Best Track Committee Re-Analysis Comments for 1953

**Replies to comments provided in boldface by Andrew Hagen and Chris Landsea – August 2014**

General comments:

1. The Monthly Weather Review (MWR) season summary article did not include any surface observation tables for the U. S. landfalling storms. It turns out that these tables were included in the hurricane season summary published in the Climatological Data National Summary Annual issue (this publication began in 1950). These tables appear to have data that was not included in the re-analysis submissions, especially for Hazel in Florida (specific examples mentioned below). In addition, there was a table of significant ship observations from the season’s cyclones.

Looking at other National Summaries, the 1950 summary had surface observation tables, the 1951 summary had no such tables, while the 1952 summary had only a ship report table.

Please examine the tables to ensure that the information is included in the data spreadsheets and into the proposed track and intensities for 1950, 1952, and 1953. Also, please look over the National Summaries for subsequent years to see if they contain any useful data that was not previously included in the re-analysis submissions. A check of 1954 shows extensive data for the U. S. landfalling hurricanes of that year.

**These sources have now been checked and incorporated into the reanalysis.**

2. There are multiple instances where the committee could use more data, especially maps, during the pre-genesis phase. These include Edna, Florence, and Hazel. Please make sure that maps are included for at least 1-2 days before genesis, especially if changes to genesis times are being proposed.

**The maps and observations for Edna, Florence and Hazel for two days before genesis have been more thoroughly investigated and scanned in. These do not indicate any changes are needed from that originally submitted.**

3. Please remove the damage and casualty descriptions from the daily metadata unless they are specifically needed to help determine tracks or intensities.

**Many of the damage and casualty descriptions have now been deleted.**

1953 Storm #1, Alice:

 1. What are the “major” intensity changes analyzed for this system? None of the HURDAT lines at the beginning of the submission are coded red for major changes, and there do not appear to be any change of more than 10 kt.

**There are no “major” intensity changes. The word “major” has been changed to “minor” in the opening metadata paragraph.**

 2. In the metadata summary, there is a discussion of a possible alternative genesis scenario where the low currently tracked as Alice may have moved into the Pacific. Please re-examine this possibility. At the very least, this section should be split off into its own separate paragraph and expanded. The committee notes that the Historical Weather Map (HWM) for 28 May does support a two-low scenario, although it is unclear if the low over the Pacific was the same system seen earlier in the Caribbean.

**This discussion has been split off into its own separate paragraph in the metadata summary as requested. The support of the HWM for the two-low scenario is now explicitly mentioned. As the evidence is ambiguous, the original track for the system is maintained.**

 3. Regardless of whether the original low moved into the Pacific or not, the microfilm map for 0000 UTC 27 May shows multiple observations of 1003 mb with 15-20 kt winds from coastal stations in Honduras and Nicaragua. This suggests the central pressure was near 1001-1002 mb, which may be low enough for the cyclone to be a tropical storm despite the low environmental pressures. Please consider keeping the original HURDAT intensities.

**Agreed. The original HURDAT intensity of 35 kt is used from 12Z on the 26th through 00Z on the 27th (landfall occurred at 18Z on the 26th).**

 4. Are other pressures available from Cuba to help refine the intensity when crossing the island?

**Ramon Perez at the Cuban Meteorological Service was contacted, but had no further information regarding this cyclone.**

 5. There is a typo on the metadata summary: “1004 mb with 5 was recorded”.

**This has been corrected to “1004 mb with 5 kt was recorded.”**

 6. The metadata summary states “and the storm was relatively weak on those”. Please consider removing that given the lack of flights into the storm on 3-4 June.

**That text has been removed.**

 7. Please provide more information about the “possible 65 kt wind” at 1800 UTC 5 June. If the wind speed of the ship in question cannot be properly determined, please remove the mention of this ob from the submission.

**No further information on this ship could be obtained. As requested, mention of this ship observation has been deleted.**

1953 Storm #2 (new):

 1. The committee concurs with adding this system to HURDAT.

**Agreed.**

 2. There is a typo in the metadata summary:“temperaturs”.

**This has now been corrected.**

 3. Please re-examine the time of extratropical transition to see if the current proposed time could be delayed 6-12 hours.

**Agreed, the extratropical transition of this system has been delayed by 6 hours to 12Z July 15th.**

 4. The cyclone apparently passed near Cape Cod and Nantucket on 15-16 July. Please examine the available data from those areas to help refine the position and intensity.

