



National Wind Institute

StickNet and TTUKa Radar Measurements

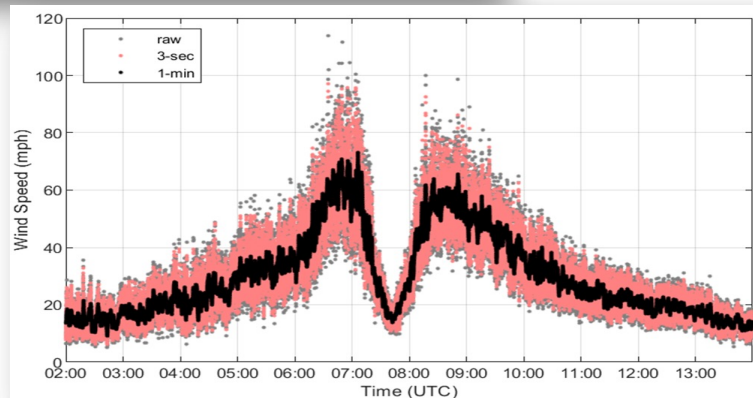
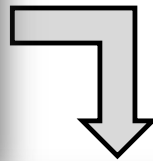
SHORELINE21 Workshop
April 26, 2021

Drs. John Schroeder and Brian Hirth

StickNet (SN) Weather Monitoring Platforms



National Wind Institute



▪ *SN Specifications:*

- 48 – rapidly deployable 2.25m tripod towers
- Self powered (~7 days)
- Sampling rate of 1-10 Hz

▪ *Nominal Deployment:*

- 12 SN stations are transported in each of four covered trailers to the region.
- Each team is comprised of two people and can deploy an individual SN platform in approximately 5 minutes
- The team typically targets the high wind regime with a denser network of SN deployments, and deploys some platforms relatively late to mitigate track errors
- SN stations can be placed in scientifically valuable locations
- Information is relayed every minute

▪ *Funding:*

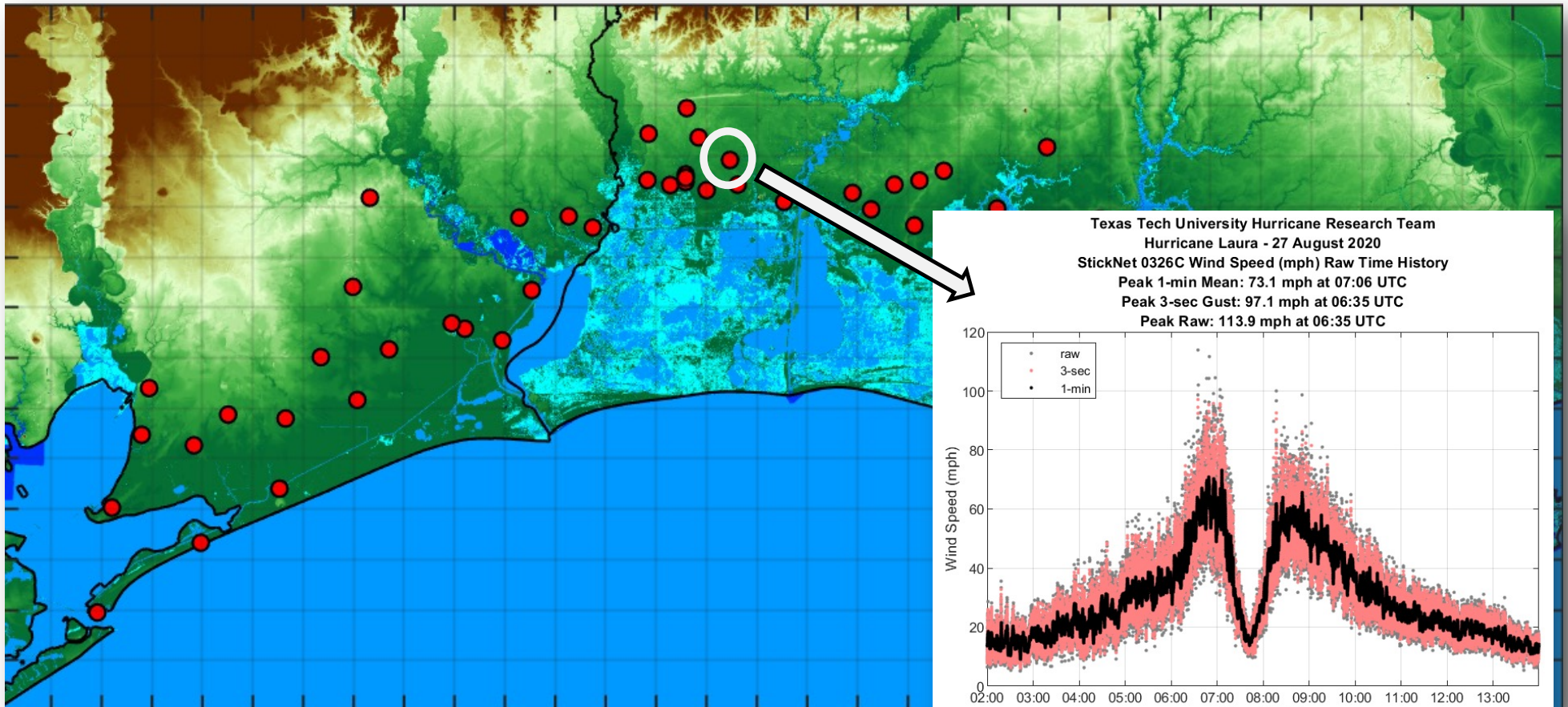
- Deployments during the 2021 Atlantic Hurricane Season are funded by Risk Management Solutions

