



Tropical Cyclone Observations: The Value Proposition

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The Short Story

Aim to give some insight into WeatherFlow's contribution to tropical cyclone landfall observations, and to highlight the balancing act maintaining the data's value proposition to industry

WeatherFlow...

- Has been for around ~25 years
- Designed, built, owns and operates the largest private mesonet in the US
- Has a traditional focus on wind observations in the coastal environment
 - Comparatively unobserved, but where many people live, work and recreate
- Collects, quality assures, stores, adds value and delivers data to a wide variety of commercial clients and government partners, as well as to the general public



Trusted agent with managed data rights



WeatherFlow Hurricane Network



HurrNet

established 2008



~100 stations engineered and sited to

- Survive category 3 hurricanes
- Maximize open exposure
- Avoid debris flows

Design specs

- Deliver standardized observations
- Real-time, low latency
- Continuous 3-sec gusts
- 1-minute rolling averages
- Long range coms, with local backup
- Solar powered with battery backup
- Mounted at 10m on concrete poles

Batting 1000 since inception



WeatherFlow Professional Network

ProNet

established 1996

~500 stations in intracoastal zone

- Many mounted on marine exposed structures and nav aids
- Same spec as HurrNet (except pole)
- 12 include water level / waver sensor
- Expanding by 10-20 stations/year

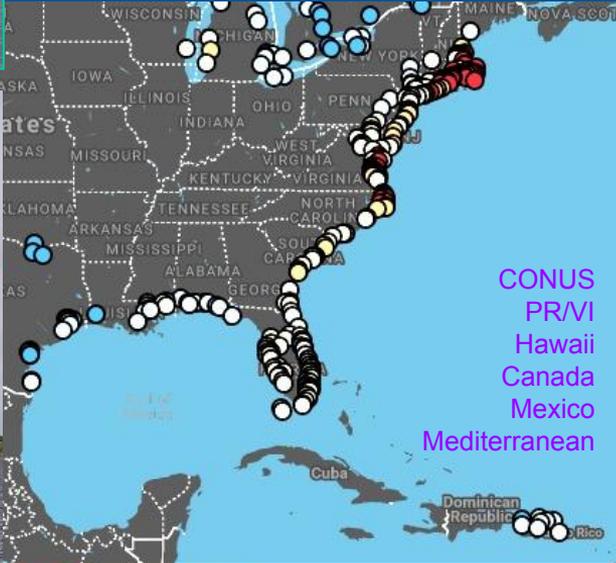
Experience matters... 25+ years of

- High uptime
- Delivering data in all weather
- Optimizing exposure and survivability
- Eliminating failure modes
- Collaboration with WFOs and NHC

Installed on the FCMP Towers



WeatherFlow



Tempest^o Weather System by WeatherFlow



22,000 US installs and growing

- No moving parts
- Solar powered
- Wireless
- Instantly connected

It's a weather station...

- Wind speed and direction
- Temperature and humidity
- Haptic rain sensing
- UV and solar radiation
- Lightning

and much much more...

- Fully featured app
- Constantly learning
- AI powered forecasting

An internet-of-things weather station so advanced, it's simple...

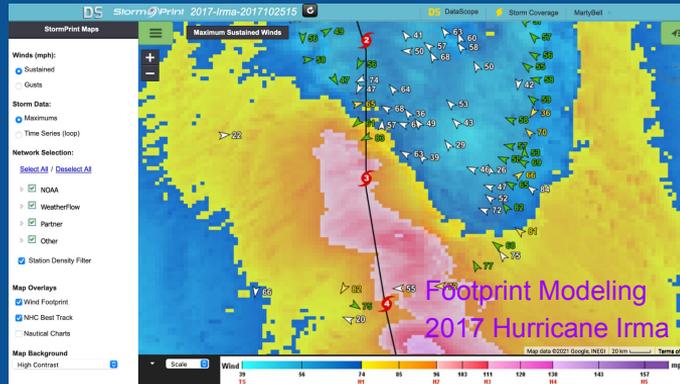
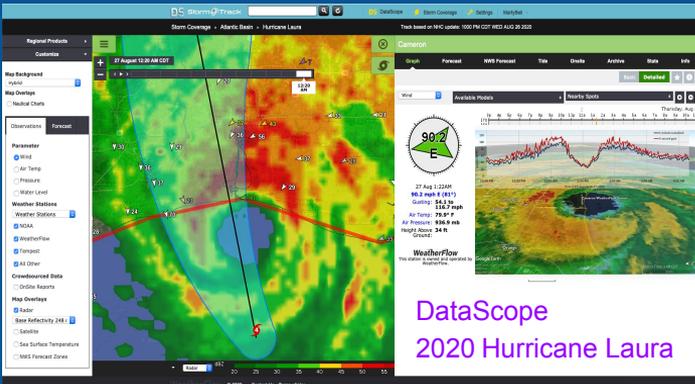
Storm Chasing from the Couch