**Hourly observation were obtained from both Cape Cod (Hyannis Barnstable) and Nantucket for the 15th and 16th of July. These indicate that the center of the decaying cyclone remained offshore.**

1953 Storm #3, Barbara:

 1. Please supply the full reference for James and Thomas (1953) somewhere in the write-up.

**The reference for James and Thomas has been placed at the end of the metadata summary for Barbara.**

2. In the 12 August daily metadata, there is reference to a 06Z ship ob on a microfilm map. This map is currently not in the scanned material. Please provide the map or correct the time of the ob if it is wrong.

**On the 12 August 06Z microfilm map, there is a ship called “NC” plotted near 28.8N 74.5W with a 50 kt SE wind (look for five barbs).**

3. Please better justify the proposed reductions in intensity on 12 August. A 50 kt ship report at 06Z suggests the intensity could be higher at that time. In addition, while the aircraft- reported pressures of 1002-1005 mb are a poor match for the reported hurricane-force winds, the committee notes that the cyclone was embedded in an area of 1016+ mb external pressures. This suggests the possibility that the cyclone was of hurricane strength at 1800 UTC as currently shown in HURDAT.

**Agreed. The intensities at 8/12 06Z – 18Z are increased to 55, 55 and 65 kt (up from 50, 50 and 50 kt, respectively). The intensities at 00, 06 and 12Z on the 13th are all changed to 65 kt.**

4. While the committee agrees that the original HURDAT peak and landfall intensities likely need reduction, it is concerned about how the multiple 973 mb central pressure estimates were derived, especially since these are 15-20 mb lower than any apparent observed pressure. Please re-examine this and change the landfall/peak intensities if warranted.

**The land/station data has been examined as thoroughly as possible with the available data. Given that there were no observed pressures inside the RMW, it seems difficult or impossible to give an accurate landfall central pressure for this hurricane. The 975 mb central pressure that had been placed into HURDAT at 00Z on the 14th in the first draft is removed.**

**Regarding the 973 mb central pressure derived by the Schloemer equation after the hurricane moved back over water, this equation was only considered trustworthy enough to use if all 4 parameters needed to obtain a central pressure value are known with a high degree of accuracy. This was true in this case because the aircraft reported that the location where the 993 mb (1st parameter) extrapolated pressure was reported was 40 nmi (2nd parameter) from the center, and the RMW (3rd parameter) was reported. The 4th parameter is the environmental pressure, which was obtained from the surface data. The 973 mb central pressure at 18Z on the 14th is retained from the first draft.**

**One final note is that the intensities at 06Z and 12Z on 14 August was changed from 80 to 75 kt, in agreement with the landfall intensities for the 2nd and 3rd landfall and also in agreement with what it says in the metadata summary. There is no evidence to increase the original HURDAT intensity from 70 to 80 kt at 06Z and from 65 to 80 kt at 12Z. Now the intensity is closer to the original HURDAT intensity at those times.**

5. In the metadata summary, the part about Barbara possibly being a Category 2 hurricane is confusing given that the current HURDAT shows a 95 kt landfall intensity and a conflicting category 1 designation. Please re-write this for clarify.

**This has been re-written.**

6. Please remove the term “oceanfall” wherever it may occur.

**Done.**

7. Can any more information be found on the radar fixes made while the center was over North Carolina?

**Unfortunately, no additional information can be found on these radar fixes.**

8. The 15 August daily metadata mentions a possible 986 or 996 mb pressure at 0500 UTC on a microfilm map. First, which pressure is it? Second, which microfilm map is it on? It is not readily apparent on the 0600 UTC map.

**Unfortunately, this cannot be determined definitively. It is very tiny and on the August 15 06Z microfilm map at 40.2N, 70.5W – 35 kt E. We cannot tell if the pressure says “850” or “860” or “950” or “960” or “856” or “956” or “866” or “966”. The first number is either an 8 or a 9. The 2nd number is either a 5 or a 6. The 3rd number is either a 0 or a 6.**

9. The committee does not concur with the proposed earlier time of extratropical transition (ET). The HWM and the microfilm map for 1200 UTC 15 August shows a frontal system well to the northwest of Barbara and little temperature gradient near the center. Indeed, the maps suggest that the front may not have reached the cyclone center until sometime on 16 August. While the storm weakened on 15 August, this could have been due to moving over warm water north of the Gulf Stream as much as to ET. Please re-examine this, including the possibility that ET occurred later than shown in the original HURDAT.

**Agreed to delay the original extratropical transition for Barbara from that shown in the original HURDAT by six hours to 00Z August 16th.**

10. Please contact the Canadian Hurricane Center for any information they may have on this system. That could help pin down the time of ET.

