Tropical Cyclone Report
Tropical Storm Beryl
(AL022012)
26 - 30 May 2012

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Beryl was a pre-season tropical storm that made landfall in northeastern Florida and subsequently affected portions of the southeastern United States. It was the strongest pre-season tropical cyclone of record to make landfall in the United States.

a. Synoptic History

Beryl had a lengthy and complex genesis. A trough of low pressure formed over the Yucatan Peninsula of Mexico on 16 May. This system drifted slowly eastward into the northwestern Caribbean Sea during the next three days, with a weak low pressure area forming over the Gulf of Honduras on 18 May. Little development occurred as the system persisted near the east coast of the Yucatan Peninsula through 21 May, but the low became better defined on 22 May when it began a northeastward motion that included several reformations of the center.

On 24 May, the low accelerated northeastward over the Florida Keys and southeastern Florida accompanied by gale-force winds. However, strong southwesterly vertical wind shear inhibited the formation of organized deep convection. Early on 25 May, the system interacted with a mid/upper-level cold low to the northeast of the Bahamas, which resulted in the center reforming to the northeast during the day. Gale-force winds developed over a small area near the center, accompanied by organized deep convection, and it is estimated that the system became a subtropical storm near 0000 UTC 26 May about 290 n mi east of Jacksonville, Florida. The "best track" chart of Beryl's path is given in Fig. 1, with the wind and pressure histories shown in Figs. 2 and 3, respectively. The best track positions and intensities are listed in Table 1[1].

Beryl was moving northward at the time of genesis. Shortly thereafter, its forward motion slowed as it became vertically aligned with the upper-level low. The cyclone turned southwestward on 26 May as pressures rose in a low/mid-level ridge to the north, and this was followed by a faster west-southwestward to westward motion on 27 May. Little change in strength occurred on 26 May as the storm entrained dry air that disrupted the convection. On 27 May, the convection became more persistent, anticyclonic outflow developed, and the temperatures in the core increased. With these changes, Beryl became a tropical storm, and it reached a peak intensity of 60 kt late that day. Some weakening occurred early on 28 May, and

[1] A digital record of the complete best track, including wind radii, can be found on line at ftp://ftp.nhc.noaa.gov/atcf. Data for the current year's storms are located in the *btk* directory, while previous years' data are located in the *archive* directory.

Beryl made landfall around 0410 UTC that day near Jacksonville Beach, Florida as a 55-kt tropical storm.

After landfall, Beryl weakened to a tropical depression as it moved west-northwestward across northeastern Florida at a decreasing forward speed. A mid/upper-level trough moving into the eastern United States then weakened the ridge and allowed Beryl to recurve northeastward later that day. This motion brought the center across southeastern Georgia and into southern South Carolina early on 30 May. The cyclone intensified as it approached the coast, and it regained tropical-storm status around 0600 UTC that day. Beryl accelerated northeastward along the coasts of South and North Carolina while gradually losing its deep convection, becoming post-tropical due to the lack of convection around 1800 UTC 30 May while the center was near the North Carolina coast.

The post-tropical cyclone moved east-northeastward into the open Atlantic, and it became extratropical near 0000 UTC 1 June while located about midway between Bermuda and Nova Scotia. The extratropical low turned east-southeastward on 2 June before being absorbed by a larger low early the next day.

b. Meteorological Statistics

Observations in Beryl (Figs. 2 and 3) include subjective satellite-based Dvorak and Hebert-Poteat technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB) and the Satellite Analysis Branch (SAB), as well as objective Advanced Dvorak Technique (ADT) estimates from the Cooperative Institute for Meteorological Satellite Studies/University of Wisconsin-Madison. Observations also include flight-level, stepped frequency microwave radiometer (SFMR), and dropwindsonde observations from flights of the 53rd Weather Reconnaissance Squadron of the U. S. Air Force Reserve Command. Data and imagery from NOAA polar-orbiting satellites including the Advanced Microwave Sounding Unit (AMSU), the NASA Tropical Rainfall Measuring Mission (TRMM), the European Space Agency's Advanced Scatterometer (ASCAT), the Indian Oceansat Scatterometer (OSCAT), and Defense Meteorological Satellite Program (DMSP) satellites, among others, were also useful in constructing the best track of Beryl.

The 53rd Weather Reconnaissance Squadron made three flights into Beryl with seven center fixes. The maximum flight-level winds at 850 mb were 80 kt at 2352 UTC 27 May and the maximum bias-corrected surface wind estimate from the SFMR was 55 kt. The lowest pressure reported by the aircraft was 992 mb at 2259 UTC 27 May.

Ship reports of winds of tropical-storm force associated with Beryl are given in Table 2, and selected surface observations from land stations and data buoys are given in Table 3. Beryl brought tropical-storm conditions to portions of northeastern Florida and southeastern Georgia on 27-28 May. On land, a Weatherflow station at Huguenot Park, Florida (near Jacksonville), reported sustained winds of 47 kt at 0110 UTC 28 May, while a second Weatherflow station at Buck Island, Florida, reported a wind gust of 63 kt 25 min later. The lowest pressure on land was 995.0 mb at a WeatherUnderground station in Atlantic Beach, Florida at 0359 UTC 28 May.

