**On-line Supplement for**

# A Reanalysis of the 1931 to 1943 Atlantic Hurricane Database

Christopher W. Landsea*, Andrew Hagen**, William Bredemeyer**, Cristina Carrasco**, David A. Glenn***, Adrian Santiago**, Donna Strahan-Sakoskie****, and Michael Dickinson*****

*NOAA/NWS/NCEP/National Hurricane Center, Miami, Florida, USA; **University of Miami, Miami, Florida, USA; ***NOAA/NWS/WFO Morehead City, Morehead City, North Carolina, USA; University of North Carolina at Charlotte, Charlotte, North Carolina, USA; Accurate Environmental Forecasting, Narragansett, Rhode Island, USA

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**1. Metadata file, Best Track Change Committee correspondence, and raw observations examples – the 1938 Great Atlantic Hurricane**

All Atlantic basin tropical storms and hurricanes in the new best track database are accompanied by a "metadata file". This file consists of a day-by-day listing of peak meteorological observations and previous estimates of the storm's position and intensity. The metadata also contains a descriptive paragraph about the particular methodology employed for making changes in the genesis, track, intensity and decay of that TC including what sources were crucial for revising the best track, whether or not a wind-pressure relationship was utilized, if wind decay models were used for inland wind estimates, and any other pertinent information. All of the tropical storms and hurricanes for the period of 1931 to 1943 are considered "UNNAMED". However, many of these storms have been recognized by various informal names. These are included in the metadata file when at all possible. The following is an example of a single metadata entry for Storm #6, 1938 – the "Great New England Hurricane". After the metadata, the Comments from and Replies to the Best Track Change Committee for this single hurricane are provided. Table A1 indicate significant (hurricane force and greater) reports collected for this system and made available in the raw observations database.

*Storm #6, 1938 (The Great New England Hurricane) Metadata*

1938 Storm 6 (originally Storm 4) – Revised in 2012

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29185 09/10/1938 M=13  4 SNBR= 647 NOT NAMED   XING=1 SSS=3
29185 09/09/1938 M=15  6 SNBR= 647 NOT NAMED   XING=1 SSS=3
         **        **  *

(The 9th is new to HURDAT.)
29190 09/09*  0   0   0    0*  0   0   0    0*128 194  30    0*130 206  30    0

29190 09/10*  0   0   0    0*142 215  35    0*144 238  35    0*146 250  35    0
29190 09/10*132 218  30    0*134 230  35    0*136 242  40    0*138 253  40    0
            *** ***  **      *** ***         *** ***  **      *** ***  **

29195 09/11*148 262  35    0*149 274  35    0*150 285  35    0*152 297  35    0
29195 09/11*140 263  45    0*142 274  45    0*145 285  45    0*147 297  45    0
            *** ***  **      ***      **      ***      **      ***      **

29200 09/12*153 310  40    0*154 324  40    0*155 337  40    0*156 348  40    0
29200 09/12*149 310  45    0*152 324  45    0*155 337  45    0*159 347  45    0
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            ***      **      ***      **                **      *** ***  **

29205 09/13*157 358  40    0*158 371  45    0*160 383  45    0*161 394  50    0
29205 09/13*164 357  45    0*169 367  45    0*172 377  45    0*173 388  50    0
            *** ***  **      *** ***          *** ***          *** ***

29210 09/14*162 406  50    0*164 419  55    0*167 432  55    0*169 445  60    0
29210 09/14*173 400  50    0*174 412  55    0*175 423  55    0*176 433  60    0
            *** ***          *** ***          *** ***          *** ***

29215 09/15*172 457  65    0*174 468  70    0*176 478  75    0*179 490  80    0
29215 09/15*177 443  65    0*178 453  70    0*179 463  75    0*181 473  80    0
            *** ***          *** ***          *** ***          *** ***

29220 09/16*183 502  80    0*186 516  85    0*189 530  85    0*192 540  90    0
29220 09/16*183 483  85    0*186 494  90    0*189 505  95    0*195 516 100    0
                ***  **          ***  **          ***  **      *** *** ***

29225 09/17*194 550  95    0*197 563 100    0*200 575 105    0*202 586 115    0
29225 09/17*205 527 110    0*210 538 115    0*212 550 115    0*213 565 115    0
            *** *** ***      *** *** ***      *** ***          *** ***

29230 09/18*204 596 120    0*207 607 125    0*210 620 125    0*213 636 130    0
29230 09/18*213 580 120    0*214 596 125    0*217 615 125    0*222 635 130    0
            *** ***          *** ***          *** ***          *** ***

29235 09/19*217 656 130    0*223 678 135    0*232 700 135    0*241 716 140    0
29235 09/19*228 655 130    0*235 675 135    0*242 695 135    0*248 711 140    0
            *** ***          *** ***          *** ***          *** ***

29240 09/20*250 727 140    0*259 736 140    0*267 743 135    0*280 748 130    0
29240 09/20*252 724 140    0*258 734 140    0*267 743 135    0*280 748 130    0
            *** ***          *** ***

29245 09/21*298 749 120    0*322 744 110    0*352 731 100  938E390 730  85  940
29245 09/21*298 749 120    0*322 744 120    0*352 731 110  940*393 729 105  940
                                    ***              ***  ******* *** ***

29250 09/22E434 731  70  967E453 735  45  988E473 770  35  987E454 791  35    0
29250 09/22E434 731  60  969E465 745  40    0E477 773  35  987E470 778  35    0
                    **  *** *** ***  **  *** *** ***          *** ***

(The 23rd is new to HURDAT.)
29252 09/23E450 770  30    0*  0   0   0    0*  0   0   0    0*  0   0   0    0

29255 HR NY3 CT3 RI3 MA3
29255 HR NY3 CT3 RI3 MA2
                    ***
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Landfall:

September 21 1945Z: 40.7N, 72.9W, 941 mb, 105 kt, 40 nmi Radius of Maximum Wind, 1011 mb OCI, 350 nmi Radius of Outer Closed Isobar, 41 kt forward speed

September 21 2040Z:  41.3N, 72.9W, 946 mb, 100 kt, 40 nmi Radius of Maximum Wind, 1011 mb OCI, 350 nmi Radius of Outer Closed Isobar, 41 kt forward speed

Major changes are made to the track and major alterations to the intensity shown in Neumann et al. (1999). Evidence for these alterations comes from the Historical Weather Map series, Monthly Weather Review, Original Monthly Records from NCDC, the COADS ship database, Tannehill (1938), Pierce (1939), Myers and Jordan (1956), Dunn and Miller (1960), Schwerdt et al. (1979), Ho et al. (1987), Jarrell et al. (1992), Boose et al. (2001), and Kaplan and DeMaria (2001).

September 9: HWM analyzes a trough extending west-southwest out of West Africa.  HURDAT does not yet list this system.  No gales or low pressures.

September 10: HWM does not analyze a closed low on this day.  HURDAT listed this as a 35 kt tropical storm at 14.2N, 21.5W.  Available observations suggest that the 40 kt tropical storm was centered at 13.6N, 24.3W. Ship highlights: 30 kt ENE with 1009 mb at 12Z at 15.5N, 24.3W (COA); 25 kt NE with 1005 mb at 18Z at 14.2N, 26.7W (COA).  Land highlights: No gales or low pressures in Cape Verde Islands.

September 11: HWM analyzes an open trough located at 15N, 27W on this day.  HURDAT listed this as a 35 kt tropical storm at 15.0N, 28.5W.  Available observations suggest that the 45 kt tropical storm was centered at 14.5N, 28.5W.  Ship highlights: 40 kt S at 1 UTC at 12.5N, 25.2W (COA); 35 kt SW with 1012 mb at 10 UTC at 11.5N, 27.5W (COA).  Land highlights: No gales or low pressures in Cape Verde Islands.

September 12: HWM does not analyze a closed low on this day.  HURDAT listed this as a 40 kt tropical storm at 15.5N, 33.7W.  Available observations suggest that the 45 kt tropical storm was centered at 15.5N, 33.7W. Ship highlights: No gales or low pressures.

September 13: HWM does not analyze a closed low on this day. HURDAT listed this as a 45 kt tropical storm at 16.0N, 38.3W. Available observations suggest that the 45 kt tropical storm was centered at 17.0N, 33.7W. Ship highlights: No gales or low pressures due to lack of ships in the area. "There was some evidence of cyclonic circulation central about 19N, 37W, on the morning of September 13, 1938, but the storm has not been definitely charted prior to the evening of September 16, when it appears to have become a full developed hurricane" (1938 MWR).

September 14: HWM does not analyze a closed low on this day. HURDAT listed this as a 55 kt tropical storm at 16.7N, 43.2W. Available observations suggest that the 55 kt tropical storm was centered at 17.2N, 42.3W. Ship highlights: No gales or low pressures due to lack of ships in the area.

September 15: HWM does not analyze a closed low on this day. HURDAT listed this as a 75 kt hurricane at 17.6N, 47.8W. Available observations suggest that the 75 kt hurricane was centered at 17.9N, 46.3W. Ship highlights: No gales or low pressures due to lack of ships in the area.

September 16: HWM analyzes a closed low of at most 1010 mb centered near 22.5N, 50.0W. HURDAT listed this as an 85 kt hurricane at 18.9N, 53.0W. Available observations suggest that the 95 kt hurricane was centered at 18.9N, 50.5W. Ship highlights: 20 kt NW with 1006 mb at 15Z at 18.9N, 50.6W (COA); 30 kt ENE with 1012 mb at 18Z at 23.8N, 51.5W (COA). Regarding the intensity: "There was some evidence of cyclonic circulation central about 19N, 37W, on the morning of September 13, 1938, but the storm has not been definitely charted prior to the evening of September 16, when it appears to have become a full developed hurricane. At about 9:30 p.m., ships time, on September 16 [September 17 at 0130 UTC], the Brazilian S.S. Alegrete was near the center in approximately 21 12 N., 52 46 W., barometer 28.31 (uncorrected) [958 mb], wind force 12 [70 kt], shifting from east-northeast to east-southeast" (1938 MWR).

