



NHC's Experimental Arrival of Tropical-Storm-Force Winds Graphics

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National Hurricane Center

National Hurricane Conference
New Orleans, Louisiana
April 20, 2017



Time of Arrival Information



- Primary time of arrival tool (HURREVAC) assumes perfect NHC forecast
 - Uses deterministic NHC forecast information
 - Does not account for track, forward speed, intensity, or size uncertainties
 - Can be used to plan for a direct hit (but still doesn't incorporate timing uncertainty)
- Timing information that incorporates forecast uncertainty is available within NHC Wind Speed Probability text product
 - Information is limited to 12 h time periods through 48 h, and 24 h time periods at days 2 through 5.



Report for Hurricane Earl
Based on Advisory 30 Issued 09/01/10 5PM EDT (OLD Advisory)

Facility Timing Details (132 Items)

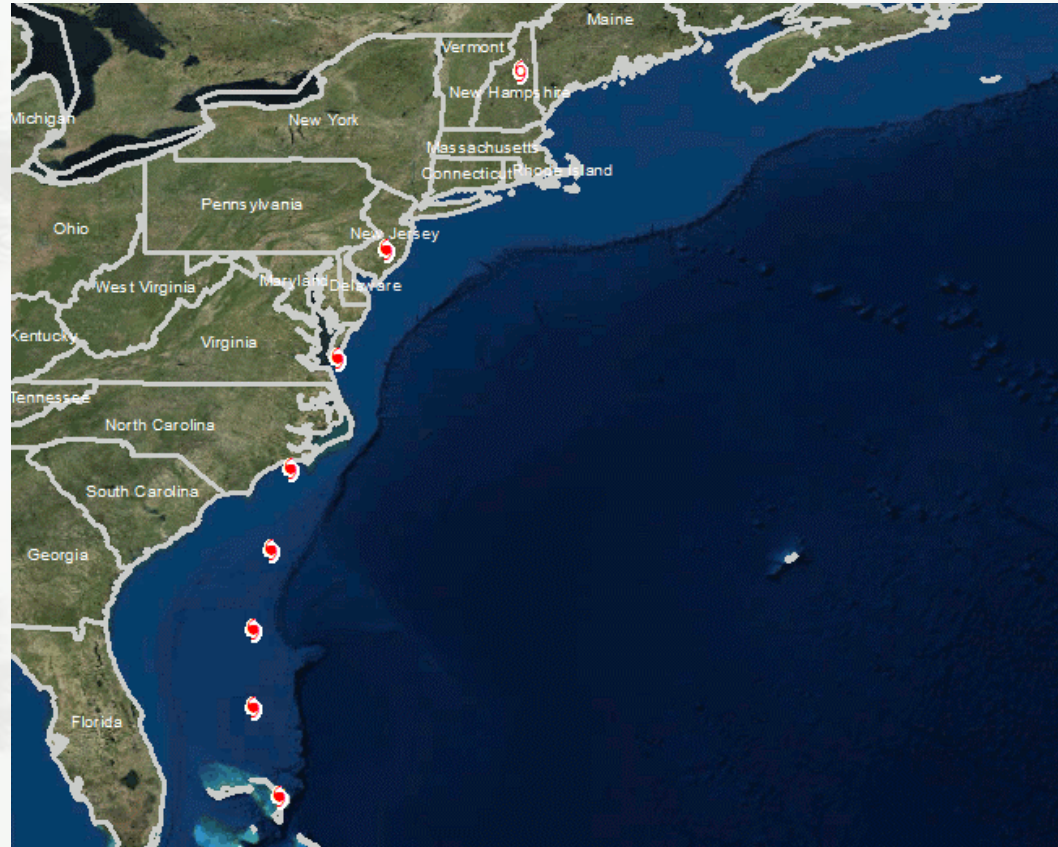
| Location | EvacType | Mobilize (hrs) | Evac. (hrs) | Closure (hrs) | Hazards (hrs) |
|-----------------------------------|----------|----------------|------------------|---------------|-----------------|
| Fee Island Ferries | Wind | 09/01 23E (1) | 09/01 23E 25 | 09/03 00E 6 | 09/03 08E (2) |
| Pulaski Skyway Bridge | Wind | 09/02 05E (3) | 09/02 06E 16.8 | 09/03 01E 6 | 09/03 07E (2.5) |
| Port Jefferson Dock | Wind | 09/01 23E (1) | 09/02 00E 25 | 09/03 01E 6 | 09/03 09E (2) |
| Grant Point Dock | Wind | 09/02 00E (1) | 09/02 01E 25 | 09/03 02E 6 | 09/03 10E (2) |
| Hutchinson Pk Pkwy-Palms Pl... | Wind | 09/02 12E (3) | 09/02 15E 12 | 09/03 03E 6 | 09/03 09E (2) |
| Cross Bk Expy-White Plains Rd | Wind | 09/02 18E (3) | 09/02 21E 6 | 09/03 03E 6 | 09/03 09E (2) |
| Hutchinson Pk Pkwy-Exd 9 | Wind | 09/02 11E (3) | 09/02 14E 12.9 | 09/03 03E 6 | 09/03 09E (2) |
| Loop Pkwy-Headbrook Pkwy | Sturge | 09/02 01E (3) | 09/02 04E 24 | 09/03 04E 6 | 09/03 10E (6.5) |
| FDR Drive-Willensburg Bridge | Sturge | 09/02 03E (3) | 09/02 06E 22 | 09/03 04E 6 | 09/03 10E (6.5) |
| Van Wyck-Grand Central Pkwy | Sturge | 09/01 16E (3) | 09/01 19E 33 | 09/03 04E 6 | 09/03 10E (6.5) |
| Hyland Blvd-16th Midland Ave | Sturge | 09/02 12E (3) | 09/02 15E 13 | 09/03 04E 6 | 09/03 10E (6.5) |
| BQE-Atlantic Ave and Hamilton Ave | Sturge | 09/02 00E (3) | 09/02 03E 25 | 09/03 04E 6 | 09/03 10E (7) |
| NJ Rte 17-HP 4.95-5.5 | Sturge | 09/02 08E (3) | 09/02 11E 16.8 | 09/03 04E 6 | 09/03 10E (6.5) |
| NJ Rte 7-HP 2.2 | Sturge | 09/02 08E (3) | 09/02 11E 16.8 | 09/03 04E 6 | 09/03 10E (6.5) |
| BQE-16th-Hamilton Ave | Sturge | 09/02 00E (3) | 09/02 03E 25 | 09/03 04E 6 | 09/03 10E (7) |
| BR Bridge-ct span | Wind | 09/02 20E (3) | 09/02 23E 6.1 | 09/03 05E 2 | 09/03 07E (2.5) |
| Queensboro Bridge-ct span | Wind | 09/02 19E (3) | 09/02 22E 7 | 09/03 05E 2 | 09/03 07E (2.5) |
| MH Bridge-ct span | Wind | 09/02 16E (3) | 09/02 19E 10.4 | 09/03 05E 2 | 09/03 07E (2.5) |

Time of Arrival

Accounting for Forecast Uncertainty

- **1,000 realistic alternative scenarios are created**
 - Official NHC forecast
 - Historical NHC track and intensity forecast errors
 - Climatology and persistence wind radii model
- **Weakening over land**
- **Track model spread**

Past NHC track forecast errors are correlated to the spread of track model guidance



Wind Speed Probability realizations for Hurricane Irene (2011) Advisory 22



Timing Info in Text Product

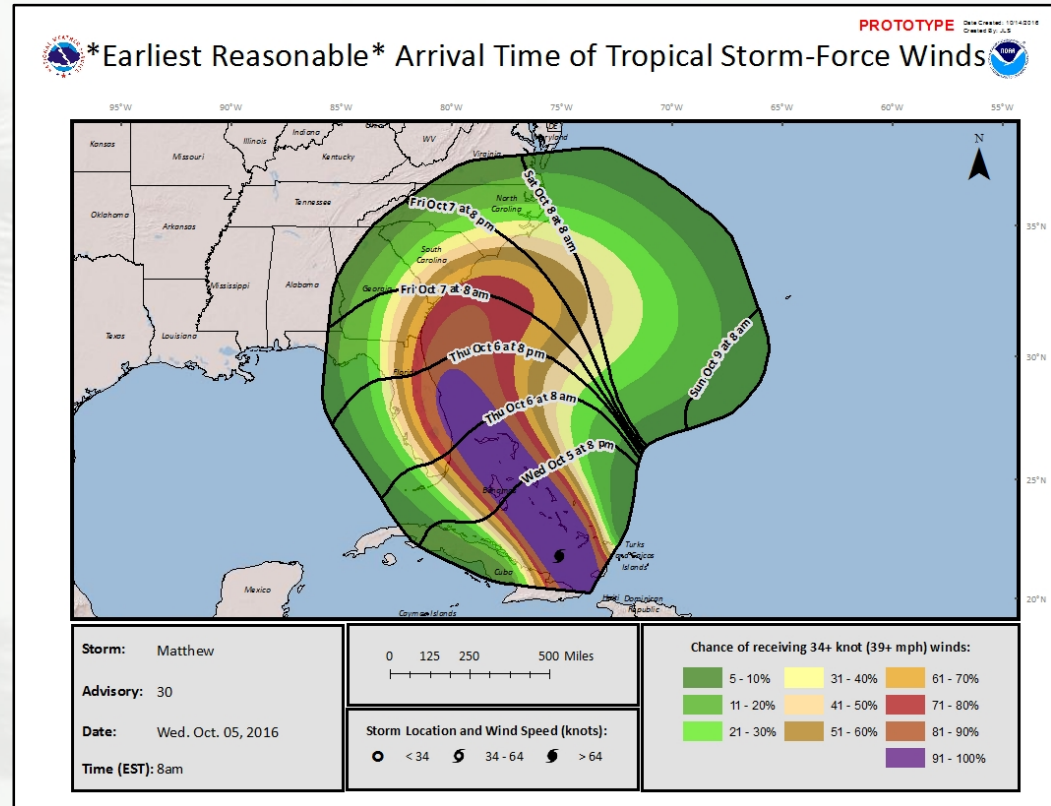


- - - - WIND SPEED PROBABILITIES FOR SELECTED LOCATIONS - - - -

| TIME PERIODS | FROM 00Z SUN | | FROM 12Z SUN | | FROM 00Z MON | | FROM 12Z MON | | FROM 00Z TUE | | FROM 00Z WED | | FROM 00Z THU | | FROM 00Z FRI | |
|---------------|--------------|------------|--------------|------------|--------------|------------|--------------|------------|--------------|------------|--------------|------------|--------------|------------|--------------|--|
| | TO 12Z SUN | TO 00Z MON | TO 00Z MON | TO 12Z MON | TO 00Z TUE | TO 00Z WED | TO 00Z WED | TO 00Z THU | TO 00Z THU | TO 00Z FRI | TO 00Z FRI | TO 00Z SAT | TO 00Z SAT | TO 00Z SUN | TO 00Z SUN | |
| FORECAST HOUR | (12) | (24) | (36) | (48) | (72) | (96) | (120) | (144) | (168) | (192) | (216) | (240) | (264) | (288) | (312) | |
| LOCATION | KT | | | | | | | | | | | | | | | |
| YARMOUTH NS | 34 | X | X(X) | X(X) | 1(1) | 1(2) | X(2) | 2(4) | | | | | | | | |
| EASTPORT ME | 34 | X | X(X) | X(X) | X(X) | 1(1) | 1(2) | 2(4) | | | | | | | | |
| BAR HARBOR ME | 34 | X | X(X) | X(X) | 2(2) | 2(4) | 2(6) | 2(8) | | | | | | | | |
| AUGUSTA ME | 34 | X | X(X) | X(X) | 3(3) | 4(7) | 1(8) | 2(10) | | | | | | | | |
| PORTLAND ME | 34 | X | X(X) | X(X) | 6(6) | 8(14) | 1(15) | 2(17) | | | | | | | | |
| CONCORD NH | 34 | X | X(X) | X(X) | 13(13) | 12(25) | 2(27) | 1(28) | | | | | | | | |
| BOSTON MA | 34 | X | X(X) | 1(1) | 25(26) | 12(38) | 1(39) | X(39) | | | | | | | | |
| BOSTON MA | 50 | X | X(X) | X(X) | 1(1) | 2(3) | X(3) | 1(4) | | | | | | | | |
| BOSTON MA | 64 | X | X(X) | X(X) | X(X) | 1(1) | X(1) | X(1) | | | | | | | | |
| HYANNIS MA | 34 | X | X(X) | 3(3) | 34(37) | 9(46) | X(46) | X(46) | | | | | | | | |
| HYANNIS MA | 50 | X | X(X) | X(X) | 2(2) | 1(3) | 1(4) | 1(5) | | | | | | | | |
| HYANNIS MA | 64 | X | X(X) | X(X) | X(X) | 1(1) | X(1) | X(1) | | | | | | | | |
| NANTUCKET MA | 34 | X | X(X) | 6(6) | 37(43) | 8(51) | X(51) | X(51) | | | | | | | | |
| NANTUCKET MA | 50 | X | X(X) | X(X) | 2(2) | 3(5) | X(5) | X(5) | | | | | | | | |
| NANTUCKET MA | 64 | X | X(X) | X(X) | 1(1) | X(1) | X(1) | X(1) | | | | | | | | |
| PROVIDENCE RI | 34 | X | X(X) | 3(3) | 37(40) | 13(53) | 1(54) | X(54) | | | | | | | | |
| PROVIDENCE RI | 50 | X | X(X) | X(X) | 3(3) | 4(7) | X(7) | 1(8) | | | | | | | | |
| PROVIDENCE RI | 64 | X | X(X) | X(X) | 1(1) | 1(2) | X(2) | X(2) | | | | | | | | |
| HARTFORD CT | 34 | X | X(X) | 2(2) | 34(36) | 20(56) | 1(57) | X(57) | | | | | | | | |
| HARTFORD CT | 50 | X | X(X) | X(X) | 4(4) | 7(11) | X(11) | X(11) | | | | | | | | |
| HARTFORD CT | 64 | X | X(X) | X(X) | 1(1) | 1(2) | 1(3) | X(3) | | | | | | | | |
| MONTAUK POINT | 34 | X | X(X) | 7(7) | 42(49) | 17(66) | 1(67) | X(67) | | | | | | | | |
| MONTAUK POINT | 50 | X | X(X) | X(X) | 8(8) | 8(16) | 1(17) | X(17) | | | | | | | | |
| MONTAUK POINT | 64 | X | X(X) | X(X) | 2(2) | 3(5) | X(5) | X(5) | | | | | | | | |
| NEW YORK CITY | 34 | X | X(X) | 6(6) | 40(46) | 28(74) | 1(75) | X(75) | | | | | | | | |
| NEW YORK CITY | 50 | X | X(X) | X(X) | 9(9) | 21(30) | 1(31) | X(31) | | | | | | | | |
| NEW YORK CITY | 64 | X | X(X) | X(X) | 2(2) | 8(10) | X(10) | X(10) | | | | | | | | |