2020 Measurement Example

Hurricane Laura – SN Deployments and Raw Measurements



National Wind Institute



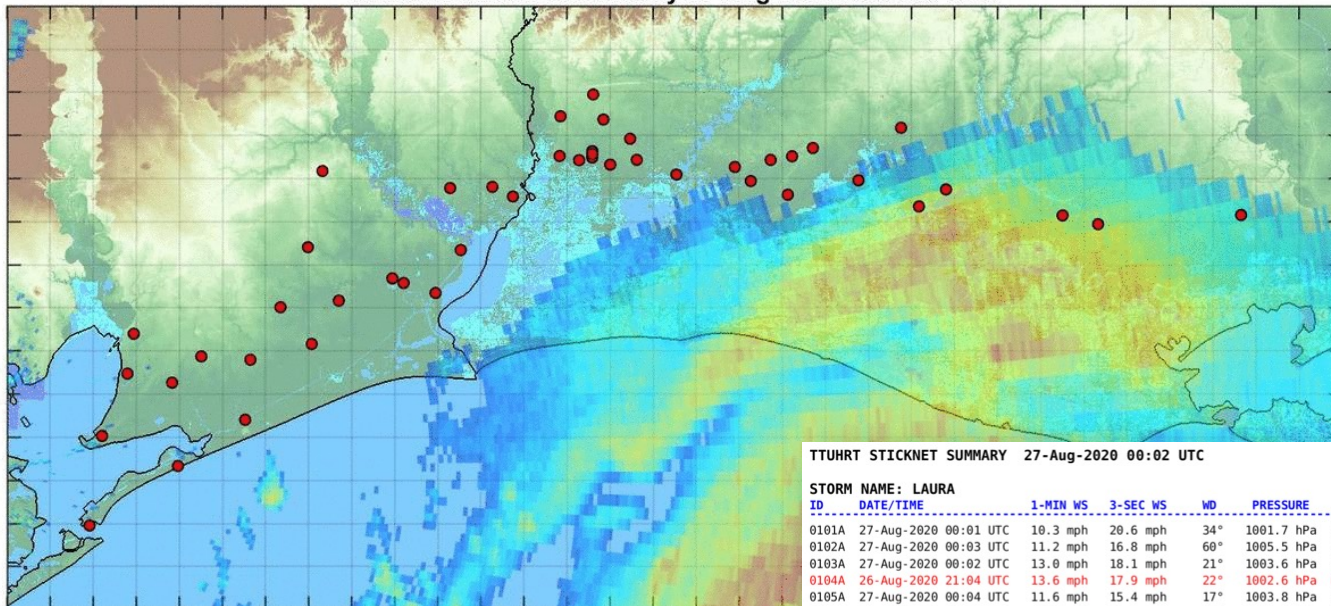
2020 Measurement Example

Hurricane Laura – Real-Time Measurements



National Wind Institute

KHGX WSR-88D Reflectivity 27-Aug-2020 00:02:00 UTC



TTUHRT STICKNET SUMMARY 27-Aug-2020 00:02 UTC

STORM NAME: LAURA

ID	DATE/TIME	1-MIN WS	3-SEC WS	WD	PRESSURE	ZO	ID	DATE/TIME	1-MIN WS	3-SEC WS	WD	PRESSURE	ZO
0101A	27-Aug-2020 00:01 UTC	10.3 mph	20.6 mph	34°	1001.7 hPa	0.523 m	0325C	27-Aug-2020 00:01 UTC	10.3 mph	15.2 mph	46°	1006.2 hPa	0.091 m
0102A	27-Aug-2020 00:03 UTC	11.2 mph	16.8 mph	60°	1005.5 hPa	0.046 m	0326C	27-Aug-2020 00:01 UTC	11.9 mph	15.9 mph	42°	1005.7 hPa	0.046 m
0103A	27-Aug-2020 00:02 UTC	13.0 mph	18.1 mph	21°	1003.6 hPa	0.046 m	0327C	27-Aug-2020 00:01 UTC	8.7 mph	13.6 mph	54°	1005.8 hPa	0.466 m
0104A	26-Aug-2020 21:04 UTC	13.6 mph	17.9 mph	22°	1002.6 hPa	0.018 m	0328C	27-Aug-2020 00:01 UTC	12.8 mph	17.0 mph	47°	1005.9 hPa	0.056 m
0105A	27-Aug-2020 00:04 UTC	11.6 mph	15.4 mph	17°	1003.8 hPa	0.030 m	0329C	27-Aug-2020 00:01 UTC	13.6 mph	19.2 mph	20°	1005.6 hPa	0.046 m
0106A	27-Aug-2020 00:03 UTC	9.6 mph	12.5 mph	15°	1004.9 hPa	0.056 m	0330C	27-Aug-2020 00:01 UTC	16.3 mph	27.1 mph	48°	1004.2 hPa	0.152 m
0107A	27-Aug-2020 00:03 UTC	9.8 mph	16.6 mph	31°	1009.2 hPa	0.056 m	0331C	27-Aug-2020 00:01 UTC	14.8 mph	18.1 mph	32°	1005.5 hPa	0.030 m
0108A	27-Aug-2020 00:04 UTC	10.3 mph	14.5 mph	15°	1004.3 hPa	0.225 m	0332C	27-Aug-2020 00:01 UTC	12.5 mph	16.8 mph	21°	1005.4 hPa	0.078 m
0109A	27-Aug-2020 00:01 UTC	12.1 mph	15.7 mph	36°	1004.0 hPa	0.030 m	0333C	27-Aug-2020 00:01 UTC	8.9 mph	11.9 mph	33°	1005.7 hPa	0.105 m
0110A	27-Aug-2020 00:01 UTC	14.5 mph	18.8 mph	63°	1003.6 hPa	0.024 m	0334C	27-Aug-2020 00:01 UTC	6.3 mph	9.6 mph	44°	1005.4 hPa	0.135 m