**The Canadian Hurricane Center has been contacted, but they have no additional information regarding this system.**

1953 Storm #4, Unnamed:

 1. What is the relevance of the quote about the Navy plane on 29 August?

**The quote has been removed.**

 2. Please re-examine the genesis location and time of this system. The system is supposed to have originated from an area of weak cyclonic turning near the Isle of Pines on 28 August. However, the various maps – especially the HWM – suggest that this area of turning was still south of western Cuba on 29 August and over the southeastern Gulf of Mexico on 30 August. The maps suggest that instead that a) the cyclone possibly originated from an area of cyclonic turning over the Gulf of Mexico north of western Cuba (as depicted by the 1200 UTC 29 August microfilm map) or b) originated near or over south Florida (as depicted on the 1200 and 1800 UTC 29 August microfilm maps. Either way, the maps do not appear to support either the original HURDAT track or the proposed revisions prior to 30 August.

**Agreed to delay genesis by 24 hours, compared to the original HURDAT. Numerous observations indicate that the system did not produce any tropical storm force winds during the 28th or 29th, nor did not obtained a closed circulation until 18Z on the 29th while over south Florida. Genesis is thus delayed by 24 hours and is started as a 25 kt tropical depression. This revision is also consistent with the Cuban assessment in Perez et al., as they did not consider this system as a tropical storm for Cuba. (There is no basis for the 985 mb central pressure listed in HURDAT at 12Z on the 29th, and it is removed since there are substantial amounts of data that indicate that the cyclone was only a tropical disturbance with lowest pressures of around 1010 mb at that time.)**

 3. Pending the resolution of the genesis issues, the committee concurs with the proposed downgrade in intensity as the cyclone crossed Cuba and Florida. However, the submission needs to document what the maximum observed winds were in those places – even if they are below tropical-storm force.

**The highest observed winds from the system while a disturbance over/near Cuba on the 28th and early 29th are 15 kt. The highest observed winds from the system while over/near Florida on the 29th and early 30th are 20 kt.**

 4. What is the basis for upgrading this system to a tropical storm at the Georgia landfall? Is there any data other than the Climatological Data description that indicates tropical-storm conditions in Georgia? Please provide the relevant observations or use the depression intensity from the current HURDAT.

**The 30 kt wind observation at 12Z on the 1st was the justification in the first draft. It is agreed that this is not enough to justify an upgrade to a tropical storm for Georgia. The intensity at 06Z on the 1st is changed back to 30 kt and no tropical storm impact is analyzed for Georgia.**

 5. Is it known how and when this system was included in HURDAT to begin with? It was not in the original Monthly Weather Review article in 1953, and given the data the committee would hesitate to add it if it were not already in HURDAT.

**This system was first added as a tropical storm in the Cry et al. (1959) Technical Memo. Another contemporary climatological account was Tannehill (1956) with seasonal summaries. Tannehill, however, did not include this system. Why Cry decided to include this as a new tropical storm was not discussed in his tech memo and will likely remain a mystery.**

1953 Storm #5, Carol:

 1. In the excerpt from the ATS report in the 2 September metadata, the sea level pressure is given as 994 mb. Is this a typo in either the submission or the original ATS report?

**This was a typo in the submission and has been corrected to 944 mb.**

 2. The committee concurs with the upgrade to Category 5 at peak intensity. Perhaps it would be appropriate to add a comment about how Carol at this time may have been similar to Andrew of 1992 or Felix of 2007?

**This sentence has been added.**

2a. On a related note, can a central pressure be found or estimated for the Air Force fix on the morning of 3 September, when the eye was also 3-8 n mi wide? It is noted that there is supposed to be a page in the Annual Tropical Storm Report listing all of the aircraft fixes from Carol (see a note on page 59), but this page cannot be located.

**Unfortunately, a central pressure cannot be located from the September 3rd morning fix from the Air Force.**

 3. In the metadata summary, please remove or re-write the comment about “reanalyzed for this thesis”. The thesis part is not relevant here.

**This sentence has been deleted.**

 4. The committee also concurs with the removal of the hurricane impact in Maine, pending data showing that the radius of maximum winds (RMW) was east of the Maine coast.

