

Preliminary Field Investigation of Damage Caused by Hurricane Matthew

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University of Florida



Hurricane Matthew



September 28-October 9, 2016

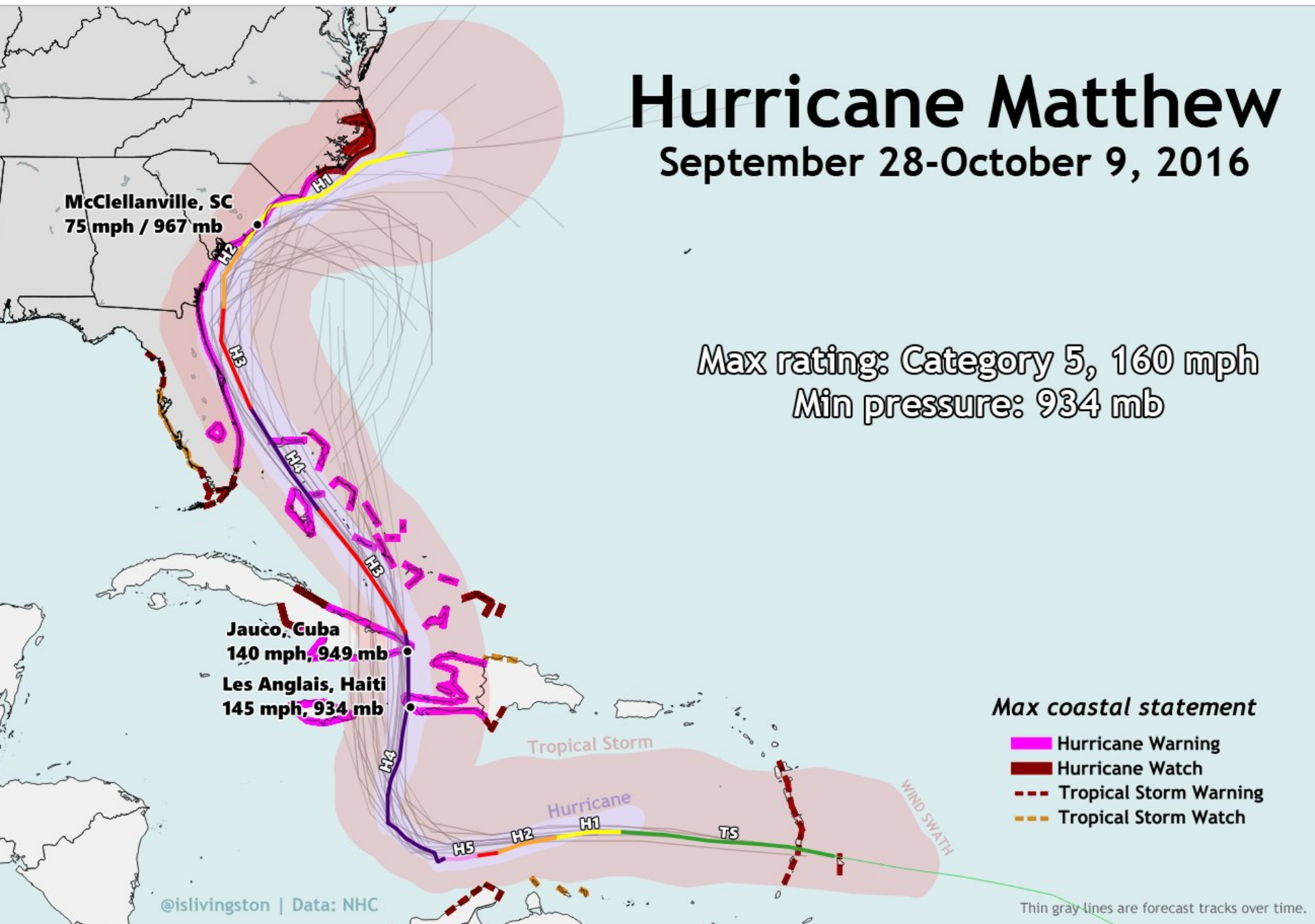
McClellanville, SC
75 mph / 967 mb