0111A	27-Aug-2020 00:03 UTC	12.3 mph	16.3 mph	10°	1004.2 hPa	0.018 m	0335C	27-Aug-2020 00:01 UTC	9.8 mph	13.9 mph	13°	1006.2 hPa	0.056 m
0112A	27-Aug-2020 00:05 UTC	10.1 mph	14.1 mph	48°	1005.1 hPa	0.046 m	0336C	27-Aug-2020 00:01 UTC	16.6 mph	23.0 mph	38°	1004.0 hPa	0.083 m
0213A	27-Aug-2020 00:04 UTC	14.8 mph	23.0 mph	71°	1002.3 hPa	0.030 m	0437C	27-Aug-2020 00:01 UTC	9.4 mph	13.6 mph	138°	1008.3 hPa	0.187 m
0214A	27-Aug-2020 00:04 UTC	12.5 mph	18.3 mph	28°	1004.4 hPa	0.523 m	0438C	27-Aug-2020 00:01 UTC	12.8 mph	17.0 mph	56°	1006.4 hPa	0.000 m
0215A	26-Aug-2020 23:28 UTC	9.4 mph	12.8 mph	30°	1004.9 hPa	0.091 m	0439C	27-Aug-2020 00:01 UTC	15.9 mph	19.5 mph	93°	1006.3 hPa	0.005 m
0216A	27-Aug-2020 00:05 UTC	8.9 mph	11.6 mph	37°	1004.3 hPa	0.030 m	0440C	27-Aug-2020 00:01 UTC	18.8 mph	25.9 mph	40°	1005.5 hPa	0.020 m
0217A	27-Aug-2020 00:04 UTC	16.1 mph	20.6 mph	54°	1005.2 hPa	0.014 m	0441C	27-Aug-2020 00:01 UTC	16.3 mph	20.8 mph	37°	1005.8 hPa	0.015 m
0218A	27-Aug-2020 00:04 UTC	12.1 mph	18.6 mph	23°	1004.6 hPa	0.056 m	0442C	27-Aug-2020 00:01 UTC	7.4 mph	12.5 mph	44°	1005.6 hPa	0.426 m
0219A	27-Aug-2020 00:04 UTC	9.4 mph	12.8 mph	89°	1006.7 hPa	0.037 m	0443C	27-Aug-2020 00:01 UTC	14.1 mph	18.1 mph	58°	1005.2 hPa	0.119 m
0220A	27-Aug-2020 00:04 UTC	15.2 mph	18.6 mph	35°	1006.1 hPa	0.030 m	0444C	27-Aug-2020 00:01 UTC	9.8 mph	17.0 mph	117°	1007.1 hPa	0.105 m
0221A	27-Aug-2020 00:04 UTC	14.5 mph	18.8 mph	114°	1006.7 hPa	0.046 m	0445C	27-Aug-2020 00:01 UTC	20.1 mph	26.6 mph	41°	1005.0 hPa	0.025 m
0222A	27-Aug-2020 00:01 UTC	10.1 mph	12.3 mph	20°	1005.0 hPa	0.119 m	0446C	27-Aug-2020 00:01 UTC	10.1 mph	12.8 mph	59°	1004.4 hPa	0.078 m
0223A	27-Aug-2020 00:01 UTC	12.1 mph	15.9 mph	13°	1003.1 hPa	0.078 m	0447C	27-Aug-2020 00:01 UTC	16.1 mph	22.1 mph	44°	1005.0 hPa	0.015 m
0224A	27-Aug-2020 00:03 UTC	8.5 mph	11.0 mph	36°	1005.0 hPa	0.135 m	0448C	27-Aug-2020 00:01 UTC	17.0 mph	25.1 mph	32°	1005.1 hPa	0.024 m