September 17: HWM analyzes a closed low of at most 995 mb centered near 21.5N, 54W. HURDAT listed this as a 105 kt hurricane at 20.0N, 57.5W. The MWR Track of the Hurricane of September 16-22, 1938 (Chart IX) shows a center near 21N, 55.2W at 12 UTC on this day. Available observations suggest that the 115 kt hurricane was centered at 21.2N, 55.0W. Ship highlights: 70 kt ENE with 958 mb at 0130Z at 21.2N, 52.8W (MWR); 45 kt NE and 996 mb at 12 UTC at 22.5N, 54.7W (HWM); 35 kt NE and 1012 mb at 16 UTC at 23.5N, 57.5W (COA); 45 kt NE and 1008 mb at 20 UTC at 22.5N, 58.5W (COA). Regarding the intensity: "Early on the morning of September 17, the Netherlands S.S. Socrates encountered the storm while near 21N, 59W, and had increasing winds, backing from east-northeast to northwest and then to west-southwest, lowest barometer 29.29 inches [992 mb]" (1938 MWR).

September 18: HWM analyzes a closed low of at most 995 mb centered near 21.5N, 61W. HURDAT listed this as a 125 kt hurricane at 21.0N, 62.0W. The MWR Track of the Hurricane of September 16-22, 1938 (Chart IX) shows a center near 21.2N, 58W at 0 UTC. The MWR Track of the Hurricane of September 16-22, 1938 (Chart IX) shows a center near 21.5N, 62W at 12 UTC. Available observations suggest that the 125 kt hurricane was centered at 21.7N, 61.5W. Ship highlights: 60 kt ENE and 1003 mb at 0 UTC at 22.5N, 58.5W (COA); 60 kt W with 992 mb at 0135Z at 20.6N, 59.3W (MWR); 50 kt E and 1011 mb at 8 UTC at 22.5N, 58.5W (COA); 35 kt NW-W and 1004 mb at 20 UTC at 21.2N, 66.3W (MWR Robin Goodfellow); 945 mb (time and location unknown) (MWR). "The highest wind experienced [by British S.S. Socrates] was W-11 [60 kt] at 9:35 p.m. [September 18 at 0035 UTC], ships time, in latitude 20 38 N, longitude 59 17 W" (1938 MWR). Regarding the intensity: "A vessel reporting by radio gave [a] barometer reading[s] below 28 inches, the British S.S. Corrales, 27.90 inches [945 mb] on the 18th" (1938 MWR).

September 19: HWM analyzes a closed low of at most 990 mb centered near 24.5N, 70W. HURDAT listed this as a 135 kt hurricane at 23.2N, 70.0W. The MWR Track of the Hurricane of September 16-22, 1938 (Chart IX) shows a center near 21.8N, 65.5W at 0 UTC. The MWR Track of the Hurricane of September 16-22, 1938 (Chart IX) shows a center near 23.7N, 70.2W at 12 UTC. Available observations suggest that the 135 kt

hurricane was centered at 24.2N, 69.5W. Ship highlights: 35 kt NE and 1005 mb at 2 UTC at 28.4N, 69.3W (MWR Pan America); 35 kt W and 1001 mb at 9 UTC at 23.6N, 73.8W (COA); 50 kt NE and 988 mb at 12 UTC at 25.7N, 70.0W (COA); 70 kt E and 982 mb at 14 UTC at 25.5N, 69.9W (MWR Gulfhawk); 45 kt SSW and 1006 mb at 15 UTC at 24.3N, 72.7W (COA); 35 kt SE and 1006 mb at 18 UTC at 23.5N, 69.5W (COA); 45 kt NE and 1007 mb at 21 UTC at 27.4N, 73.4W (COA); 45 kt NE and 1007 mb at 21 UTC at 27.0N, 73.0W (COA); 35 kt S with 1007 mb at 21 UTC at 25.6N, 72.8W (COA); 35 kt ENE and 1006 mb at 22 UTC at 27.2N, 74.1W (COA).

September 20: HWM analyzes a closed low of at most 990 mb centered near 27.5N, 75W. HURDAT listed this as a 135 kt hurricane at 26.7N, 74.3W. The MWR Track of the Hurricane of September 16-22, 1938 shows a center near 25.2N, 73W at 0 UTC. The MWR Track of the Hurricane of September 16-22, 1938 (Chart IX) shows a center near 28.8N, 75.2W at 12 UTC. Available observations suggest that the 135 kt hurricane was centered at 26.7N, 74.3W. Ship Highlights: 65 kt NE at 2 UTC at 26.3N, 74.2W (COA); 50 kt E and 986 at 5 UTC at 33.4N, 74.4W (COA); 50 kt SW at 6 UTC at 26.0N, 74.1W (COA); 70 kt SSE and 992 mb at 9 UTC at 27.8N, 72.6W (MWR Jean Lafitte); 45 kt NE and 956 mb at 9 UTC at 27.1N, 73.9W (MWR Antigua); 70 kt E and 1005 mb at 9 UTC at 27.4N, 72.4W (COA); 70 kt E and 953 mb at 12 UTC at 27.1N, 74.6W (MWR Atlantida); 50 kt SE and 1008 mb at 12 UTC at 27.6N, 72.6W (HWM); 60 kt S at 12 UTC at 25.6N, 73.9W (COA); 70 kt SSE and 986 mb at 12 UTC at 27.6N, 73.8W (COA); 60 kt SE and 980 mb at 12 UTC at 27.8N, 72.5W (COA); 70 kt SSE and 995 mb at 12 UTC at 27.8N, 72.5W (COA); 50 kt SE and 1009 mb at 13Z at 27.4N, 72.4W (COA); 55 kt SE and 1009 mb at 13Z 27.0N, 72.0W (COA); 70 kt S and 976 mb at 15 UTC at 27.6N, 74.0W (MWR Phobos); 70 kt ENE and 950 mb at 23 UTC at 30.0N, 75.7W (MWR India Arrow); 943 mb (time and location unknown) (MWR). Several gales of 35 kt-45 kt observed. Regarding the intensity: "a vessel reporting by radio gave a barometer reading below 28 inches...the British S. S. Carinthia, 27.85 [943 mb] on the 20th" (MWR).

September 21: HWM analyzes an extratropical closed low of at most 990 mb centered near 37.5N, 74.5W attached to a N-S cold front. HURDAT listed this as a 100 kt hurricane at 35.2N, 74.4W. The MWR Track of the Hurricane of September 16-22, 1938 (Chart IX) shows a center near 30.2N, 76.0 W at 0 UTC. The MWR Track of the Hurricane of September 16-22, 1938 (Chart IX) shows a center near 35.5N, 75.0W at 12 UTC. Available observations suggest that the 110 kt hurricane was centered at 35.2N, 73.1W. Ship highlights: 60 kt S and 1005 mb at 4 UTC at 30.5N, 72.5W (MWR); 70 kt W and 954 mb at 9 UTC at 33.4N, 74.4W (COA); 60 kt N and 969 mb at 15Z at 36.2N, 74.6W (MWR); 70 kt SE and 952 mb at 17 or 18 UTC at 38.9N, 72.0W (MWR Birmingham City); 70 kt NW and 970 mb at 17Z or 18Z at 39.3N, 73.8W (MWR Stewart); 45 kt NW with 972 mb at 17 UTC at 38.2N, 74.5W (COA). Land highlights: 53 kt at 9 UTC at Hatteras, North Carolina at 35.3N, 75.6W (NCDC); 53 kt W with 982 mb at 17 UTC at Atlantic City, New Jersey at 39.4N, 74.5W (NCDC, MWR); 40 kt SE at 17 UTC at Providence, Rhode Island at 41.8N, 71.3W (NCDC); 44 kt N at 17 UTC at New York City, New York at 40.8N, 74.0W (NCDC); calm center from 1850Z-1950Z at Brentwood, Long Island, New York (40.8N, 73.2W) (MWR); 981 mb at 19 UTC at Newark Airport, New Jersey at 40.8N, 74.3W (NCDC); 45 kt SE with 995 mb at 19 UTC at Nantucket, Massachusetts at 41.3N, 70.1W (NCDC); 946 mb at 1945 UTC at Bellport, Long Island, New York at 40.75N, 72.9W (NCDC); 76 kt SW and 979 mb at 20 UTC at Providence, Rhode Island at 41.8N, 71.3W (NCDC); 95 kt (1-min/anemometer height unknown) at 2020Z at Fishers Island (41.3N, 72.0W) (NCDC); 33 kt SE and 996 mb at 21 UTC at Nantucket, Massachusetts at 41.3N, 70.1W (NCDC); 63 kt S and 985 mb at 21 UTC at Boston at 42.4N, 71.0W (NCDC); 40 kt SE with 979 mb (min p) at 22 UTC at Concord, New Hampshire at 43.2N, 71.5W (NCDC); 40 kt S with 975 mb (min p) at 22 UTC at Albany, New York at 42.7N, 73.8W (NCDC). "It was not until September 21 that the hurricane approached any coastal or island area close enough to be felt seriously. At about 7:30 a.m. E.S.T. [1230 UTC] of that day, the center was about 75 miles east or slightly north of east from Cape Hatteras, where the barometer reading at that time was 29.30 and the wind velocity 50 miles an hour from the northwest. With the center approximately the same distance east of Atlantic City, at about 1 p.m. [18 UTC], the hurricane caused a maximum wind velocity of 61 miles an hour from the west at 12:55 p.m. [1755 UTC], simultaneously with the lowest barometer reading, 28.99 inches. At Sandy Hook, the lowest reading was 28.71 inches, shortly after 2