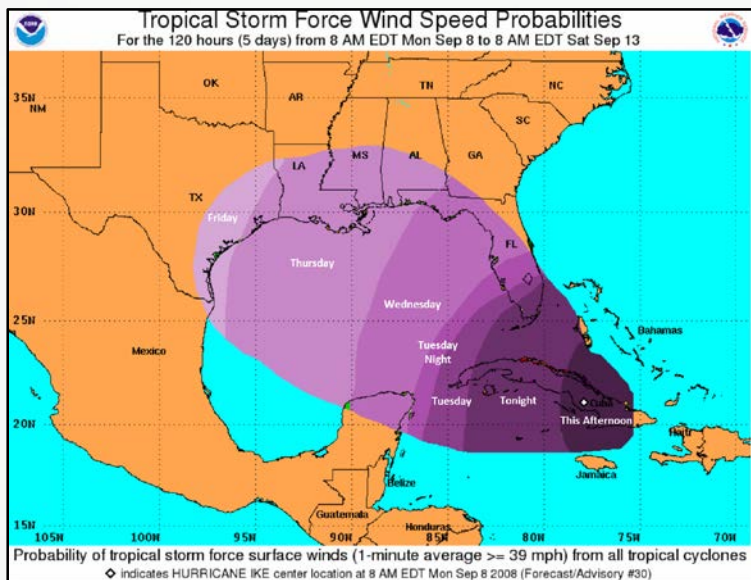
Experimental Arrival of Tropical-Storm-Force Winds Graphic

- Uses timing information from the same realizations used to create the NHC wind speed probability products
- Accounts for forecast uncertainty
- Provides graphical depiction of potential arrival times of tropical-storm-force winds

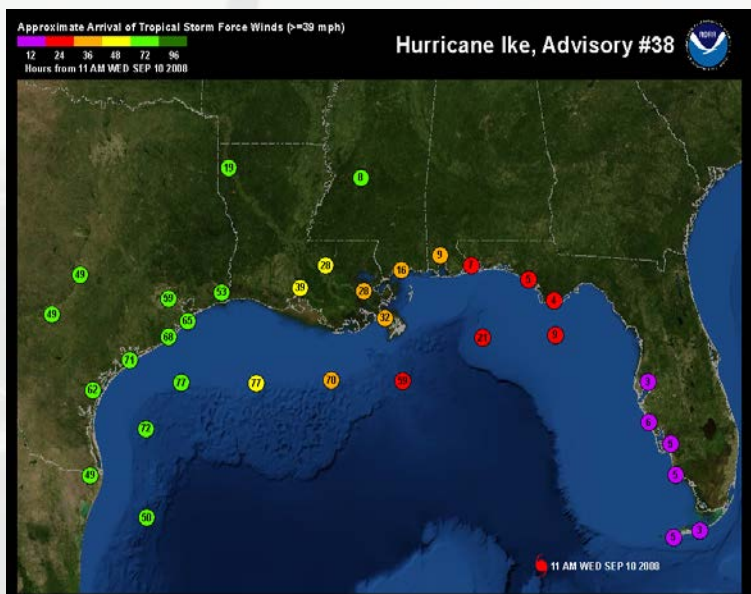




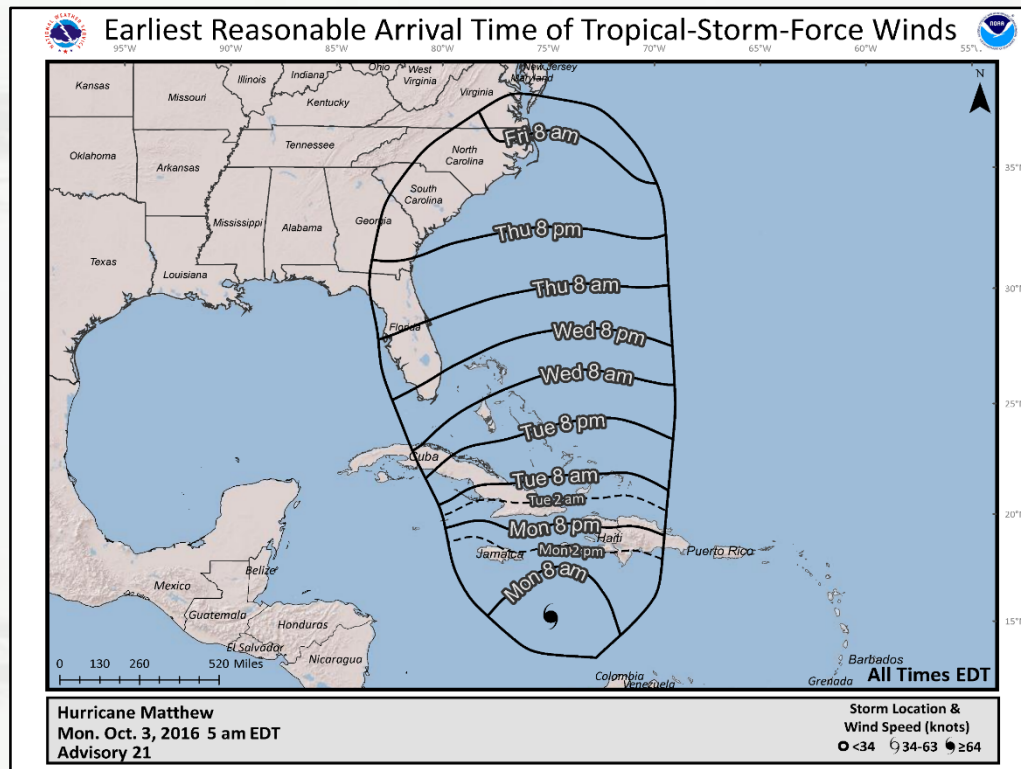
The Time Has Arrived - 5 Years in the Making



Initial 2012 Rough Sketches/Ideas

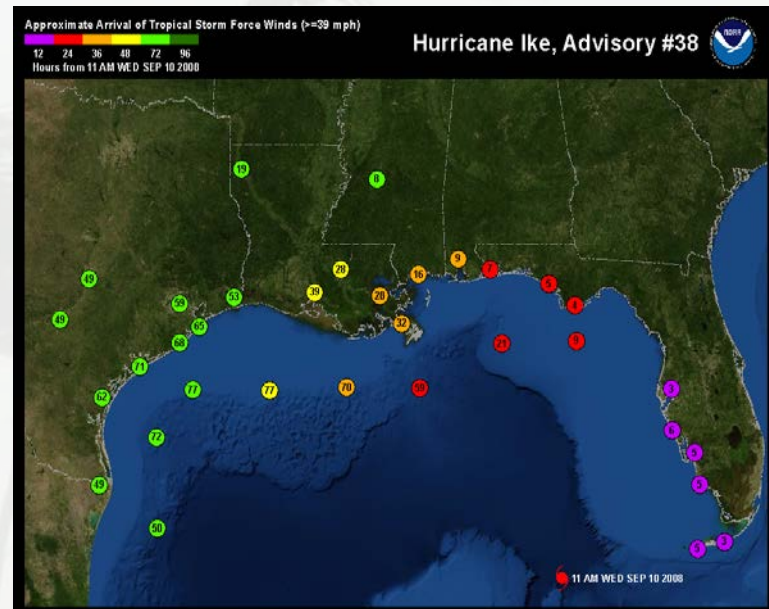
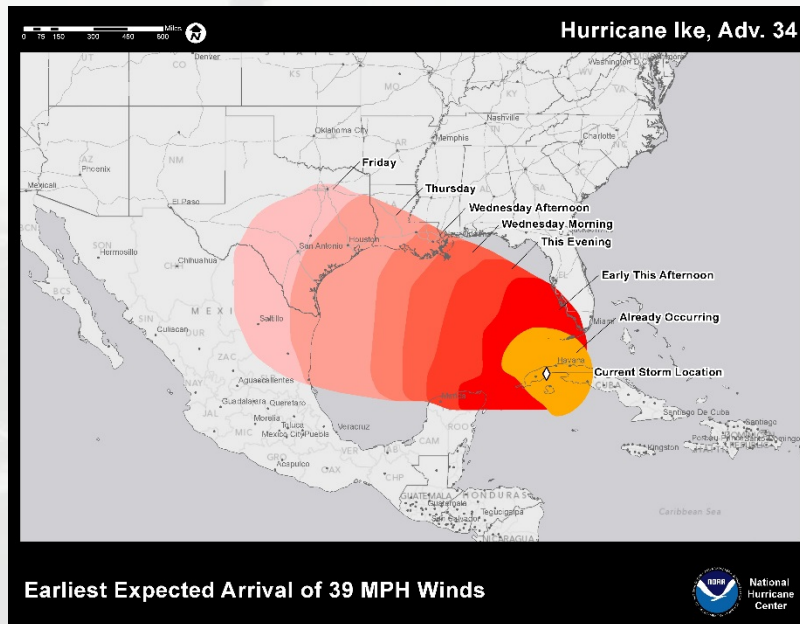
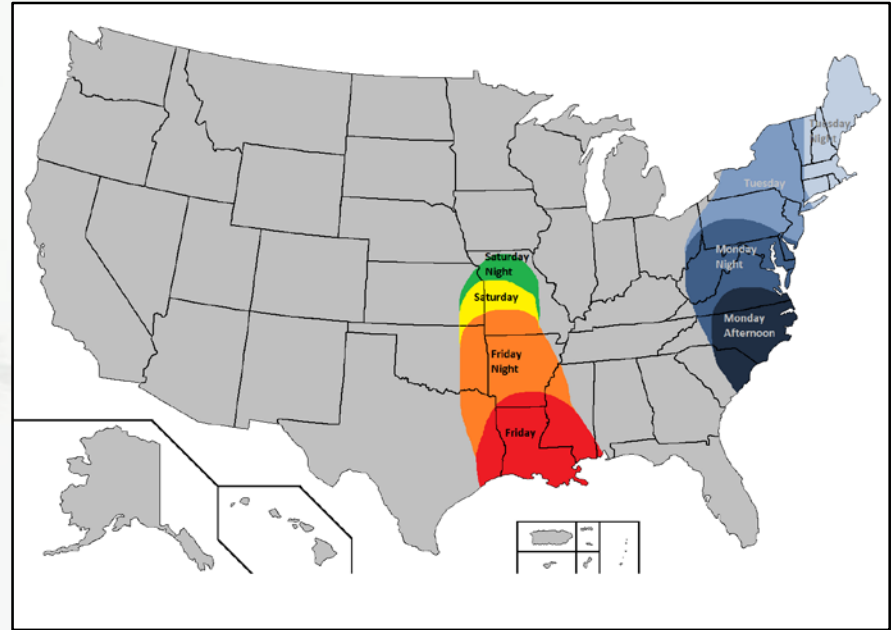
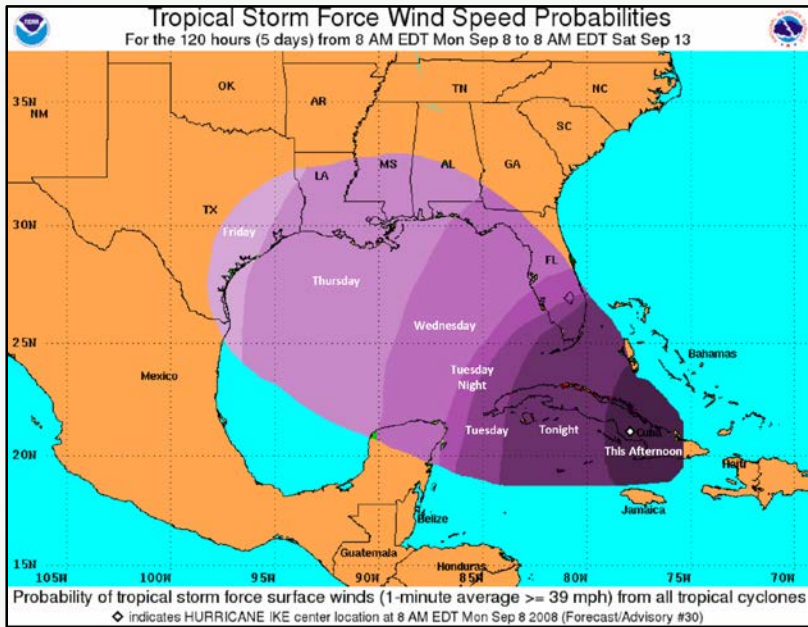