Tropical-storm-force wind gusts occurred along the coast of South Carolina and southern North Carolina on 30 May as Beryl passed over that area. After Beryl became post-tropical, gale-force winds occurred along portions of the North Carolina Outer Banks. A Weatherflow station at Jennettes Pier, North Carolina, reported sustained winds of 42 kt at 2045 UTC 30 May with a peak gust of 55 kt. The National Ocean Service (NOS) station at Cape Hatteras, North Carolina, reported 6-min mean winds of 41 kt at 2248 UTC 30 May with a peak gust of 48 kt. The lowest pressure measured during Beryl's passage along the southeastern U. S. coast was 994.0 mb from two Weatherflow stations along the North Carolina coast.

At sea, the center of Beryl passed over NOAA buoy 41012, which reported 10-min mean winds of 44 kt at 2200 UTC 27 May and a peak gust of 58 kt. The lowest pressure at the buoy was 994.6 mb at 2150 UTC 27 May. Two of the ship reports require some additional comment. First, the strongest wind reported by a ship was 50 kt from the *Norwegian Gem* (call sign C6VG8) at 1000 UTC 28 May. However, this report was after landfall, at a location about 150 n mi from the center, and at an elevation of 51 m, so its representativeness is unknown. Second, a ship with the call sign H3VU reported 45-kt winds at 1500 UTC 26 May. This report appears to be too high when compared to nearby buoy data.

Beryl produced storm surges of generally 1-3 ft above normal tide levels along portions of the northeastern Florida and southeastern Georgia coasts on 27-28 May, with the highest reported surge being 3.73 ft above normal tide levels at the NOS station at Fernandina Beach, Florida. These surges resulted in maximum inundations of 2-3 ft above ground level. Storm surges of 1-3 ft above normal tide levels also occurred along portions of the coasts of South and North Carolina on 30 May, which resulted in an inundation of about 1 ft above ground level.

Beryl produced rainfall totals of 3-7 in, with isolated heavier amounts, from northeastern Florida across southeastern Georgia and southern South Carolina into eastern North Carolina. An area of rains with totals in excess of 10 in occurred over northern Florida, with Wellborn reporting a storm total of 15.00 in. The rain caused minor inland flooding. The pre-Beryl disturbance caused widespread heavy rains in central Cuba, with 24-h rainfalls on 23-24 May exceeding 4 inches in many locations. The maximum reported rainfall in Cuba was 21.93 in at Puerto Pesquero de Casilda in the state of Sancti Spiritus.

Beryl produced four known tornadoes. An EF-1 tornado near Truttney's Landing, North Carolina, on 30 May destroyed three mobile homes and damaged over 60 other homes. Another EF-1 tornado occurred near Holly Hill, South Carolina, on 29 May. EF-0 tornadoes occurred near Port St. Lucie, Florida, on 28 May and near Yankeetown, Florida, on 29 May.

Beryl's initial designation as a subtropical storm is based on its proximity to the upper-level cold low at genesis and the subsequent alignment of the two systems. The ensuing transformation to a tropical cyclone is based on the formation of anticyclonic outflow seen in animated satellite imagery and the warming of the core temperatures seen in AMSU data.

Beryl's analyzed peak intensity of 60 kt is based mainly on a blend of the aircraft flight-level winds and bias corrected SFMR estimates. The Jacksonville WSR-88D observed Doppler radar winds of 80-85 kt between 4000-8000 ft near the time and location of the maximum aircraft winds. While the data does not support an after-the-event upgrade, the radar winds suggest the possibility that Beryl briefly became a hurricane late on 27 May.

Operationally, Beryl was designated a tropical depression while the center moved along the southeastern coast of the United States. Although ship reports of tropical-storm-force winds were received in real time, it was unclear how representative they were. Experimental data from the Indian OSCAT scatterometer received later suggests the ship reports were representative, and thus Beryl has been designated a tropical storm in the post-analysis on 30 May. The re-intensification is likely due to a combination of an increase in forward motion and baroclinic forcing from the eastern U. S. trough, which caused the winds to increase before Beryl lost tropical cyclone characteristics.

c. Casualty and Damage Statistics

Beryl directly caused one death[2] when a severe thunderstorm associated with the cyclone blew down a tree onto an SUV in Orangeburg County, South Carolina, killing the occupant. The storm caused minor property damage in the United States, but the insured amounts were less than the $25 million dollar threshold used by the Property Claims Service to declare a catastrophe. Thus, an estimated damage figure is not available.

d. Forecast and Warning Critique

The genesis of Beryl was generally well anticipated. Special Tropical Weather Outlooks on the out-of-season disturbance were first issued on 23 May, at which time the system was given a low (less than 30 %) chance of development during the next 48 hours. Later outlooks increased the chances for development, with the system being given a high (greater than 50%) chance about 24 h before genesis occurred.

A verification of NHC official track forecasts for Beryl is given in Table 4a. Official forecast track errors were significantly lower than the mean official errors for the previous 5-yr period. The NHC forecasts consistently did a good job of showing the various changes in direction that Beryl would make, as well as forecasting the landfall area in northeastern Florida. A homogeneous comparison of the official track errors with selected guidance models is given in Table 4b. As good as the NHC track forecasts were, the forecast from the consensus aids TCON, TVCA, TVCE, and GUNA were better than the official forecasts at almost all times. The NHC forecasts were generally better than the dynamical model forecasts.

A verification of NHC official intensity forecasts for Beryl is given in Table 5a. Official forecast intensity errors were lower than the mean official errors for the previous 5-yr period.