p.m., maximum wind 56 N at 1 p.m. The calm center was felt at Brentwood, Long Island, between 1:50 p.m. and 2:50 p.m. Drizzling rain was reported at intervals, with the sun shining during or three 5-minute periods. The wind movement was so slight during that time that a cigarette could have been lighted in the open without difficulty. Shortly before 4 p.m. the center reached the Connecticut coast passing between New Haven and Bridgeport; lowest pressure at New Haven was 28.11 at 3:50 p.m. At Hartford the minimum pressure, 28.04, was reached at 4:30 p.m. Moving at a very rapid rate, the center crossed Vermont between 6 and 9 p.m., its course having changed from north by east to north by west, while crossing Massachusetts. At Northfield the lowest barometer reading was 28.77 at 7:30 p.m. and at Burlington at 8 p.m." (1938 MWR). "NY, CT, RI, MA – All Category 3 - 946 mb central pressure" (Jarrell et al.). "Environmental pressure - 1015 mb, Estimated maximum sustained (equivalent 1 min) surface wind at landfall - 110 kt" (Schwerdt et al. 1979). "Sep. 21, 1938, 943 mb central pressure, 946 mb observed in Bellport, NY, RMW of 45 nmi, movement 48 kt, landfall at 40.7N, 72.9W, 'storm becoming extratropical'" (Ho et al. 1987). "1938 Sep 21, All sections of New England, Extreme Intensity ["Extreme" being 948 mb or less, maximum winds 136 kt and higher]" (Dunn and Miller). "F2/F3 damages observed from wind-caused impacts, Suggests boosting winds at 21st/12Z from 100 to 110 kt, 18Z 85 to 110 kt, landfall at 20Z with 110 kt, 22nd/00Z from 70 to 90 kt, 06Z from 45 to 60 kt" (Boose et al. 2001). "Suggest maximum sustained surface winds of 85 kt" (Kaplan and DeMaria 2001).

September 22: HWM analyzes an extratropical closed low of at most 985 mb centered near 47.5N, 75.5W attached to a stationary front. HURDAT listed this as a 35 kt extratropical low at 47.3N, 77.0W. The MWR Track of the Hurricane of September 16-22, 1938 (Chart IX) shows a center near 43.5N, 73W at 0 UTC. The MWR Track of the Hurricane of September 16-22, 1938 (Chart IX) shows a center near 46.5N, 77W at 12 UTC. Available observations suggest that the 35 kt extratropical low was centered at 47.7N, 77.3W. Land highlights: 41 kt S and 971 mb at 2330Z at Burlington, Vermont at 44.5N, 73.2W (NCDC); 973 mb at 0 UTC at Burlington, Vermont at 44.5N, 73.2W (NCDC); 995 mb at 0 UTC at Portland, Maine at 43.65N, 70.25W (NCDC); 996 mb at 0 UTC at Providence, Rhode Island at 41.8N, 71.3W (NCDC); 993 mb at 0 UTC at Boston,

Massachusetts at 42,4N, 71.0W (NCDC); 982 mb at 0 UTC at Albany, New York at 42.7N, 73.8W (NCDC); 993 mb at 6 UTC at Burlington, Vermont at 44.5N, 73.2W (NCDC); several other gales and low pressures.

September 23: HWM analyzes an extratropical closed low of at most 1005 mb centered near 42.5N, 72.5W attached to a stationary front. HURDAT does not list a position for this day. The MWR Track of the hurricane of September 16-22, 1938 shows a center near 45.0N, 77.0W at 0 UTC. Available observations suggest that the 30 kt extratropical low was centered at 45.0N, 77.0W.

Genesis is begun 18 hours earlier, based upon land and ship observations on the 9th showing a closed low had developed just off of the West African coast. Following a thorough examination of all available data and records for each day of the storm's existence, recommendations were made for moderate to major track modifications to the HURDAT database. These include: 1) removal of unrealistic acceleration at the track beginning, 2) removal of speed problem on the 12th, 3) added a stairstep track on the 17th, 4) only minor changes to timing and position of landfall in New England, 5) added an additional 6 hr position for more realistic end of track.

Recommendations were also made for generally minor intensity alterations to the HURDAT database for the 10th to the 12th, the 16th and 17th, and the 21st and 22nd, with the exception of a major increase of 20 kt at 18Z on the 21st. On the 10th at 18Z with the system located just southwest of the Cape Verde Islands, a 1005 mb peripheral pressure was recorded in association with the cyclone, and on the 11th at 01Z, a 40 kt wind was recorded. The analyzed intensity at 00Z on the 11th is 45 kt (up from 35 kt originally). (It is of note that the 40 kt S wind is listed as being in nearly the same spot as the 20 kt S wind. However, given the rather poor navigational tools available in 1938, it is quite likely that the relative positions of the two ships with regards to the storm's center may be off by 30 or even 60 nm.) After that, observations near the cyclone were lacking until 17 September at 0130Z, when the SS Alegrete recorded a peripheral pressure of 958 mb with hurricane force winds at 21.2N, 52.8W. A 958 mb peripheral pressure reading suggests maximum winds of

greater than 103 kt according to the Brown et al. (2006) southern pressure-wind relationship and greater than 105 kt for its intensifying subset. Winds are boosted from 95 to 110 kt at 00 UTC on the 17th and adjusted upward accordingly on the 16th. Additional ships encountered the storm during the days following this period. On the 18th at 12Z, the hurricane was located a few hundred miles north of the Lesser Antilles. On this day, the British S.S. Corrales recorded a pressure of 945 mb (it is uncertain whether this is a peripheral or central pressure). The 945 mb pressure suggests maximum winds of at least 116 kt from the Brown et al. (2006) southern pressure-wind relationship. The 125 kt intensity in HURDAT at 12Z on the 18th is not changed. On the 20th at 12Z, with the hurricane located northeast of the Bahamas, the Atlantida recorded a 953 mb pressure with simultaneous hurricane force winds, and at 23Z, the ship India Arrow recorded 950 mb with simultaneous hurricane force. Those two ships did not experience 180 degree wind shifts. The British S.S. Carinithia recorded a 943 mb pressure sometime on the 20th, but it is uncertain whether this is a peripheral or central pressure measurement. The 943 mb pressure on the 20th suggests maximum winds of at least 112 kt according to the Brown et al. (2006) north of 25N pressure-wind relationship. The 135 kt intensity in HURDAT at 12Z on the 20th is not changed. No changes are made to the original HURDAT intensities from the 18th through the 20th. The peak intensity of 140 kt is retained from 18Z on the 19th through 06Z on the 20th. It is of note that the original HURDAT assessment of a 140 kt peak intensity is not directly supported by any data. However, the current data is not sufficient to justify changing this, but considerable uncertainty remains as to the peak intensity obtained by this major hurricane. A 938 mb central pressure value is listed in HURDAT at 12 UTC on the 21st. This value may be partially based on the work of Myers and Jordan in the July 1956 MWR. They extrapolated the ship pressures and the observed pressure gradient to derive an estimated pressure of 27.75 in (939.8 mb) at 1200 EST (17Z) 21 September and this combined with the observed changes may have been used for the HURDAT value. It is noted that they derive a similar central pressure for the afternoon of 20 September, which was not used in HURDAT. Thus based upon the Myers and Jordan work, the central pressure value at 12Z on the 21st is changed to 940 mb. At 12Z on the 21st, the hurricane was just east of North Carolina, and it was accelerating northward. A 940 mb central pressure equals 115 kt according to the Brown et al. (2006) north of 25N pressure-wind relationship and 103 kt according to the

Landsea et al. (2004) north of 35N pressure-wind relationship. A 110 kt intensity is chosen for 12Z on the 21st (up from 100 kt originally). Ship data from prior to landfall as well as station data from landfall suggest that the 940 mb central pressure in HURDAT 18Z on the 21st should be retained in HURDAT.

At landfall (1945Z on the 21st), a pressure of 946 mb likely with calm or light winds measured in Bellport, Long Island, New York (40.7N, 72.9W) was the lowest pressure recorded on land. A landfall central pressure of 941 mb is analyzed here, which is in agreement with Jarvinen's analysis which used SLOSH. This is close to Ho et al.'s (943 mb) and HURDAT's 18Z (940 mb) values and somewhat deeper than Jarrell et al. (946 mb), who apparently assumed that Bellport observed the central pressure. The position at 1945Z was determined to be 40.7N, 72.9W, which is essentially over Bellport, Long Island. As described in Myers and Jordan, the pressure center and the wind center for this hurricane were offset by about 15 nmi (with the wind center southwest of the pressure center) due to its extreme translational speed. As is usually indicated in HURDAT, the best track positions here are based upon the wind (circulation) center. Based on observations and commentary from primary and secondary sources, the wind center is analyzed to have made landfall essentially right where the 946 mb was recorded at Bellport, and the pressure center likely came through about 0.1 degrees east of that location (near 72.8W when it made landfall on Long Island). Brentwood (40.8N, 73.2W) recorded calm or very light winds lasting for 1 hour. 941 mb suggests maximum winds of 103 kt from the Landsea et al. (2004) northern-pressure wind relationship. The RMW of the hurricane at landfall is estimated to be 40 nmi, somewhat smaller than Ho et al.'s assessment. This is slightly larger than the 30 nmi RMW which would be average given the central pressure and latitude (Vickery et al. 2000). However, the speed of the hurricane was about 41 kt at landfall, which would significantly increase the winds on the right side of the storm. Another consideration is that extratropical transition had been well underway and was nearly complete at landfall, and the pressure-wind relationship is not valid for extratropical cyclones. There are no available wind measurements from anemometers on Long Island to the right of the path of the center. There were only a few wind estimates there in commentary from secondary sources.