**Agreed.**

**Hourly observations of wind speed and direction were obtained from Eastport from the EDADS website under “Surface Weather Observations” typing in 09/07/1953 for date and “ME” for state. Here are some relevant obs (time in EST):**

**10-11 am: 32 mph NE**

**11am – noon: 38 mph NE**

**11:58 am EST: 48 mph NE (max w - fastest mile)**

**noon – 1pm: 32 mph NE**

**1-2 pm: 25 mph NE**

**2-3 pm: 22 mph N**

**3:10 pm: 988.7 mb (min p)**

**3-4 pm: 22 mph NW**

**4-5 pm: 22 mph NW**

**5-6 pm: 16 mph NW**

**These indicate that the left-side RMW went through Eastport at 1658Z (11:58 am) with the minimum pressure recorded later (2010Z). However, the right-side RMW with the strongest winds likely was on the order of 100 nm east of the Maine coast. But this evidence from Eastport, since it is the farthest east geographic location and the max winds were only 42 kt, this is enough evidence to remove Carol as a hurricane for Maine. Moreover, impacts described in the New England Climatological Data are also consistent with tropical storm effects.**

 5. Has the Canadian Hurricane Center been contacted for more data on this system in Canada? This could help with the intensity and the ET timing.

**The Canadian Hurricane Center (Chris Fogarty) has been contacted. However, they have been unable to provide any additional Canadian observations or impacts for this system.**

 6. In the metadata summary regarding 6 September, “An 85 kt intensity is chosen…”. Please re-write this to better state that the chosen intensity is below that of the wind-pressure relationships, but above the original HURDAT intensity.

**This has been re-written.**

1953 Storm #6, Dolly:

 1. Are the central pressures in the proposed HURDAT record for 10 September correct? Should the 999 mb at 1800 UTC that day be 989 mb?

**The central pressure should be 989 mb. 999 mb was a typo.**

 2. Please re-examine the intensities on 9-10 September, especially the 50 kt intensity at 1800 UTC 9 September. Do the multiple reports of 45 kt winds at a distance from the center suggest the possibility of a higher intensity at that time?

**The intensity with Dolly on the 9th and 10th is very confusing because the ship and aircraft data is conflicting. We chose to believe the 1005 mb aircraft central pressure on the 9th at 1345Z while disregarding the 999 mb with 30 kt from the ship Valencia at 2330Z on the 8th. Given the possibility that it was stronger, especially given the two 45 kt winds at a distance from the center, the intensities at 9/9 12-18Z have been increased by 5 kts from the first draft. The intensities at 9/10 00Z through 9/10 12Z are also increased by 5 kts from the first draft.**

 3. While it appears the 998 mb reported at Bermuda was the minimum pressure, could you please contact the Bermuda Meteorological Service to double check this?

**The Bermuda Meteorological Service (Ian Currie and Kimberley Zuill) has been contacted regarding Dolly. They confirmed the 998 mb observation, but had no further useful measurements.**

 4. The committee concurs with the other proposed changes for this system, pending the resolution of point 2.

**Thank you.**

1953 Storm #7 (new) **(now in Additional Notes)**:

 1. The committee does **not** concur with adding this system at this time. While the system is intriguing, the case for calling this a tropical cyclone does not appear to be strong enough given the synoptic pattern the cyclone was embedded in and the extraordinarily high latitude at which it forms. If this system were to be accepted into HURDAT, would it be a record for the farthest north case of tropical cyclogenesis in the Atlantic basin?

**Agreed. This system has been moved to the additional notes section.**

 2. A possible analog for this cyclone might be the Redskins Playoff Game storm of January 1992 near the east coast of the United States. That storm had some of the wind and convective structure characteristics of a tropical cyclone. However, it formed in the northeastern quadrant of a large deep-layer baroclinic low, which made it unclear just how tropical it was.

**This 1992 analog has been mentioned in the summary for the system.**

1953 Storm #8, Edna **(now #7):**

 1. What is the NW wind mentioned by Truchelut in the 12 September daily metadata? Note that no map is available for this date in the scanned material, and the committee would like to have maps for 11-13 September for this storm.

**The NW wind mentioned by Truchelut at 06Z on the 12th had to have been the 10 kt NW with 1012 at 7.5N, 52.8W (COA). Maps have now been made available back to 11 September. Note that the microfilm maps begin around 60W in the early 1950s era.**

 2. Please re-examine the proposed changes to the genesis. While instant development from a wave to a storm has been observed, it would be more normal to have the gradual development from a tropical depression shown in the original HURDAT. Are detailed data for the aircraft mission on 14 September available? If so, can they be analyzed to see if the aircraft actually found the center? In addition, the 1800 UTC 14 September microfilm map shows two ships with 10 kt winds and pressures of 1008 mb, indicating a possible central pressure of 1007 mb – several mb lower than the surrounding pressures. This might justify calling the system a depression at that time.