- Prep stations well before events
- 24-7 operations during tropical (and other) storms
- Coordination with deployment efforts
- Focus on real-time data acquisition, quality assurance and delivery
- Focus turns to post storm assessment and footprint modeling

Typically WeatherFlow Networks capture between 50 and 80% of the maximum winds speeds recorded during US tropical cyclone landfalls

Peaks - 2019 Hurricane Dorian

Organization	Mesonet	Station	Max Avg (mph)	Max Gust (mph)
WeatherFlow	Professional	Jennettes Pier	86.1	98.6
WeatherFlow	Professional	Avon Sound	83.0	98.0
WeatherFlow	Professional	Alligator Bridge	82.5	94.1
WeatherFlow	Professional	Pamlico Sound	82.1	94.8
WeatherFlow	Professional	Hatteras High	81.2	100.6
WeatherFlow	Professional	KHK Resort	79.6	91.3
WeatherFlow	Professional	Oregon Inlet CG	78.8	98.5
WeatherFlow	Professional	Winyah Bay	77.2	87.5
NOS	COOPS	Hatteras Landing	74.9	92.2
WeatherFlow	Professional	Waves	74.7	86.3
WeatherFlow	Professional	Frisco Woods	74.5	88.6
NDBC	C-MAN	Cape Lookout	73.6	94.4
WeatherFlow	HurrNet	Fort Macon	73.4	90.0
WeatherFlow	Professional	Ocracoke	73.4	89.0
WeatherFlow	HurrNet	Buxton	73.1	90.8
NOS	COOPS	Duck Pier	72.5	87.5
WeatherFlow	Professional	Avon Ocean	70.5	83.8
WeatherFlow	Professional	North River	66.9	81.3
WeatherFlow	Professional	Federal Point	66.7	75.3
WeatherFlow	Professional	Fort Sumter	66.7	80.3
WeatherFlow	Professional	Shutes Folly	66.2	80.0
UF	FCMP	FCMP T1	65.8	75.3
WeatherFlow	HurrNet	Oregon Inlet	65.5	84.1
WeatherFlow	Professional	Cape Henry	63.3	70.1
WeatherFlow	Professional	REAL Slick	62.9	82.3
WeatherFlow	Professional	Croatan Sound	62.4	81.1
WeatherFlow	Professional	Roanoke Sound	62.1	80.1
NOS	COOPS	Beaufort	59.9	73.6
WeatherFlow	Professional	3rd Island	59.1	67.6
NOS	COOPS	Fort Story	58.8	70.2



Business Model Insights

Despite WeatherFlow data being subject to exclusivity agreements, we have found a balance...

... publish **just the right amount** !

- HurrNet is almost entirely funded by the insurance sector
 - Initial buildout in collaboration with RenRe
 - Ongoing buildout in collaboration with New Paradigm Group
 - RenRe and RMS are both data buyers, and well as many others
- ProNet supported by a wide variety of industrial sectors and consumers
- Both receive additional support from NOAA through the National Mesonet Program

- Data is extensively used by the NHC and WFOs in real-time, and in post storm analysis
- Data is freely available to the research community, within some limits



Mix of deployable and fixed assets effective strategy for observing tropical cyclone landfalls

Themed Questions

Is data is the new gold?

Absolutely!

- WeatherFlow has long had the tagline... “Better data, better decisions”
- In today’s world of AI, this has never been more true



Is there a role for industry in this arena?

Absolutely!

- WeatherFlow has been living proof for over a decade
- WeatherFlow is a provider, as well as conduit to industry



The same monetization opportunities exist for all deployable asset programs



The Value Proposition

The balancing act...

Industry will pay for data if it adds value to their offerings or provides a competitive advantage

However, **if we publish** that data to the world at large, in real-time, we lose the value proposition

So where does the balance lie? Can we have our cake and eat it too?

- Limit parameters?
- Delayed release?
- Reduced fidelity?
- Data use agreements?

What is acceptable to industry partners, data providers, and funding agencies?