[2] Deaths occurring as a direct result of the forces of the tropical cyclone are referred to as "direct" deaths. These would include those persons who drowned in storm surge, rough seas, rip currents, and freshwater floods. Direct deaths also include casualties resulting from lightning and wind-related events (e.g., collapsing structures). Deaths occurring from such factors as heart attacks, house fires, electrocutions from downed power lines, vehicle accidents on wet roads, etc., are considered "indirect" deaths.

The NHC forecasts correctly indicated that Beryl would stay below hurricane strength before reaching northeastern Florida, and that the cyclone would re-intensify to a tropical storm while moving over the southeastern U. S. coast. However, they underestimated how much strengthening would occur before the Florida landfall. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 5b, which shows that several of the intensity forecast aids outperformed the NHC forecasts during the 24-96 h period. The objective aids performed very well at 72 h, where their average errors were 5 kt or less.

Watches and warnings associated with Beryl are given in Table 6. A tropical storm warning was issued for the landfall area in northeastern Florida 49 h before landfall. It should be noted that tropical storm watches and warnings were not issued for portions of the southeastern U. S. coast as Beryl passed near or over it on 30 May even though the cyclone was forecast to regain tropical-storm status. This was in anticipation that the strongest winds would remain south of the coastal areas, which proved correct during the time that the system was a tropical cyclone.

Acknowledgements

Much of the data in this report was furnished by the National Weather Service Forecast Offices in Melbourne, Florida; Jacksonville, Florida; Charleston, South Carolina; Wilmington, North Carolina; and Morehead City, North Carolina. David Roth of the Hydrometeorological Prediction Center in College Park, Maryland provided additional rainfall data for the United States. Jay Titlow of Weatherflow provded the Weatherflow data, while Jeff Masters of the WeatherUnderground provided the WeatherUnderground data. The Meteorological Service of Cuba provided the rainfall data from Cuba.

Table 1. Best track for Tropical Storm Beryl, 26 - 30 May 2012.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
25 / 1200	30.1	76.1	1010	30	low
25 / 1800	31.1	75.1	1006	35	"
26 / 0000	32.3	75.0	1001	40	subtropical storm
26 / 0600	32.4	75.3	1001	40	"
26 / 1200	32.0	75.9	1000	40	"
26 / 1800	31.5	76.2	999	40	"
27 / 0000	31.1	77.0	998	45	"
27 / 0600	30.7	78.0	998	45	"
27 / 1200	30.3	78.9	998	50	"
27 / 1800	30.1	79.8	997	55	tropical storm
28 / 0000	30.1	80.7	993	60	"
28 / 0600	30.2	81.7	996	50	"
28 / 1200	30.4	82.5	1000	30	tropical depression
28 / 1800	30.5	83.0	1003	30	"
29 / 0000	30.6	83.2	1005	25	"
29 / 0600	30.8	83.4	1005	25	"
29 / 1200	31.3	83.0	1006	25	"
29 / 1800	31.7	82.7	1006	25	"
30 / 0000	32.0	81.8	1004	25	"
30 / 0600	32.6	80.6	1002	35	tropical storm
30 / 1200	33.7	78.9	1000	40	"
30 / 1800	34.5	77.1	997	40	low
31 / 0000	35.4	75.1	994	45	"
31 / 0600	36.3	72.9	996	40	"
31 / 1200	37.1	70.4	998	35	"
31 / 1800	37.8	67.6	1000	35	"
01 / 0000	38.7	65.0	1001	35	extratropical
01 / 0600	39.4	62.4	1002	35	"
01 / 1200	39.4	59.8	1001	35	"
01 / 1800	38.5	57.5	1000	35	"
02 / 0000	38.1	53.2	1000	35	"
02 / 0600					absorbed by extratropical low
27 / 2300	30.1	80.5	992	60	minimum pressure
28 / 0410	30.2	81.4	994	55	landfall near Jacksonville Beach, Florida

Table 2. Selected ship reports with winds of at least 34 kt for Tropical Storm Beryl 26 - 30 May 2012.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
25 / 1800	KABP	33.2	76.8	040 / 37	1016.5
26 / 1100	H3VU	33.6	77.2	030 / 40	1015.0
26 / 1500	WCZ553	30.5	77.4	300 / 37	1006.0
26 / 1500	H3VU	34.3	76.3	080 / 45	1016.0
26 / 1800	A8IY3	33.2	77.7	050 / 35	1016.1
26 / 1800	WKAE	33.9	76.3	070 / 36	1014.4
28 / 0000	WCZ553	29.4	79.5	180 / 40	1001.0
28 / 0000	KCDK	29.6	79.4	180 / 35	1009.5
28 / 1000	C6VG8	29.3	79.5	150 / 50	1008.0
30 / 0600	WCZ553	30.9	80.4	220 / 35	1001.0
30 / 1000	WDD612	32.7	78.7	190 / 41	1001.4
30 / 1500	WDC692	31.6	76.1	200 / 36	1007.5

Table 3. Selected surface observations for Tropical Storm Beryl, 26 - 30 May 2012. Note that the table includes observations from the post-tropical phase.