2017 Experimental Version



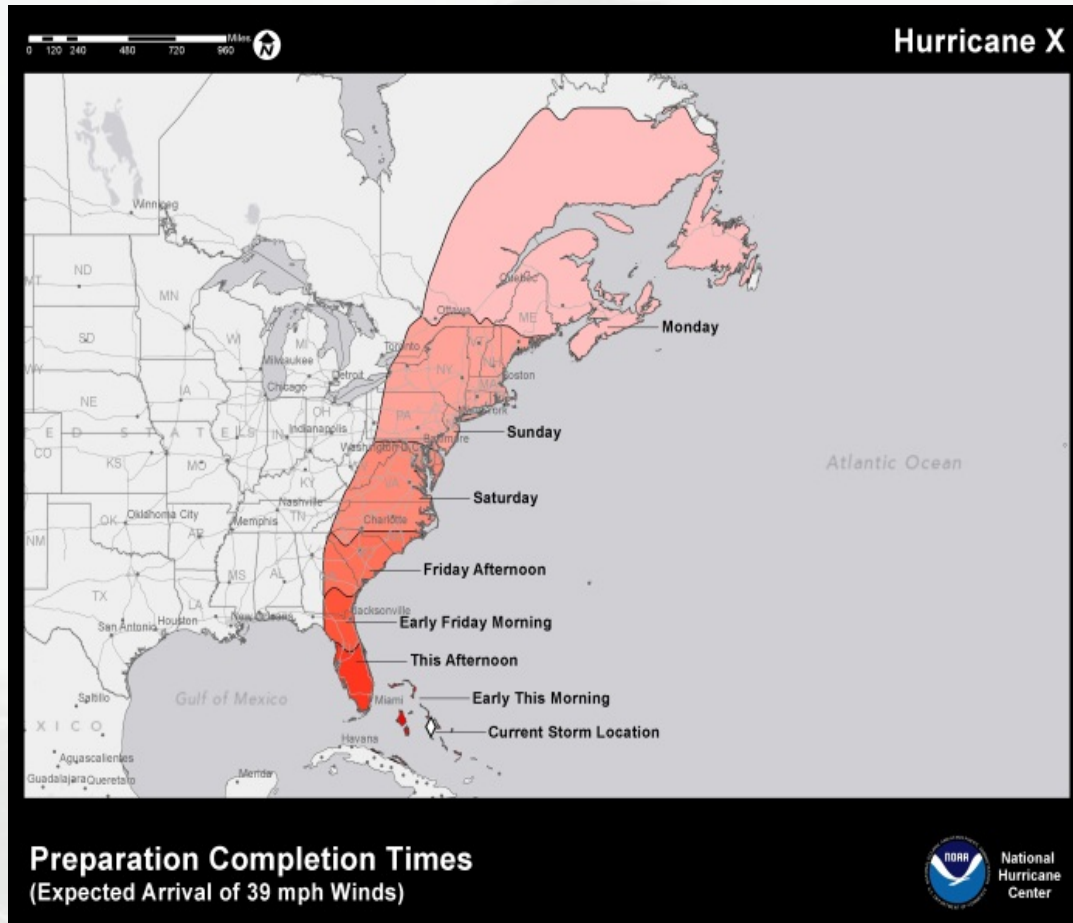


Initial Sketches (2012)



First NCAR/ERG Survey (2012)

113 EMs, 51 Media, 459 Public, 54 NWS WCMs = 677 Total



Criteria:

Ease of understanding

- 83% of EMs
- 95% of Media
- 83% of Public
- 74% of WCMs

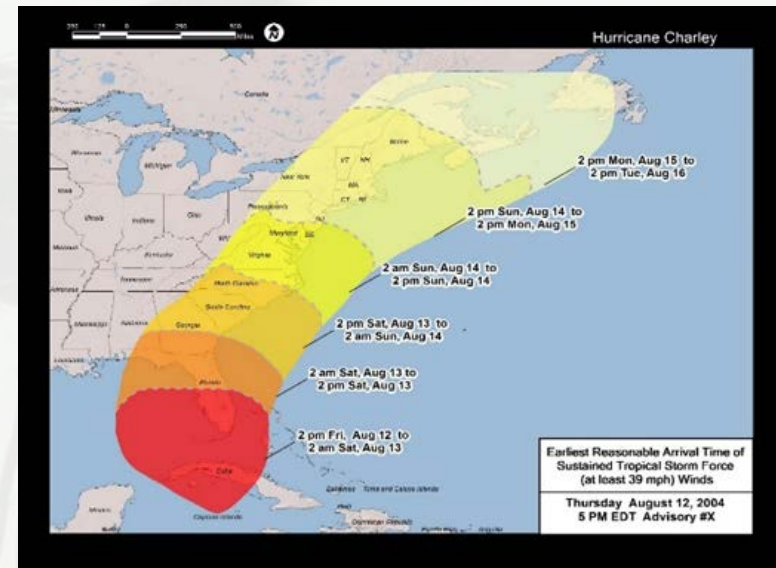
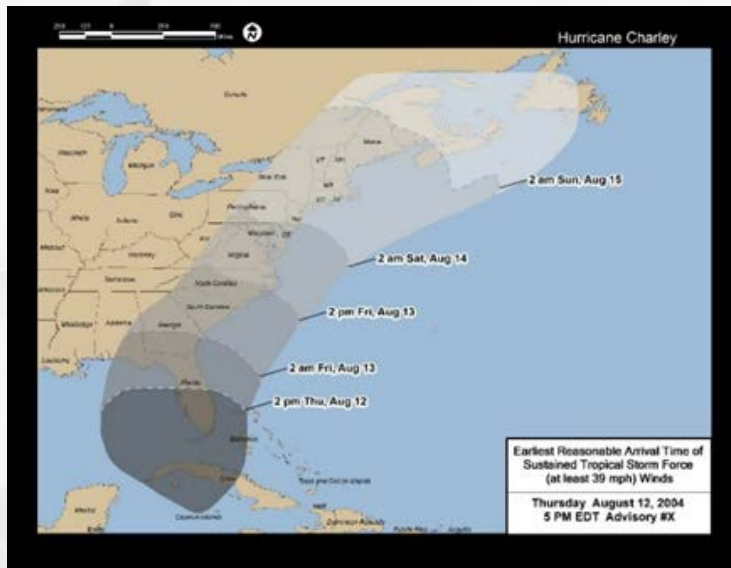
Usefulness

- 81% of EMs
- 95% of Media
- 81% of Public
- 70% of WCMs

Strong support for the map as an NHC product

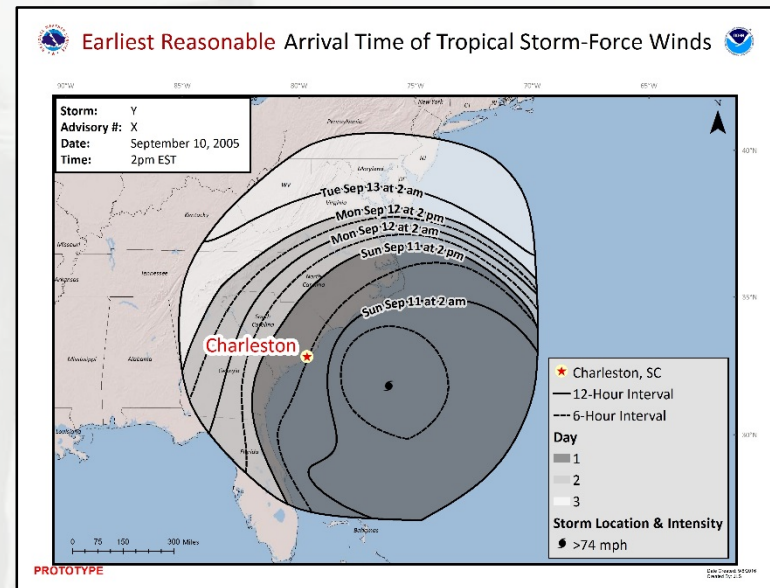
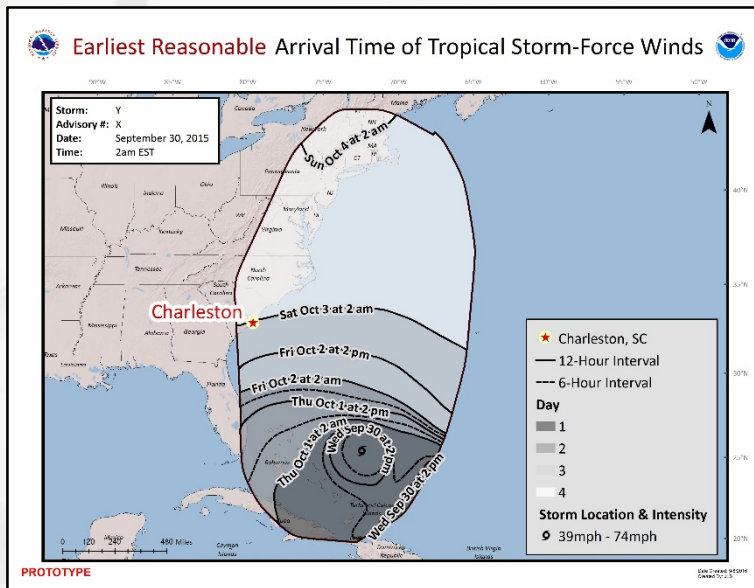
Exploratory Interviews and Focus Groups (2015)

- One-on-one webinar interviews (April 2015)
 - 5 broadcast meteorologists, 6 emergency managers
- Focus groups (Summer 2015) - EMs, BM, and WFOs
 - New York City and Bethpage, NY (11 participants)
 - Orlando, Melbourne, and Rockledge, FL (36 participants)
 - Norfolk and Wakefield, VA (23 participants)
 - Houston and Dickinson, TX (24 participants)



ERG Surveys (2016)

- Emergency managers and broadcast meteorologists
 - Atlantic and Gulf coasts (Virginia to Texas, Puerto Rico, US Virgin Islands)
 - Sent to state/territorial EM agencies, with requests for coastal county EM contacts
 - Sent to chief meteorologists at ABC, NBC, CBS, and FOX affiliates serving coastal markets
 - 659 contacted, 79 responded (12% response rate)
 - Shown various versions for Joaquin or Ophelia



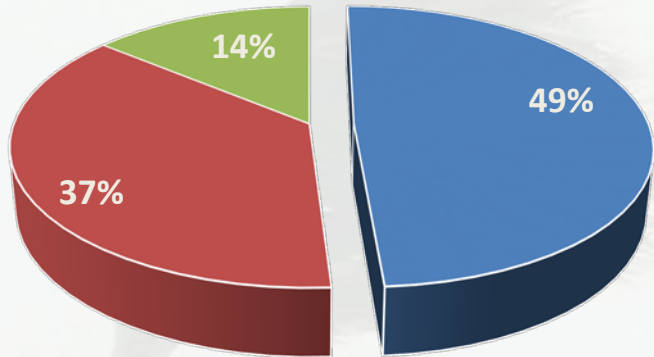


ERG Surveys (2016) – Findings

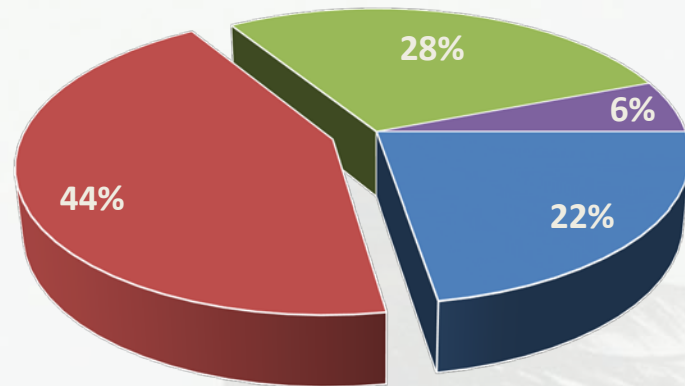
Earliest Reasonable (10%) vs. Most Likely (50%)



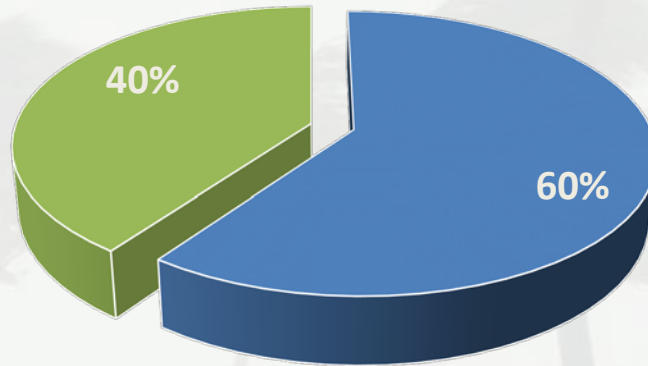
Emergency Managers – External Use



Broadcast Meteorologists – External Use



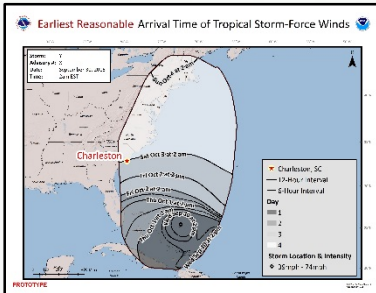
WFOs – External Use



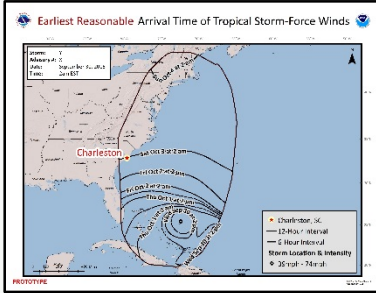
- Earliest Reasonable
- Most Likely
- Both
- Neither/Not Sure/No Preference

