

Tropical Cyclone Report
Tropical Storm Bill
29 June - 2 July, 2003

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Bill made landfall on the Louisiana coast just west of Cocodrie as a 50-kt tropical storm.

a. Synoptic History

The interaction of a tropical wave with a mid- to upper-level low resulted in the formation of a surface low pressure area over the Yucatan Peninsula on 28 June. This system was accompanied by a large area of cloudiness and thunderstorms that extended eastward over the northwestern Caribbean Sea. Upper-level winds were marginally favorable for development but the interaction with land inhibited tropical cyclone formation. As soon as the low moved toward the north-northwest away from Yucatan, the convection became better organized. It is estimated that a tropical depression formed at 0600 UTC 29 June and reached tropical storm status by 1200 UTC on the same day.

Bill moved on a north-northwesterly to northerly track and, as the shear relaxed, the storm gradually intensified. It then turned to the north-northeast and reached its peak intensity of 50 knots, with a minimum pressure of 997 mb, at 1800 UTC 30 June when the cyclone's center was very near the coast. Initially, the convection and stronger winds were located to the northeast of the center due to wind shear from the southwest. Near landfall time, the wind field and convection became a little more symmetric as the shear relaxed. Bill made landfall near King Lake, about 20 miles west of Cocodrie on the south coast of Louisiana at its peak intensity around 1900 UTC 30 June. Thereafter, Bill weakened to a tropical depression as it moved toward the northeast over Central Mississippi and Alabama. It became an extratropical low near the border of Tennessee and Virginia by 1800 UTC 2 July and was absorbed by a frontal system by 0600 UTC 3 July.

The "best track" chart of the tropical cyclone'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.

b. Meteorological Statistics

Observations in Tropical Storm Bill (Figs. 2 and 3) include satellite-based Dvorak technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB), the Satellite Analysis Branch (SAB) and the U. S. Air Force Weather Agency (AFWA), as well as flight-level observations from flights of the 53rd Weather Reconnaissance Squadron of the U.S. Air Force Reserve Command. Ship reports of winds of tropical storm force associated with Bill are given in Table 2, and selected surface observations from land stations and data buoys are given in Table 3.

Bill reached tropical storm status based on a report of 38 knots from the ship HG3Q located to the northeast of the developing center at 1200 UTC 29 June. Bill's peak intensity of 50 knots and minimum pressure of 997 mb were based on a report from a reconnaissance plane of 66 knots at 850 mb and a reliable minimum pressure of 997 mb surface observation from Lumcon Marine Center, near Cocodrie, respectively.

c. Casualty and Damage Statistics

There were four deaths associated with Bill. A 10-year old boy drowned in Holly Spring Creek in Raleigh, North Carolina, a man was killed by a falling tree in Atlanta, Georgia, and two swimmers drowned at Panama City Beach, Florida in rip currents produced by Bill. The wind damage was confined to downed branches and trees across the eastern portion of southeast Louisiana and coastal Mississippi where there were power outages. The most significant storm surge flooding was noted in coastal sections of southeast Louisiana primarily in southern Terrebonne Parish where the local levee was breached and overtopped in the Montegut area. This resulted in some homes being flooded. An F1 (Fujita Scale) tornado touched down in Reserve, Louisiana around 1710 UTC 30 June, hitting a private school and causing significant damage to several buildings. It then hit a mobile home park damaging at least 20 homes. The Property Claim Services Division of the Insurance Service Office reports that insured losses due to Bill totaled 22 million dollars in Louisiana. Total losses for Louisiana and Mississippi are estimated at \$50 million.

d. Forecast and Warning Critique

Advisories on the tropical cyclone were initiated when early morning visible images confirmed the presence of a well-defined center of circulation. Concurrently, a report from a ship indicated that the winds had reached tropical storm strength-hence there were no tropical depression advisories. This transition can occur when a strong pressure gradient prevails before a system in formative stage develops a closed circulation. However, a post-analysis suggests that a tropical depression may have formed six hours earlier, as indicated in the best track.

Bill was a short-lived tropical cyclone and the number of forecasts is quite small. The average official track errors were 54, 96, 146 and 189 n mi for the 12, 24, 36, 48 h forecasts, respectively¹. These errors are greater than the average official track errors for the 10-yr period 1993-2002 of 45, 81, 116, 150 n mi, respectively, Table 4 includes a summary of all track guidance during Bill. Average official intensity errors were 4, 6, 3 and 1 kt for the 12, 24, 36, 48 h forecasts, respectively. For comparison, the average official intensity errors over the 10-yr period 1993-2002 are 6, 10, 13, and 15 kt, respectively.