It is estimated that the central pressure filled slightly - to 946 mb - at the second landfall in Connecticut. The hurricane's second landfall was around 2040 UTC at 41.3N, 72.9W near New Haven. A central pressure of 946 mb equals 99 kt according to the Landsea et al. (2004) northern pressure-wind relationship. At both landfalls the OCI and ROCI are analyzed at 1011 mb and 350 nmi, respectively. From a pressure-wind relationship standpoint, the large size of the storm and the larger than average RMW are counteracted by the very fast speed of the cyclone. Another consideration is that extratropical transition had been well underway and was nearly complete at landfall, and the pressure-wind relationship is not valid for extratropical cyclones. The highest official reliable wind observation recorded on land that was not influenced by terrain effects was 95 kt (1-minute) at Fishers Island, NY (41.3N, 72.0W) at 2020Z. An investigation into obtaining the height of this anemometer reveals that it was likely in the range of 10 to 15 meters. The observer at Fishers Island noted that the anemometer failed at 2020Z, right after the 95 kt value was recorded. The observer estimated a highest one-minute wind of 104 kt at 2035Z. Estimated maximum velocity reported by the observer at the Watch Hill Coast Guard Station (41.3N, 71.8W) in Westerly, Rhode Island was 105 kt. A secondary source states that the anemometer of a ship in the harbor at New London, CT at 41.35 degrees N, 71.1W recorded a value of exactly 87 kt before the anemometer blew away. The RMW of this hurricane was located between New London, CT and Westerly, RI. At Block Island, RI (41.2N, 71.6W), a maximum 5-minute wind of 71 kt SE (14 m) converts to a 10 m 1-min wind of 74 kt. Block Island's fastest mile wind was measured at 79 kt, which converts to a 10m 1-min wind of 76 kt. Block Island was located about 10 to 15 nmi outside of the right RMW. Other stations' maximum winds, after converting to 10m 1-min values are: Providence, RI: 68 kt; Boston, MA: 64 or 71 kt (depending whether you convert from 5-min or from fastest mile). It is estimated that the maximum surface sustained winds at the Long Island, NY landfall were about 105 kt, which is slightly below the Schwerdt et al.'s and Boose et al.'s value (110 kt) and significantly above that suggested by Kaplan and DeMaria (85 kt) and that shown originally in HURDAT (also 85 kt). Kaplan and DeMaria's analysis focused solely upon observed wind values, and did not utilize the Army Corps source where the 95 kt observation was found. Other than the winds mentioned above, the wind data coverage on the right side of the hurricane was rather sparse. The right RMW is analyzed to have crossed eastern Long Island. This retains the hurricane as a Category 3 at

the first (NY) landfall. For the Connecticut landfall, winds are suggested to have dropped slightly to 100 kt. Category 3 winds are likely to have been felt along the immediate coast of eastern Connecticut and extreme western Rhode Island in a tiny area between 72.0W-71.8W. However, Massachusetts impact was analyzed to be about Category 2, which is a downgrade from Category 3 originally estimated in HURDAT. An additional post-landfall central pressure was added for the 00Z 22nd HURDAT of 969 mb based on a 971 mb reading from Burlington, Vermont. This replaced a value of 967 mb originally in HURDAT. Following landfall, the peak observed winds within two hours of the 00Z and 06Z on the 22nd synoptic times were land-based observations of 60 kt from Boston, Massachusetts and 30 kt from Burlington, Vermont. The Kaplan and DeMaria (2001) inland decay algorithm for New England suggested winds of 62 and 40 kt at 00Z and 06Z, respectively. Consequently, winds in HURDAT were decreased from 70 to 60 kt at 00Z and from 45 to 40 kt at 06Z.

An application of SLOSH for this hurricane was provided by Jarvinen (2006). For his run, he utilized the pressure center positions, which as mentioned earlier were about 15 nmi northeast of the wind center. Using central pressures of 941 mb at landfall in New York and 946 mb at landfall in Connecticut and an RMW of 26 nmi (from the pressure center), SLOSH's output closely matches the observed storm surges at Providence, Rhode Island and Buzzards Bay, Massachusetts. The SLOSH model gave maximum 1 min surface winds of 113 kt at the southern shoreline on eastern Long Island and 104 kt at the shoreline in Connecticut. However, these values do not take into account any increases in stability due to the cool water near New England. Thus the SLOSH model output is consistent with a large Category 3 at landfall.

One last consideration was whether the system was extratropical before or after landfall in New England. Oddly, it was listed as extratropical in HURDAT at 18 UTC on the 21st (right before landfall), but the track is shown in Neumann et al. (1999) as still retaining hurricane status until just after landfall. It has been officially considered a hurricane at landfall in Jarrell et al. and in the Saffir-Simpson Hurricane Scale designation in HURDAT. Pierce (1939) considered it extratropical, as he even showed frontal boundaries when the system

was as far south as 35N at 12 UTC on the 21st. However, ship observations near the core of the system were lacking on the 21st. While it is clear that the system was extratropical soon after landfall in New England (and was likely completely transitioned by 00 UTC on the 22nd), the lack of observations makes knowing its true character at landfall ambiguous. Perhaps Ho et al.'s assessment of "becoming extratropical" at landfall is most appropriate. Therefore, the 1938 Great New England hurricane will be retained with hurricane status just up to landfall.

A final note is that the track for the 1938 New England Hurricane was extended an extra six hours on the 23rd to accommodate some Historical Weather Map data showing that the system was still in existence on this date and also to provide a more realistic velocity at its conclusion.

*Storm #6, 1938 (The Great New England Hurricane) Best Track Change Committee Comments and Replies to the Comments*

Comments on the proposed revisions from the Best Track Supervisory Committee are in regular font. [Replies to the Committee are in boldface.]

1938 Storm #6 (originally #4):

1. Please include a binder map for 9 September.

**Done. After obtaining this and adding on the rather numerous COADS observations, a closed circulation had developed by 12Z on the 9th just offshore from the West African coast. Thus genesis is begun 18 hours earlier than indicated in HURDAT.**

2. On the plotted map for 0000 UTC 11 September, there is a S 50 kt/mph observation plotted next to a S 25 kt/mph. Is the former observation the basis for raising the intensity at this time to 45 kt? If so, this looks a little strange given the second, much lower, wind observation nearby. Please clarify this and include the explanation in the metadata summary if need be.

**Note that the initial work on this system conducted by Donna Strahan back in 2005 was plotted in units of mph. Thus the observations in question are actually a S 40 kt and a S 20 kt reports, as correctly indicated in the excel database and daily summary. The 40 kt observation is the reason for boosting the assessed intensity from 35 to 45 kt at 00Z on the 11th. Given the rather poor navigational tools available in 1938, it is quite likely that the relative positions of the two ships with regards to the storm's center may be off by 30 or even 60 nm.**

3. The HWM show a ship with W 20 kt/mph and 1008 mb near 17N 37W at 1200 UTC 13 September. If this is correct, is it possible that proposed position for that time (already nudged northward) needs to be nudged farther northward?

**There was a 15 kt WNW at 16.6N, 37.4W in COADS at 12Z on the 13th. Agreed to adjust the position northward by 0.2N to 17.2N at that time.**

4. The committee notes that the original HURDAT assessment of a 140 kt peak intensity is not directly supported by any data. The current data is not sufficient to justify changing this, but the uncertainty should be stated in the metadata summary.

**Agreed and done.**

5. The 938 mb central pressure at 1200 UTC 21 September may be at least partially based on the work of Myers and Jordan in the July 1956 MWR. They extrapolated the ship pressures and the observed pressure gradient to derive an estimated pressure of 27.75 in (939.8 mb) at 1200 EST (17Z) 21 September and this combined with the observed changes may have been used for the HURDAT value. It is noted that they derive a similar central pressure for the afternoon of 20 September, which was not used in HURDAT. Unless some other source for the 938 mb reading can be found, the committee suggests changing this value to 939 or 940 mb. The metadata summary should be re-written to reflect this.

**Agreed to change the 938 mb central pressure in HURDAT at 12Z on the 21st to 940 mb passed upon the work of Myers and Jordan.**

6. As with some of the storms of 1937, there is an issue with the use of the Landsea et al wind pressure-relationship for a system undergoing extratropical transition. The metadata summary should reflect this uncertainty.

**Agreed and added.**

7. Two comments on the 21 September daily metadata: First, "W-E cold front" should probably be "N-S cold front". Second, this is a very long write-up. Please shorten it by removing the parts about the damages and observations that are not necessary to determine the track and intensity.

**Done.**

8. The committee agrees with the proposed landfall intensities of 105 kt at Long Island and 100 kt in Connecticut. The committee's consensus is that the system was a tropical cyclone undergoing extratropical transition during the two landfalls, then became extratropical over New England after landfall. Therefore, it concurs with changing the time of extratropical transition in HURDAT. Richard Pasch's comments: The surface data do not indicate that cold air penetrated the core of the cyclone at landfall in New England. Therefore, I agree that the system was still a tropical cyclone at 1800 UTC 21 September. Also, based on the wind measurement at Fishers Island and the observed storm surges, the intensity at landfall should be that of a major hurricane. A value of 105 kt, as shown in the revised best track, seems quite reasonable.

**Agreed.**

**2. First aircraft flights into a hurricane**

Figure A1 provides in full the original report of the first ever aircraft flights into a hurricane. These were prepared by William H. Jones-Burdock, 1st Lt., U.S. Army Air Corps and Joseph B. Duckworth, Colonel, U.S. Army Air Corps. The success of these impromptu missions eventually led to the aircraft reconnaissance program of the U.S. Navy and U.S. Army Air Corps (now the U.S. Air Force) – the "Hurricane Hunters".