**After a reexamination of the data, the aircraft observations plotted on the 14 September 18 UTC microfilm map indicate that there were NE surface and flight-level winds in a location where there would have been west or northwest winds had a closed circulation existed. The system is analyzed to be a 45 kt tropical wave at 18Z on 14 September. The pressure gradient in the northern semicircle as well as WSW of the supposed “center” was about 4.5 mb / 120 NM. South of the supposed “center”, the pressure gradient is more gradual. Based on the analysis and reexamination, no additional changes have been made.**

 3. In the metadata summary, a section discusses the aircraft mission late on 16 September. While the eye of the hurricane was reported as not being well defined, it was described as 20 miles across and elliptical. Also, the two fix positions were fairly close together despite the apparently difficulty in finding the center. Why, then, would the 969 mb pressure be treated as an “upper bound”? Please re-evaluate the intensity assuming that the 969 mb is a good central pressure.

**The quote about the eye being 20 miles across and elliptical was “determined by radar observation.” This means that they might not have been inside the eye when they reported this. The 969 mb was a dropsonde surface pressure. The dropsonde is believed to have been dropped from a flight-level of 500 mb. Dropsondes in this era had no wind data or position data. How can we be sure that the dropsonde splashed in the eye? I think it is safe to assume that the 969 mb was either the central pressure, or probably close to the central pressure, assuming they were trying to hit the center of the eye with the dropsonde. 969 mb is added as a central pressure at 18Z on the 16th. No changes are made to the revised wind speeds, however a few words have been changed in the metadata summary to reflect this change.**

 4. The committee concurs with the rest of the proposed changes.

**Agreed.**

1953 Storm #9, Unnamed **(now #8)**:

 1. Can it be determined when this system was added to HURDAT and why it was given an intensity of 60 kt? It seems very strange that the hurricane forecasters of this era would ignore a system in the Gulf of Mexico heading for Florida.

**It is unusual that the forecasters would not be issuing advisories on this system. Perhaps it is because at the same time Edna was occurring and threatening the U.S. East Coast. This system was first added as a tropical storm in the Cry et al. (1959) Technical Memo. Another contemporary climatological account was Tannehill (1956) with seasonal summaries. Tannehill, however, did not include this system. Why Cry decided to include this as a new tropical storm was not discussed in his tech memo and will likely remain a mystery.**

2. The microfilm data shows a summary from a recon flight into the system on 15 September. This is included in the metadata summary but not the daily metadata. Please include it there.

**This has now been included in the daily metadata paragraph for 15 September.**

 3. The committee concurs with the delayed genesis.

**Agreed.**

 4. Since there were 3 separate 40 kt ship reports, is it possible that the cyclone reached a peak intensity of 45 kt?

**Agreed to now indicate a 45 kt intensity from 12Z on the 16th through 00Z on the 17th.**

 5. Please state the basis for calling the cyclone a tropical storm on 20 September and at landfall in Florida on 21 September. There do not seem to be any observations of tropical-storm force winds. In addition, while the central pressures are low, the cyclone has a large pressure field that suggests the winds could be lower than those suggested by the wind-relationships. Please provide a basis for the upgrade or keep the system a depression through landfall.

**The landfall intensity was not upgraded. It was downgraded from 50 kt (original HURDAT point before landfall) to 35 kt (revised HURDAT landfall intensity). Although there were no observed tropical storm force winds, there is not enough evidence to downgrade it to a tropical depression. No additional changes have been made.**

1953 Storm #10, Florence **(now #9)**:

 1. Please provide scanned maps for the pre-genesis period.

**The HWM and microfilm maps have now been provided for 00Z 22nd onward. These do not indicate an earlier genesis.**

 2. Please re-examine the genesis of this system. The maps for 1200 UTC 23 September suggest a vorticity center or wind shift is near 15N 78W (related to the ITCZ or monsoon trough), while the low analyzed near the proposed genesis location of Florence has three strong southeasterly winds blowing into it and no obvious circulation or vorticity. Is it possible that the real genesis location is to the southwest of what is currently in HURDAT?

**Agreed to make a shift to 15N 78W at 12Z on the 23rd for genesis of this system. This results in a major change to the track of the cyclone.**

 3. What was the nature of the fix obtained by the Navy aircraft at 2030 UTC 25 September? Was it by radar or by penetration?

**It is unknown whether the Navy fix was a radar or penetration fix. However, no central pressure was available at this time.**

 4. The intensities from 0600 UTC 25 September to 0000 UTC 26 September may have been reduced too much. The last aircraft fix that reported a central pressure was at 1346 UTC 25 September, at which time the hurricane was rapidly intensifying. While this trend stopped before landfall, there does not appear to be sufficient the data to rule out the cyclone reaching major hurricane intensity around 1800 UTC that day. Please re-evaluate the intensities using a peak of 100 kt at that time, unless there is clear evidence that the 968 mb pressure was at the peak intensity.