Table 5 lists the watches and warnings associated with Tropical Storm Bill.

¹ All forecast verifications in this report include the depression stage of the cyclone. National Hurricane Center verifications presented in these reports prior to 2003 did not include the depression stage.

The weather activity that became Tropical Storm Bill was first described in the Tropical Weather Outlook issued at 1130 am EDT June 24, more than 6 days prior to landfall. After genesis, the potential for intensification was stated in all the public and forecast advisories. The tropical storm warning was issued 22 hours prior to landfall. Although Bill made landfall within the area of warning, it is always difficult to precisely forecast the point of landfall. Figure 4 shows the track guidance available at 0600 UTC 30 June. Note that none of the models captured the north-northeastward turn of Bill prior to landfall.

Table 1. Best track for Tropical Storm Bill, 29 June-2 July 2003.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
28 / 0600	19.5	89.0	1009	20	low
28 / 1200	20.0	89.3	1008	20	"
28 / 1800	20.3	89.4	1008	20	"
29 / 0000	21.0	89.8	1008	20	"
29 / 0600	22.0	90.0	1007	30	tropical depression
29 / 1200	23.4	90.5	1007	35	tropical storm
29 / 1800	24.6	91.1	1009	40	"
30 / 0000	25.9	91.3	1008	45	"
30 / 0600	27.1	91.5	1007	45	"
30 / 1200	28.2	91.5	1002	50	"
30 / 1800	29.1	91.0	997	50	"
01 / 0000	30.4	90.3	998	45	"
01 / 0600	31.6	89.3	1003	30	tropical depression
01 / 1200	32.7	88.4	1004	25	"
01 / 1800	33.6	87.0	1007	20	"
02 / 0000	34.1	86.0	1007	20	"
02 / 0600	35.0	84.5	1007	20	"
02 / 1200	35.6	83.5	1009	20	"
02 / 1800	36.5	82.0	1009	20	extratropical
03/ 0000	37.3	79.5	1009	20	"
03/ 0600					absorbed by a front
30 / 1800	29.1	91.0	997	50	minimum pressure
30 / 1900	29.3	91.0	997	50	landfall at King Lake, LA or 20 miles W of Cocodrie, LA.

Table 2. Selected ship reports with winds of at least 34 kt for Tropical Storm Bill, 29 June-2 July 2003.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
29 / 1200	H3GQ	24.2	88.9	150 / 38	1013.0
29 / 1500	C6FM7	25.0	90.0	130 / 40	1014.0
29 / 1800	C6FM7	25.4	89.7	140 / 40	1014.0
29 / 1800	H3GQ	25.6	90.3	130 / 35	1012.0
29 / 2000	BURL1	28.9	89.4	180 / 36	1017.5
29 / 2100	C6FM7	24.9	89.2	150 / 40	1013.0
30 / 0000	MZFR9	25.6	89.5	140 / 45	1012.1
30 / 0000	H3GQ	27.1	91.9	080 / 35	1011.0
30 / 0300	MZFR9	26.0	90.1	140 / 36	1013.0
30 / 0300	HP9685	27.3	90.8	100 / 38	1011.5
30 / 0600	MZFR9	26.5	90.7	190 / 37	1012.6
30 / 0700	HP9685	27.3	90.8	150 / 35	1010.3
30 / 0900	MZFR9	27.0	91.3	250 / 37	1009.5
30 / 1800	HP9685	27.3	90.8	200 / 40	1009.1
01 / 0105	DPIA1	30.2	88.1	140 / 39	1012.7

Table 3. Selected surface observations for Tropical Storm Bill, 29 June-2 July, 2003

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)			
Louisiana								
Slidell	1/0009	1001.7	1/0006	36	45			6.26
Boothville	30/2223	1008.0	30/1901	32	45			
New Orleans Lakefront	30/2314	1000.7	30/2340	38	46			6.12
New Orleans Int. Air	30/2246	998.3	30/2247	35	40			3.51
Rigolets			30/2320	40	48	3.08		
Mandeville			01/0110	43	54	5.04		
Mid Lake Causeway			30/2110	38	51	2.91		
Belle Chase Naval Air St.			30/2145		36			
Industrial Canal						4.80		
South Shore Harbor						3.75		
Frenier						4.47		
Caillou Bayou						4.36		
Grand Isle						3.12		
Lumcon Marine Center	30/1720	997.7	30/1746	43				
Lumcon Ponchartrain	1/0008	996.0	30/2208	41	54			
Terrebone Bay	30/1944	997.8	30/1994	50	58			
Turtle Cove			30/2345	38	44			
Southeast			30/2354		42			
Citrus			30/2004		48			
Venice			30/1459	34				
Houma			30/1003	39				
Mississippi								
Keesler Air Force			30/0307		45	4.05		
Gulfport			1/0054	37	45			4.10
Pascagoula			1/0221		36			3.94
Point Cadete						4.64		
Waveland						4.99		
Bayou Bienvenue						5.54		
Bayou Dupre						5.27		
NOAA buoy and Cman								
42007			1/0250	34	46			
42040			30/2050	36	49			