Max rating: Category 5, 160 mph
Min pressure: 934 mb

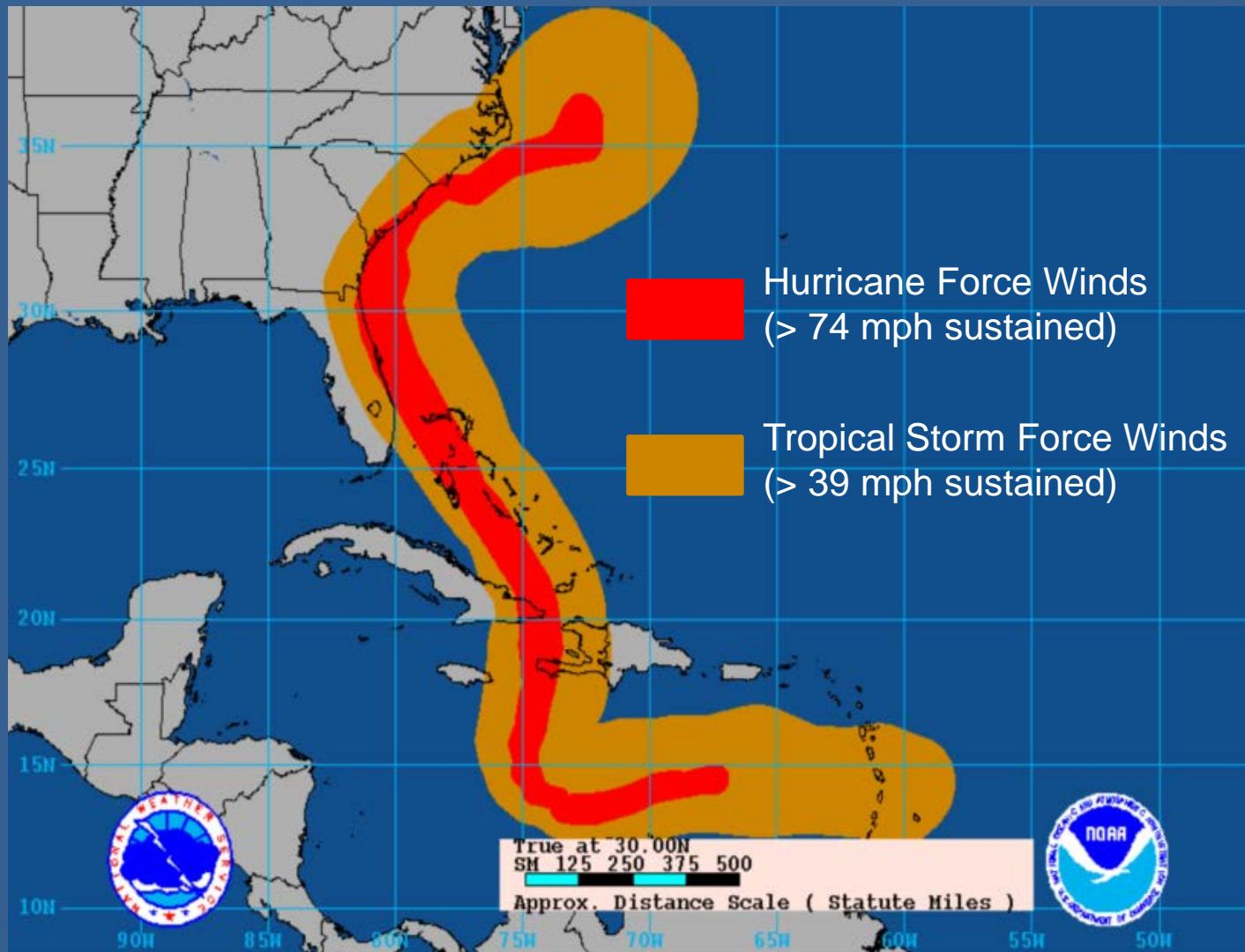
Jauco, Cuba
140 mph, 949 mb
Les Anglais, Haiti
145 mph, 934 mb

Max coastal statement

-  Hurricane Warning
-  Hurricane Watch
-  Tropical Storm Warning
-  Tropical Storm Watch