**Agreed. The intensities from 9/25 18Z through 9/26 06Z have been increased from the first draft. Intensities at these times are now 100, 95 and 90 kt (90, 90 and 85 in the first draft of the reanalysis).**

 5. The committee does **not** concur with the proposed 975 mb landfall pressure, which is based on backing the pressure out of the wind-pressure relationship. Given the lack of winds or pressures near the center, there is no way to determine how good the proposed 80 kt landfall intensity is, and thus it should not be used to estimate the pressure. Please delete the pressure and the associated discussion in the metadata summary. Also, in this discussion, please find some better scientific term than “spit out” to describe the results of the inland decay analysis.

**The 975 mb central pressure in the first draft has been removed from the 18Z HURDAT slot. The phrase “spit out” has been replaced by the word “yielded.”**

 5a. On a related note, the Climatological Data National Summary reports a minimum pressure of 990.9 mb in DeFuniak Springs, Florida about 11:00 AM local time. It also notes a 30-40 minute lull that suggests an eye passage, although the time of the lull is not mentioned. Can this information be used to estimate the landfall RMW and minimum pressure? Does the proposed track go over DeFuniak Springs?

**We obtained all available hourly Surface Weather Observations from the EV2 website (including Eglin AFB in Valpariso, Tyndall AFB in Panama City, Panama City Airport, and Crestview Airport) for a more accurate determination of a 15Z landfall near 30.3N 86.2W. The revised track did (and still does) go over De Funiak Springs. Unfortunately, the hourly De Funiak Springs observations were not available. As the committee points out, it is ambiguous from the Climatological Data National Summary whether the 991 mb value was actually measured during the lull. A run of the Ho et al. inland decay pressure model assuming the 991 mb was in the eye only gives only about a 989 mb central pressure at landfall, from a 1-2 hour transit from the coast to De Funiak Springs. This is not consistent with the 993 mb with 40 kt NNW winds (over land exposure) measured at 1630Z at Valpariso (Eglin AFB), a location closer to the coast yet later in time to the De Funiak Springs, as the Valpariso observations would suggest a substantially lower central pressure. Moreover, a 989 mb central pressure would suggest only 61 kt from the Brown et al. north of 25N and only 58 kt north of 25N weakening subset pressure-wind relationships. Given a low environmental pressure (1008 mb), likely large RMW (at least 30 nm from the 76 kt at Panama City Airport observation), and relatively slow (~9 kt) forward speed, one would arrive at a maximum wind of only 50-55 kt from these considerations, which is much lower than the 76 kt observed. Thus it appears that the De Funiak Springs 991 mb was likely observed at 16Z, but that lower pressure (but not recorded for some reason) and the 30-40 minute lull occurred later. The hurricane is thus still listed as an 80 kt Category 1 at landfall in northwest Florida.**

 6. The committee concurs with the proposed earlier dissipation.

**Agreed.**

1953 Storm #11, Gail **(now #10)**:

 1. The 3 October metadata mentions the ship S. S. Thorbjorg which passed near the center. The 986 mb reported pressure is being treated as a central pressure. Can it be determined that the ship was in the eye at the time and not somewhere else in the central core?

**Although no sources say that they experienced the calm center, one source says that the ship reported a minimum pressure of 986 mb. Another source states the ship reported 44 kt with a simultaneous 991 mb, while at a different time, the ship estimated peak winds around 65-70 kt. This source implies that the 991 mb with the 44 kt was likely measured inside the RMW. This, taken together with the other source that states a min pressure of 986 mb, is enough to believe that the central pressure of Gail was about 986 mb.**

 2. In the metadata summary, there is “Gail was picked up by a westward moving trough or cold front”. Should this be eastward moving?

**Yes, westward has been changed to eastward.**

 3. The committee concurs with the proposed merging of Gail and the original storm #11. Can any explanation be found of why this was not done to begin with, given what was in the Navy report on the storm?

**Interestingly, Tannehill (1956) displayed in his book a track for this system, which had a merged track quite similar to that reanalyzed here including extension of the track through October 11th. Cry et al. (1959), however, first indicated two separate systems, which is what had been in HURDAT. Why Tannehill’s solution of a merged track was not accepted is unknown and will likely remain a mystery.**

 4. The committee concurs with the remainder of the proposed changes.

**Thank you.**

1953 Storm #12, Unnamed **(now #11)**:

 1. In the 8 October daily metadata there is a comment “[which I believe is Storm 10]”. Please remove this unless it is necessary.