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)			
BURL1			30/1840	49	67			
GDIL1			30/2050	36	49			
LA Offshore Oil Port ^e			30/2025	56 ^f	67			

^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 National Geodetic Vertical Datum (1929 mean sea level).

^e 150 feet above sea level.

^f 5-min average wind.

Table 4. Preliminary forecast evaluation (heterogeneous sample) for Tropical Storm Bill, 29 June- 2 July. Forecast errors (n mi) are followed by the number of forecasts in parentheses. Errors smaller than the NHC official forecast are shown in bold-face type. Verification includes the depression stage, but does not include the extratropical stage.

Forecast Technique	Forecast Period (h)						
	12	24	36	48	72	96	120
CLP5	55 (9)	107 (8)	205 (6)	332 (4)			
GFDI	65 (6)	111 (6)	178 (4)	267 (2)			
GFDL	76 (5)	136 (5)	173 (5)	247 (3)			
LBAR	51 (9)	100 (8)	162 (6)	218 (4)			
AVNI	48 (7)	91 (6)	181 (4)	196 (2)			
AVNO	52 (7)	89 (7)	149 (4)	214 (3)			
AEMI	50 (4)	115 (3)	160 (2)				
BAMD	55 (9)	97 (8)	147 (6)	222 (4)			
BAMM	66 (9)	128 (8)	229 (6)	330 (4)			
BAMS	84 (9)	172 (8)	297 (6)	404 (4)			
UKMI	35 (8)	61 (7)	100 (5)	109 (3)			
UKM	39 (4)	39 (4)	82 (3)	104 (2)			
A98E	56 (9)	87 (8)	144 (6)	194 (4)			
A9UK	54 (4)	93 (3)	139 (3)	188 (2)			
OFCL	54 (9)	96 (8)	146 (6)	189 (4)			
NHC Official (1993-2002 mean)	45 (2985)	81 (2726)	116 (2481)	150 (2230)			

Table 5. Watch and warning summary for Tropical Storm Bill, 29 June-2 July.

Date/Time (UTC)	Action	Location
29 / 1500	Tropical Storm Watch issued	San Luis Pass to Morgan City
29 / 2100	Tropical Storm Watch discontinued	All
29 / 2100	Tropical Storm Warning issued	High Island to Pascagoula, including Lake Ponchartrain
30 / 0300	Hurricane Watch issued	Intercoastal City to Morgan City
30 / 1800	Tropical Storm Warning modified	Cameron to Pascagoula
30 / 1800	Hurricane Watch discontinued	All
30 / 2100	Tropical Storm Warning modified	Intercoastal City to Pascagoula
1 / 0000	Tropical Storm Warning modified	Grand Isle to Pascagoula
1 / 0300	Tropical Storm Warning modified	Mississippi River to Pascagoula
1 / 0600	Tropical Storm Warning discontinued	All

