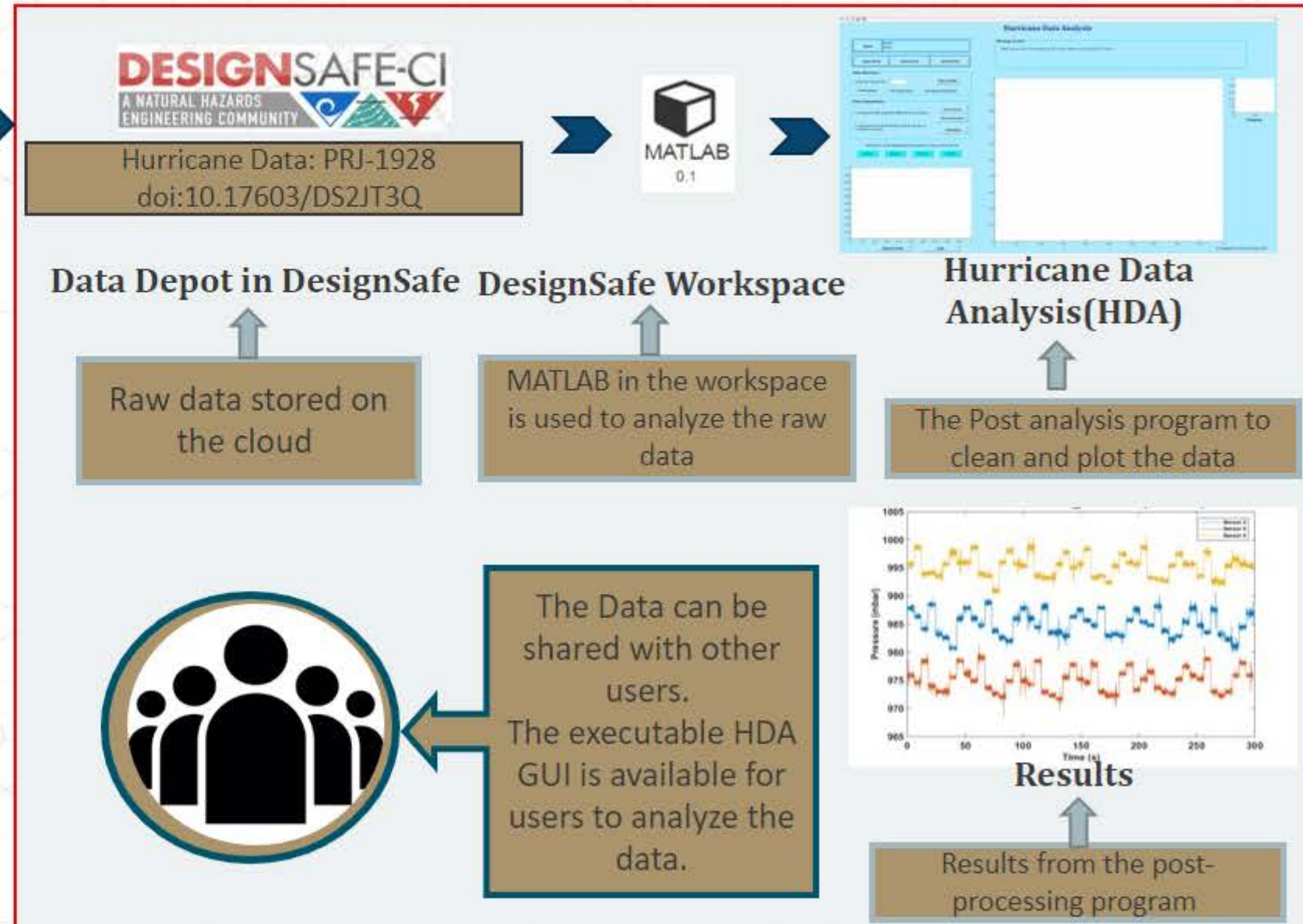
- WSN with and without casing vs. scanivalve
- Effect of tubing