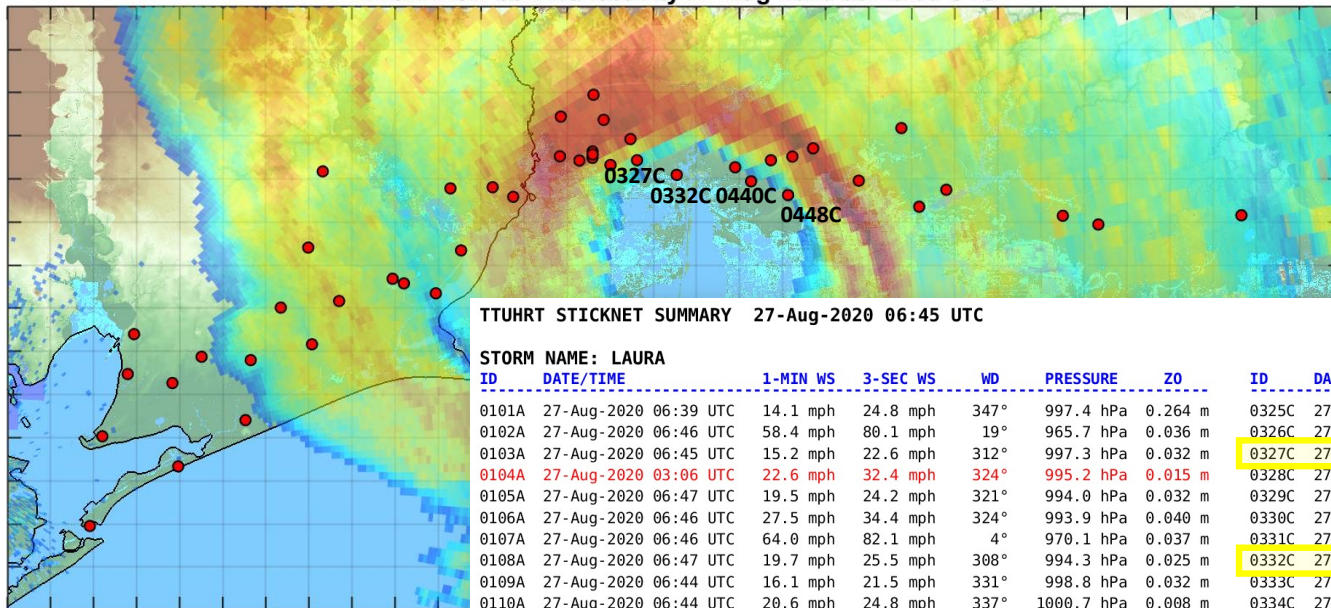
2020 Measurement Example

Hurricane Laura – Real-Time Measurements



National Wind Institute

KHGX WSR-88D Reflectivity 27-Aug-2020 06:45:00 UTC



TTUHR STICKNET SUMMARY 27-Aug-2020 06:45 UTC

STORM NAME: LAURA

ID	DATE/TIME	1-MIN WS	3-SEC WS	WD	PRESSURE	ZO	ID	DATE/TIME	1-MIN WS	3-SEC WS	WD	PRESSURE	ZO
0101A	27-Aug-2020 06:39 UTC	14.1 mph	24.8 mph	347°	997.4 hPa	0.264 m	0325C	27-Aug-2020 06:44 UTC	44.7 mph	61.3 mph	24°	973.0 hPa	0.092 m
0102A	27-Aug-2020 06:46 UTC	58.4 mph	80.1 mph	19°	965.7 hPa	0.036 m	0326C	27-Aug-2020 06:44 UTC	58.8 mph	83.2 mph	12°	963.2 hPa	0.029 m
0103A	27-Aug-2020 06:45 UTC	15.2 mph	22.6 mph	312°	997.3 hPa	0.032 m	0327C	27-Aug-2020 06:44 UTC	64.6 mph	113.2 mph	23°	956.6 hPa	0.264 m
0104A	27-Aug-2020 06:06 UTC	22.6 mph	32.4 mph	324°	995.2 hPa	0.015 m	0328C	27-Aug-2020 06:44 UTC	56.4 mph	75.6 mph	359°	974.8 hPa	0.078 m
0105A	27-Aug-2020 06:47 UTC	19.5 mph	24.2 mph	321°	994.0 hPa	0.032 m	0329C	27-Aug-2020 06:44 UTC	59.1 mph	83.4 mph	342°	965.3 hPa	0.046 m
0106A	27-Aug-2020 06:46 UTC	27.5 mph	34.4 mph	324°	993.9 hPa	0.040 m	0330C	27-Aug-2020 06:44 UTC	26.2 mph	38.5 mph	2°	989.4 hPa	0.102 m
0107A	27-Aug-2020 06:46 UTC	64.0 mph	82.1 mph	4°	970.1 hPa	0.037 m	0331C	27-Aug-2020 06:44 UTC	72.0 mph	88.8 mph	339°	959.9 hPa	0.013 m
0108A	27-Aug-2020 06:47 UTC	19.7 mph	25.5 mph	308°	994.3 hPa	0.025 m	0332C	27-Aug-2020 06:44 UTC	66.0 mph	100.2 mph	49°	951.4 hPa	0.024 m
0109A	27-Aug-2020 06:44 UTC	16.1 mph	21.5 mph	331°	998.8 hPa	0.032 m	0333C	27-Aug-2020 06:44 UTC	34.0 mph	50.1 mph	318°	980.4 hPa	0.088 m
0110A	27-Aug-2020 06:44 UTC	20.6 mph	24.8 mph	337°	1000.7 hPa	0.008 m	0334C	27-Aug-2020 06:44 UTC	32.7 mph	47.0 mph	8°	978.2 hPa	0.170 m
0111A	27-Aug-2020 06:46 UTC	24.8 mph	39.4 mph	313°	992.1 hPa	0.020 m	0335C	27-Aug-2020 06:44 UTC	26.6 mph	42.7 mph	338°	979.2 hPa	0.170 m