ERG Surveys (2016) – Findings

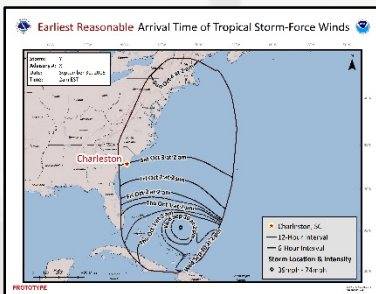
Shading and Labeling



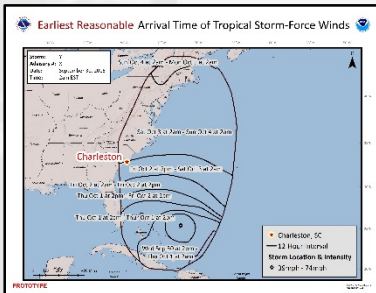
- Overall, slight preference for gray shading (45%) over no shading (42%)



- But, some thought the darkest segments were where the most intense winds would occur
 - 29% of EMs thought the shading indicated intensity, not timing



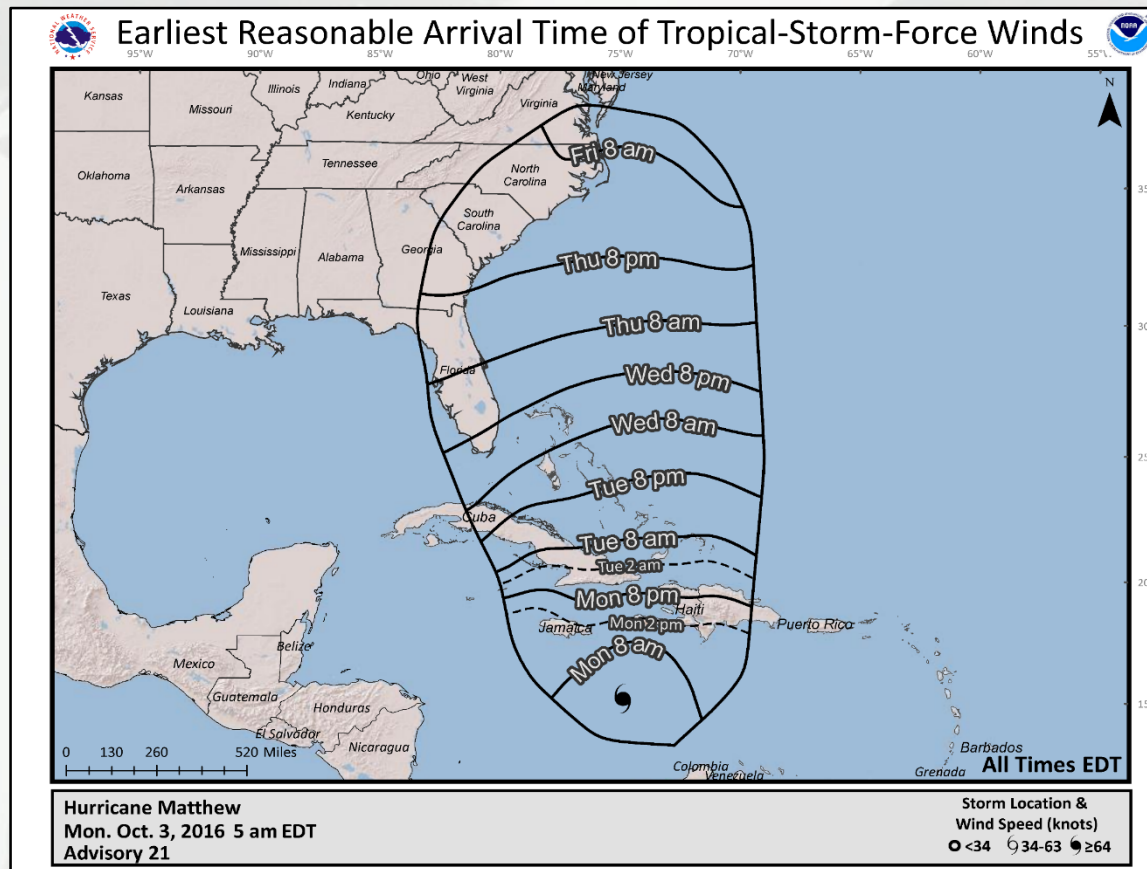
- 73% preferred specific time labels over general time labels
 - e.g., Monday 2 pm vs. Monday afternoon



- 84% preferred labels on the borders rather than within segments

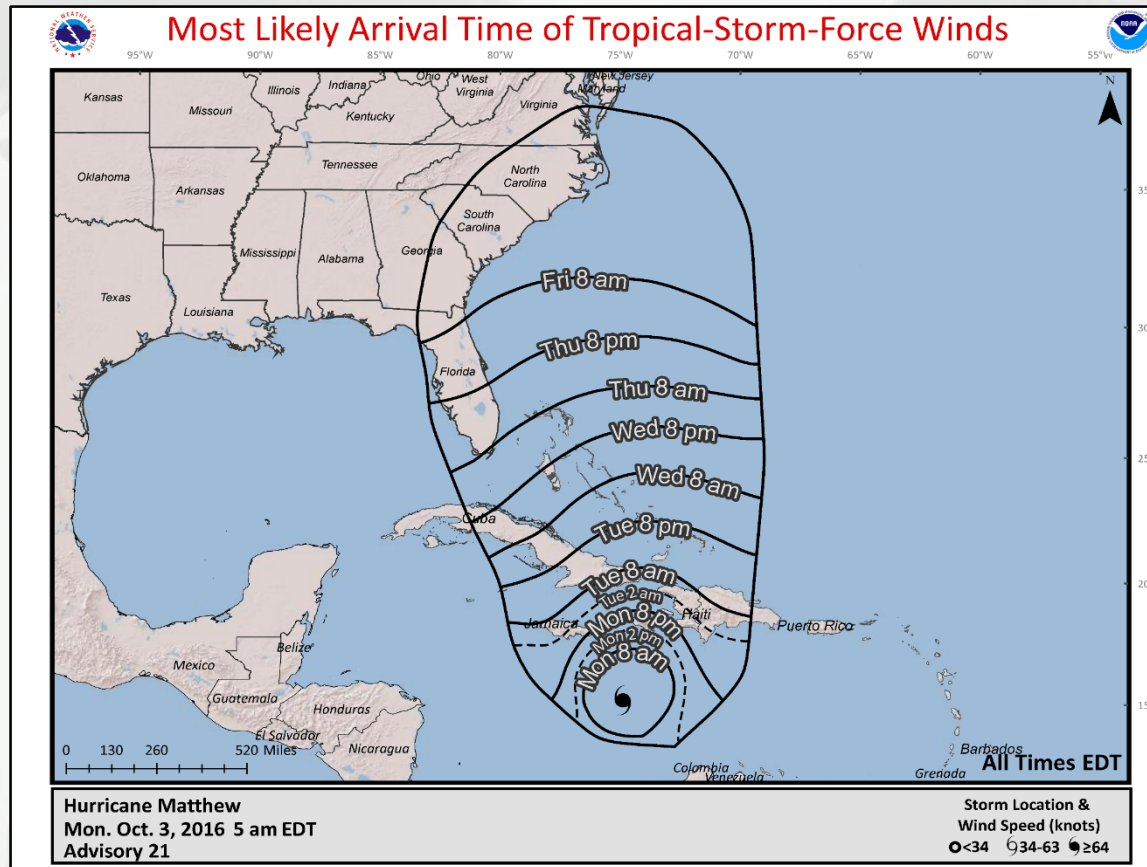
Earliest Reasonable Arrival Time

- No more than a 1-in-10 chance of sustained TS winds arriving before the indicated time
- Best for those with a low tolerance of risk (those who want to be sure they're done preparing in time)



Most Likely Arrival Time

- Equally likely that sustained TS winds will arrive before or after the indicated time
- Best for those with a higher tolerance of risk (those who are more willing to not have preparations done in time)

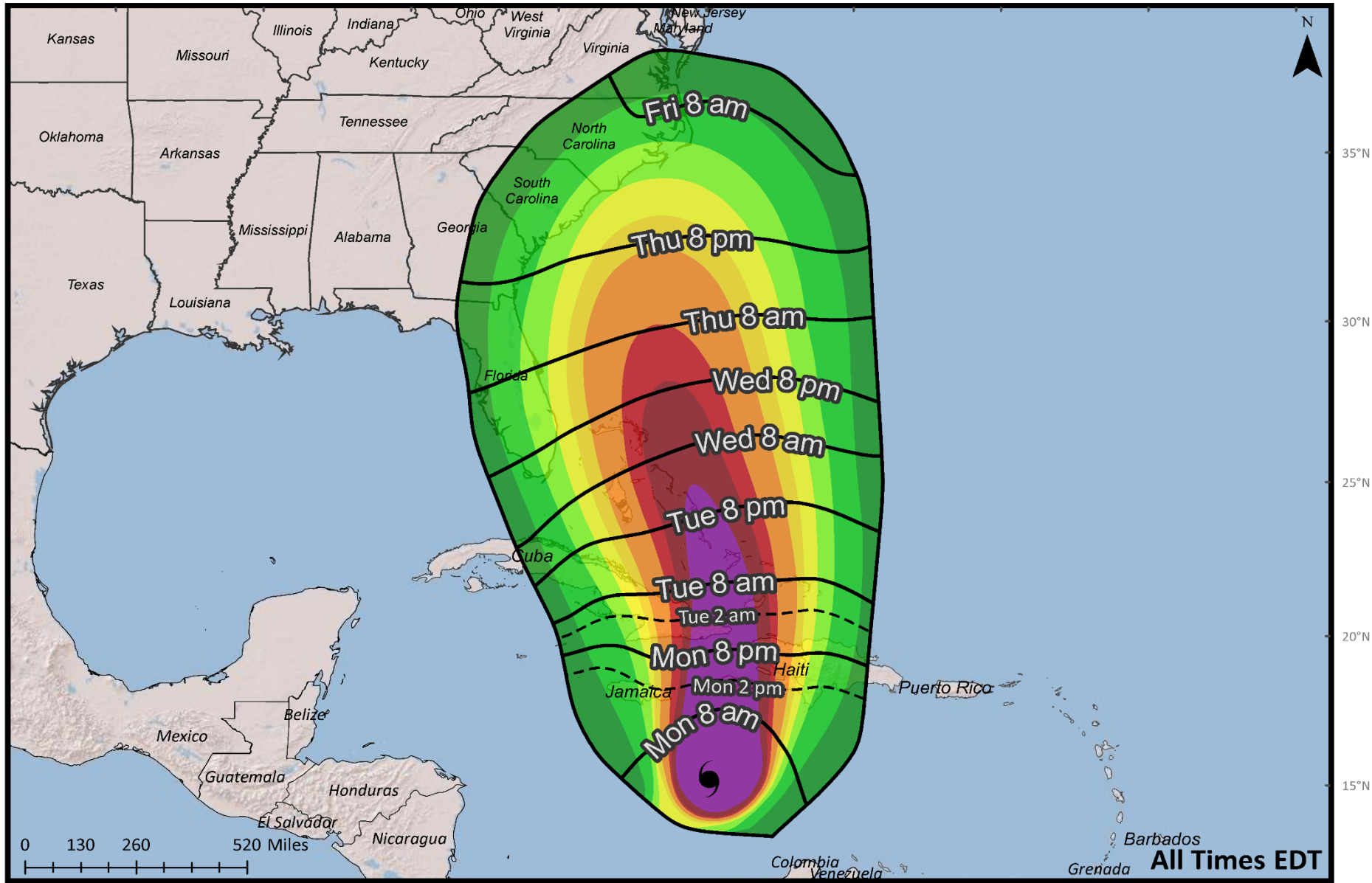




Earliest Reasonable Arrival Time of Tropical-Storm-Force Winds



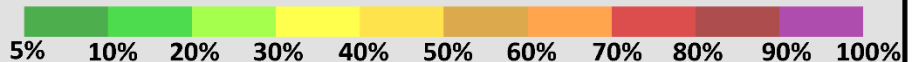
95°W 90°W 85°W 80°W 75°W 70°W 65°W 60°W 55°W