Hurricane Matthew Wind Speeds



Hurricane Matthew

Wind Speed Observations



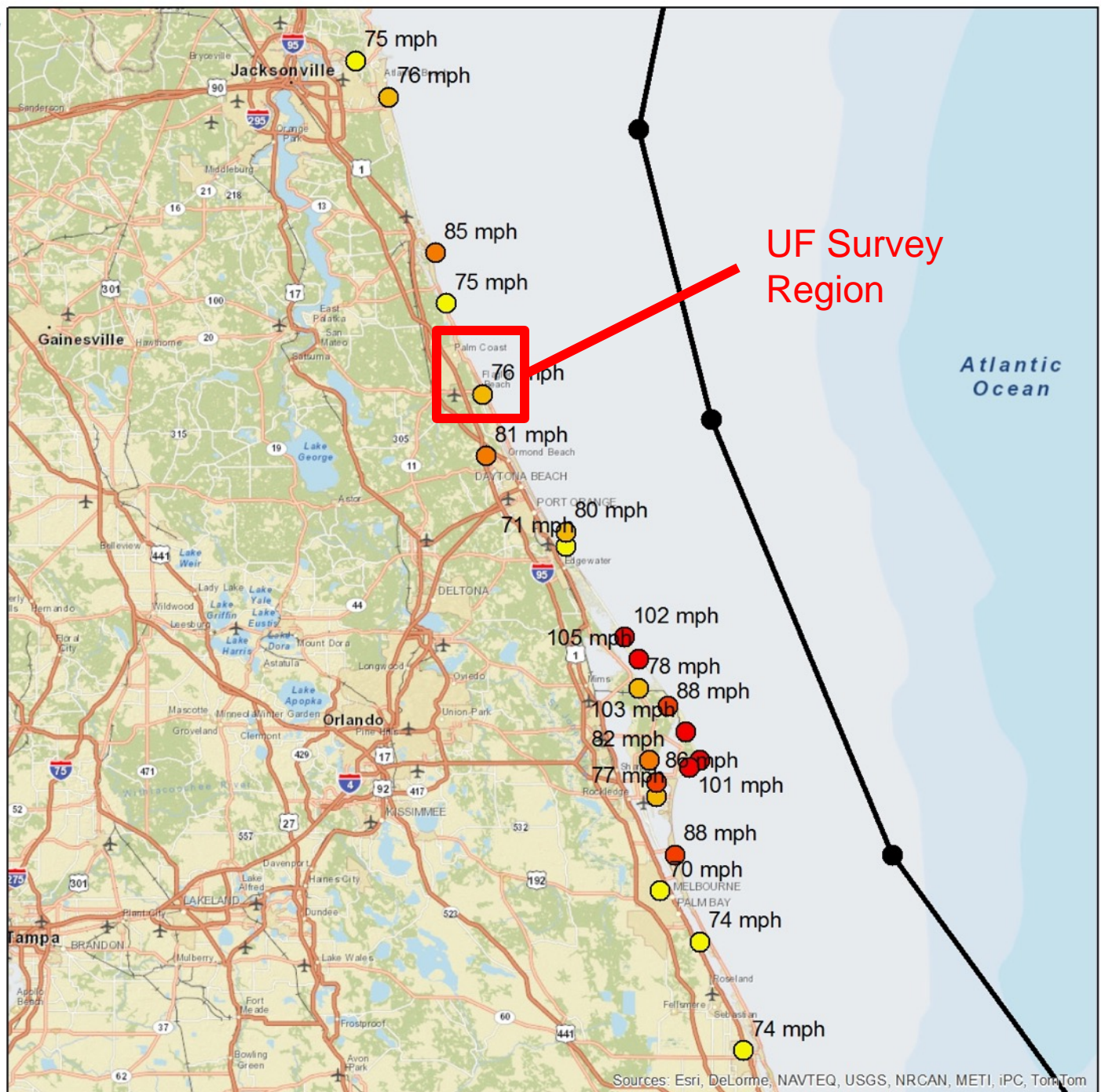
Legend

● Hurricane Track

Wind Gusts

- 70-75 mph
- 75-80 mph
- 80-85 mph
- 85-90 mph
- 90-105 mph

0 5 10 20 30 40
Miles

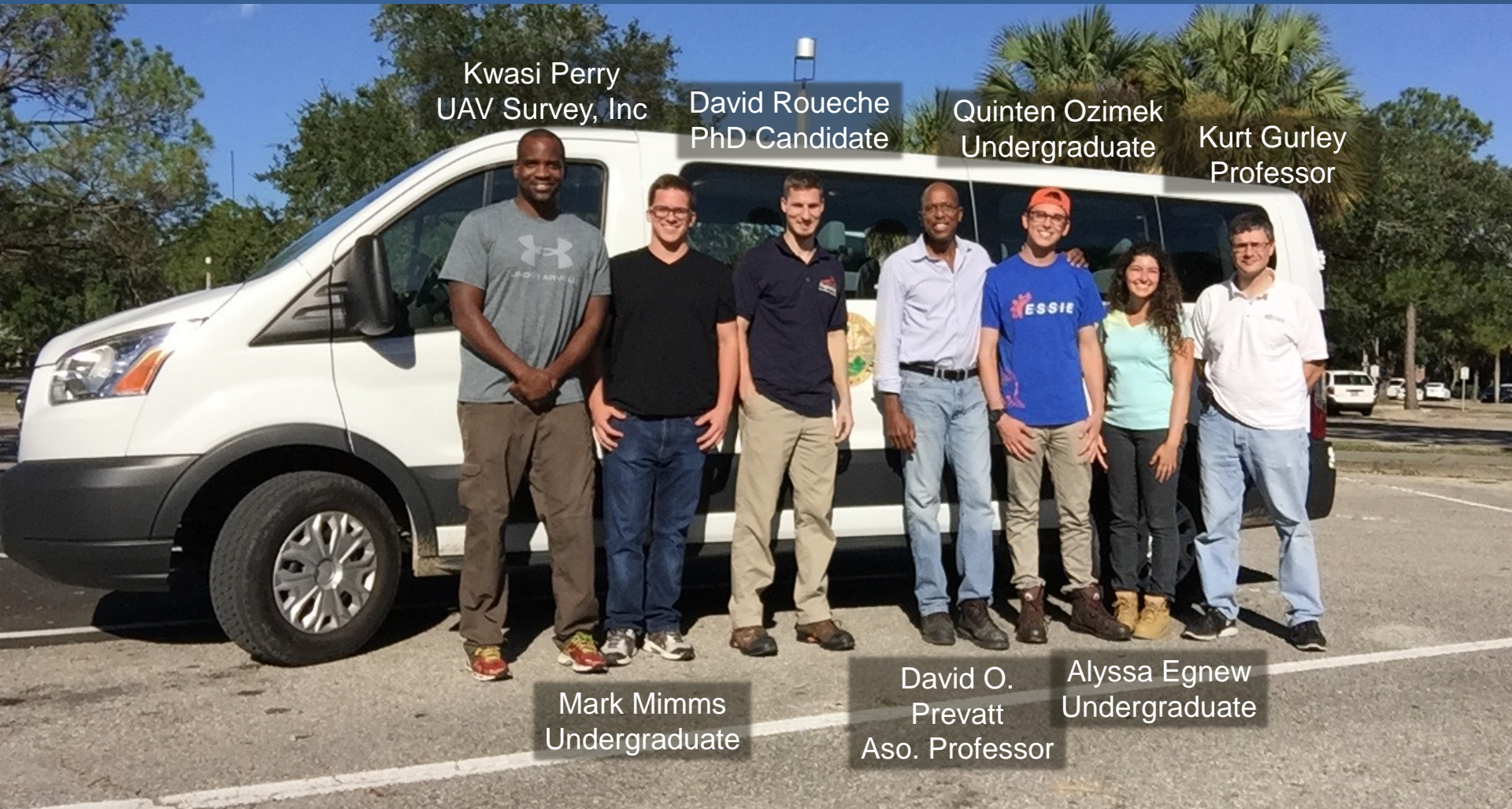


UF Damage Assessment