0112A	27-Aug-2020 06:48 UTC	63.8 mph	83.2 mph	14°	962.6 hPa	0.017 m	0336C	27-Aug-2020 06:44 UTC	41.8 mph	58.2 mph	318°	984.9 hPa	0.118 m
0213A	27-Aug-2020 06:46 UTC	35.1 mph	48.3 mph	9°	986.6 hPa	0.027 m	0437C	27-Aug-2020 06:44 UTC	15.2 mph	28.2 mph	162°	1006.7 hPa	0.152 m
0214A	27-Aug-2020 06:46 UTC	40.3 mph	57.5 mph	321°	975.3 hPa	0.075 m	0438C	27-Aug-2020 06:44 UTC	40.5 mph	47.9 mph	141°	997.9 hPa	0.000 m
0215A	27-Aug-2020 06:03 UTC	11.2 mph	16.6 mph	348°	997.6 hPa	0.325 m	0439C	27-Aug-2020 06:44 UTC	42.5 mph	51.2 mph	178°	996.9 hPa	0.028 m
0216A	27-Aug-2020 06:48 UTC	25.1 mph	31.8 mph	3°	992.5 hPa	0.025 m	0440C	27-Aug-2020 06:44 UTC	84.3 mph	105.4 mph	97°	961.9 hPa	0.014 m
0217A	27-Aug-2020 06:47 UTC	58.4 mph	76.3 mph	109°	969.5 hPa	0.068 m	0441C	27-Aug-2020 06:44 UTC	70.7 mph	86.6 mph	98°	973.5 hPa	0.009 m
0218A	27-Aug-2020 06:45 UTC	14.8 mph	20.8 mph	307°	1000.1 hPa	0.037 m	0442C	27-Aug-2020 06:44 UTC	29.1 mph	42.3 mph	132°	988.8 hPa	0.258 m
0219A	27-Aug-2020 06:47 UTC	29.1 mph	38.0 mph	147°	1001.0 hPa	0.034 m	0443C	27-Aug-2020 06:44 UTC	61.3 mph	74.7 mph	115°	981.6 hPa	0.055 m
0220A	27-Aug-2020 06:47 UTC	49.2 mph	61.1 mph	107°	988.5 hPa	0.028 m	0444C	27-Aug-2020 06:44 UTC	23.3 mph	31.5 mph	145°	1004.7 hPa	0.032 m
0221A	27-Aug-2020 06:47 UTC	59.1 mph	74.5 mph	180°	977.7 hPa	0.009 m	0445C	27-Aug-2020 06:44 UTC	45.6 mph	65.3 mph	118°	991.4 hPa	0.028 m
0222A	27-Aug-2020 06:44 UTC	20.6 mph	24.6 mph	300°	1001.4 hPa	0.025 m	0446C	27-Aug-2020 06:44 UTC	40.0 mph	53.7 mph	346°	983.8 hPa	0.055 m
0223A	27-Aug-2020 06:21 UTC	11.4 mph	17.4 mph	296°	997.6 hPa	0.091 m	0447C	27-Aug-2020 06:44 UTC	30.2 mph	38.3 mph	125°	961.5 hPa	0.577 m
0224A	27-Aug-2020 06:46 UTC	33.3 mph	52.3 mph	339°	985.5 hPa	0.034 m	0448C	27-Aug-2020 06:44 UTC	80.1 mph	103.8 mph	107°	965.1 hPa	0.010 m