**This has been removed.**

 2. The committee concurs with the remainder of the proposed changes, including the earlier dissipation.

**Thank you.**

 3. Near the end of the metadata discussion, replace “circulation became extremely elongate” with “circulation became extremely elongated” and replace “west of southwest” to “west or southwest”.

**These changes have been made.**

1953 Storm #13, Hazel (**now #12)**

**The pre-genesis maps for Hazel have been added in. However, these do not suggest any changes are needed for the timing of genesis.**

 1. Is a landfall RMW for Florida available? If so, please add it to the landfall lines at the start of the submission. There is a mention in the metadata summary that the RMW was likely smaller than average, but the value is not explicitly stated.

**The wind and pressure data from the Climatological Data National Summary indicate that the RMW was quite small – around 10 nm (perhaps even 5 nm), due to simultaneous maximum winds/minimum pressures at Captiva, Ft. Myers, Lake Placid, Okeechobee, and Fort Pierce. None of these stations (with the possible exception of Ft. Myers) were inside the RMW despite the center passing between 10 and 20 nm from each of these stations.**

 2. The data table in the Climatological Data National Summary has information that does not seem to be in the spreadsheet or in the submission. These include:

 a. Captiva, Florida reported a minimum pressure of 990.6 mb at 10:50 AM local time, which is also the time given for the reported maximum sustained winds.

 b. The time of the minimum pressure in Okeechobee City, Florida is given as 3 PM local time, which is also the time of the reported maximum sustained winds.

 c. Fort Pierce, Florida reported a minimum pressure of 990.9 mb at 4:15 local time, which is 5 minutes after the reported maximum sustained winds. The table says a significant wind shift occurred at the time of lowest pressure, with the center likely 4-8 miles north of the station.

 It appears that all of these stations were south of the actual center, and the table does not mention any lulls at the stations. The table states that all of the pressures were reduced to sea level.

**All of these data have now been added into the daily summary and the excel spreadsheets.**

 3. Please find the detailed observations from these three stations. While the new data strengthens the case that this cyclone was a hurricane at landfall, the reports of tornadoes in the Okeechobee City area suggests additional analysis are required to determine the source of the observed conditions.

**Of these stations, only one – Fort Pierce – had hourly observations available via the EV2 website. It is possible that the reported “tornadoes” in St. James City on Pine Island and near Okeechobee City were instead direct effects of the hurricane’s wind along with a very small RMW.**

 4. In addition, please find whatever detailed observations are available from the Punta Gorda/Port Charlotte area and from Vero Beach. These should not be limited to standard meteorological sources, but should also include whatever newspaper accounts of the storm may be available. Such data should help refine the track across Florida as well as the intensity.

**No observations were available from Punta Gorda/Port Charlotte. Hourly observations were obtained from Vero Beach, which suggested that the center went very close or right over the station as the cyclone was making oceanfall. Unfortunately, these were hourly observations: 25 kt ESE and 998 mb at 2026Z, 15 kt NNE and 993 mb at 2125Z, and 15 kt WSW and 997 mb at 2226Z. A lower minimum pressure could have occurred at this station, but was not recorded. Obtaining local newspaper accounts is beyond the scope of this project. However, the additional information from the National Climatic Data Summary and the station data from EV2 have allowed for a much more accurate determination of the track and intensity of Hazel.**

 5. The table includes a note about Arcadia, Florida experiencing a lull between 1:45 and 2:08 PM local time, with the wind shifting from north to west. However, the lowest pressure in Arcadia was 997.7 mb, which is inconsistent with the other pressures near the center. The table also states a lull occurred in Fort Myers, Florida about 20 minutes prior to the lowest pressure and the maximum winds. However, data from the other stations mentioned above suggests this was not due to an eye passage.

**Agreed. This information is now included in the writeup.**

 6. Can some of the kinks in the track during the extratropical phase on 13-16 October be smoothed out?

**Agreed, smoothed.**

 7. In the metadata summary, please replace “Punda Gorda” with “Punta Gorda”.

**Done.**

1953, Storm #14, Unnamed **(now #13):**

 1. The committee notes that at 1800 UTC 24 November, the proposed revision uses the aircraft-measured pressure. However, it is about 90 n mi from the aircraft-reported center position as shown in the daily metadata. Why did this happen, and does one of the positions need correcting?