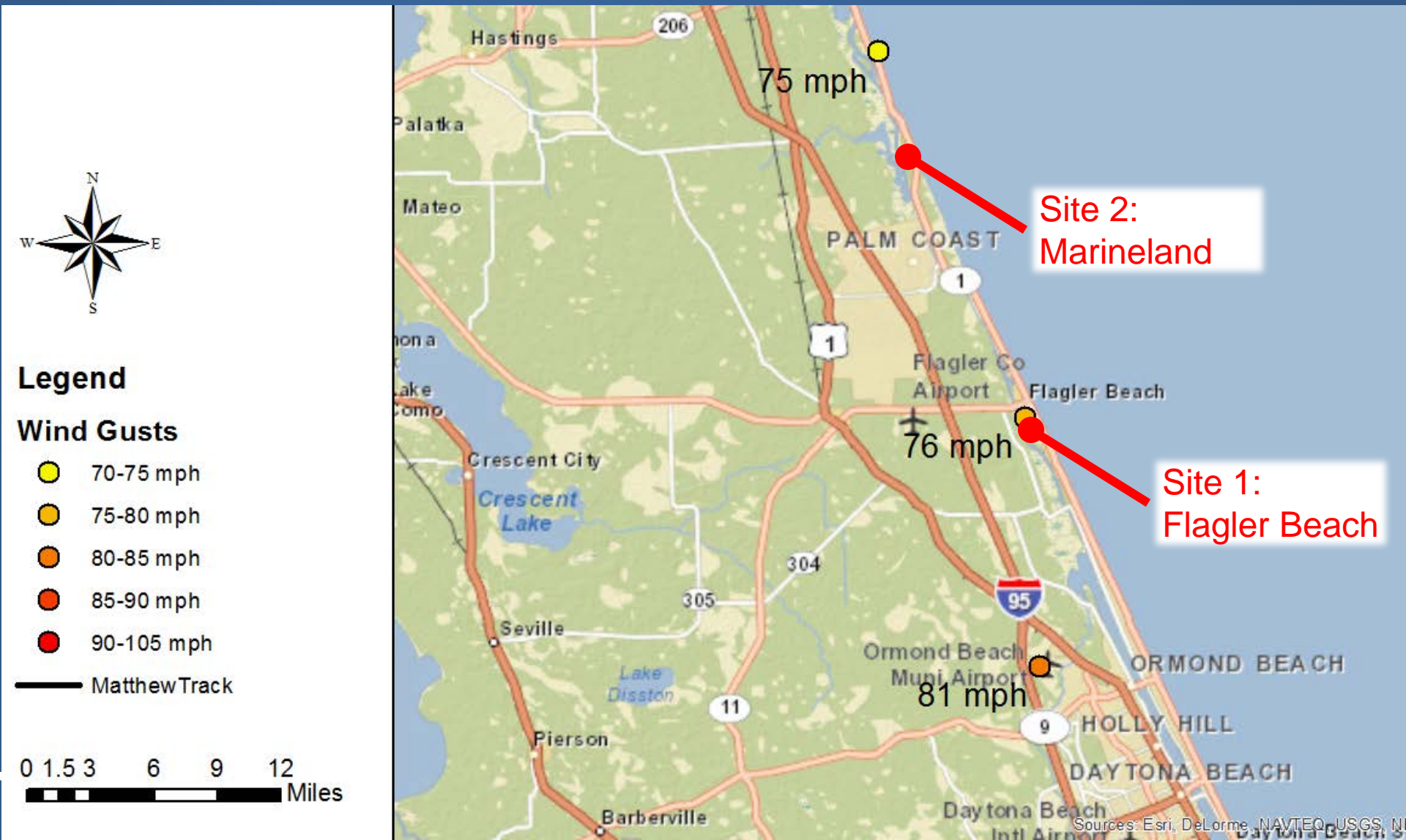
Objectives:

- Investigate regions along the Florida coast that experienced hurricane force wind speeds
- Demonstrate survey methodologies:
 - Ground survey: Survey123 app
 - Aerial Survey: UAV flights
- Provide recommendation for a full assessment