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)			
Florida								
International Civil Aviation Organization (ICAO) Sites								
K40J – Perry 30.10N 83.58W								4.19
KCOF – Patrick AFB 28.23N 80.60W	28/1955	1012.8	28/1829	27	42			0.83
KCRG – Jacksonville Craig Airport 30.33N 81.52W	28.0430	996.6	28/0125	27	50			4.25
KDAB – Daytona Beach 29.18N 81.05W	28/0040	1007.3	28/1714	26	35			2.33
KFHB – Fernandina Beach 30.61N 81.46W			28/0115	30	47			
KGNV – Gainesville 29.68N 82.27W								5.03
KJAX – Jacksonville International Airport 30.49N 81.69W	28/0459	998.0	28/0331	39	49			5.73
KNIP – Jacksonville NAS 30.24N 81.68W	28/0453	996.5	28/0253	35	56			3.87
KNRB – Mayport Naval Station 30.39N 81.42W	28/0415	995.8	28/0230	40	54			2.81
KOCF – Ocala 29.18N 82.22W			28/2110	35	49			
KSGJ – St. Augustine 29.97N 81.33W	28/0258	998.5	27/1917	27	41			2.78
KVQQ – Jacksonville Cecil Field 30.22N 81.88W			28/0335	23	38			
Coastal-Marine Automated Network (C-MAN) Sites								
SAUF1 – St. Augustine 29.86N 81.27W 17.0m	28/0200	999.5	27/1950	33	42			
National Ocean Service (NOS) Sites								
FRDF1 – Fernandina Beach 30.67N 81.47W 6.4m	28/0418	1000.5	28/0124	29	41	3.73	4.64	

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)			
MYPF1 – Mayport 30.40N 81.43W	28/0412	997.3	28/0248	43	56	2.95	3.04	
TRDF1 – Trident Pier 28.41N 80.59W 6.4m	27/2242	1009.1	27/1636	18	25	1.92	1.95	
I-295 Bridge 30.19N 81.69W						2.61	3.08	
Sites from other Government Agencies								
Alachua FAWN 29.79N 82.40W								6.58
Live Oak FAWN 30.29N 82.90W								4.56
2 NE MacClenny FAWN 30.30N 82.10W								5.18
NASA KSC111 28.60N 80.64W 16.5m			28/1900	28	53			
NASA KSC421 28.78N 80.80W 16.5m			28/1730	32	38			
Ocklawaha FAWN 28.99N 82.00W								3.81
Putnam Hall FAWN 29.69N 82.00W								7.50
Public/Other								
Cooks Hammock 29.92N 83.28W								8.09
Midway 30.00N 83.08W								12.65
2 SW Orange Springs 29.48N 81.97W								6.45
2 WSW Pierson 29.23N 81.46W								4.80
1 SW Starke 29.94N 82.12W								6.45
Weatherflow Buck Island 30.39N 81.48W	28/0410		28/0135	44	63			
Weatherflow Jacksonville Beach Pier 30.29N 81.38W			27/2250	46	56			
Weatherflow Jacksonville Huguenot Park 30.41N 81.41W			28/0110	47	59			
Weatherflow Jacksonville Terminal Channel 30.34N 81.63W			28/0255	32	44			

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)			
Weatherflow Lewis 29.92N 81.33W	28/0225		27/1820	24	37			
Weatherflow New Smyrna Beach 29.04N 80.90W	28/0025	1005.1	28/1710	21	35			
WeatherUnderground Atlantic Beach 30.34N 81.40W	28/0359	995.0	28/0129		46			
Wellborn 30.23N 82.82W								15.00
Georgia								
ICAO Sites								
KBQK – Brunswick 31.15N 81.47W			28/0435	28	39			
KSAV – Savannah International Airport 32.12N 80.20W	30/0453	1004.4	29/1632	27	34			1.03
KSSI – St. Simons Island 31.15N 81.38W	28/0753	1007.4	28/0428	32	42			3.24
KSVN – Hunter AAF 32.03N 81.15W	30/0155	1003.9	28/0319	26	36			1.34
NOS Sites								
FPKG1 – Ft. Pulaski 32.03N 80.90W 6.7m	30/0524	1003.4	28/0300	35	44	2.93	4.47	
Sites from other Government Agencies								
3 SSW Alma GAEMN 31.50N 82.50W								3.45
Brinswick GAEMN 31.19N 81.50W								3.67
4 SE Homerville GAEMN 31.00N 82.70W								4.31
6 SW Odum GAEMN 31.60N 82.10W								5.88
SAXG1 – Sapelo Island NERRS 31.42N 81.29W 10.0m	30/0045	1005.0	27/1606	25	38			
Woodbine GAEMN 31.00N 81.80W								5.95
Public/Other								
Brunswick 31.16N 81.50W								5.25

Location	Minimum Sea Level Pressure	Maximum Surface

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)			
5 WSW Forrest Beach 32.12N 80.82W			27/2200		40			
1 SW Grahamville 32.47N 80.97W								6.00
Johnsonville 33.82N 79.44W								4.49
5 E Nichols 34.23N 79.06W								4.28
2.2 WSW Ridgeland 32.46N 81.02W								4.88
Weatherflow Isle of Palms (lat/lon unknown)			27/1820		37			
North Carolina								
ICAO Sites								
K2DP – Dare Bombing Range 35.67N 75.90W								4.14
KCTI – Cedar Island (lat/lon unknown)			302120		49			
KEWN – New Bern 35.07N 77.05W								4.08
KHSE – Hatteras 35.23N 75.62W	30/2205	997.6	30/1828	29	43			1.53
KILM – Wilmington 34.27N 77.90W			30/2029		39			4.10
KMQI – Manteo 35.92N 75.70W			30/2135		38			
KMRH – Beaufort 34.73N 76.65W			30/2003		35			1.82
KNBT - Piney Island 35.02N 76.47W			30/2030		47			
KNCA – New River 34.70N 77.35W			30/1743		36			2.50
KNJM – Bogue Field 34.70N 77.03W			30/1431		39			2.19
KNKT – Cherry Point 34.89N 76.88W								3.49
KOAJ – Jacksonville 34.83N 77.62W								3.67
RAWS								
HFMN7 – Hoffman Forest 34.83N 77.32W								3.45