TTUKa Mobile Research Radars



National Wind Institute

▪ *TTUKa Radar Specifications:*

- Two truck mounted Doppler radars
- Frequency 35 GHz / Wavelength 8.6 mm
- Half-power beamwidth of 0.33 degrees
- Maximum range of 10-15 km

▪ *Recently Completed Upgrades:*

- Trucks, servers, generators, leveling hydraulics, peripherals

▪ *Nominal Deployment:*

- Two locations with coordinating scanning to provide measurements for dual-Doppler synthesis

▪ *Funding:*

- Deployments during the 2020 Atlantic Hurricane Season were funded by NIST #70NANB19H055
- 2021 deployments are pending

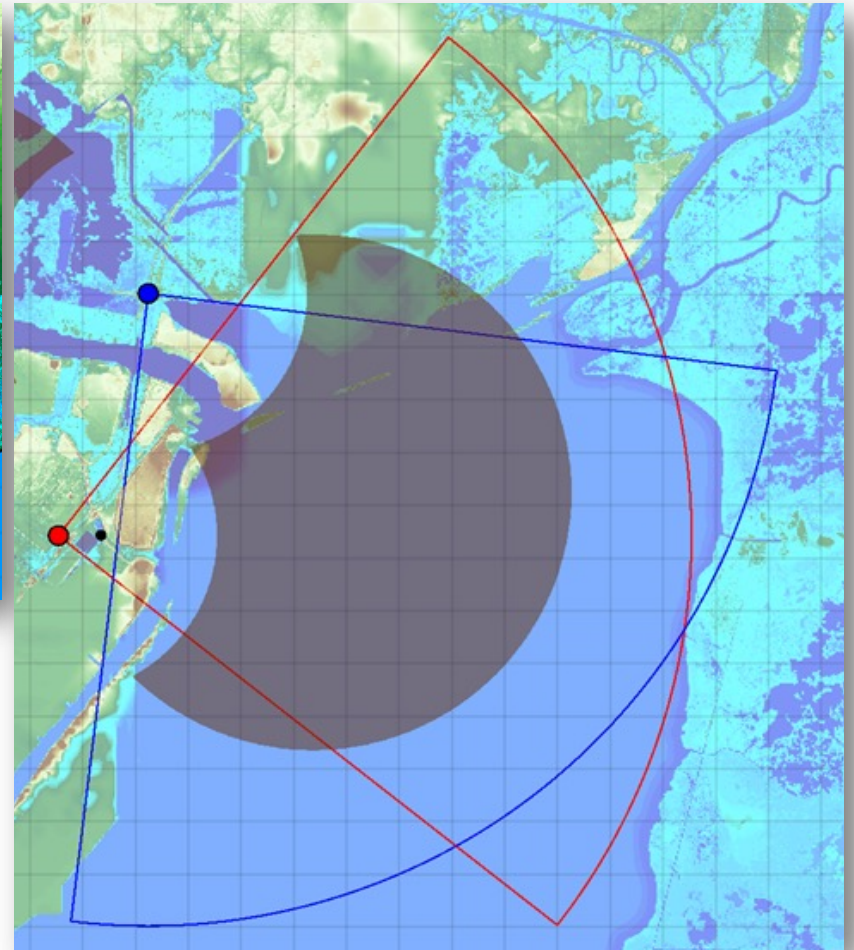
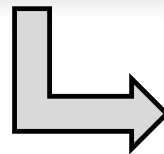
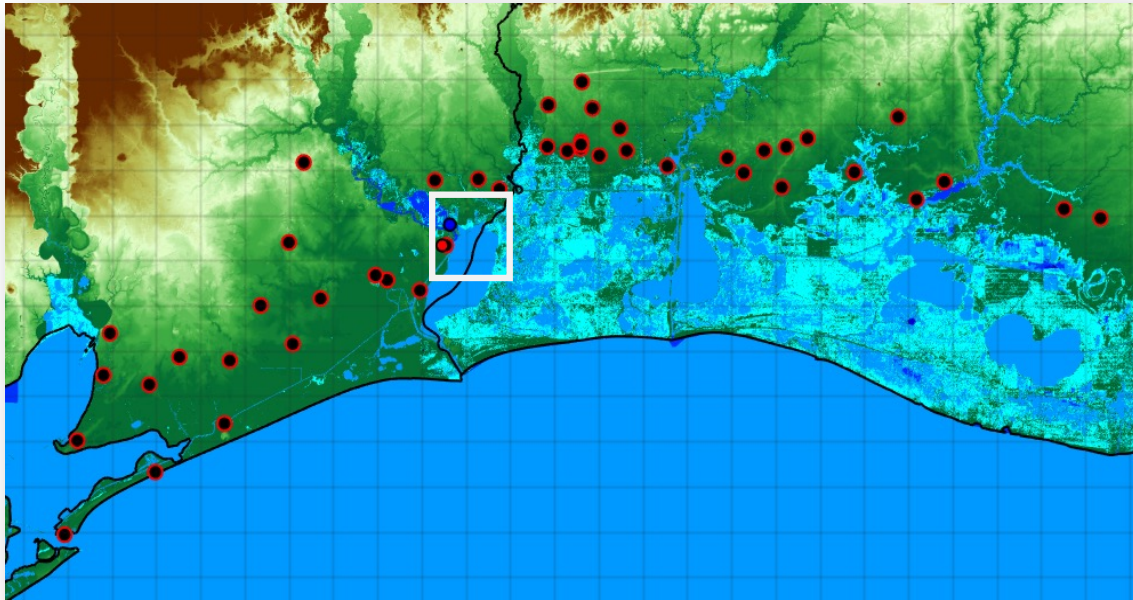