UF Damage Assessment Team

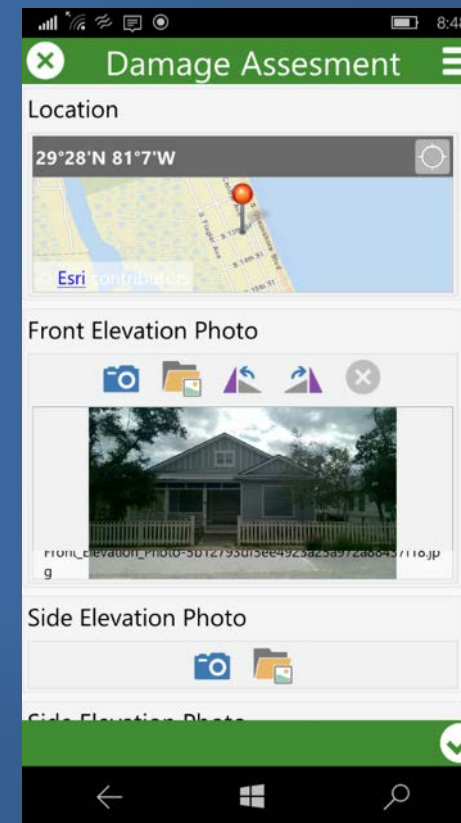
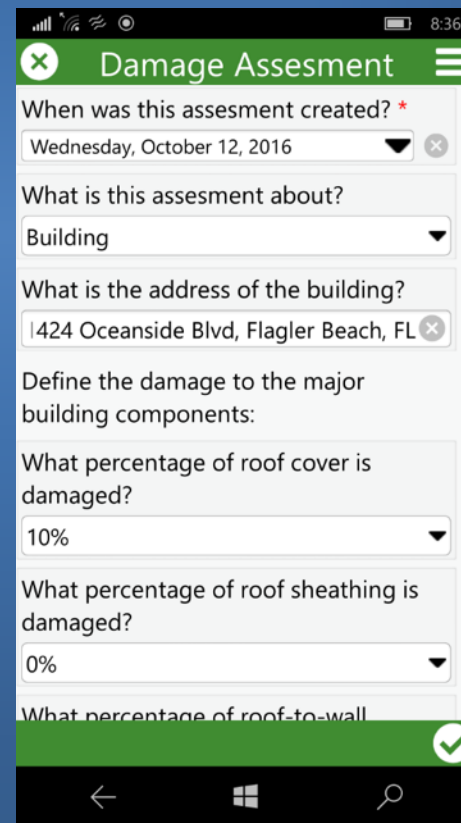
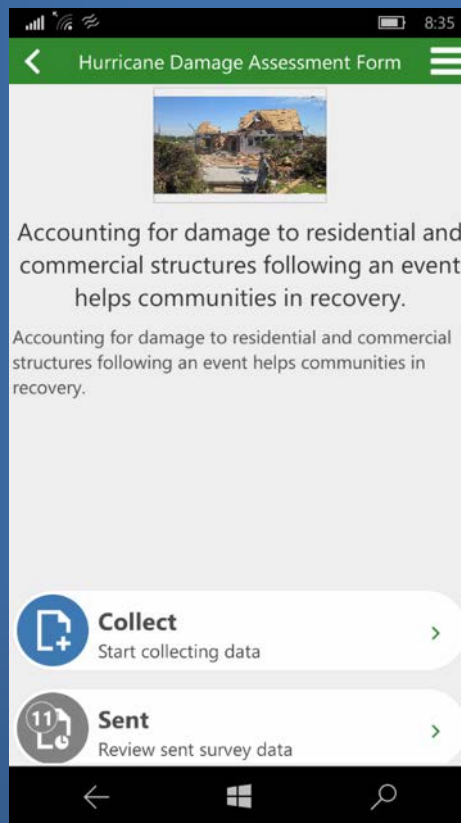
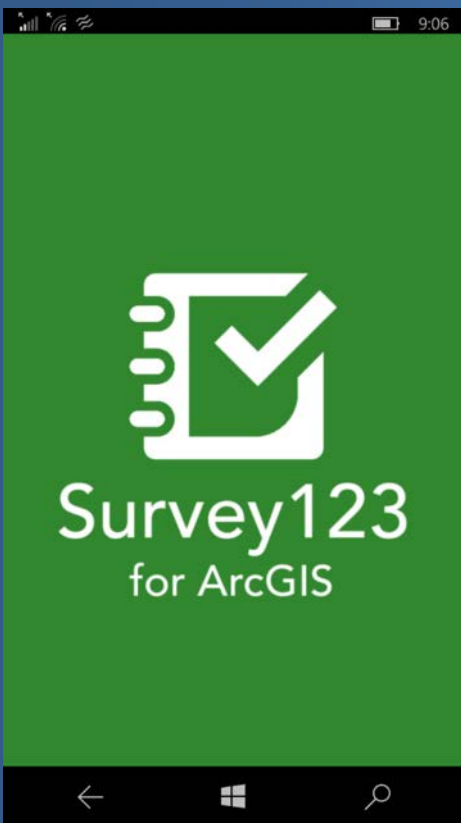