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)			
NATN7 - Supply Nature Conservatory 34.08N 78.30W			30/2036		36			2.63
NBRN7 – New Bern 35.10N 77.11W								3.65
POCN7 – Pocosin Lakes 35.75N 76.51W								3.45
STCN7 – Dare Bombing Range 35.76N 75.85W								3.80
SUNN7 - Sunny Point 34.00N 77.96W			30/2037		37			2.70
TS161 – Fairfield 35.54N 76.22W								3.31
C-MAN Sites								
CKLN7 – Cape Lookout 34.62N 76.53W 10.0m	30/2000	998.6	30/1500	31	38			
NOS Sites								
BFTN7 – Beaufort 34.72N 76.67W 7.0m	30/1912	998.5	30/1430	26	39			
DUKN7 – Duck 36.18N 75.75W 14.4m	30/2236	999.7	30/2018	32	36	1.43		
HGCN7 – Hatteras 35.21N 75.70W 9.0m	30/2136	997.0	30/2248	41	48	2.54		
JMPN7 – Wrightsville Beach 34.21N 77.80W 7.0m	30/1624	998.4	30/1118	31	37	1.16		
University Networks								
OCP1 – CORMP Ocean Crest Pier 33.91N 78.15W 12.2m	30/1603	998.1	30/1102	31	36			
Public/Other								
2.7 SW Creswell 35.85N 76.83W								4.32
1.4 SW Havelock 34.90N 76.92W								3.91
0.9 WNW Kill Devil Hills 36.02N 75.68W								6.96
3.8 WNW Maysville 34.92N 77.30W								4.12
5.6 SE Scranton 35.42N 76.49W								6.10
Weatherflow Alligator	30/2122	1000.0	30/2004	35	42			

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft)[c]	Storm tide (ft)[d]	Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)[b]	Gust (kt)			
Bridge 35.90N 76.01W								
Weatherflow Avon Ocean 35.35N 75.50W	30/2236	996.7	30/2336	33	41			
Weatherflow Avon Sound 35.37N 75.51W	30/2200	997.2	30/2300	37	44			
Weatherflow Buxton 35.26N 75.52W	30/2210	994.0	30/2305	26	45			
Weatherflow Frisco Woods 35.25N 75.63W	30/2100	997.0	30/2240	39	46			
Weatherflow Hatteras High 35.26N 75.56W	30/2215	994.0	30/2205	33	45			
Weatherflow Jennettes Pier 35.91N 75.59W	30/2125	999.0	30/2045	42	55			
Weatherflow Ocracoke 35.14N 76.01W	30/2000	996.0	30/2135	38	45			
Weatherflow Pamlico Sound 35.43N 75.83W	30/2135	996.0	30/2145	39	45			
Weatherflow REAL Slick 35.57N 75.49W	30/2200	998.1	30/2325	34	43			
Buoys								
41002 - S of Hatteras 31.86N 74.84W 5.0m	25/2118	1003.9	25/2158	37[e]	45			
41004 – Edisto 32.50N 79.10W 5.0m	30/0950	1001.1	30/0940	30[f]	56			
41008 - Grays Reef 31.40N 80.87W 5.0m	30/0150	1005.7	28/0130	32[f]	41			
41012 - E of St. Augustine 30.04N 80.53W 5.0m	27/2150	994.6	27/2200	44[f]	58			
41013 - Frying Pan Shoals 33.44N 77.74W 5.0m	30/1550	999.1	30/1800	35[f]	45			
41037 – CORMP SE of Wilmington, NC 33.99N 77.36W 3.0m	30/1800	997.9	30/1300	30	39			
41038 – CORMP Wrightsville Beach , NC 34.14N 77.72W 3.0m	30/1700	998.6	30/1800		35			

[a] Date/time is for sustained wind when both sustained and gust are listed.
[b] Except as noted, sustained wind averaging periods for C-MAN and land-based ASOS reports are 2 min; buoy averaging periods are 8 min.

[c] Storm surge is water height above normal astronomical tide level.
[d] Storm tide is water height above the North American Vertical Vertical Datum of 1988 (NAVD1988).
[e] 1-minute average wind.
[f] 10-minute average wind.

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Beryl, 26 – 30 May 2012. Mean errors for the 5-yr period 2007-11 are shown for comparison. Official errors that are smaller than the 5-yr means are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL (Beryl)	**18.6**	**19.9**	**28.9**	**31.3**	**33.6**	**53.0**	
OCD5 (Beryl)	53.1	117.3	197.0	274.6	425.2	691.4	
Forecasts	17	15	13	11	7	3	
OFCL (2007-11)	30.4	48.4	65.9	83.1	124.4	166.5	
OCD5 (2007-11)	46.9	95.2	151.7	211.6	316.8	404.3	