2020 Measurement Example

Hurricane Laura – TTUKa Radar Deployments



National Wind Institute



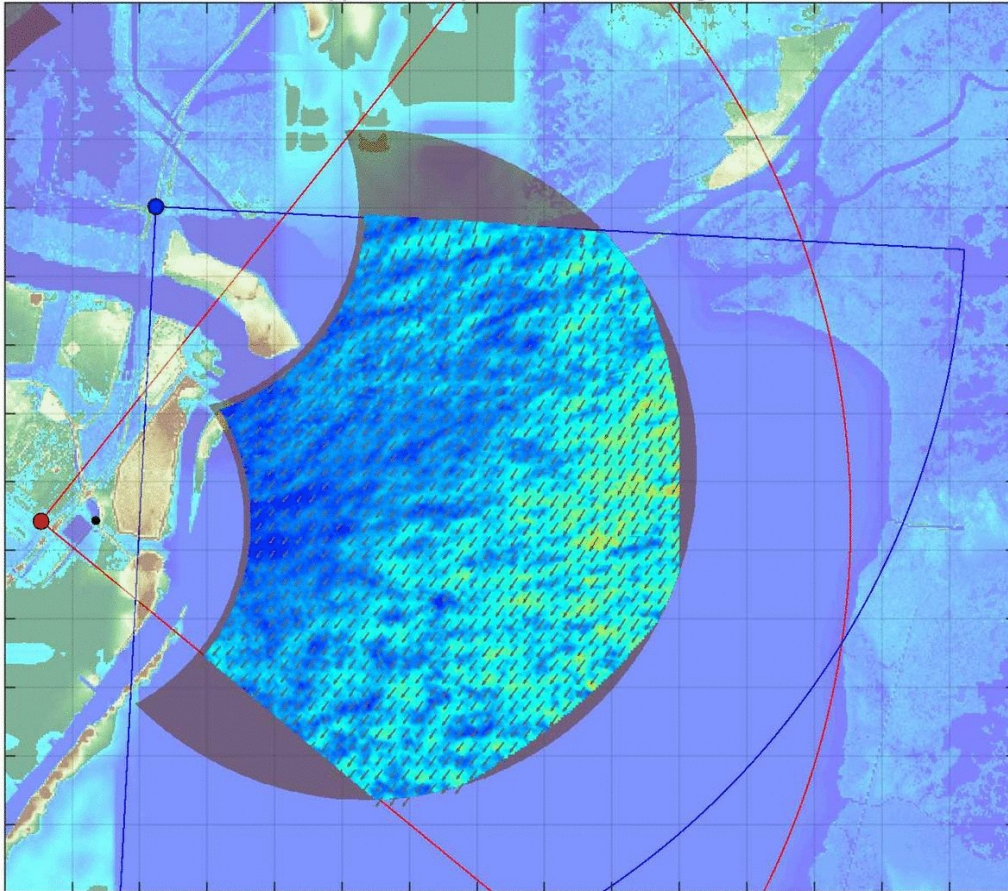
2020 Measurement Example

Hurricane Laura – TTUKa Dual-Doppler Wind Fields

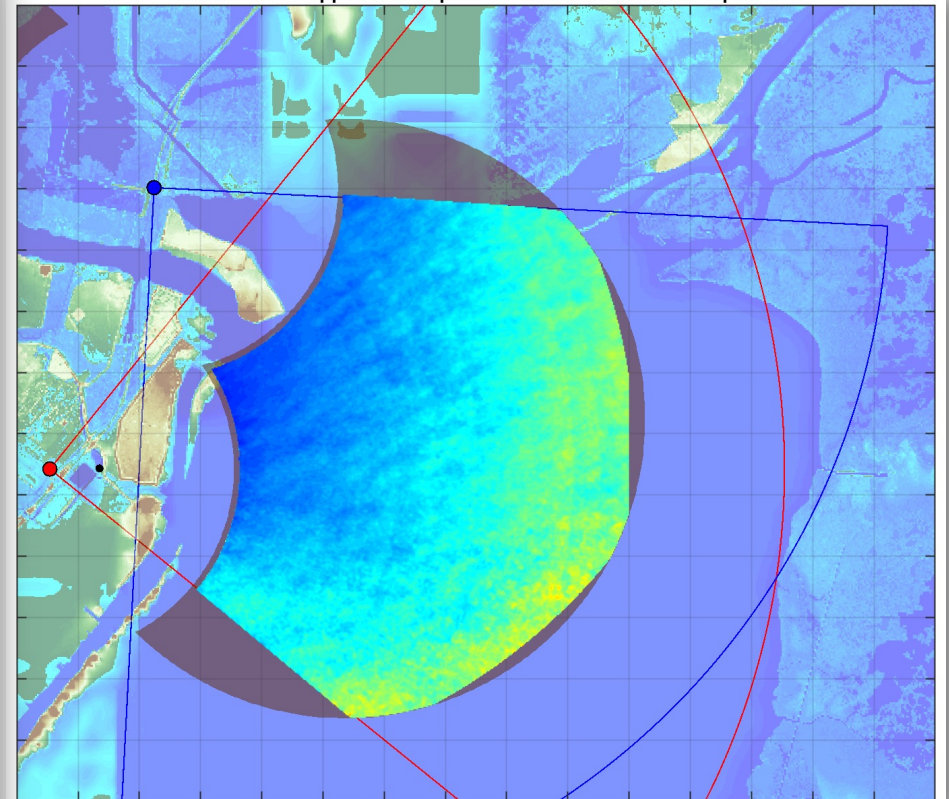


National Wind Institute

TTUKa Dual-Doppler Wind Speed at 200 m 27-Aug-2020 01:57:28



TTUKa Dual-Doppler Wind Speed at 200 m 45-minute Composite



2020 Measurement Example

Hurricane Delta – Bridging Measurement Paradigms



National Wind Institute