Assessment Sites



Ground Survey

- ESRI Survey123 for ArcGIS mobile survey app
- Allows for creation of custom survey forms that are accessed and submitted via smartphone




Ground Survey

- Submitted surveys are automatically compiled into online database that can be shared with stakeholders

Survey123 for ArcGIS My Surveys Help David

Hurricane Damage Assessment Form Overview Design Collaborate Analyze Data




Form_1 (153 features, 1 selected)

When was this assessment created?	What is this assessment about?	What is the address of the building?	What percentage of roof cover is damaged?	What percentage of roof sheathing is damaged?	What percentage of roof-to-wall connections are damaged?	What percentage of wall cover is damaged?	What percentage of wall is damaged?
Oct 8, 2016	Building	1428 SA1A	10%	0%	0%	0%	0%
Oct 8, 2016	Building	1440 S. A1A	30%	20%	10%	10%	10%
Oct 8, 2016	Building	1420 S. A1A	10%	10%	0%	0%	0%
Oct 8, 2016	Building	1416 S. A1A	0%	0%	0%	0%	0%
Oct 8, 2016	Building	1401 S. Daytona St.	0%	0%	0%	0%	0%
Oct 8, 2016	Building	1411 S. Daytona Ave.	0%	0%	0%	Unknown	0%
Oct 8, 2016	Building	1415 S. Daytona Ave.	0%	0%	0%	0%	0%


Options

Individual Response

Attachments:



Front_Elevation_Photo-bb8c4453c38346099c5bba2d6c460db1.jpg



Side_Elevation_Photo_1-ee75c2df4b82432eb35ce71cc70b6115.jpg

Submitted By: david.roueche

Submitted Time: 10/08/2016 10:38:58

Print Current Response

Open in ArcGIS Map Viewer Expand Table Show Individual Response CSV Download

UAV Survey

- Quad copter UAV
- Flight Elevation:
220 ft
- Flight Speed:
~30 mph
- Imagery Pixel Size:
5 cm (2 in.)
- Total high Resolution
Photos: 581
- Survey completion time:
15 minutes



Flagler Beach, FL

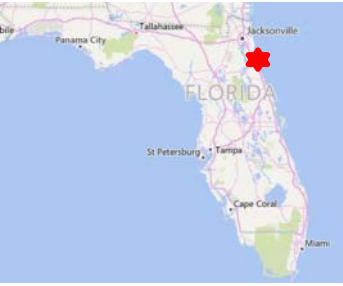




3D Model from UAV Data

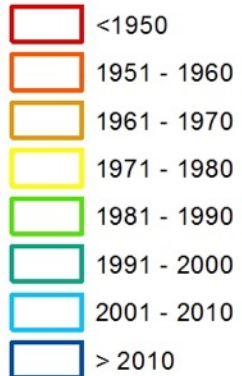


Flagler Beach Flagler County, FL



Legend

Year Built



0 0.02 0.04
Mile



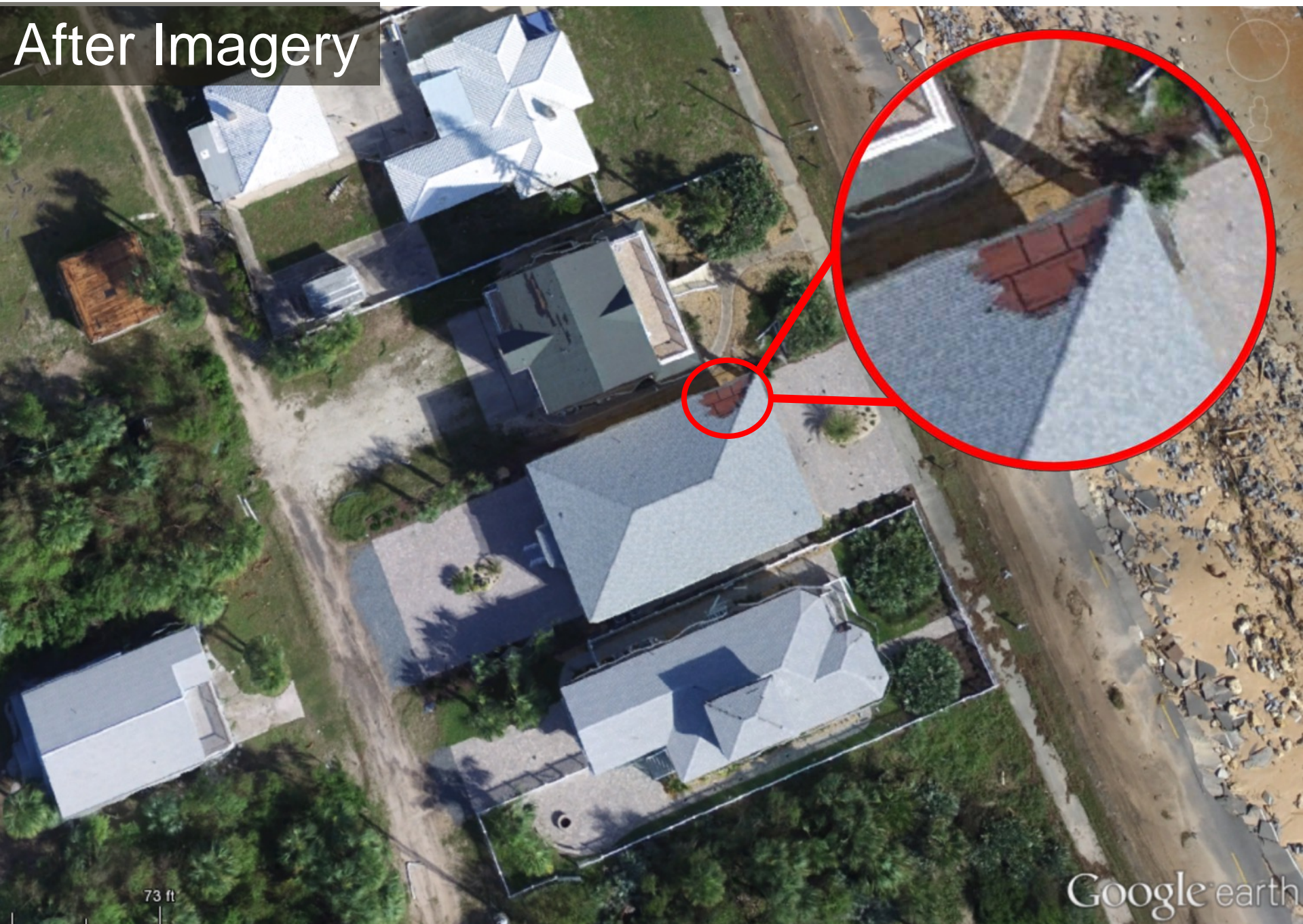
Sources: Esri, DeLorme, NAVTEQ, USGS, INRCA, IGN, IGC, TomTom, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors