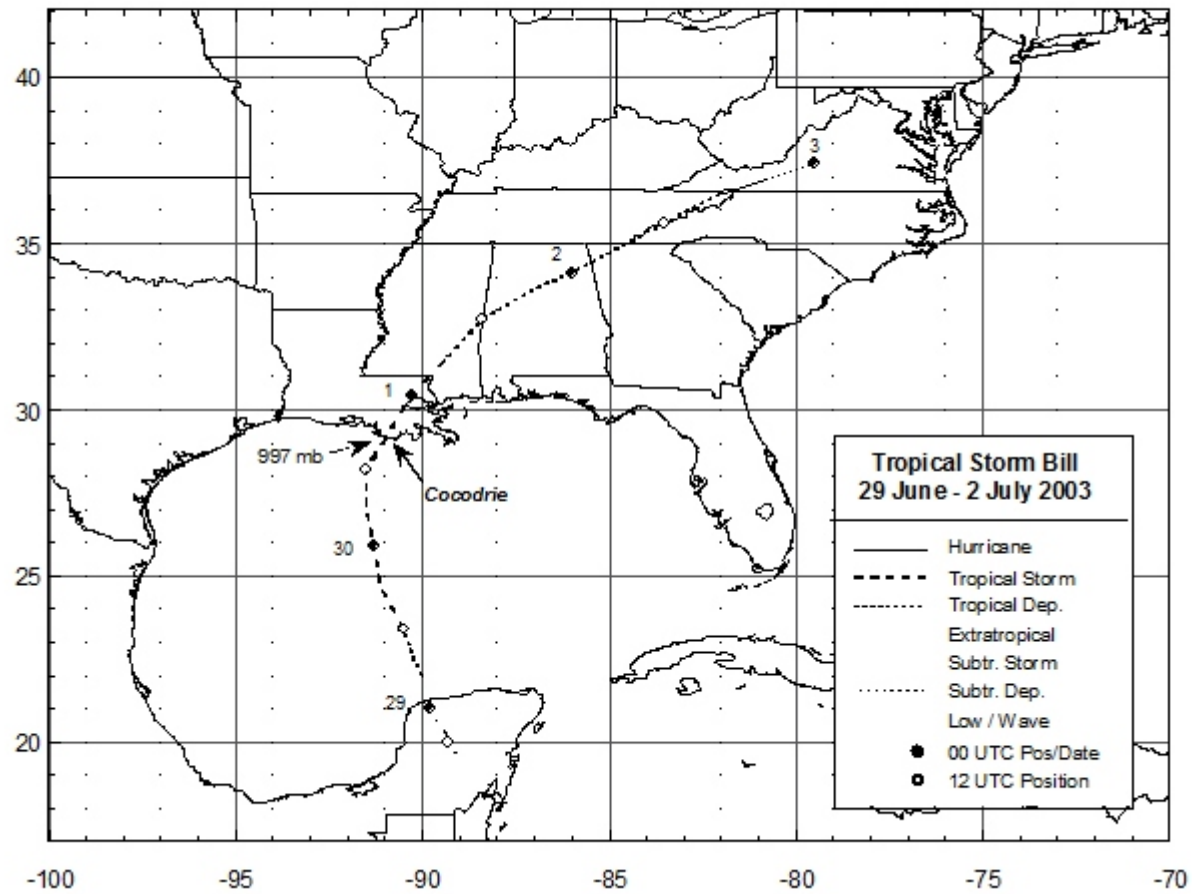


Figure 1. Best track positions for Tropical Storm Bill, 29 June- 2 July, 2003. Track after landfall is based on analyses from the NOAA Hydrometeorological Prediction Center.