Integration with DESIGNSAFE-CI

Field or WoW Data Collection



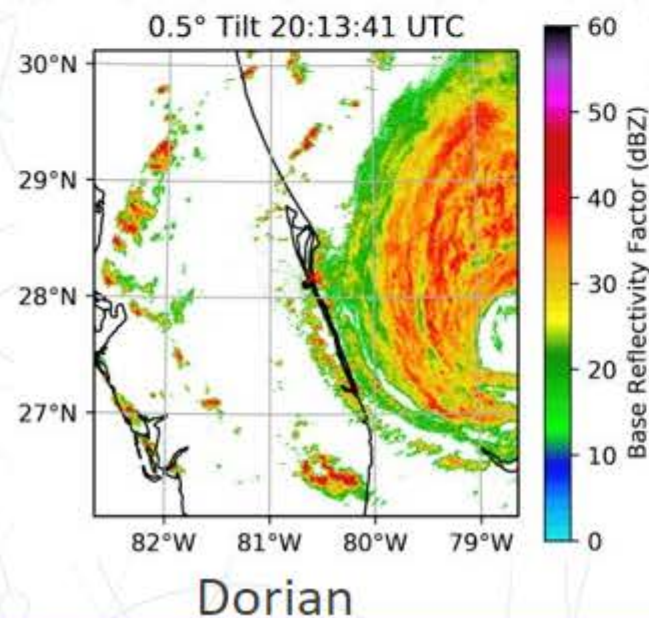
Data storage and analysis on DesignSafe



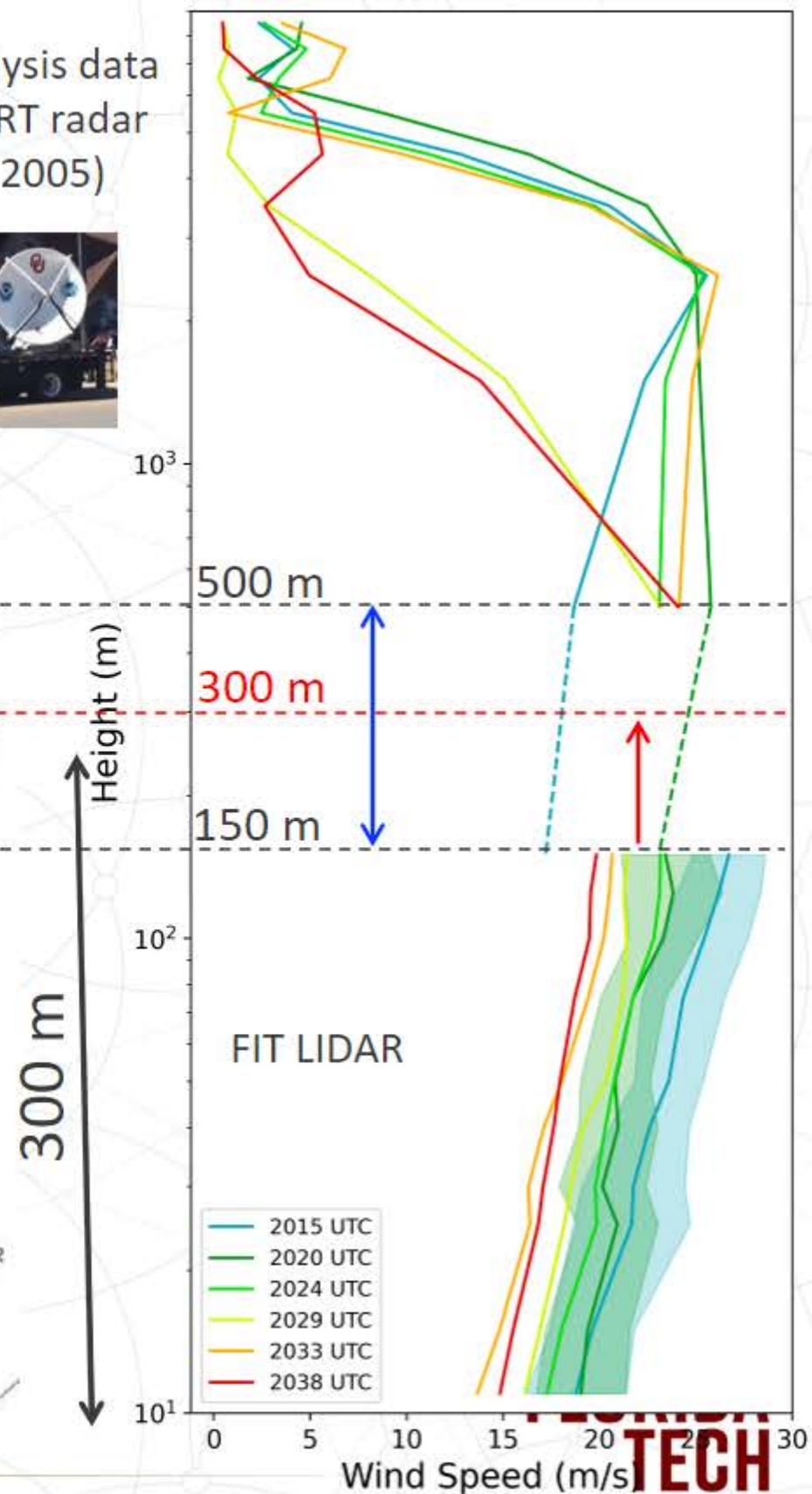
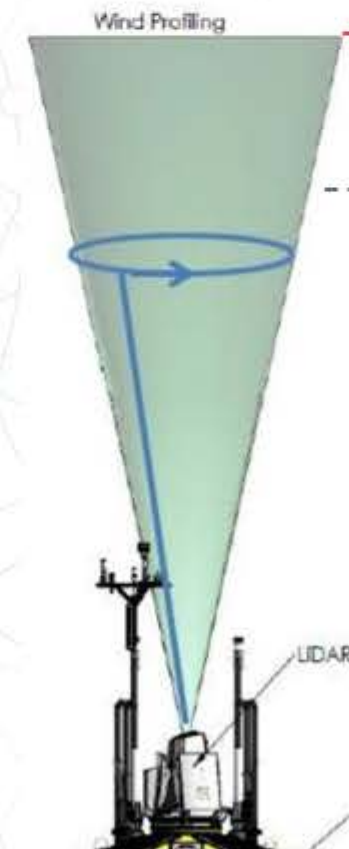
- DS data depot receives raw data during the hurricane.
- Once files are synchronized, the GUI code Hurricane Data Analysis, cleans and post processes raw data on DS.
- Time histories of pressure and wind speed and direction can be computed and shared,.