Before Imagery



Google earth

After Imagery



73 ft

Google earth

1424 S Oceanshore Blvd, Flagler Beach, FL

Year Built: 2015

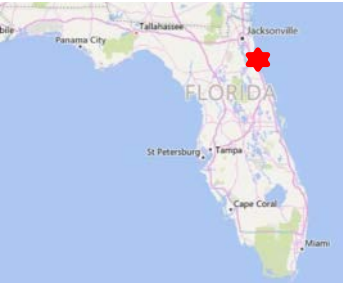
UAV Imagery



Ground Survey Photo

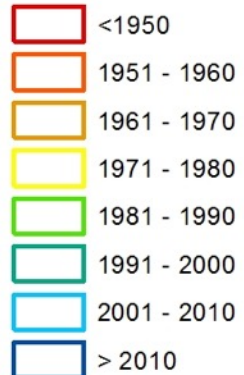


Marineland Flagler County, FL

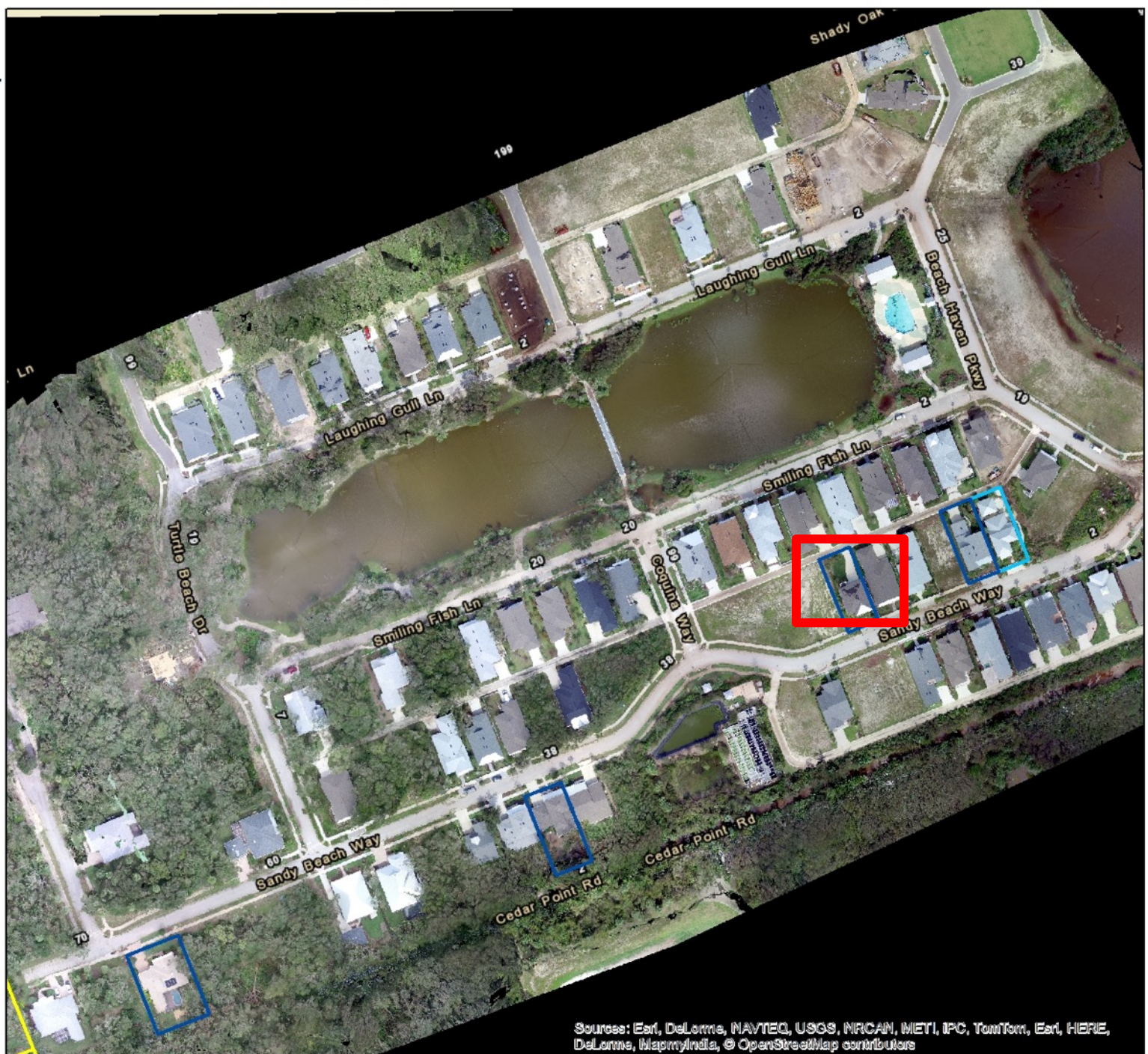


Legend

Year Built



0 0.02 0.04
Miles



Sources: Esri, DeLorme, NAVTEQ, USGS, INRAN, INETI, IPC, TomTom, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors

An aerial photograph of a residential property showing a house with a grey shingled roof. A red arrow points to a section of the roof where shingles are missing, revealing the underlying structure. A red oval on the ground in front of the house contains numerous dark, rectangular pieces of shingle debris scattered across the lawn and sidewalk. A red line connects the oval to a text box at the bottom right.

Shingle Failure
Primarily on North
Slope of Roof

Scattered Shingle Debris
Downwind of Home

Soffit Damage Observed to a Few Homes



Preliminary Damage Observations

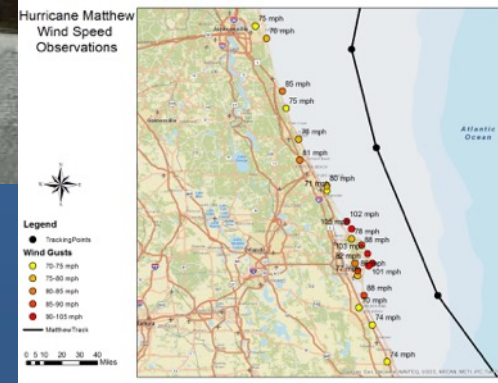
- 90 homes surveyed in Flagler County (experienced 3-second wind gusts of 70-80 mph)
- 44 homes surveyed in Flagler Beach, 46 homes surveyed in Marineland
- Damage limited to roof cover, soffits, fascia, windows
- 13% homes experienced roof cover damage (12 of 90)