**3. Coastal wind swaths for U.S. landfalling hurricanes**

The reanalysis efforts also incorporated output from the AEF wind model to provide objective guidance on what category hurricane force winds affected which states for several destructive landfalling U.S. hurricanes. The AEF wind model (Dickinson et al. 2004) is based on the operational Geophysical Fluid Dynamics Laboratory (GFDL) hurricane forecast model (Kurihara et al., 1998) which uses a multiply nested movable mesh system to depict the interior structure of tropical cyclones. The GFDL model has been extensively modified to permit simulations of the wind field produced by a hurricane with a prescribed track and intensity. The AEF wind model is a dynamical model that utilizes the physical balances in the dynamic equations to determine how a hurricane will respond to local variability in the surface conditions (primarily topography and surface roughness). The AEF wind model incorporates a high-resolution boundary layer (eight vertical levels below 1000 meters) combined with high-resolution information about topography and land use. The model input comes from data describing the tropical cyclone location, maximum wind, and structure (i.e., radius of maximum winds and radii of 50 and 34 kt winds, if available). Figure A2 provides the wind swaths of several U.S. landfalling hurricanes via the AEF wind model based upon the original and revised HURDAT2 values. These hurricanes were chosen because of their rather large disagreements between the original HURDAT2 intensity value just before landfall and the official U.S. Saffir Simpson Hurricane Wind Scale Categorization. These hurricanes include the 1934 Louisiana hurricane, the 1938 Great New England hurricane, the 1944 Great Atlantic hurricane, the 1945 Texas hurricane, the 1947 Florida and Louisiana hurricane, Carol (1954), Edna (1954), Hazel (1954), Donna (1960), and Gloria (1985).

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REGIONAL CONTROL OFFICE
EIGHTH WEATHER REGION
PRESQUE ISLE ARMY AIR FIELD
PRESQUE ISLE, MAINE

22 October 1943

SUBJECT: Report of a Flight Through A Tropical Hurricane

TO : All Stations

1. Enclosed is a report of a hurricane for your information. Colonel Duckworth gives herein a Pilot Report on the location on the eye of the storm.

For the Regional Control Officer:

L A Kiley, Jr.

LEO A. KILEY, JR.
Major, Air Corps,
Asst. Regional Control Officer

HEADQUARTERS
ARMY AIR FORCES INSTRUCTORS' SCHOOL (INSTRUMENT PILOT)
Bryan, Texas

19 August 1943

# FLIGHT THROUGH A TROPICAL HURRICANE

BY WILLIAM H. JONES - BURDICK, 1st Lt., AIR CORPS

PILOT-WEATHER OFFICER

## Chronological Log - Bryan to Galveston and Return

1635 Take-off from Bryan Field. Sky high overcast with cloud bank of stratocumulus on horizon from West Northwest through South to West Southwest. Surface wind North Northeast 20 with strong gusts.

1655 Over Navasota at 7300' entering fractocumulus clouds which extend from approximately 4000' to 10000' with a thick altostratus layer above. Cloud not dense, turbulence light, free air temperature 8.5 deg. C.

1700 Lower clouds visible through breaks. Turbulence moderate, static light.

1705 Altitude 6900'. Between Cloud layers. Turbulence smooth, very light rain.

1707 Stratocumulus below. Moderate static.

1710 Altitude 6900'. Free air temperature 10 deg. C. Turbulence smooth, static light.

1715 Heavy rain, strong rain static.

1716 Rain continues but static only moderate. Some crash static intermittently.

1720 Getting darker, cloud more dense, rain very heavy, turbulence light. Rain static building up, blocking out GS radio range intermittently.

1725 Turbulence light to moderate, rain very heavy.

1728 Altitude 7300'. Free air temperature 8 deg. C., cloud getting somewhat lighter.

1730 Rain less heavy. Cloud much lighter, ground visible through breaks. Surface wind apparently South Southeast.

1735 Crossed east leg of GS range and changed course to 330 deg. Mag.

1740 Now flying in thick cloud. Turbulence smooth to light.

1743 Turbulence moderate.

1744 Turbulence moderate to severe.

1745 Sighted clear space ahead and to the left.

1746 Now flying in "eye" of storm. Ground clearly visible, sun shining through upper clouds to the west. Circling to establish position. Surface wind South. (This point was first thought to be Red Bluff on Galveston Bay south of the town of LaForte, but a check flight in clear weather three days later established the position of the clear space 8 miles northeast, west across the bay from Double Bayou).

1753 Still circling. Altitude 5000', temperature 23 deg. C.

1800 Headed west for Houston. Cloud very dense, rain light, turbulence moderate, intermittent precipitation static.

1805 Apparently in a thunderstorm. Altitude 5500'. Heavy rain, turbulence moderate to severe. Free air temperature now 8 deg. C.

1815 Changed heading to 10 deg. Mag. Rain light to moderate. Turbulence light.

1825 Headed 330 deg. Mag. Rain very light, turbulence almost smooth. Apparently flying between thick cloud layers.

1835 Altitude 5500'. Broken statocumulus clouds below, high overcast of altostratus above.

1836 Breaking out into the open with high altostratus deck above.

1900 Landed at Bryan. Sky clear to the northwest.

In addition to the cold recital of facts of the two flights through the hurricane, it might be appropriate to outline the happenings at the ground as the storm passed over the Houston-Galveston area. Newspaper and radio reports have termed the storm as the most severe in thirty years and quoted many Houston residents as saying this was much more severe than that of either 1915 or 1941. These sources also stated that winds up to 132 miles an hour were reported at the municipal Airport. Some $11,000,000 damage was caused by the storm in the Houston-Galveston area. Luckily, only thirteen deaths have been attributed directly to the storm, but at the time of this writing salvage and repair work is still uncompleted.

A flight over the area was conducted on Friday, three days after the storm. At that time large areas north of Houston were still under water and extensive damage was still visible from the air throughout the Houston-Galveston area. Hurricane warnings were issued far in advance of the storm while it was still in the Gulf, but only when the storm was practically upon Galveston did these warnings forecast winds above 65 miles an hour. The storm was described in these warnings as of small diameter and only moderate intensity. On reconstructing the track of the storm it was found that its greatest intensity - that is, winds above 100 miles an hour, was near the center of the cyclone, or low pressure area, and then only while the storm was located over Galveston Bay and the adjacent

land regions. From the small movement of the "eye" of the storm, as shown by its positions in the two flights described above, it is evident that the center became stagnated over the bay region and built up an intensity. Reports from stations to the north and east of Houston show that this intensity was lost very quickly as the center moved over land.

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(Excerpt)

(Not for publication without the consent of

WILLIAM H. JONES-BURDICK, 1st Lt., Air Corps,
Pilot Weather Officer)

HEADQUARTERS
ARMY AIR FORCES INSTRUCTORS' SCHOOL (INSTRUMENT PILOT)
Office of the Commanding Officer
Bryan, Texas

19 August 1943

# FLIGHT THROUGH A TROPICAL HURRICANE

BY JOSEPH B. DUCKWORTH, COLONEL, AIR CORPS

During the afternoon and evening of July 27, 1943, a tropical hurricane struck Galveston and Houston, Texas from the Gulf of Mexico.

Between the hour of 14:00 and 19:00 two experimental trips were made (without landing, of course) in an AT-6 airplane, around and through the center of the hurricane. The observer on the first trip was 2nd Lt. Ralph M. O'Hair, navigator, and on the second trip 1st Lt. Wm. H. Jones-Burdick, a pilot-weather officer. Both trips were made at differing altitudes between 4000 ft. and 9000 ft.

On the first trip the hurricane was centered north of Galveston and both the Galveston and Houston radio ranges were operating. These two ranges were checked over in turn and upon reaching Galveston a northward course was flown through the "eye" of the storm. On the second trip the "eye" was found to be slightly west-northwest of its former position and this trip was made to the east of Houston over Galveston to 30 miles east of Galveston range and back west-northwest through the "eye" of the storm. No difficulties were encountered on either trip.

Upon entering the overcast weather at the edge of the storm, which consisted of a series of local squalls, the air was smooth, except in the local squalls, where the ordinary roughness associated with such squalls was encountered.

After passing through these squalls and getting into the storm proper the air smoothed out completely; the rain became steady and heavier as the southerly course was maintained. The outside air temperature in this northwest section of the storm was 9 deg. C at 7000 ft. As Galveston was approached, the rain became much heavier and throughout this whole area rain static was exceptionally heavy. This static did not interfere with proper operation of the airplane's receiver, however, as periods of complete quist between the periods of static provided ample radio reception. Houston radio was contacted when just south of Houston. They requested our position, altitude, and destination, as usual, and took the opportunity of warning us that Galveston was experiencing a hurricane. We replied that we were on an experimental instrument flight to Galveston and return to Bryan with no landings contemplated and that we would attempt to locate the center of the disturbance, if possible. Upon turning north from Galveston toward where we thought the center of the storm would be, we encountered increasing turbulence as the "eye" was approached. The turbulence was of the choppy or bumpy type, apparently consisting of small gusts close together. A few up-drafts were encountered but they were widely separated and not nearly as severe as those found in the average thunder storm.

As the center was approached the air became steadily more choppy and bumpy, being severe at times. As we broke into the "eye" of the storm we were, of course, contact, and could see the sun and the ground. Apparently the "eye" was like a leaning cone as observation of the ground showed a considerable ground wind. No attempt was made to come close to the ground in order to check this more closely, due to the possibility of exceptional turbulence, resulting from ground friction.

A broadcast was sent out locating the center over Galveston Bay about ten miles southwest of the little settlement of Double Bayou. This broadcast was received by Houston, but no reply was received, due to their transmitting facilities having gone out. The Houston radio was now inoperative but both Galveston and Beaumont were operating.

The trip continued back to Bryan without further incident and the Beaumont range was contacted upon crossing the west leg of that range. Due to the strong winds, the trip back was, of course, of longer duration than the trip down to Galveston.

On the second trip, with the weather officer, who is also a pilot, as passenger, the same conditions as previously outlined were encountered. On this trip a deeper penetration of the southeast quadrant of the hurricane was flown in order to check the free air temperature in the southeast quadrant. As the southeast quadrant was entered, the free air temperature went from 9 deg. C. up to 23 deg. C. The "eye" was again flown through, and its position indicated that the hurricane had moved west or northwest and was affecting Houston more strongly. Later reports, by the grapevine, have indicated that the center passed over Ellington Field, and the writer is sorry now that he did not attempt to contact Ellington tower for any information they might have wished transmitted.