ZephIR Z300 LIDAR

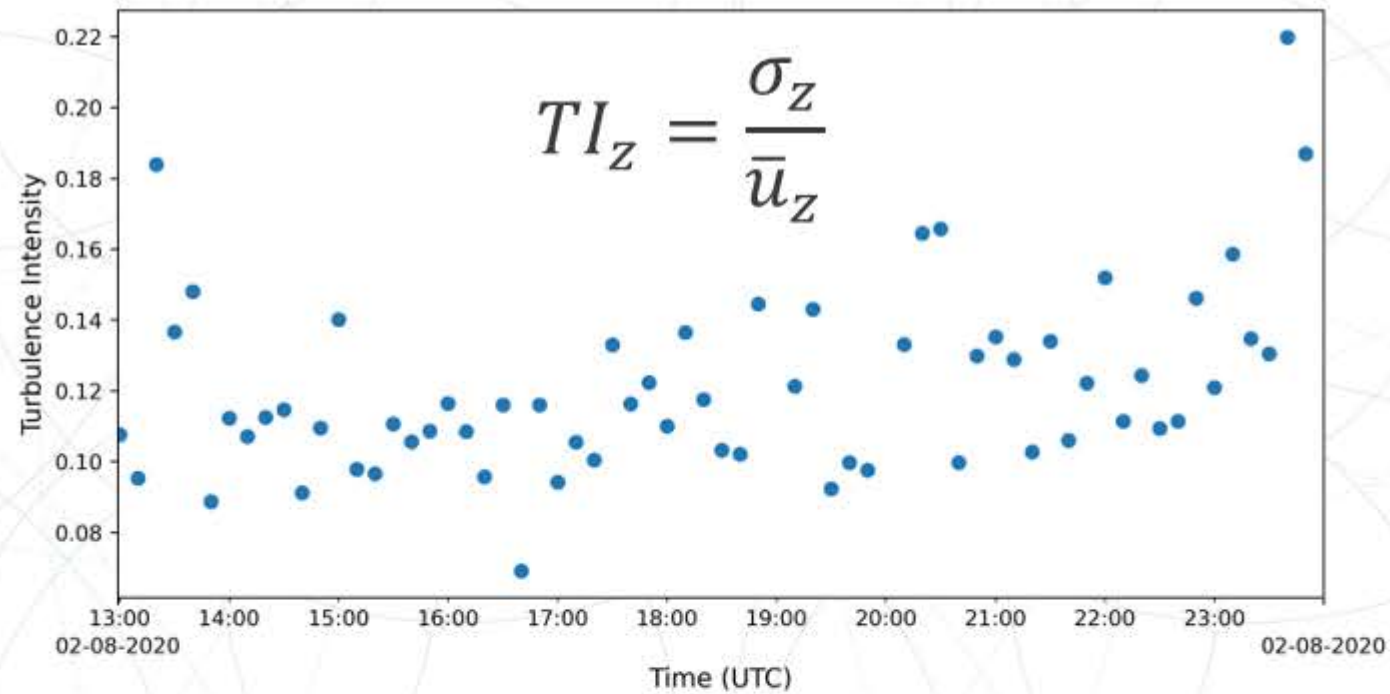
- Conically scanning infrared lidar
- 10 vertical range gates between 11m and 300m
- 20 second resolution for each scan of data
- Horizontal and vertical wind speed and direction
- 10-minute average profiles
- Turbulence intensity



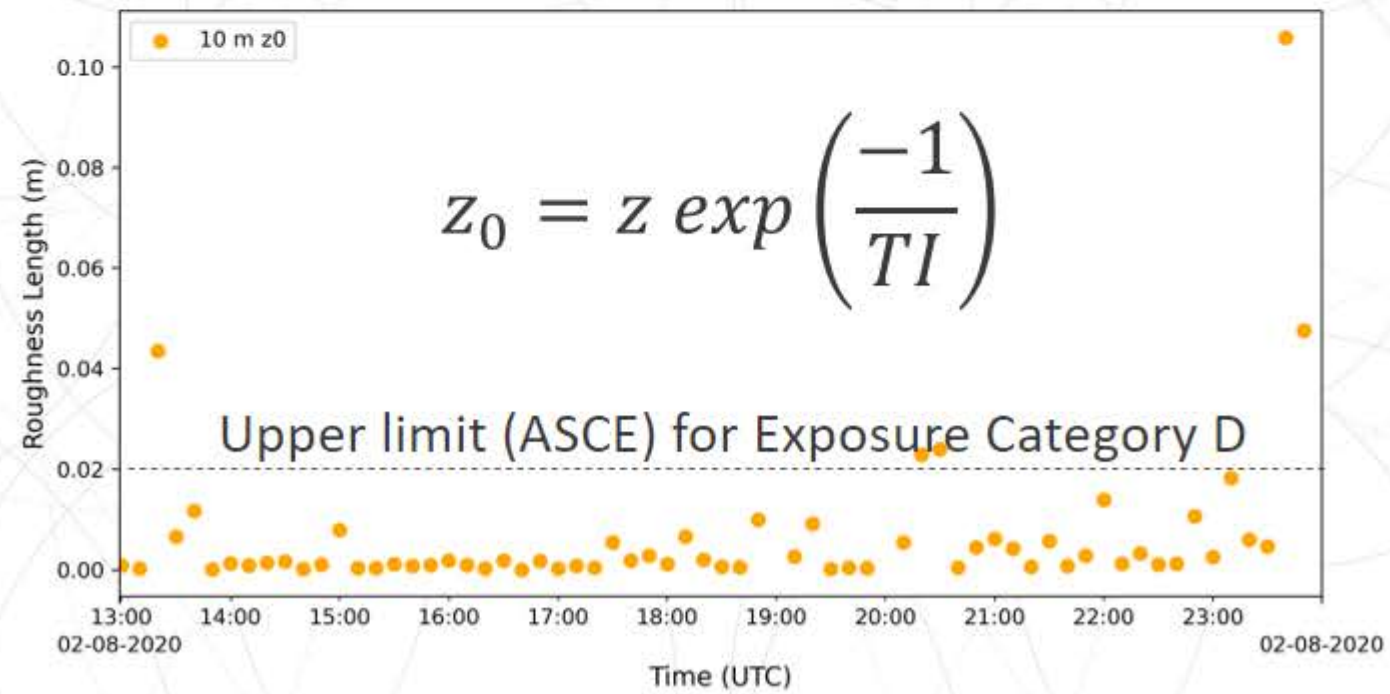
Dual Doppler Analysis data
from the OU SMART radar
(Biggerstaff et al., 2005)