Hurricane Matthew
Mon. Oct. 3, 2016 5 am EDT
Advisory 21

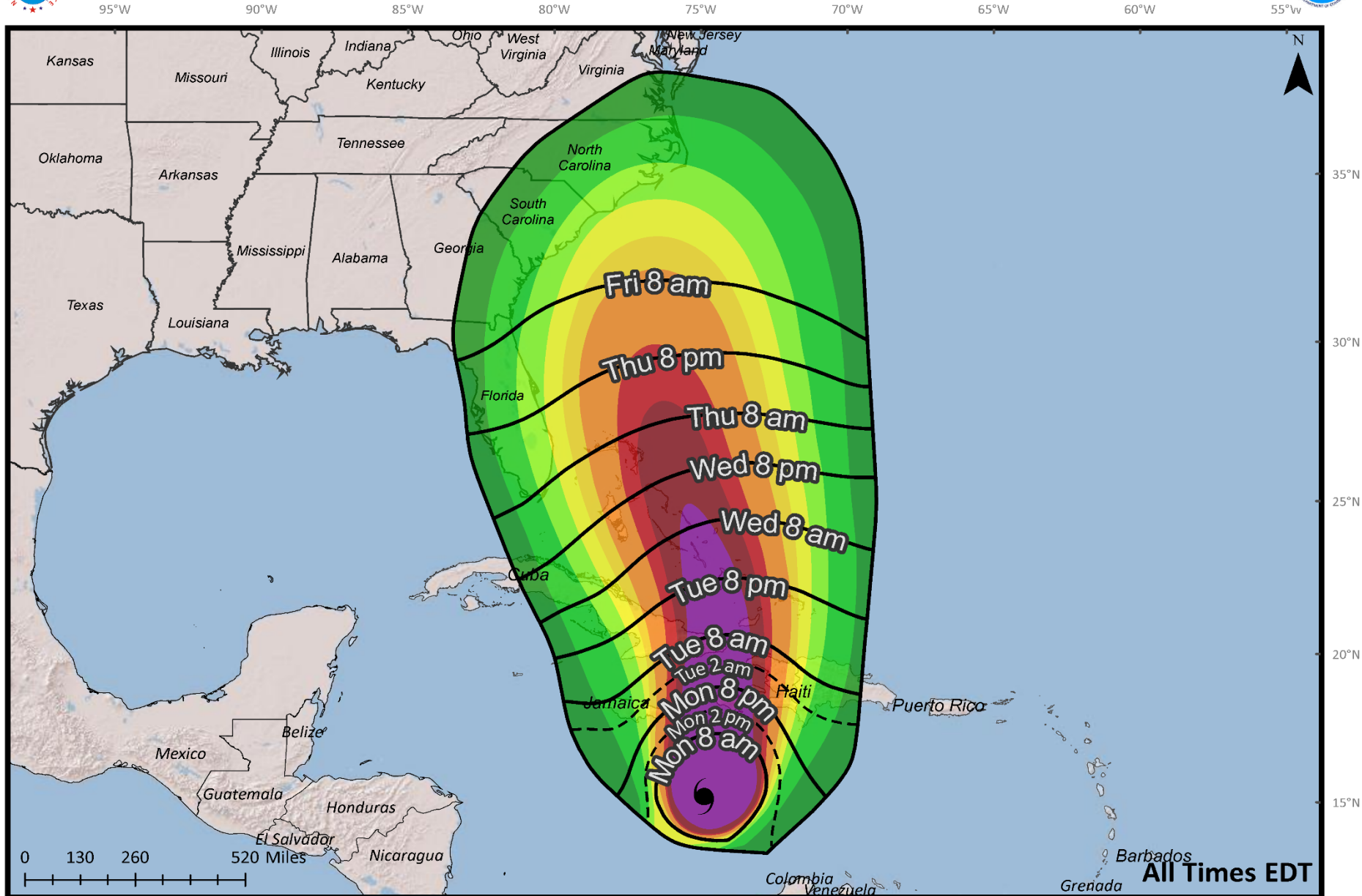
Storm Location & Wind Speed (knots)
 ○ <34 ◐ 34-63 ◑ ≥64

Five-day chance of receiving sustained 34+ knot (39+ mph) winds





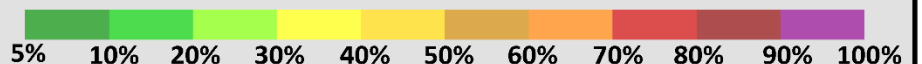
Most Likely Arrival Time of Tropical-Storm-Force Winds



Hurricane Matthew
Mon. Oct. 3, 2016 5 am EDT
Advisory 21

**Storm Location &
 Wind Speed (knots)**
 ○ <34 ◐ 34-63 ● ≥64

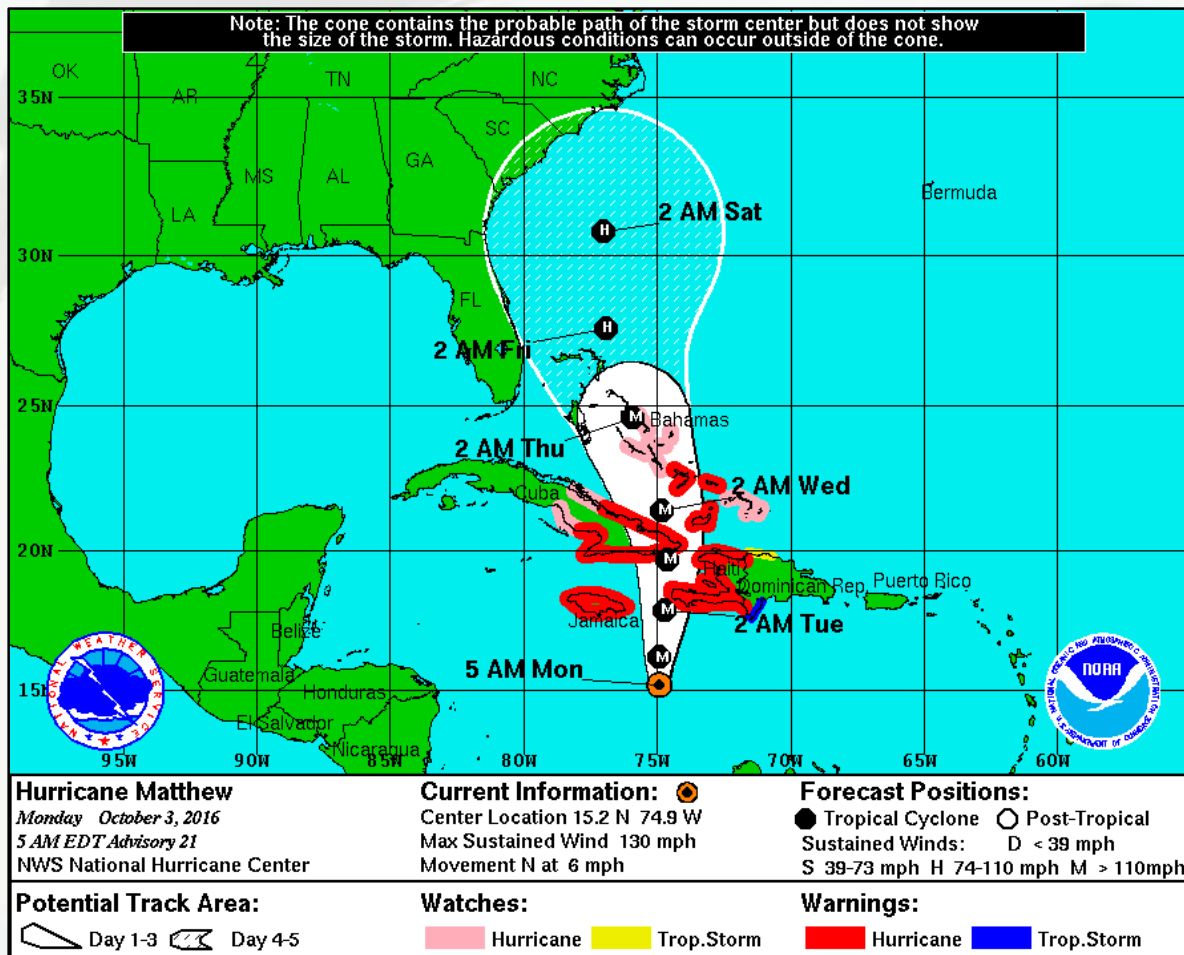
Five-day chance of receiving sustained 34+ knot (39+ mph) winds





When *Could* Tropical-Storm-Force Winds Begin?

Hurricane Matthew, Advisory 21 (5 am EDT, Mon Oct. 3)
West Palm Beach, Florida





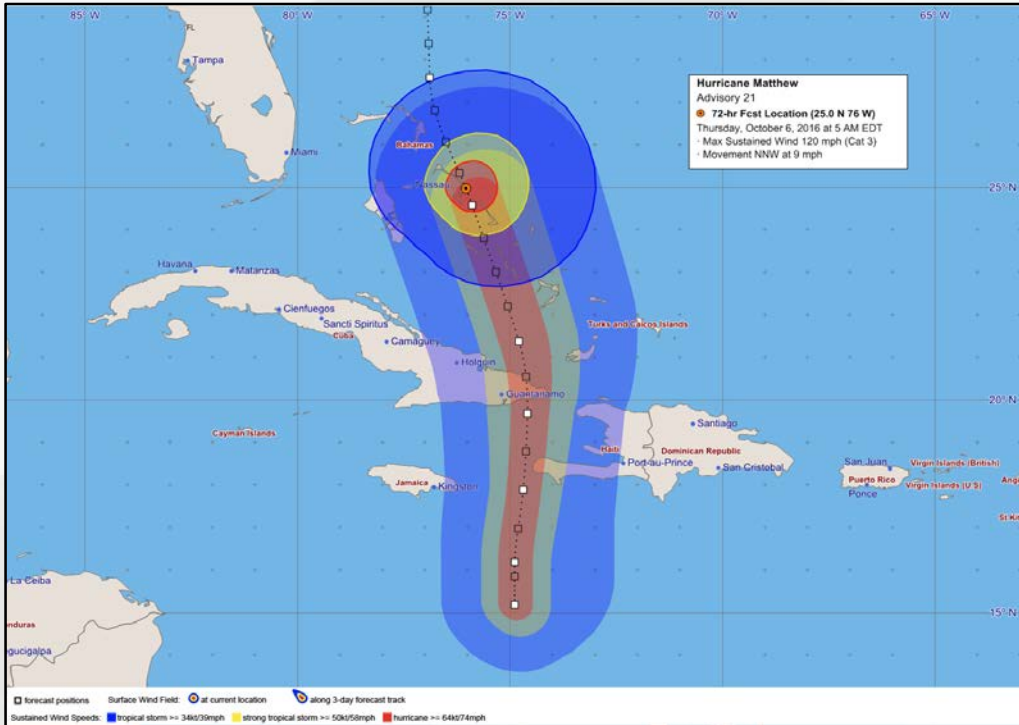
When *Could* Tropical-Storm-Force Winds Begin?

Hurricane Matthew

West Palm Beach, Florida



Assuming Official Forecast: N/A



Report for Hurricane Matthew DirectHit FL Palm Beach
Based on Advisory 21 Issued 10/3/2016 5 AM EDT (Old Advisory)

Wind Forecast Details - At Lat / Lon (26.71N 80.06W)

Meaning Of Report
 This list represents wind detail information for a single point location. The time frame ranges from hour 0(the hour of the forecast) to hour 72(the limit of the forecast).

Cautionary Note:
 This information is quite specific and is subject to large forecast errors. You should NOT use these wind forecasts until just before landfall, and then only as a general indication of the expected wind patterns.

| Date/Time (hr) | Wind Speed | From Direction | 34kt distance | 50kt distance | 64kt distance | Eye distance | Hour |
|----------------|----------------|----------------|---------------|---------------|---------------|--------------|------|
| 10/04/16 19EDT | less than 34kt | (030) | 395 miles | 493 miles | 529 miles | 562 miles | 38 |
| 10/04/16 20EDT | less than 34kt | (030) | 386 miles | 483 miles | 521 miles | 554 miles | 39 |
| 10/04/16 21EDT | less than 34kt | (030) | 377 miles | 475 miles | 512 miles | 545 miles | 40 |
| 10/04/16 22EDT | less than 34kt | (030) | 367 miles | 466 miles | 504 miles | 537 miles | 41 |
| 10/04/16 23EDT | less than 34kt | (030) | 358 miles | 458 miles | 495 miles | 528 miles | 42 |
| 10/05/16 00EDT | less than 34kt | (030) | 349 miles | 450 miles | 486 miles | 520 miles | 43 |
| 10/05/16 01EDT | less than 34kt | (030) | 338 miles | 441 miles | 476 miles | 512 miles | 44 |
| 10/05/16 02EDT | less than 34kt | (030) | 329 miles | 433 miles | 467 miles | 503 miles | 45 |
| 10/05/16 03EDT | less than 34kt | (020) | 326 miles | 426 miles | 460 miles | 494 miles | 46 |
| 10/05/16 04EDT | less than 34kt | (020) | 318 miles | 418 miles | 451 miles | 486 miles | 47 |
| 10/05/16 05EDT | less than 34kt | (020) | 308 miles | 409 miles | 443 miles | 476 miles | 48 |
| 10/05/16 06EDT | less than 34kt | (020) | 300 miles | 400 miles | 434 miles | 468 miles | 49 |
| 10/05/16 07EDT | less than 34kt | (020) | 291 miles | 391 miles | 426 miles | 459 miles | 50 |
| 10/05/16 08EDT | less than 34kt | (020) | 283 miles | 383 miles | 417 miles | 451 miles | 51 |
| 10/05/16 09EDT | less than 34kt | (020) | 274 miles | 374 miles | 409 miles | 442 miles | 52 |
| 10/05/16 10EDT | less than 34kt | (020) | 266 miles | 366 miles | 399 miles | 434 miles | 53 |
| 10/05/16 11EDT | less than 34kt | (020) | 257 miles | 357 miles | 391 miles | 426 miles | 54 |
| 10/05/16 12EDT | less than 34kt | (020) | 249 miles | 349 miles | 383 miles | 417 miles | 55 |
| 10/05/16 13EDT | less than 34kt | (020) | 241 miles | 341 miles | 374 miles | 409 miles | 56 |
| 10/05/16 14EDT | less than 34kt | (020) | 232 miles | 333 miles | 366 miles | 400 miles | 57 |
| 10/05/16 15EDT | less than 34kt | (020) | 224 miles | 322 miles | 358 miles | 392 miles | 58 |
| 10/05/16 16EDT | less than 34kt | (020) | 212 miles | 308 miles | 343 miles | 376 miles | 59 |
| 10/05/16 17EDT | less than 34kt | (020) | 204 miles | 300 miles | 335 miles | 368 miles | 60 |
| 10/05/16 18EDT | less than 34kt | (010) | 200 miles | 295 miles | 328 miles | 360 miles | 61 |
| 10/05/16 19EDT | less than 34kt | (010) | 192 miles | 287 miles | 320 miles | 352 miles | 62 |
| 10/05/16 20EDT | less than 34kt | (010) | 185 miles | 280 miles | 313 miles | 345 miles | 63 |
| 10/05/16 21EDT | less than 34kt | (010) | 177 miles | 272 miles | 305 miles | 337 miles | 64 |
| 10/05/16 22EDT | less than 34kt | (010) | 170 miles | 265 miles | 298 miles | 330 miles | 65 |
| 10/05/16 23EDT | less than 34kt | (010) | 162 miles | 257 miles | 290 miles | 322 miles | 66 |
| 10/06/16 00EDT | less than 34kt | (010) | 155 miles | 250 miles | 283 miles | 315 miles | 67 |
| 10/06/16 01EDT | less than 34kt | (010) | 148 miles | 243 miles | 276 miles | 308 miles | 68 |
| 10/06/16 02EDT | less than 34kt | (010) | 142 miles | 236 miles | 269 miles | 302 miles | 69 |
| 10/06/16 03EDT | less than 34kt | (010) | 135 miles | 229 miles | 262 miles | 295 miles | 70 |
| 10/06/16 04EDT | less than 34kt | (360) | 133 miles | 223 miles | 255 miles | 288 miles | 71 |
| 10/06/16 05EDT | less than 34kt | (360) | 128 miles | 217 miles | 250 miles | 281 miles | 72 |