**The proposed revised HURDAT position was actually about 60 nmi front the aircraft-reported center shown in the daily metadata. Agreed to move 18Z position on the 4th two-tenths of a degree farther north and 00Z position on 5th one-tenth of a degree farther north. The new proposed revised HURDAT position is now about 45-50 miles from the aircraft fix. Average position error for aircraft is this era is 30 nmi. Due to the ship observations in the area, we are unable to make changes much larger than that. Although ship observations could have suffered from navigation error too, there is no reason to believe the ship navigation error would be greater than the aircraft navigation error in this area.**

 2. The committee otherwise concurs with the proposed changes.

**Thank you.**

1953, Storm #15, Irene **(now #14):**

 1. It is interesting that this storm was named in real time, yet is not included on the Monthly Weather Review summary of the season. Can it be determined if that summary was written before Irene developed?

**The MWR summary was written in the December, 1953. Thus it is likely that the seasonal summary article was written and submitted prior to Irene.**

 2. The committee concurs with the proposed change in intensity on 8 December since the reported combination of winds and pressures from the ship “Esso Fawley” supports a central pressure near 995 mb. However, it is concerned that the winds were originally reported in Beaufort scale numbers instead of measured values. Have the winds from this ship been quality controlled?

**All of the winds in COADS from 1850s through the 1950s were converted from the Beaufort number to a numerical wind speed value. The Beaufort scale is what we’ve been using for the entire HURDAT reanalysis for ship winds. Unfortunately, there are no other ships near the Esso Fawley that would allow for an intercomparison to quality control the observations.**

 3. The committee otherwise concurs with the proposed changes.

**Thank you.**

1953 Additional Notes:

 1. Suspect #3: Please re-examine this case and provide a complete set of scanned maps, along with the hourly data records for Galveston, Texas, Port Arthur, Texas, and Lake Charles, Louisiana. There is no obvious indication that a tropical storm moved ashore in Louisiana or southeastern Texas at this time, and none of the various climatological data publications (with one exception) mention a disturbance. That being said:

**Hourly records were obtained for the Galveston city office, the Galveston airport office, the Port Arthur WBAS office, the Lake Charles WBAS office, the Houston city office, the Houston WBAS office, and the Ellington AFB. Additional plots were made of the COADS data appended to the HWM maps.**

The committee notes 1) the wind reports from the Texas coast and the 30 kt ship report over the Gulf,

**After examination of the tropical storm force wind reports from Galveston and Port Arthur, these are clearly transient events associated with thunderstorms moving through. Winds before and after were substantially weaker. There was one 30 kt ship report on the 25th, three on the 26th, one on the 27th, none on the 28th, and one on the 29th. A closed low could only be confirmed on the 26th. It is also noted that there was no pressure minimum recorded at any of these stations late on the 28th/early on the 29th, when the system may have made landfall.**

2) the 28 June HWM shows a ship with 20 kt winds and a 1007.5(?) mb pressure in the central Gulf of Mexico, and

**The HWM showed 15 mph (10 kt) and 1009.5 mb. COADS indicated 10 kt and 1010 mb.**

3) the 29 June HWM shows a Texas coastal station (Houston?) with north winds 15 kt and a pressure of 1010 mb, while Lake Charles, Louisiana has a pressure of 1016 mb. For the second two points, a rather strong pressure gradient is occurring to the east of the obs, and the 29 June obs hint that a small low could have been over the upper Texas coast between Houston and Lake Charles.

**The HWM plotted the Galveston airport station incorrectly. The 12Z Galveston observation was in reality S 14 kt and 1014 mb; Houston was SE 16 kt and 1014 mb; Ellington was SW 15 kt and 1015 mb; Port Arthur was SE 16 kt and 1016 mb; Lake Charles was E 9 kt and 1016 mb. Thus a trough or weak low was inland over southeastern Texas by 12Z on the 29th.**

The committee also notes that the Climatological Data National Summary mentions a rise in the Atchafalaya River at Morgan City, Louisiana, on 28 June caused by winds and tides in the Gulf of Mexico. These points suggest the possibility of a tropical storm.

**This has been added into the writeup.**

An extra complication is that the 28 June HWM shows a trough extending from the Gulf of Mexico northeastward into Louisiana, where another low or vorticity center may have been present.

**This has also been added into the writeup.**

**The bottom line is that there is** **considerable evidence that the system was a tropical depression, but no evidence either from winds or pressures that the system was a tropical storm.**

 2. Suspect #6: Please provide a complete set of scanned maps for this case.

**The COADS observations have now been annotated onto these maps.**

 3. There are three scanned maps in the Suspects folder for early October that do not relate to any system in the Additional Notes. What are these maps showing?

**These were from a suspect in the northeastern Atlantic, which was investigated but it was decided that the system was too baroclinic to mention in the Additional Notes section.**

 4. The committee concurs with leaving the remainder of the suspect systems out of HURDAT.

**Thank you.**