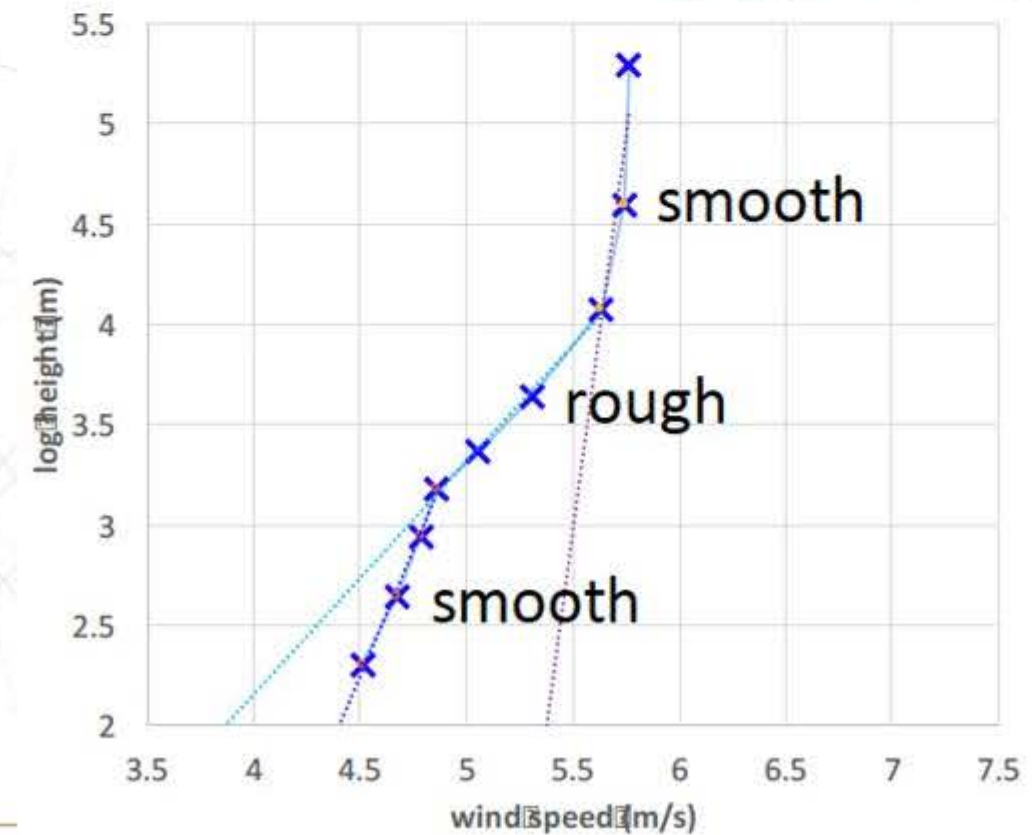
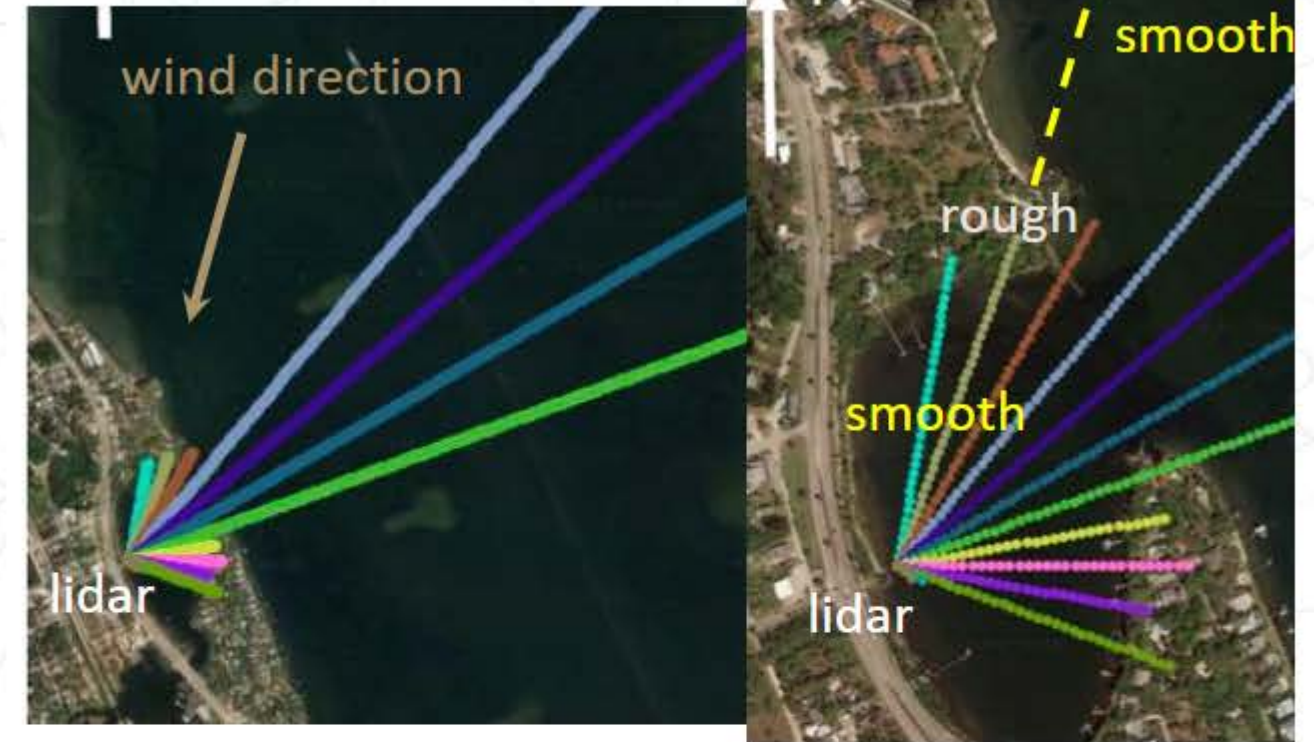
Isaias



The TI method is valid for $z_0 < 0.1$ m (Counihan 1974)



Fair Weather



house_condo :: Features Total: 2, Filtered: 2, Selected: 2

	gml_id	hash	ubid	state	county	grid	latitude	longitude	area	height	height_sou	fp_source	measuredHe	measured_1
1	NzZXWDVD...	NzZXWDVD...	76WX5CG4+...	Florida	12009	76WX5CG4+	28.17576199...	-80.593395...	218.3137054..	9.85999999...	msfp-2017	msfp-2017	9.85999999...	urn:ogc:def:u...
2	NzZXWDVD...	NzZXWDVD...	76WX5CG5+...	Florida	12009	76WX5CG5+	28.17746299...	-80.5902619...	1655.94520..	14.17000000...	msfp-2017	msfp-2017	14.17000000...	urn:ogc:def:u...

Microsoft footprint “deep learning project”

Place weather sensors in proximity of home w/ wireless pressure sensors

Lidar located upstream at open fetch coastal location

Focus on coastal transition zone

Fetch, roughness elements

Incorporation of dimensionality (e.g., Open City Model).

Modeling