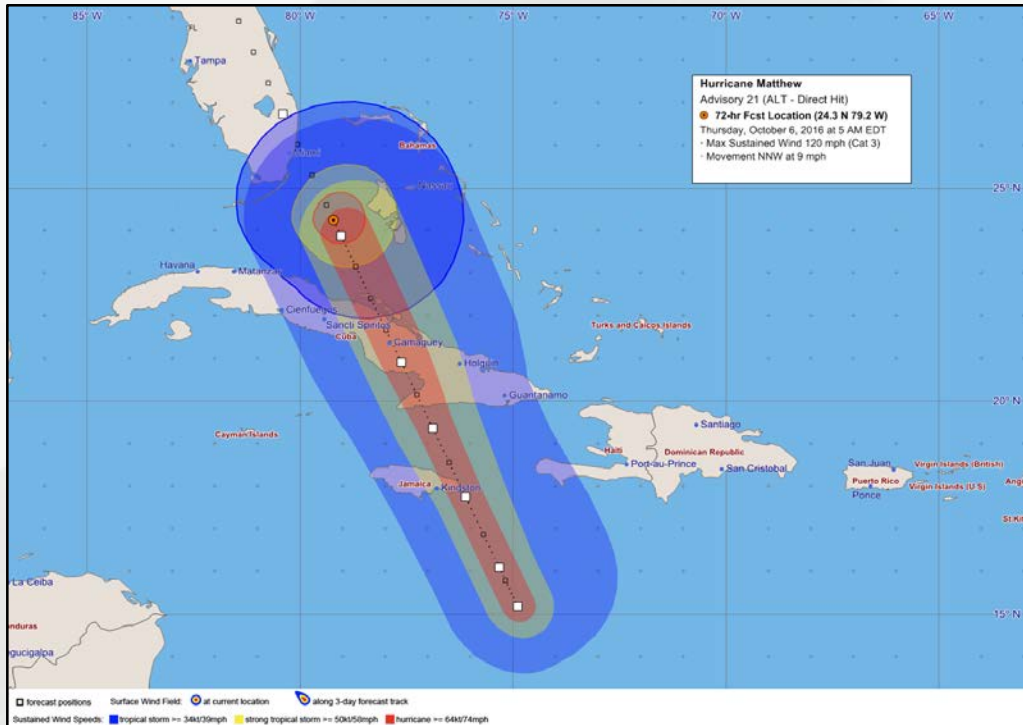
When Could Tropical-Storm-Force Winds Begin?

Hurricane Matthew

West Palm Beach, Florida



Assuming a Direct Hit: 5 am, Thu Oct. 6



Report for Hurricane Matthew DirectHit FL Palm Beach
Based on Advisory_21_ALTDirectHit Issued 10/3/2016 5 AM EDT

Wind Forecast Details - At Lat / Lon (26.7N 80.06W)

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Cautionary Note: This information is quite specific and is subject to large forecast errors. You should NOT use these wind forecasts until just before landfall, and then only as a general indication of the expected wind patterns.

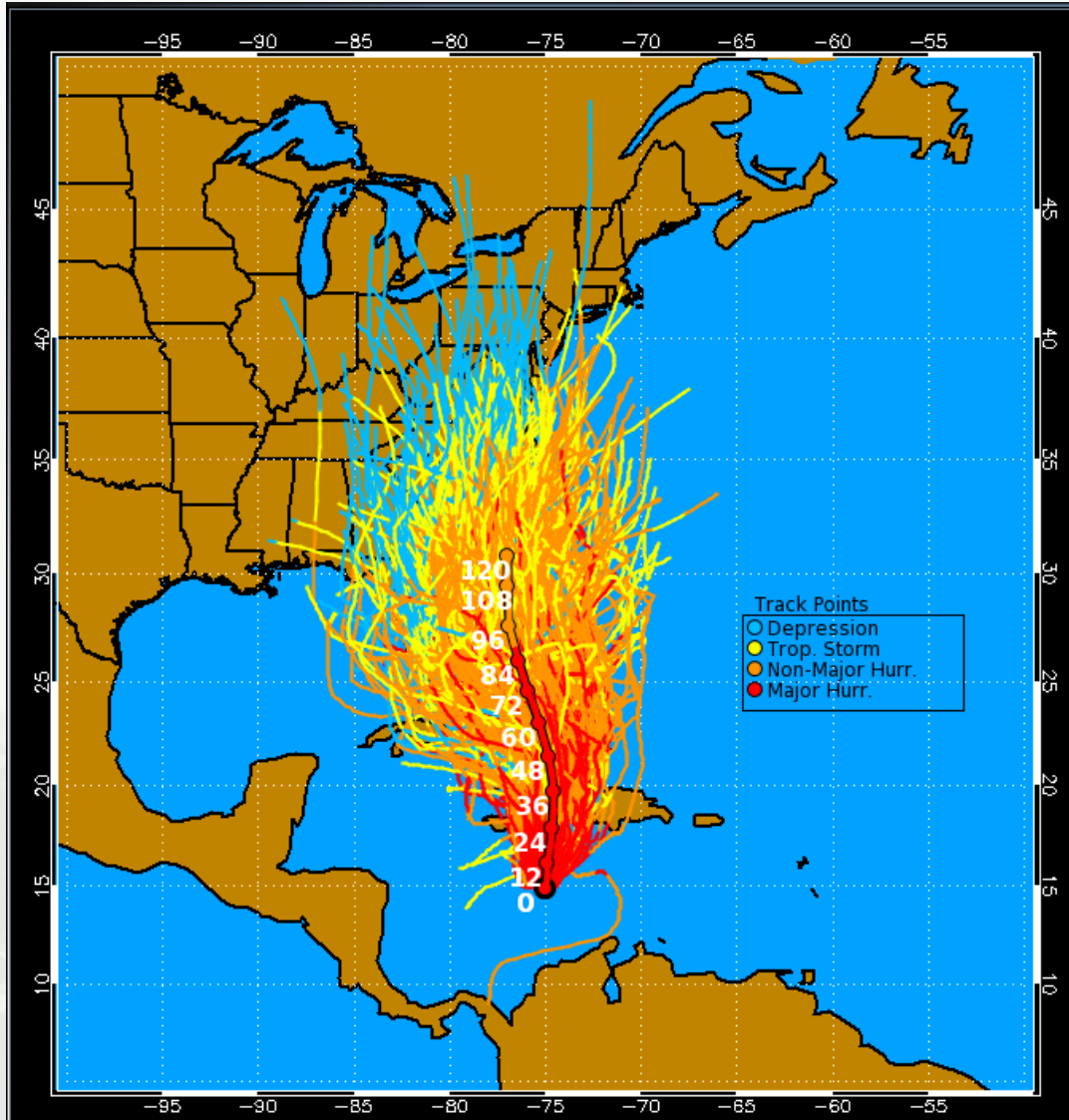
| Date/Time (hr) | Wind Speed | From Direction | 34kt distance | 50kt distance | 64kt distance | Eye distance | Hour |
|----------------|----------------|----------------|---------------|---------------|---------------|--------------|------|
| 10/04/16 19EDT | less than 34kt | (050) | 275 miles | 322 miles | 328 miles | 497 miles | 38 |
| 10/04/16 20EDT | less than 34kt | (050) | 261 miles | 310 miles | 314 miles | 487 miles | 39 |
| 10/04/16 21EDT | less than 34kt | (050) | 249 miles | 297 miles | 302 miles | 478 miles | 40 |
| 10/04/16 22EDT | less than 34kt | (050) | 236 miles | 284 miles | 289 miles | 467 miles | 41 |
| 10/04/16 23EDT | less than 34kt | (050) | 223 miles | 272 miles | 277 miles | 458 miles | 42 |
| 10/05/16 00EDT | less than 34kt | (050) | 212 miles | 260 miles | 266 miles | 448 miles | 43 |
| 10/05/16 01EDT | less than 34kt | (050) | 200 miles | 249 miles | 254 miles | 438 miles | 44 |
| 10/05/16 02EDT | less than 34kt | (050) | 188 miles | 237 miles | 243 miles | 429 miles | 45 |
| 10/05/16 03EDT | less than 34kt | (050) | 177 miles | 226 miles | 231 miles | 419 miles | 46 |
| 10/05/16 04EDT | less than 34kt | (050) | 167 miles | 215 miles | 221 miles | 410 miles | 47 |
| 10/05/16 05EDT | less than 34kt | (050) | 155 miles | 205 miles | 209 miles | 400 miles | 48 |
| 10/05/16 06EDT | less than 34kt | (050) | 145 miles | 193 miles | 199 miles | 391 miles | 49 |
| 10/05/16 07EDT | less than 34kt | (050) | 135 miles | 183 miles | 189 miles | 381 miles | 50 |
| 10/05/16 08EDT | less than 34kt | (050) | 124 miles | 171 miles | 178 miles | 372 miles | 51 |
| 10/05/16 09EDT | less than 34kt | (050) | 113 miles | 161 miles | 167 miles | 362 miles | 52 |
| 10/05/16 10EDT | less than 34kt | (050) | 102 miles | 151 miles | 157 miles | 353 miles | 53 |
| 10/05/16 11EDT | less than 34kt | (050) | 92 miles | 140 miles | 146 miles | 343 miles | 54 |
| 10/05/16 12EDT | less than 34kt | (050) | 82 miles | 130 miles | 136 miles | 334 miles | 55 |
| 10/05/16 13EDT | less than 34kt | (050) | 71 miles | 120 miles | 125 miles | 325 miles | 56 |
| 10/05/16 14EDT | less than 34kt | (050) | 61 miles | 109 miles | 115 miles | 315 miles | 57 |
| 10/05/16 15EDT | less than 34kt | (050) | 51 miles | 98 miles | 105 miles | 306 miles | 58 |
| 10/05/16 16EDT | less than 34kt | (050) | 40 miles | 87 miles | 94 miles | 297 miles | 59 |
| 10/05/16 17EDT | less than 34kt | (050) | 30 miles | 77 miles | 84 miles | 287 miles | 60 |
| 10/05/16 18EDT | less than 34kt | (050) | 20 miles | 67 miles | 74 miles | 277 miles | 61 |
| 10/05/16 19EDT | less than 34kt | (050) | 9 miles | 58 miles | 63 miles | 268 miles | 62 |
| 10/05/16 20EDT | less than 34kt | (050) | 0 miles | 47 miles | 53 miles | 259 miles | 63 |
| 10/05/16 21EDT | less than 34kt | (050) | 0 miles | 37 miles | 44 miles | 250 miles | 64 |
| 10/05/16 22EDT | less than 34kt | (050) | 0 miles | 30 miles | 38 miles | 239 miles | 65 |
| 10/05/16 23EDT | less than 34kt | (050) | 0 miles | 20 miles | 28 miles | 231 miles | 66 |
| 10/06/16 00EDT | less than 34kt | (050) | 0 miles | 9 miles | 17 miles | 222 miles | 67 |
| 10/06/16 01EDT | less than 34kt | (050) | 0 miles | 0 miles | 7 miles | 213 miles | 68 |
| 10/06/16 02EDT | less than 34kt | (050) | 0 miles | 0 miles | 0 miles | 204 miles | 69 |
| 10/06/16 03EDT | less than 34kt | (050) | 0 miles | 0 miles | 0 miles | 194 miles | 70 |
| 10/06/16 04EDT | less than 34kt | (050) | 0 miles | 0 miles | 0 miles | 185 miles | 71 |
| 10/06/16 05EDT | 34kt (39mph) | (050) | 0 miles | 0 miles | 0 miles | 176 miles | 72 |



When *Could* Tropical-Storm-Force Winds Begin?