On the whole, neither flight through the hurricane was as uncomfortable as a good, rough thunder storm. Rain has been encountered in thunderstorm which was heavier than the rain in the hurricane, to say nothing of much more severe drafts and choppy and bumpy air. The best description of the hurricane was offered by the weather officer, who stated that it was no worse than an unstable warm front.

The only embarrassing episode which could have occurred w ould have been engine failure which, with the strong ground winds, would probably have prevented a landing, and certainly would have made descent via parachute highly inconvenient.

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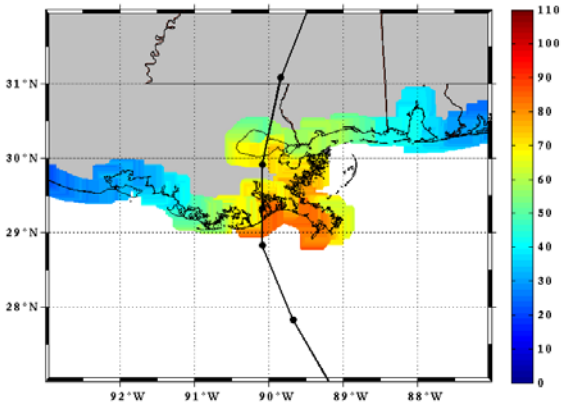
(Excerpt)





Figure A1: The report – "Flight Through a Tropical Hurricane" – by William H. Jones-Burdock, 1st Lt., U.S. Army Air Corps and Joseph B. Duckworth, Colonel, U.S. Army Air Corps.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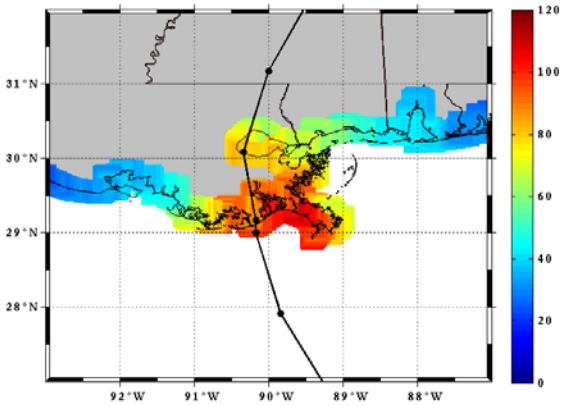
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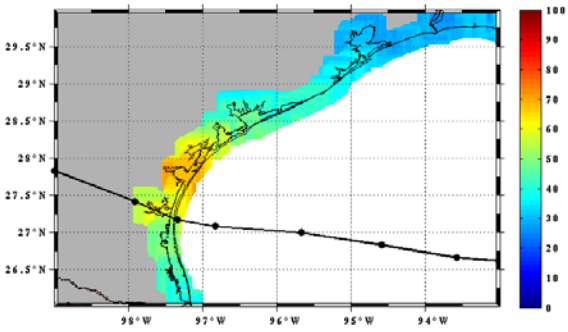
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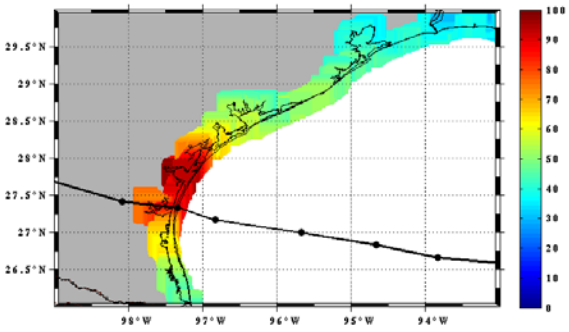
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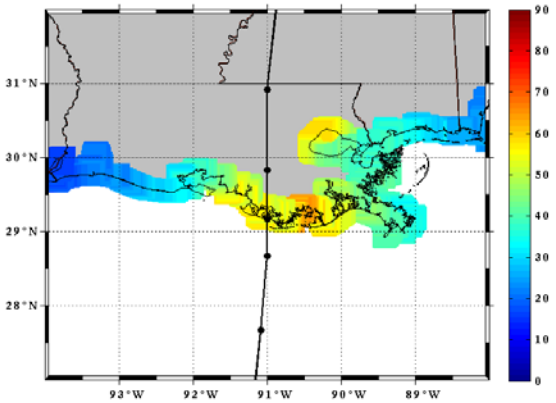