- Shingle damage mainly on north-facing roof slopes (confirming strongest winds were out of the North)

Other Damage Observations (from Social Media 1/4)



Orlando, FL
(from @weshchopper2)

Hurricane Matthew
Wind Speed
Observations



Other Damage Observations (from Social Media – 2/4)



Orlando, FL
(from @wesh)

Other Damage Observations (from Social Media – 3/4)



Daytona Beach, FL
(from @wesh)



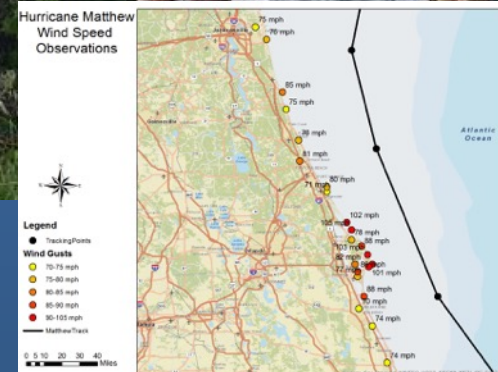
Daytona Beach, FL
(from @maryzimnik)

Other Damage Observations (from Social Media – 4/4)



Edgewater, FL
(from Shayna L Keller)

Hurricane Matthew
Wind Speed
Observations



Summary

- Both suburbs experienced similar wind strengths – the newer houses performed better
- Using the UAV survey techniques provides substantially more complete survey than on-the-ground survey
 - Enables dimensioning to measure % damage to walls windows
 - Accurate measure for roof damage particularly with tree cover
- Survey123 tool enables quick capture and uploading of geo-located house info., but some bugs still exist.
- UF proposes a follow-up survey to identify level of interior damage (water and wind) experienced
 - Survey also would associate house age and characteristics to damage
 - Consideration of social/behavioral questions – retrofit, evacuation, risk

Thank You For your Attention!

Questions?

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