Hurricane Matthew

West Palm Beach, Florida



Probability Of Reaching Intensity
 Threshold Any Time During The Forecast

| | | |
|------------------|--------|----------------|
| Tropical Storm | 100.0% | (34 - 63 kt) |
| Cat. 1 Hurricane | 100.0% | (64 - 82 kt) |
| Cat. 2 Hurricane | 100.0% | (83 - 95 kt) |
| Cat. 3 Hurricane | 100.0% | (96 - 113 kt) |
| Cat. 4 Hurricane | 100.0% | (114 - 135 kt) |
| Cat. 5 Hurricane | 4.2% | (>135 kt) |

Percentiles Of Wind Start/End Times

| 34 kt Start | | | | 34 kt End | | | |
|-------------|----------|------|-------|-----------|------|-------|--|
| Percentile | Time(hr) | Date | Time | Time(hr) | Date | Time | |
| 5.0 | 58.8 | 1005 | 16:50 | 74.5 | 1006 | 08:30 | |
| 10.0 | 63.0 | 1005 | 21:00 | 80.0 | 1006 | 14:00 | |
| 25.0 | 70.4 | 1006 | 04:25 | 87.6 | 1006 | 21:35 | |
| 50.0 | 80.9 | 1006 | 14:50 | 98.5 | 1007 | 08:30 | |
| 75.0 | 92.4 | 1007 | 02:25 | 109.6 | 1007 | 19:35 | |
| 90.0 | 103.3 | 1007 | 13:20 | 119.3 | 1008 | 05:20 | |
| 95.0 | 106.8 | 1007 | 16:50 | 119.7 | 1008 | 05:40 | |

| 50 kt Start | | | | 50 kt End | | | |
|-------------|----------|------|-------|-----------|------|-------|--|
| Percentile | Time(hr) | Date | Time | Time(hr) | Date | Time | |
| 5.0 | 66.1 | 1006 | 00:10 | 72.7 | 1006 | 06:40 | |
| 10.0 | 69.6 | 1006 | 03:35 | 77.9 | 1006 | 11:55 | |
| 25.0 | 76.2 | 1006 | 10:10 | 84.0 | 1006 | 18:00 | |
| 50.0 | 85.6 | 1006 | 19:35 | 94.5 | 1007 | 04:30 | |
| 75.0 | 95.0 | 1007 | 05:00 | 102.5 | 1007 | 12:30 | |
| 90.0 | 101.6 | 1007 | 11:35 | 112.2 | 1007 | 22:10 | |
| 95.0 | 108.6 | 1007 | 18:35 | 118.4 | 1008 | 04:25 | |

| 64 kt Start | | | | 64 kt End | | | |
|-------------|----------|------|-------|-----------|------|-------|--|
| Percentile | Time(hr) | Date | Time | Time(hr) | Date | Time | |
| 5.0 | 67.8 | 1006 | 01:50 | 73.4 | 1006 | 07:25 | |
| 10.0 | 71.7 | 1006 | 05:40 | 76.8 | 1006 | 10:50 | |
| 25.0 | 80.6 | 1006 | 14:40 | 83.9 | 1006 | 17:55 | |
| 50.0 | 89.3 | 1006 | 23:15 | 92.3 | 1007 | 02:15 | |
| 75.0 | 96.1 | 1007 | 06:10 | 100.3 | 1007 | 10:15 | |
| 90.0 | 102.1 | 1007 | 12:10 | 106.3 | 1007 | 16:20 | |
| 95.0 | 107.4 | 1007 | 17:25 | 111.3 | 1007 | 21:15 | |

Calculate



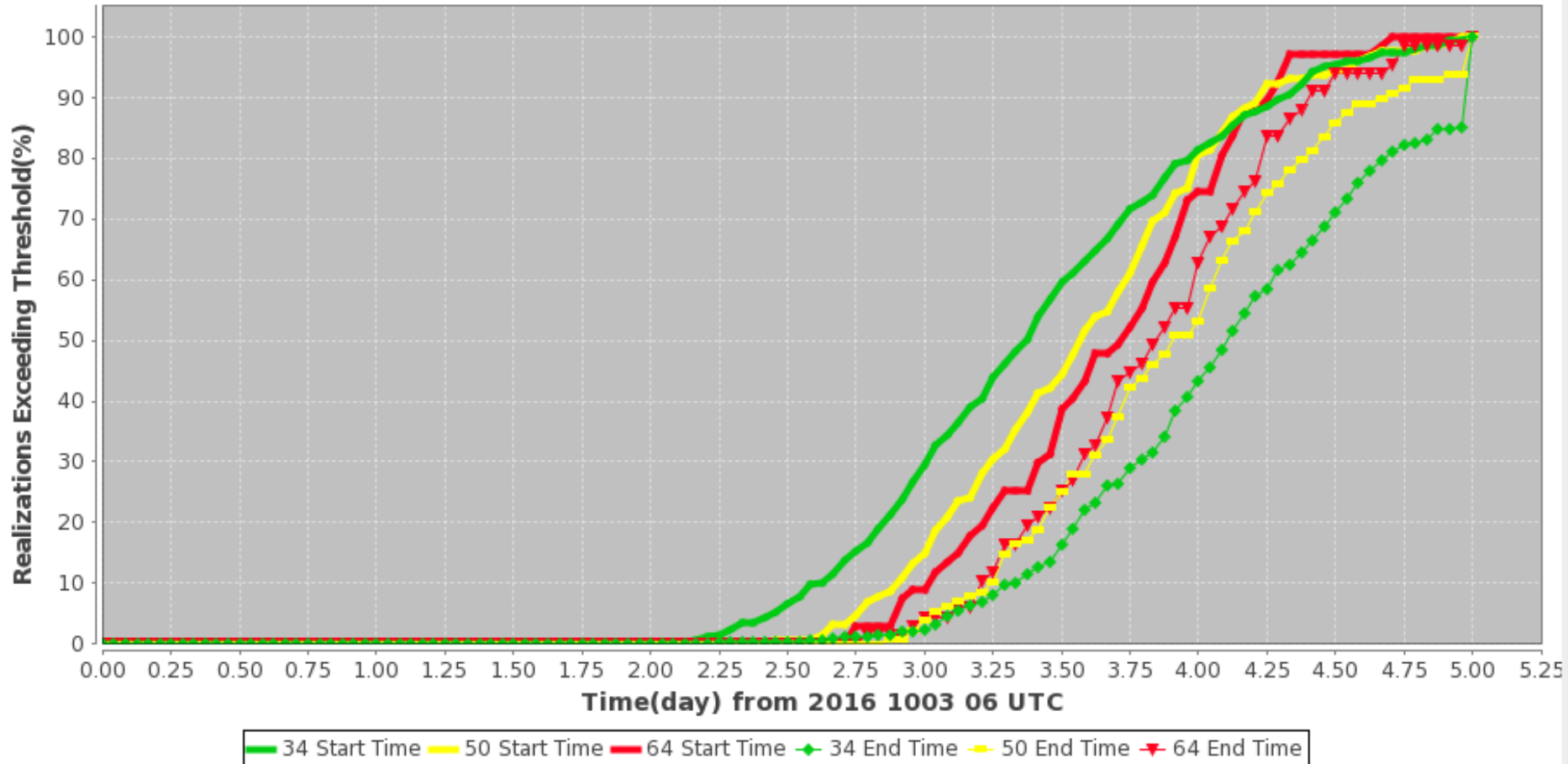
When *Could* Tropical-Storm-Force Winds Begin?

Hurricane Matthew

West Palm Beach, Florida



Cumulative Distribution





When *Could* Tropical-Storm-Force Winds Begin?

Hurricane Matthew

West Palm Beach, Florida



Wind Speed Probabilities: Between 06Z Wed and 06Z Sat

- - - - WIND SPEED PROBABILITIES FOR SELECTED LOCATIONS - - - -

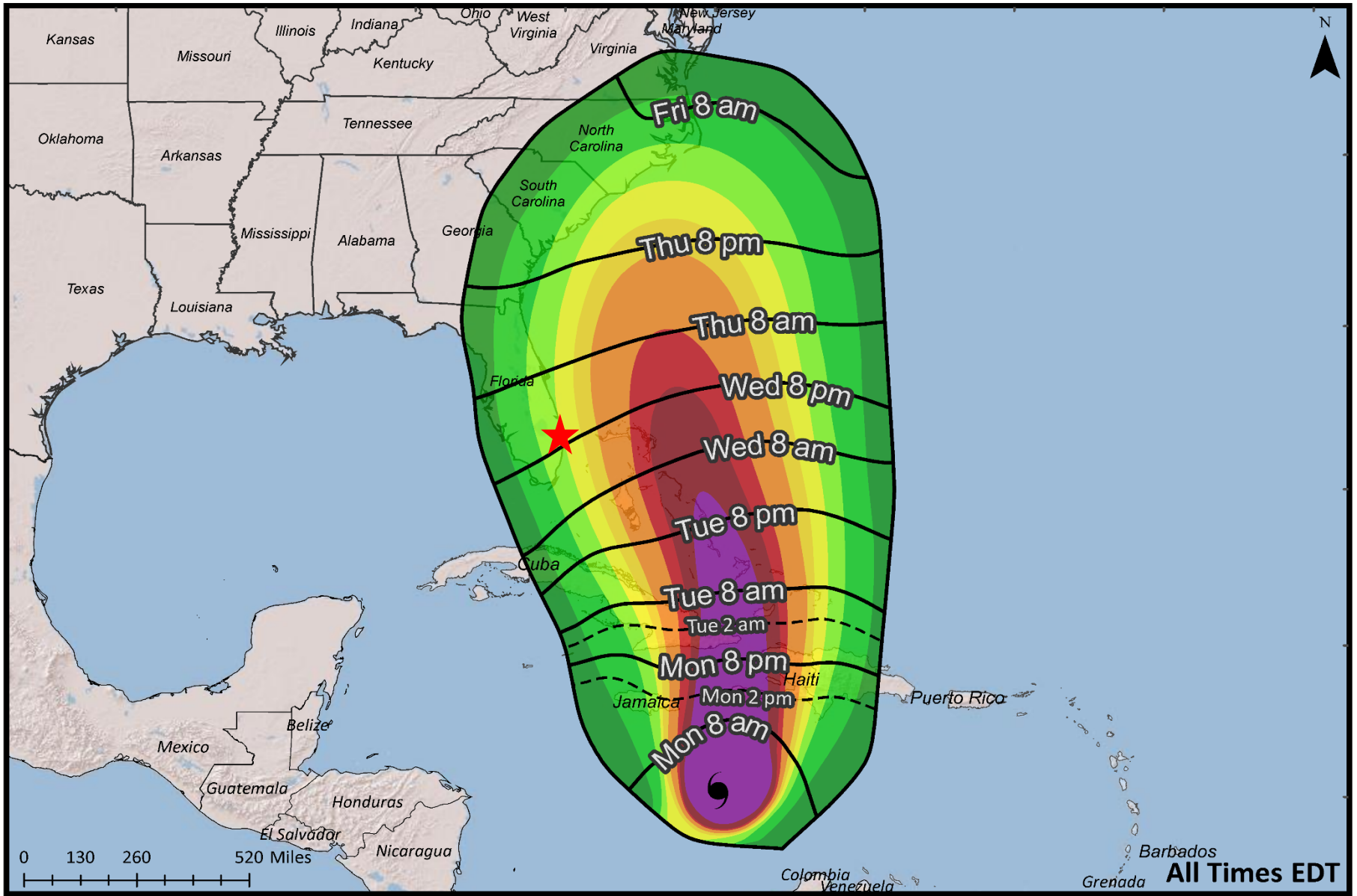
| TIME PERIODS | FROM 06Z MON TO 18Z MON | FROM 18Z MON TO 06Z TUE | FROM 06Z TUE TO 18Z TUE | FROM 18Z TUE TO 06Z WED | FROM 06Z WED TO 06Z THU | FROM 06Z THU TO 06Z FRI | FROM 06Z FRI TO 06Z SAT |
|---------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| FORECAST HOUR | (12) | (24) | (36) | (48) | (72) | (96) | (120) |
| LOCATION | KT | | | | | | |

| | | | | | | | | |
|---------------------|-----------|---|-------|-------|-------|----------------|----------------|--------------|
| PATRICK AFB | 34 | X | X(X) | X(X) | X(X) | 4(4) | 17(21) | 8(29) |
| PATRICK AFB | 50 | X | X(X) | X(X) | X(X) | 1(1) | 5(6) | 4(10) |
| PATRICK AFB | 64 | X | X(X) | X(X) | X(X) | X(X) | 2(2) | 2(4) |
| FT PIERCE FL | 34 | X | X(X) | X(X) | X(X) | 7(7) | 19(26) | 7(33) |
| FT PIERCE FL | 50 | X | X(X) | X(X) | X(X) | 1(1) | 8(9) | 3(12) |
| FT PIERCE FL | 64 | X | X(X) | X(X) | X(X) | X(X) | 3(3) | 2(5) |
| W PALM BEACH | 34 | X | X(X) | X(X) | X(X) | 10(10) | 17(27) | 6(33) |
| W PALM BEACH | 50 | X | X(X) | X(X) | X(X) | 2(2) | 8(10) | 3(13) |
| W PALM BEACH | 64 | X | X(X) | X(X) | X(X) | 1(1) | 4(5) | 2(7) |
| FT LAUDERDALE | 34 | X | X(X) | X(X) | X(X) | 11(11) | 15(26) | 6(32) |
| FT LAUDERDALE | 50 | X | X(X) | X(X) | X(X) | 3(3) | 7(10) | 2(12) |
| FT LAUDERDALE | 64 | X | X(X) | X(X) | X(X) | 1(1) | 4(5) | 1(6) |
| MIAMI FL | 34 | X | X(X) | X(X) | X(X) | 11(11) | 14(25) | 4(29) |
| MIAMI FL | 50 | X | X(X) | X(X) | X(X) | 2(2) | 7(9) | 2(11) |
| MIAMI FL | 64 | X | X(X) | X(X) | X(X) | 1(1) | 2(3) | 1(4) |