Table 4b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Storm Beryl, 26 – 30 May 2012. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here will generally be smaller than that shown in Table 4a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	17.7	20.1	29.0	33.7	43.0		
OCD5	42.3	89.1	128.9	196.4	221.1		
GFSI	18.9	25.9	30.7	36.4	49.1		
GHMI	21.1	25.5	40.0	48.4	64.7		
HWFI	19.5	29.5	36.4	43.6	**23.6**		
GFNI	20.5	37.9	39.1	51.7	73.3		
NGPI	**17.2**	27.2	29.6	37.9	87.0		
EGRI	**16.4**	26.5	34.4	39.9	103.3		
EMXI	18.8	29.2	42.2	56.7	97.7		
CMCI	**17.4**	30.0	56.8	79.0	55.9		
TCON	**15.0**	**18.5**	**23.2**	**27.1**	**37.2**		
TVCA	**15.5**	**17.4**	**19.5**	**23.5**	**28.0**		
TVCE	**14.8**	**19.5**	**20.6**	**25.1**	**34.0**		
GUNA	**15.0**	**17.2**	**20.2**	**26.0**	46.3		
AEMI	**16.6**	24.8	35.4	40.9	55.6		
LBAR	26.6	43.9	50.4	53.0	50.6		
BAMD	24.4	33.1	36.8	40.7	64.0		
BAMM	23.8	28.3	39.7	48.7	**41.8**		
BAMS	40.2	73.5	103.5	155.8	102.9		
Forecasts	14	11	9	9	4		

Table 5a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Beryl, 26 – 30 May 2012. Mean errors for the 5-yr period 2007-11 are shown for comparison. Official errors that are smaller than the 5-yr means are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL (Beryl)	**4.7**	**5.3**	**6.9**	**6.4**	**5.0**	**5.0**	
OCD5 (Beryl)	5.4	6.8	8.1	8.1	14.3	8.3	
Forecasts	17	15	13	11	7	3	
OFCL (2007-11)	7.1	10.8	13.0	15.0	16.9	17.1	
OCD5 (2007-11)	8.4	12.4	15.4	17.7	20.5	21.5	

Table 5b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Storm Beryl, 26 – 30 May 2012. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here will generally be smaller than that shown in Table 5a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	5.7	8.0	6.9	4.4	5.0	10.0	
OCD5	6.0	9.2	8.1	6.8	13.0	**8.0**	
HWFI	6.1	**7.5**	7.1	**4.0**	**3.2**	**6.0**	
GHMI	7.6	10.3	8.6	**4.3**	**3.2**	11.0	
GFNI	6.7	10.4	**6.6**	**4.9**	5.0	20.0	
DSHP	6.6	8.2	**6.5**	**3.1**	5.0	**9.0**	
LGEM	6.2	**7.5**	**5.8**	**4.0**	**4.8**	**8.0**	
ICON	5.9	8.2	**6.5**	**2.5**	**3.0**	**8.0**	
IVCN	5.9	8.7	**6.3**	**2.0**	**2.2**	10.0	
Forecasts	14	10	8	8	5	1	

Table 6. Watch and warning summary for Tropical Storm Beryl, 26 – 30 May 2012.

Date/Time (UTC)	Action	Location
26 / 0300	Tropical Storm Watch issued	Edisto Beach, South Carolina to South Santee River, South Carolina
26 / 0300	Tropical Storm Warning issued	Volusia-Brevard County Line, Florida to Edisto Beach, South Carolina
27 / 0300	Tropical Storm Watch discontinued	Edisto Beach, South Carolina to South Santee River, South Carolina
28 / 0600	Tropical Storm Warning modified to	Flagler Beach, Florida to Edisto Beach, South Carolina
28 / 0900	Tropical Storm Warning modified to	Flagler Beach, Florida to Savannah River, Georgia
28 / 1500	Tropical Storm Warning discontinued	All