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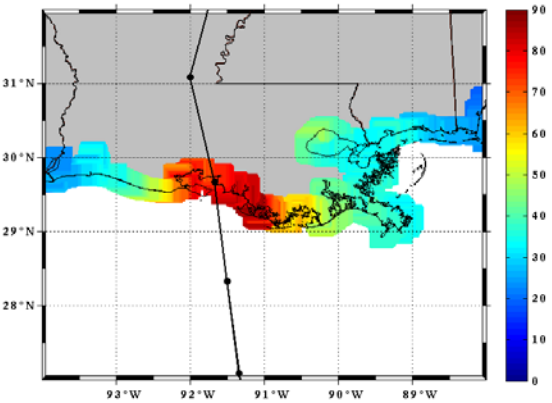
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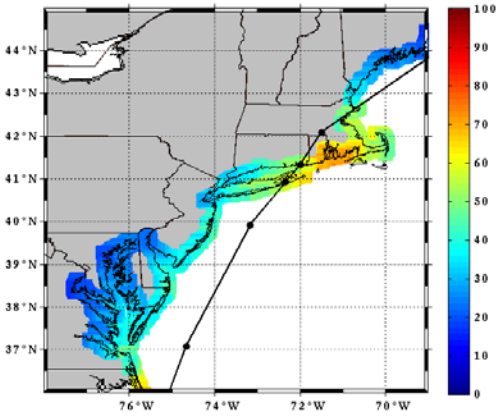
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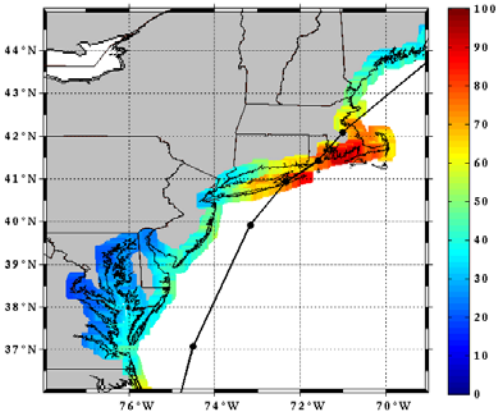
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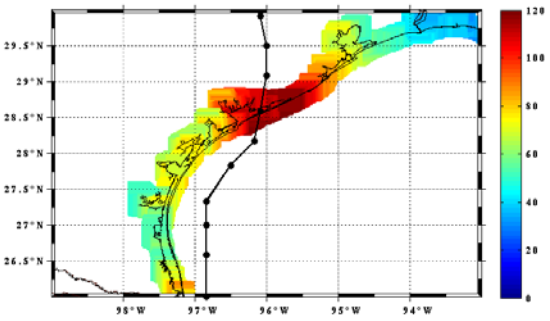
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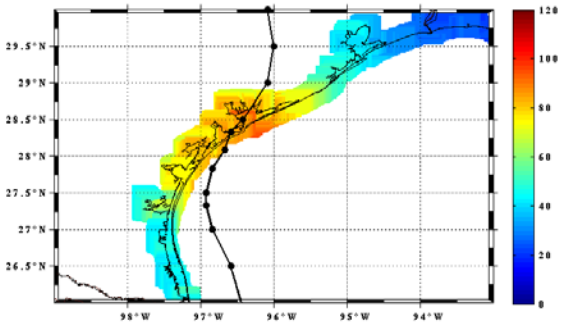
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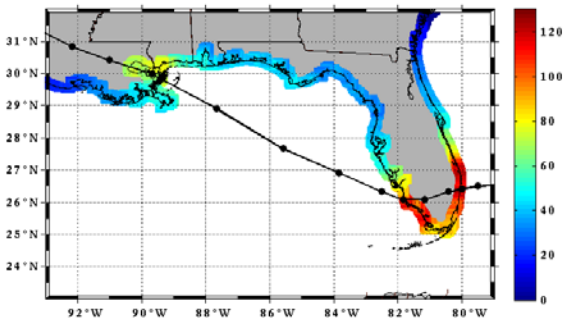
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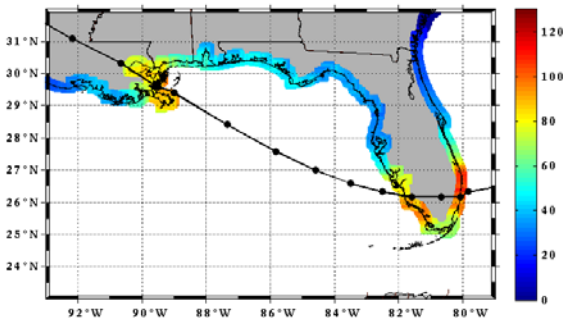
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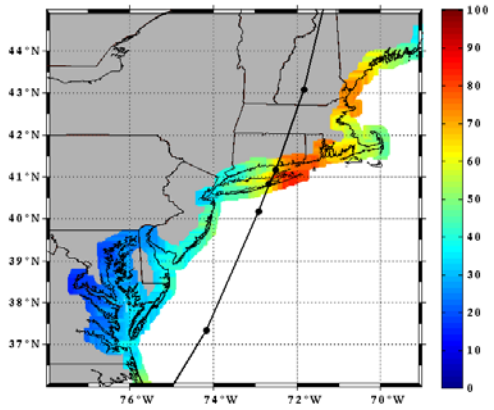
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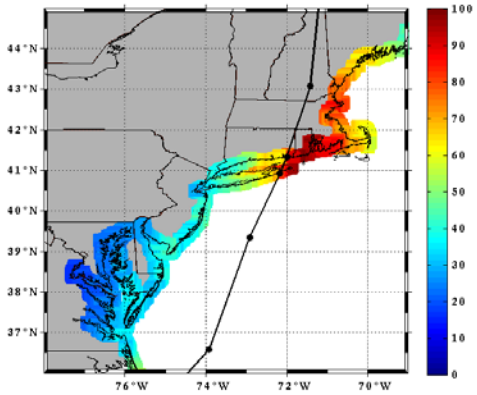
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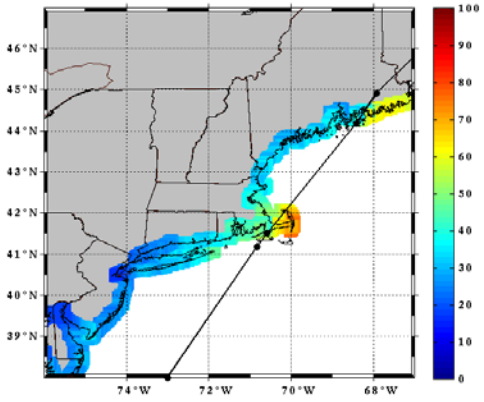
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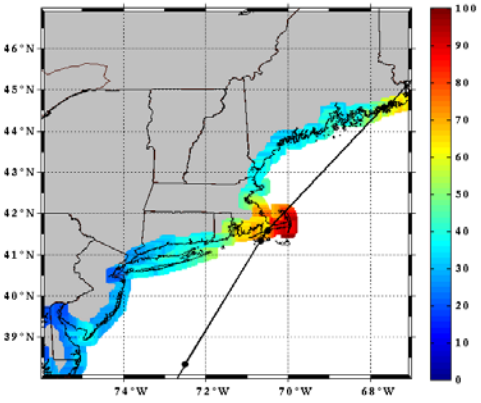
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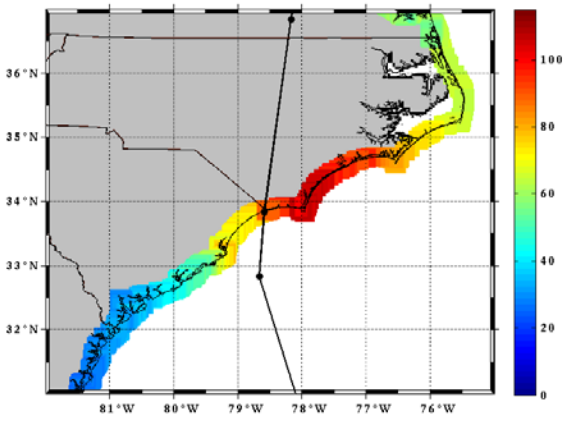
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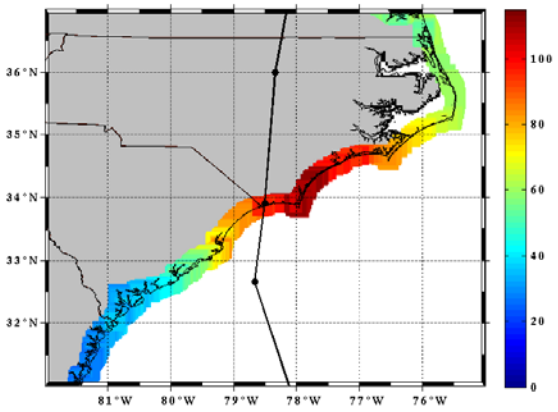
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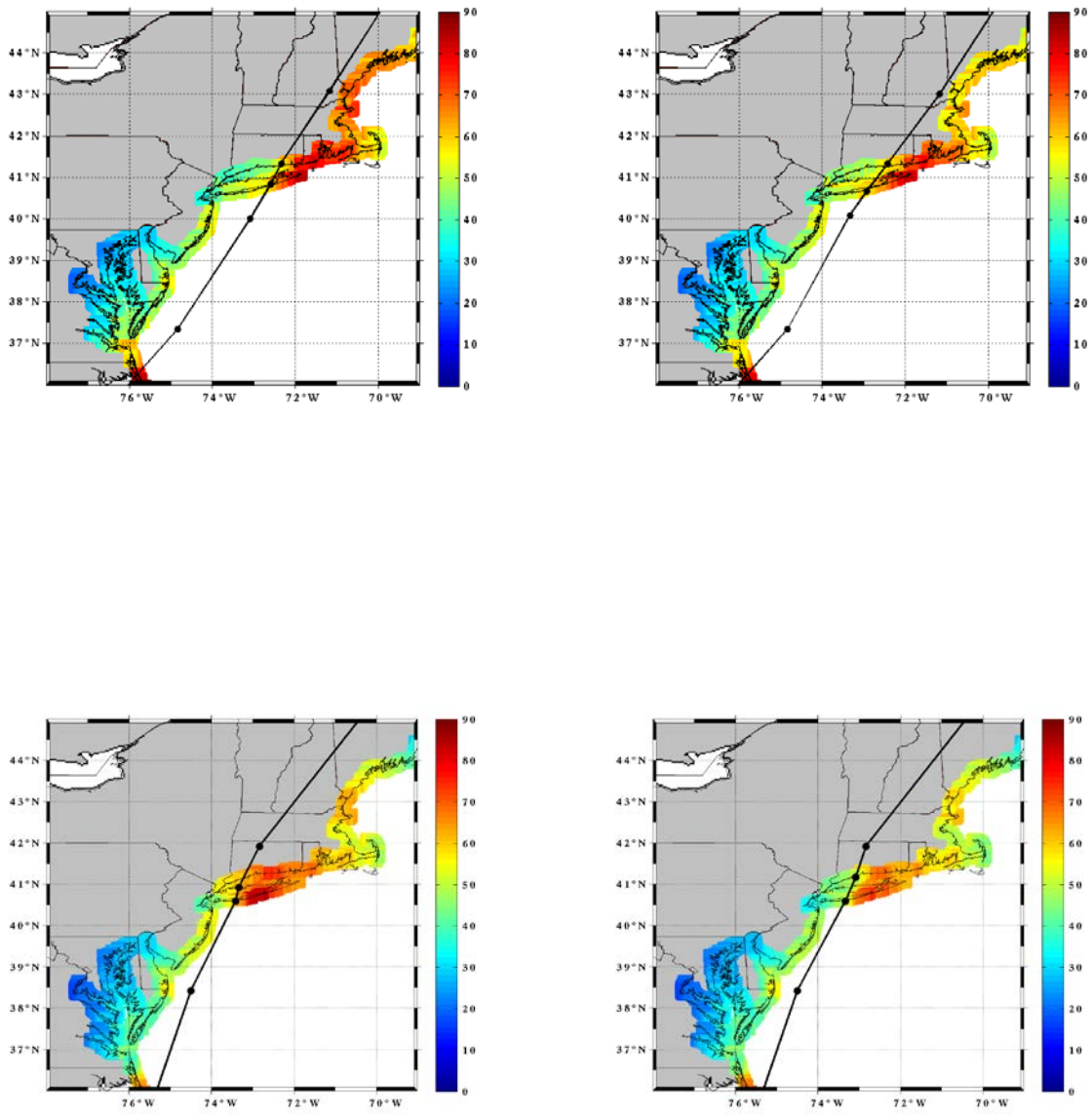