Earliest Reasonable Arrival Time of Tropical-Storm-Force Winds

95°W 90°W 85°W 80°W 75°W 70°W 65°W 60°W 55°W



Hurricane Matthew
Mon. Oct. 3, 2016 5 am EDT
Advisory 21

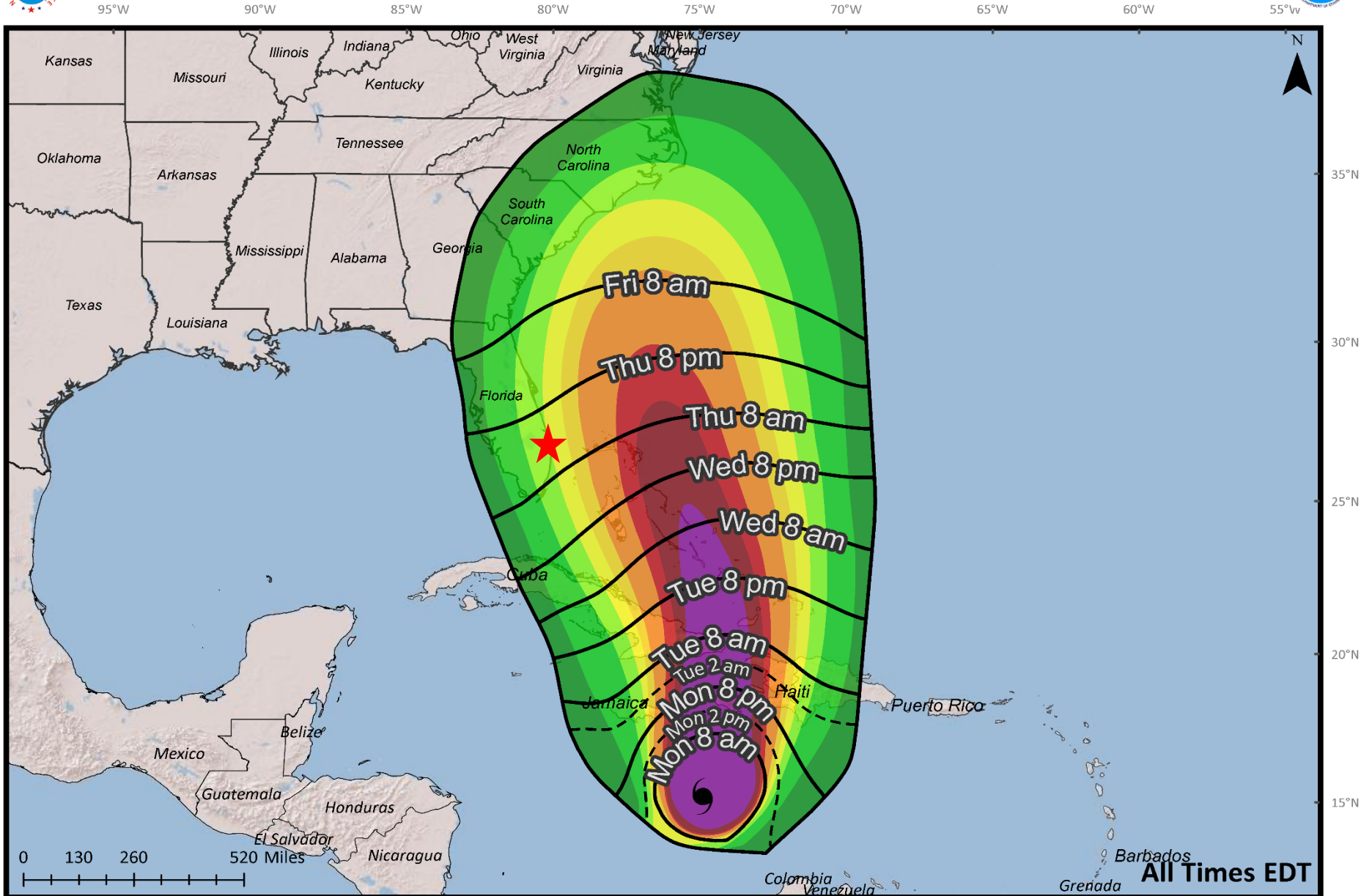
Storm Location & Wind Speed (knots)
 ○ <34 ◐ 34-63 ◑ ≥64

Five-day chance of receiving sustained 34+ knot (39+ mph) winds

| | | | | | | | | | | |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 5% | 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|



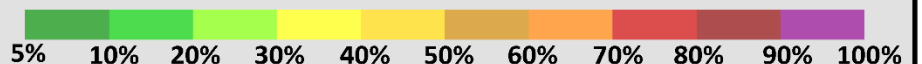
Most Likely Arrival Time of Tropical-Storm-Force Winds



Hurricane Matthew
Mon. Oct. 3, 2016 5 am EDT
Advisory 21

**Storm Location &
 Wind Speed (knots)**
 ○ <34 ◐ 34-63 ● ≥64

Five-day chance of receiving sustained 34+ knot (39+ mph) winds





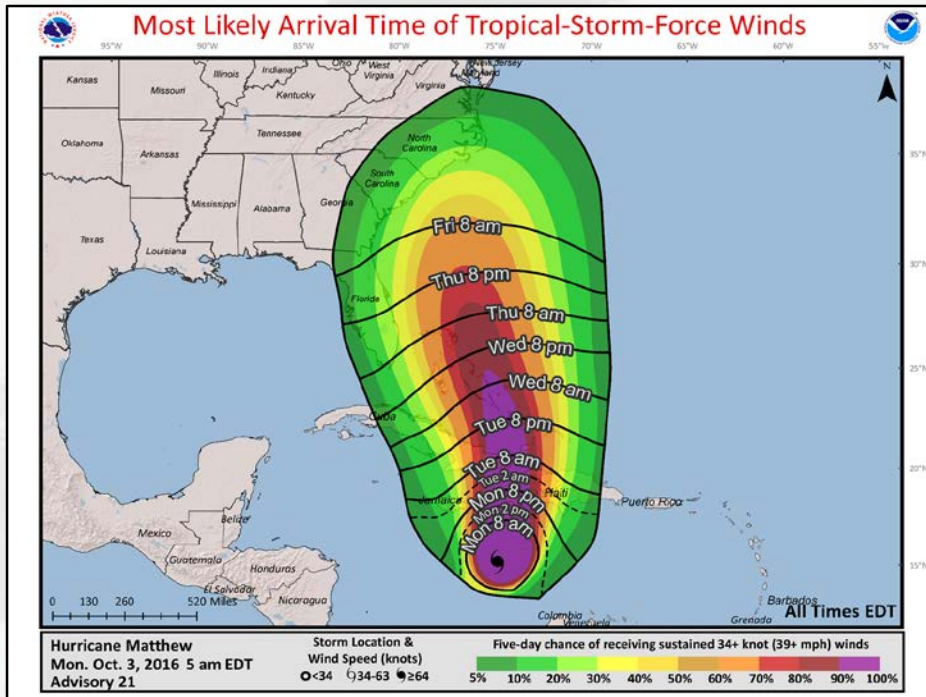
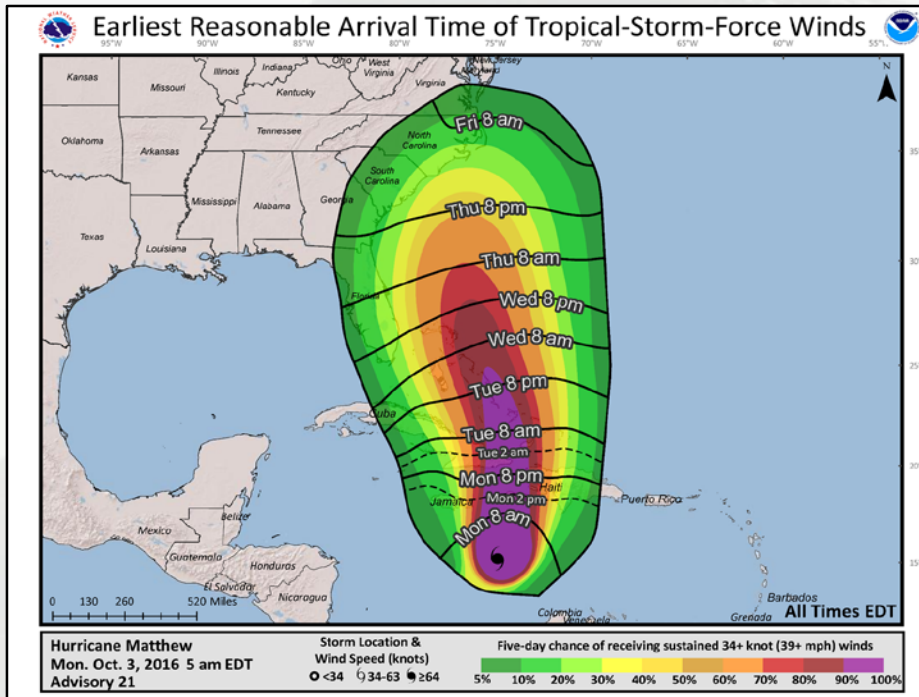
When *Could* Tropical-Storm-Force Winds Begin?

Hurricane Matthew

West Palm Beach, Florida



Earliest Reasonable: 12 am Thu, Oct. 6
 Most Likely: 2 pm Thu, Oct. 6

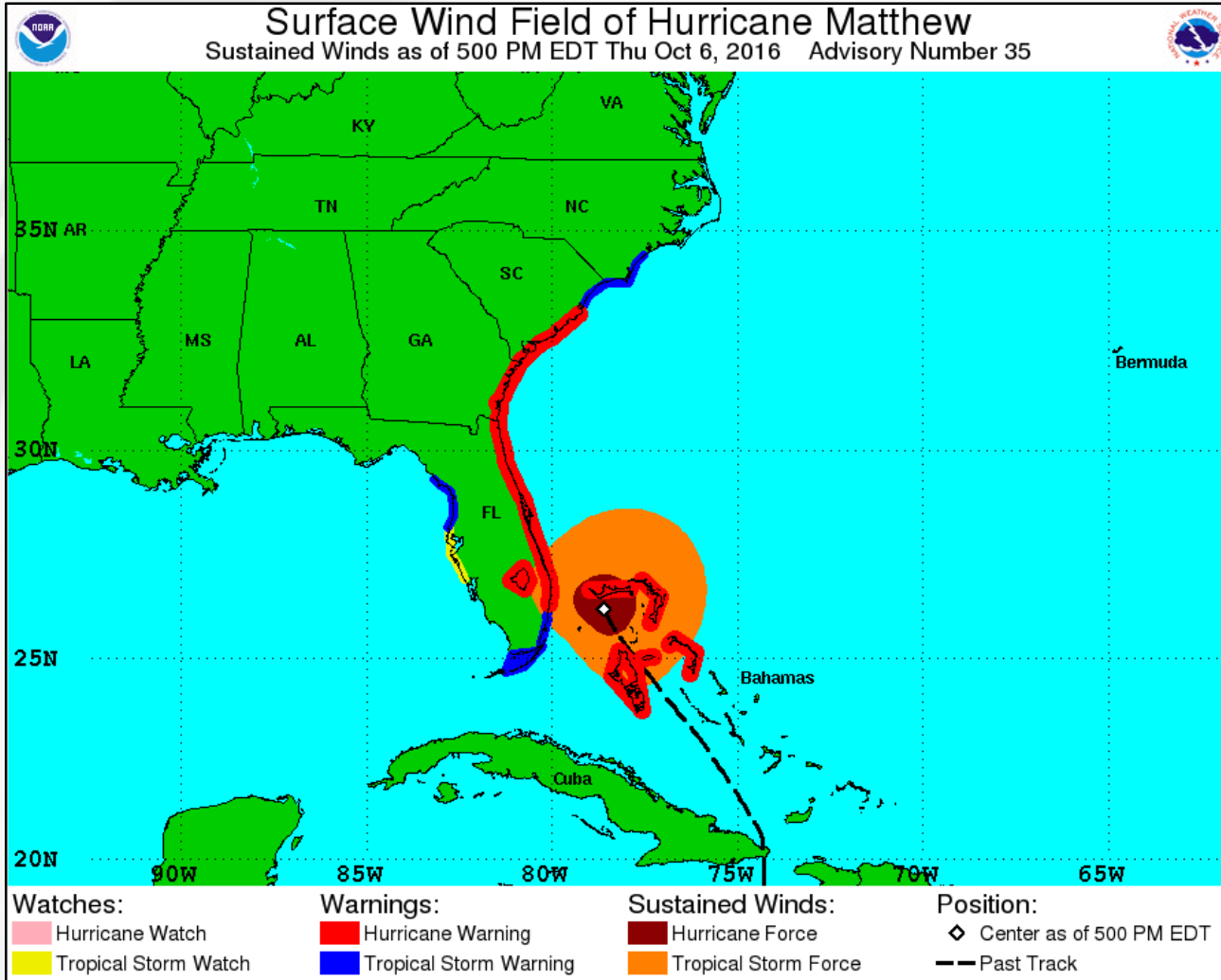




When *Did* Tropical-Storm-Force Winds Begin? Hurricane Matthew West Palm Beach, Florida



Actual: 5 pm, Thu Oct. 6





A Few Things to Note

- Timing information only available for locations that have at least a 5% chance of sustained TS winds during the next 5 days
- Arrival times available in 6-hour intervals for the first day of the forecast, followed by 12-hour intervals
- Arrival times always anchored to 8 AM and 8 PM local time regardless of advisory time
- Time zone chosen based on the cyclone's initial location and is maintained for the entire forecast period. The time zone is indicated on the graphic



Expectations for 2017



- All 4 versions will be available on the NHC website as static graphics for all Atlantic and eastern Pacific tropical cyclones on an *experimental basis*
- Comments will be accepted on the experimental products from May 15 through November 30
- Possible public survey to be conducted during the hurricane season



And with that...

**The TIME for lunch HAS
ARRIVED!**