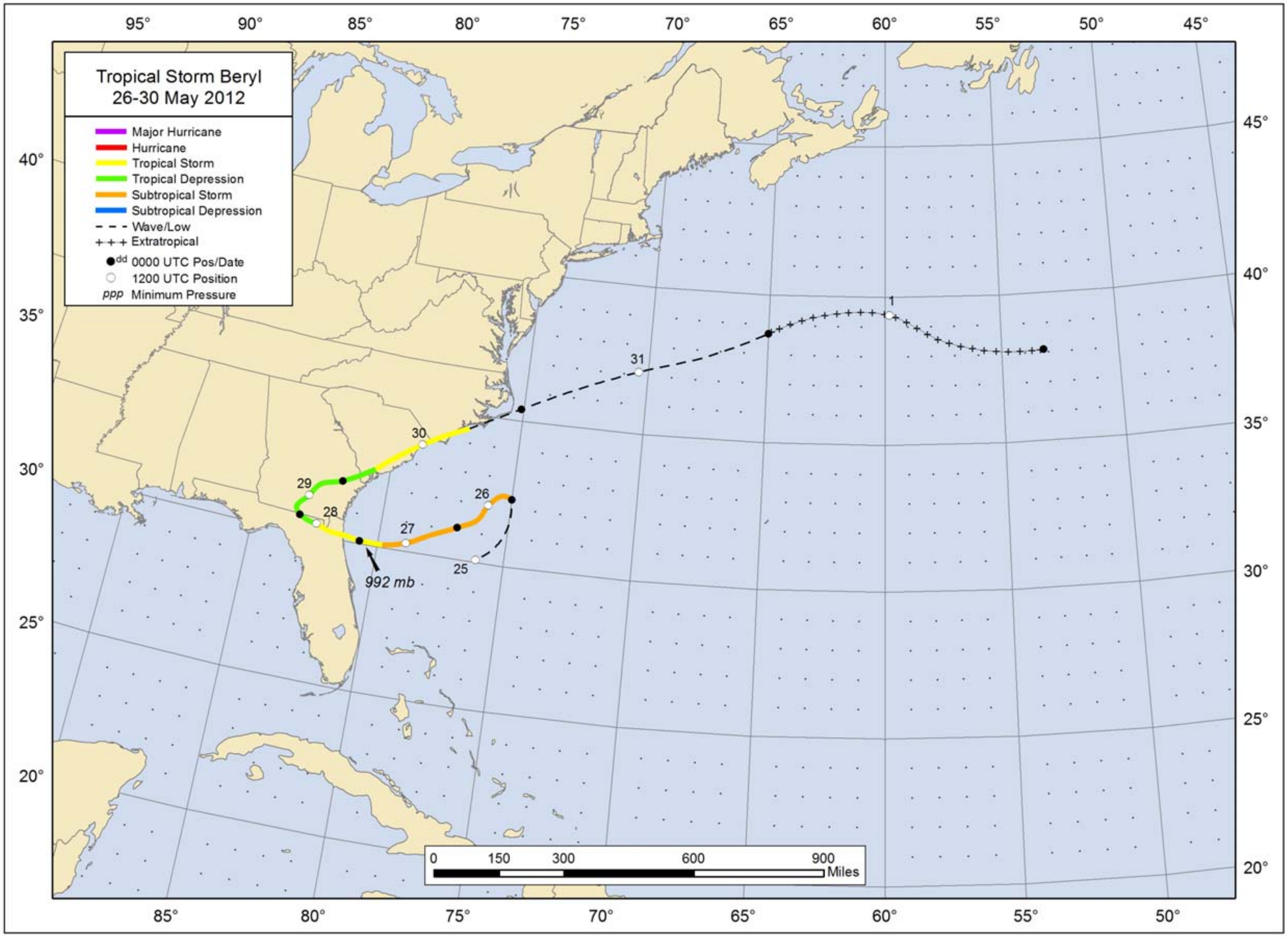

Figure 1. Best track positions for Tropical Storm Beryl, 26 – 30 May 2012. Track during the extratropical stage is based on analyses from the NOAA Ocean Prediction Center.