Figure A1: Original (left) and revised (right) track and coastal wind swaths for the 1934 Louisiana hurricane, the 1944 Great Atlantic hurricane, the 1945 Texas hurricane, the 1947 Florida and Louisiana hurricane, Carol (1954), Edna (1954), Hazel (1954), Donna (1960), and Gloria (1985).

Table A1: Significant (hurricane force and greater) reports collected in the database for Storm #6, 1938 (the Great New England Hurricane). Note that the complete database includes all reports of tropical storm force (34 kt) or stronger and 980 mb pressures or lower. Sources shown here are Monthly Weather Review (MWR), Comprehensive Ocean Atmosphere Dataset (COA), the U.S. Weather Bureau Original Monthly Records (OMR), airport weather station measurements (Airway wx), and other supplemental information (Supp).

1938 Storm 6 (originally Storm 4) – Great New England Hurricane

| Date | Time | Pressure | Wind | Direction | Air-T | SST | Location | Lat. | Lon. | Source | Name |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 17-Sep | 0130Z | 958 | 70 | ENE | | | SHIP | 21.1 | 52.8 | MWR | Alegrete |
| 18-Sep | | 945 | | | | | SHIP | | | MWR | S.S. Corrales |
| 19-Sep | 14Z | 982 | 70 | E | | | SHIP | 25.5 | 69.9 | MWR | Gulfhawk |
| 20-Sep | 2Z | | 65 | NE | 82 | 83 | SHIP | 26.3 | 74.2 | COA | 409050 |
| 20-Sep | 9Z | 956 | 45 | NE | | | SHIP | 27.1 | 73.9 | COA | US150810 |
| 20-Sep | 9Z | 1005 | 70 | E | 82 | | SHIP | 27.4 | 72.4 | COA | |
| 20-Sep | 9Z | 992 | 70 | ESE-SSE | | | SHIP | 27.8 | 72.6 | MWR | Jean Lafitte |
| 20-Sep | 9Z | 956 | 40 | NE | | | SHIP | 27.1 | 73.9 | MWR | Antigua |
| 20-Sep | 12Z | 953 | 70 | E | | | SHIP | 27.1 | 74.6 | MWR | Atlantida |
| 20-Sep | 12Z | 986 | 70 | SSE | 75 | 74 | SHIP | 27.6 | 73.8 | COA | NL013848 |
| 20-Sep | 12Z | 980 | 60 | SE | 83 | 79 | SHIP | 27.8 | 72.5 | COA | DL004807 |
| 20-Sep | 12Z | 995 | 70 | SSE | 82 | 80 | SHIP | 27.8 | 72.5 | COA | US162036 |
| 20-Sep | 15Z | 976 | 70 | S | | | SHIP | 27.6 | 74.0 | MWR | Phobos |
| 20-Sep | 23Z | 950 | 70 | ENE | | | SHIP | 30.0 | 75.7 | MWR | India Arrow |
| 20-Sep | | 943 | | | | | SHIP | | | MWR | Carinthia |
| 21-Sep | 9Z | 954 | 70 | W | 74 | 77 | SHIP | 33.4 | 74.4 | COA | |
| 21-Sep | 15Z | 969 | 60 | N | | | SHIP | 36.2 | 74.6 | MWR | San Benito |
| 21-Sep | 17Z | 976 | 40 | NNE-NW | | | SHIP | 38.6 | 73.9 | MWR | Gulfprince |
| 21-Sep | 17Z | 972 | 40 | NW | | | SHIP | 38.3 | 74.9 | MWR | Platano |
| 21-Sep | 17Z | 972 | 45 | NW | 65 | 70 | SHIP | 38.2 | 74.5 | COA | PM003315 |
| 21-Sep | 18Z | 952 | 70 | SE | | | SHIP | 38.9 | 72.0 | MWR | Birmingham City |
| 21-Sep | 18Z | 970 | 70 | NW | | | SHIP | 39.3 | 73.8 | MWR | R.G. Stewart |
| 21-Sep | 19Z | | 70 | SE | | | PROVIDENCE | 41.8 | 71.4 | OMR | |
| 21-Sep | 19Z | | 65 | NW | | | NEW YORK (CITY) | 40.7 | 74.0 | OMR | |
| 21-Sep | 19Z | 980 | 26 | E | 73 | | NEW HAVEN (CITY) | 41.3 | 72.9 | OMR | |
| 21-Sep | 19Z | 979 | 36+ | NE | 71 | | New Haven | 41.3 | 72.9 | Airway Wx | |
| 21-Sep | 1915Z | 972 | | | | | SANDY HOOK, NJ | 40.5 | 74.0 | MWR | MIN PRESSURE |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 21-Sep | 1930Z | 971 | 41+ | WNW | 59 | FloydBen | 40.6 | 73.9 | AirwayWx | | |
| 21-Sep | 1943Z | 973 | | | 56 | NEW YORK (CITY) | 40.7 | 74.0 | OMR | MIN PRESSURE | |
| 21-Sep | 1945Z | 946 | | | | BELLPORT, NY | 40.7 | 72.9 | MWR | MIN PRESSURE | |
| 21-Sep | 1950Z | 961 | 48+ | NE | | New Haven | 41.3 | 72.9 | Airway Wx | | |
| 21-Sep | ~1951Z | 973 | | | | NEW YORK (CITY) | 40.7 | 74.0 | Sup | MIN PRESSURE | |
| 21-Sep | 1951Z | 971 | 43+ | NNW | | FloydBen | 40.6 | 73.9 | Airway Wx | | G 73 |
| 21-Sep | 1955Z | | 71 | SE | | BLOCK ISLAND, RI | 41.2 | 71.6 | OMR | 5-min | |
| 21-Sep | 2000Z | 959 | 43+ | NE | | New Haven | 41.3 | 72.9 | Airway Wx | | |
| 21-Sep | 20Z | 972 | 50 | WNW | | SHIP | 40.5 | 73.8 | MWR | WASHINGTON | |
| 21-Sep | 20Z | | 75 | SE | | BLOCK ISLAND, RI | 41.2 | 71.6 | MWR | | |
| 21-Sep | 2000Z | | 79 | SE | | BLOCK ISLAND, RI | 41.2 | 71.6 | OMR | fastest mile | |
| 21-Sep | | | 71 | SE | | BLOCK ISLAND, RI | 41.2 | 71.6 | OMR | 5-min max | |
| 21-Sep | 2005Z | 971 | | | | BLOCK ISLAND, RI | 41.2 | 71.6 | Sup | MIN PRESSURE | |
| 21-Sep | 2012Z | 956 | 43+ | NE | 66 | New Haven | 41.3 | 72.9 | Airway Wx | | |
| 21-Sep | 2015Z | 971 | | | 68 | BLOCK ISLAND, RI | 41.2 | 71.6 | OMR | MIN PRESSURE | |
| 21-Sep | 2020Z | | 95 | measured | | Fishers Island, NY | 41.3 | 72.0 | supp | 1-min | |
| 21-Sep | 2030Z | 973 | 47+ | NW | 58 | FloydBen | 40.6 | 73.9 | Airway Wx | | 1-min |
| 21-Sep | 2030Z | 979 | 80 | SW | | PROVIDENCE | 41.8 | 71.4 | OMR | MIN PRESSURE | |
| 21-Sep | 2035Z | 954 | 17+ | NE | 67 | New Haven | 41.3 | 72.9 | Airway Wx | | |
| 21-Sep | 2039Z | | 70 | NW | | NEW YORK (CITY) | 40.7 | 74.0 | OMR | fastest mile | |
| 21-Sep | 2045Z | 954 | 19+ | S | 69 | New Haven | 41.3 | 72.9 | Airway Wx | | |
| 21-Sep | 2045Z | 979 | | | 73 | PROVIDENCE | 41.8 | 71.4 | OMR | MIN PRESSURE | |
| 21-Sep | | 958 | | | | Bridgeport, CT | 41.2 | 73.2 | supp | MIN PRESSURE | |
| 21-Sep | 2050Z | 952 | 35 | NE | 69 | NEW HAVEN (CITY) | 41.3 | 72.9 | MWR | MIN PRESSURE | |
| 21-Sep | 2055Z | | 67 | SE | | PROVIDENCE | 41.8 | 71.4 | OMR | 5-min | |
| 21-Sep | 21Z | 954 | 17+ | SW | 69 | New Haven | 41.3 | 72.9 | Airway Wx | | |
| 21-Sep | 2105Z | | 76 | SW | | PROVIDENCE | 41.8 | 71.4 | OMR | max 5-min | |
| 21-Sep | | | 83 | | | PROVIDENCE | 41.8 | 71.4 | OMR | fastest mile | |
| 21-Sep | 2108Z | | 52 | S | | BLOCK ISLAND, RI | 41.2 | 71.6 | OMR | 5-min | |
| 21-Sep | 2112Z | 959 | 20+ | SW | 69 | New Haven | 41.3 | 72.9 | Airway Wx | | |
| 21-Sep | 2117Z | 950 | | | 67 | HARTFORD | 41.8 | 72.7 | OMR, supp | | MIN PRESSURE |
| 21-Sep | 2123Z | 965 | 37+ | SW | 66 | New Haven | 41.3 | 72.9 | Airway Wx | | |
| 21-Sep | 2130Z | 950 | | | | HARTFORD | 41.8 | 72.7 | MWR | No calm | |
| 21-Sep | 2130Z | 985 | 42+ | WSW | 58 | FloydBen | 40.6 | 73.9 | Airway Wx | | G 65 |
| 21-Sep | 2142Z | 973 | 32+ | SW | 63 | New Haven | 41.3 | 72.9 | AirwWx | | |
| 21-Sep | | 971 | | | | Worchester, MA | 42.3 | 71.8 | supp | MIN PRESSURE | |
| 21-Sep | | 962 | | | | Amherst, MA | 42.4 | 72.5 | supp | MIN PRESSURE | |
| 21-Sep | 22Z | 977 | 37+ | SW | 65 | New Haven | 41.3 | 72.9 | Airway Wx | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 21-Sep | 22Z | 960 | 35 | ENE | 69 | Westfield, MA | 42.1 | 72.8 | Airway Wx | |
| 21-Sep | 22Z | 979 | 40 | SE | 70 | CONCORD | 43.2 | 71.5 | OMR | MIN PRESSURE |
| 21-Sep | 22Z | 975 | 40 | S | 59 | ALBANY | 42.7 | 73.8 | OMR | MIN PRESSURE |
| 21-Sep | 2200Z | 970 | | | | ALBANY | 42.7 | 73.8 | supp | MIN PRESSURE |
| 21-Sep | 2230Z | 985 | 65 | S | 70 | BOSTON (AIRPORT) | 42.4 | 71.0 | OMR | MIN PRESSURE |
| 21-Sep | ~2230Z | | 63 | S | | Boston, MA | 42.4 | 71.0 | OMR | max 5-min |
| 21-Sep | ~2230Z | | 76 | S | | Boston, MA | 42.4 | 71.0 | OMR | fastest mile |
| 21-Sep | 2245Z | 979 | | | 70 | Concord, NH | 43.2 | 71.5 | OMR | MIN PRESSURE |
| 21-Sep | 23Z | 975 | 22 | SW | 64 | Westfield, MA | 42.1 | 72.8 | Airway Wx | |
| 21-Sep | | 972 | | | | Hanover, NH | 43.7 | 72.3 | supp | MIN PRESSURE |
| 21-Sep | | 973 | | | | Rutland, VT | 43.6 | 73 | supp | MIN PRESSURE |
| 21-Sep | 0030Z | 974 | 45 | S | | NORTHFIELD | 44.2 | 72.7 | MWR | MIN PRESSURE |
| 22-Sep | 0030Z | 974 | 25 | S | 65 | Northfield, VT | 44.2 | 72.7 | OMR | MIN PRESSURE |
| 22-Sep | 0030Z | 976 | | | 65 | White River Junct, VT | 43.6 | 72.3 | OMR | |
| 22-Sep | 0030Z | 973 | 11 | N | 62 | BURLINGTON | 44.5 | 73.2 | OMR | |
| 22-Sep | 0100Z | 971 | 12 | N | 63 | BURLINGTON | 44.5 | 73.2 | OMR | MIN PRESSURE |