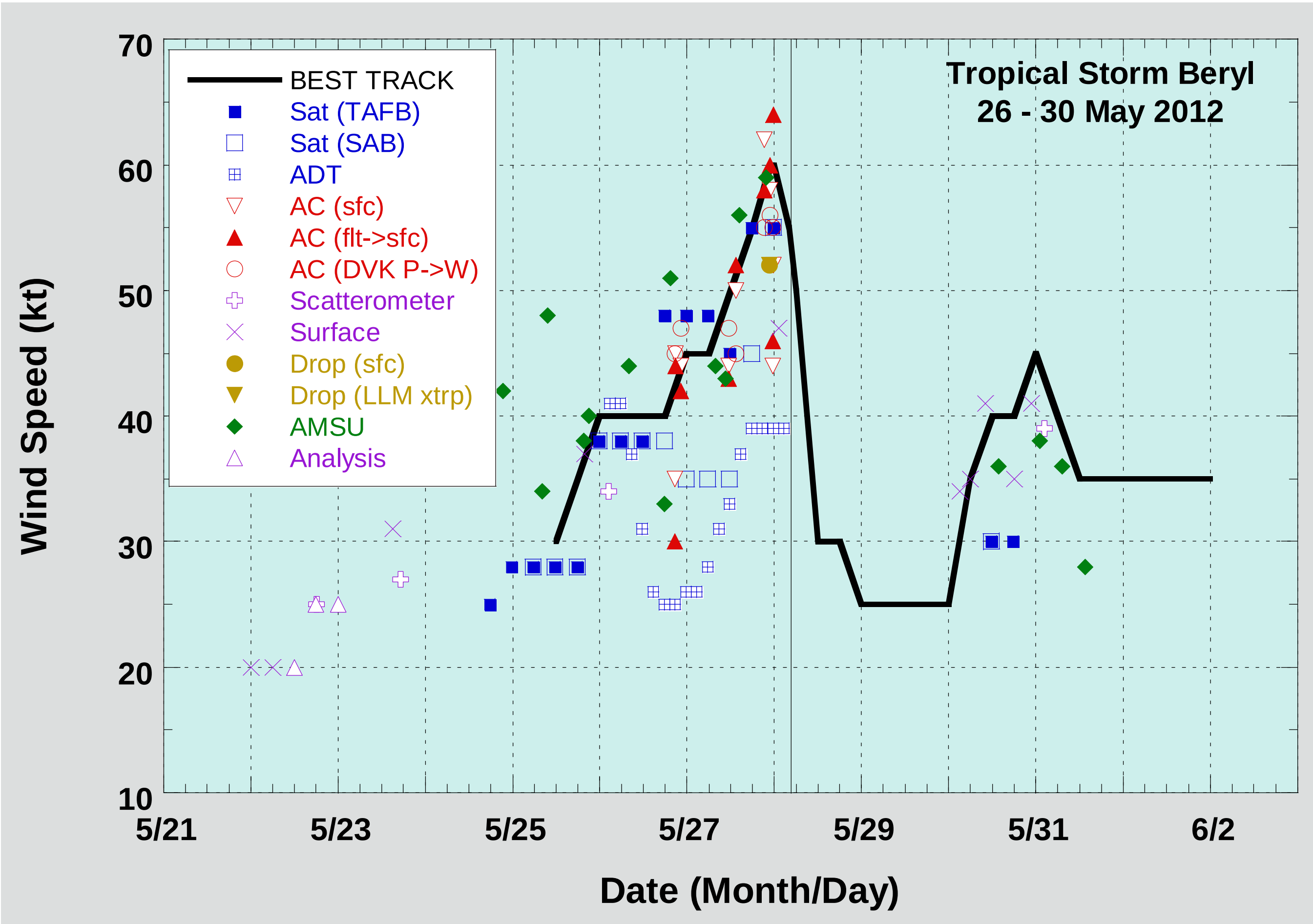

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Beryl, 26 - 30 May 2012. Aircraft observations have been adjusted for elevation using 80% and 80% adjustment factors for observations from 850 mb and 1500 ft respectively. Dropwindsonde observations include actual 10 m winds (sfc), as well as surface estimates derived from the mean wind over the lowest 150 m of the wind sounding (LLM). SFMR surface wind estimates on the figure do not include a bias correction used operationally and in post-analysis. Advanced Dvorak Technique estimates represent CI numbers. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Estimates during the extratropical stage are based on analyses from the NOAA Ocean Prediction Center. Dashed vertical lines correspond to 0000 UTC.

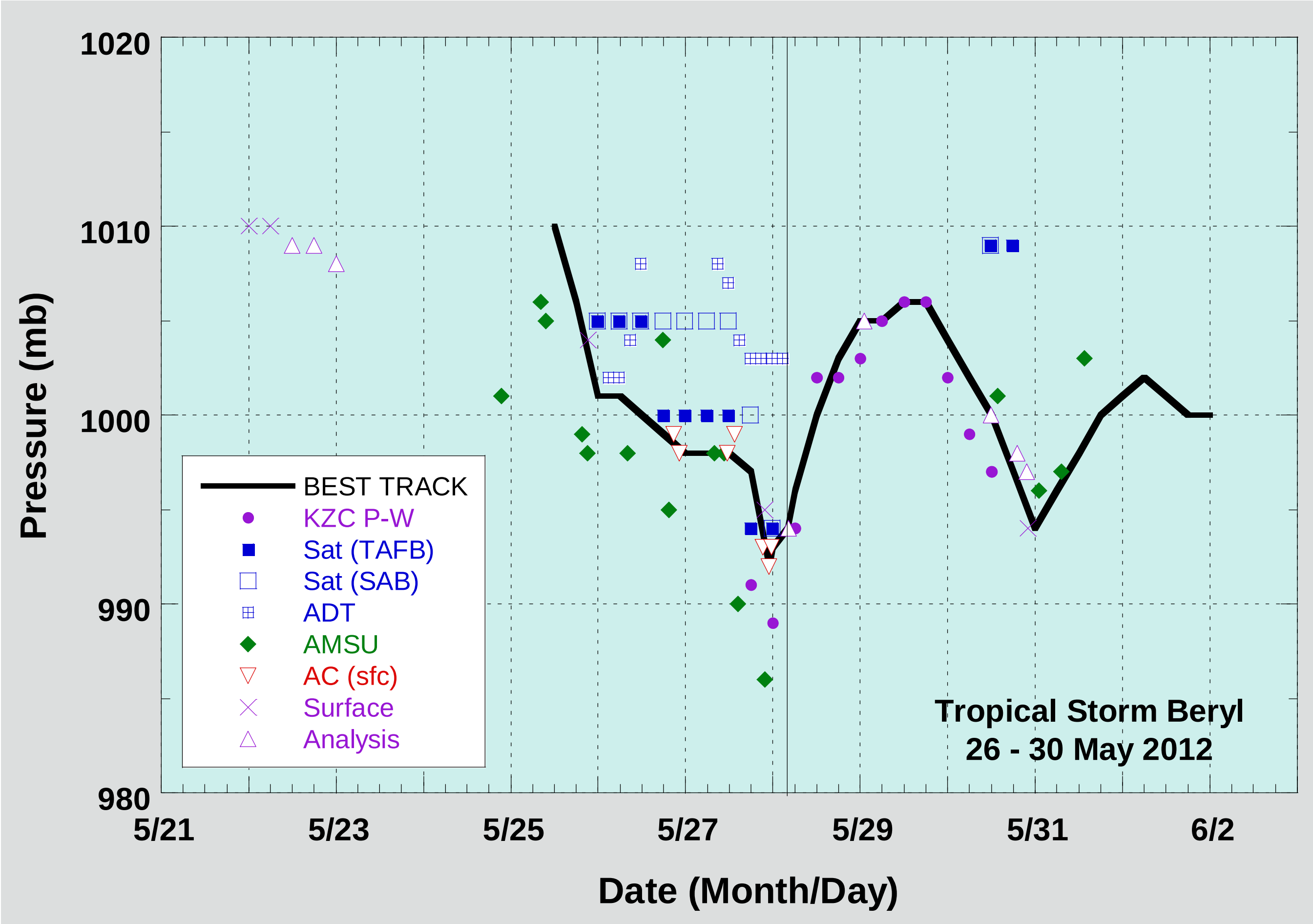

Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Beryl, 26 - 30 May 2012. Advanced Dvorak Technique estimates represent CI numbers. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. The KZC P-W values are obtained by applying the Knaff-Zehr-Courtney pressure-wind relationship to the best track wind data. Estimates during the extratropical stage are based on analyses from the NOAA Ocean Prediction Center. Dashed vertical lines correspond to 0000 UTC.