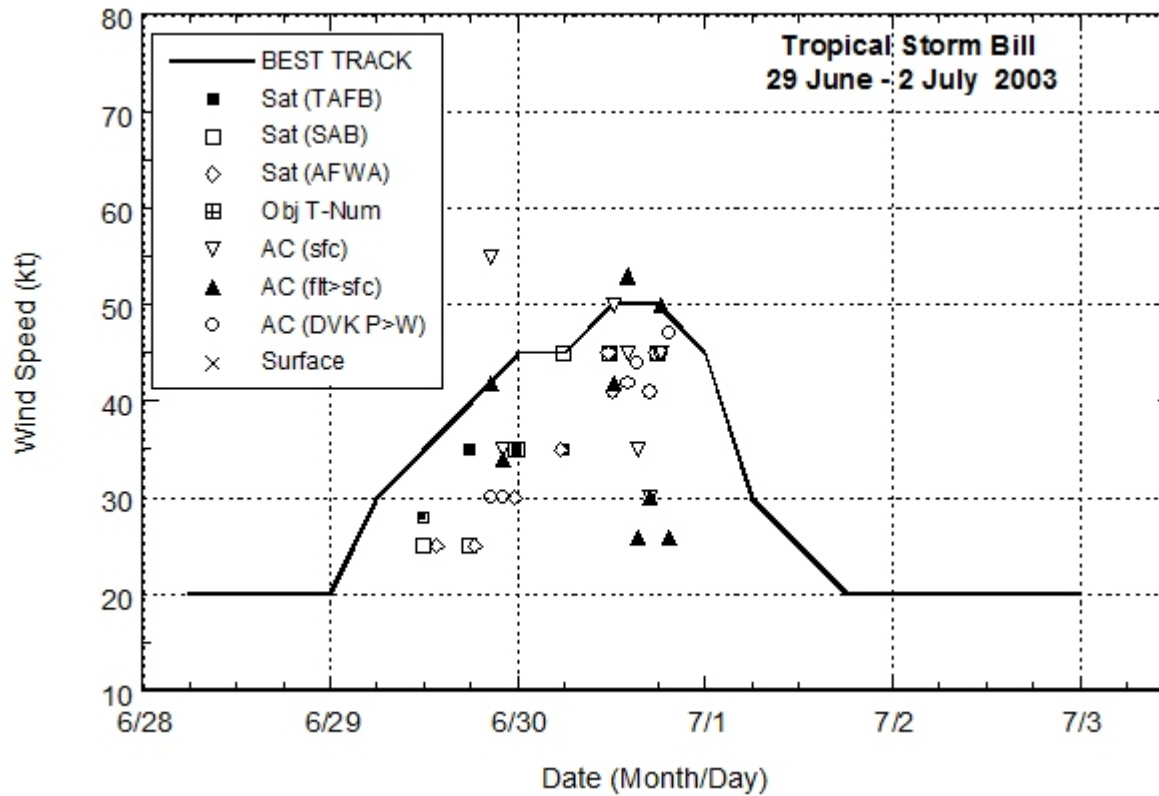


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Bill, 29 June-2 July, 2003. Aircraft observations have been adjusted for elevation using 90%, 80%, and 80% reduction factors for observations from 700 mb, 850 mb, and 1500 ft, respectively. Estimates after landfall are based on analyses from the NOAA Hydrometeorological Prediction Center.

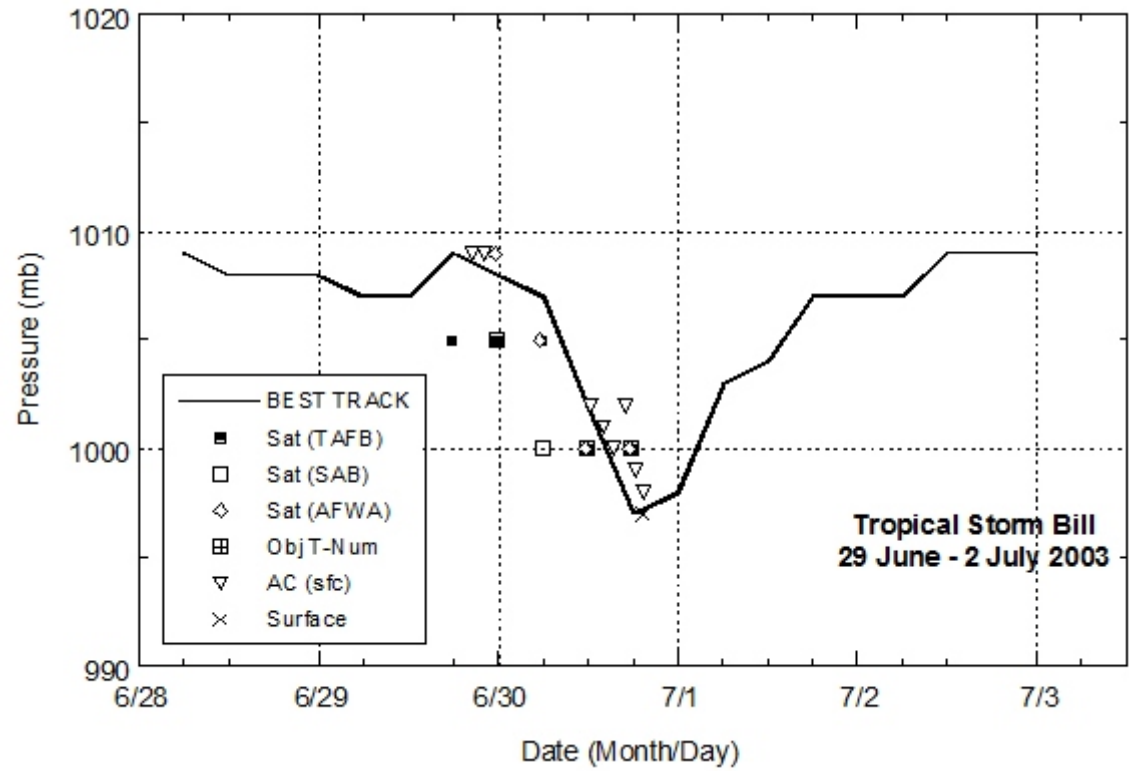


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Bill, 29 June-2 July, 2003. Estimates after landfall are based on analyses from the NOAA Hydrometeorological Prediction Center.

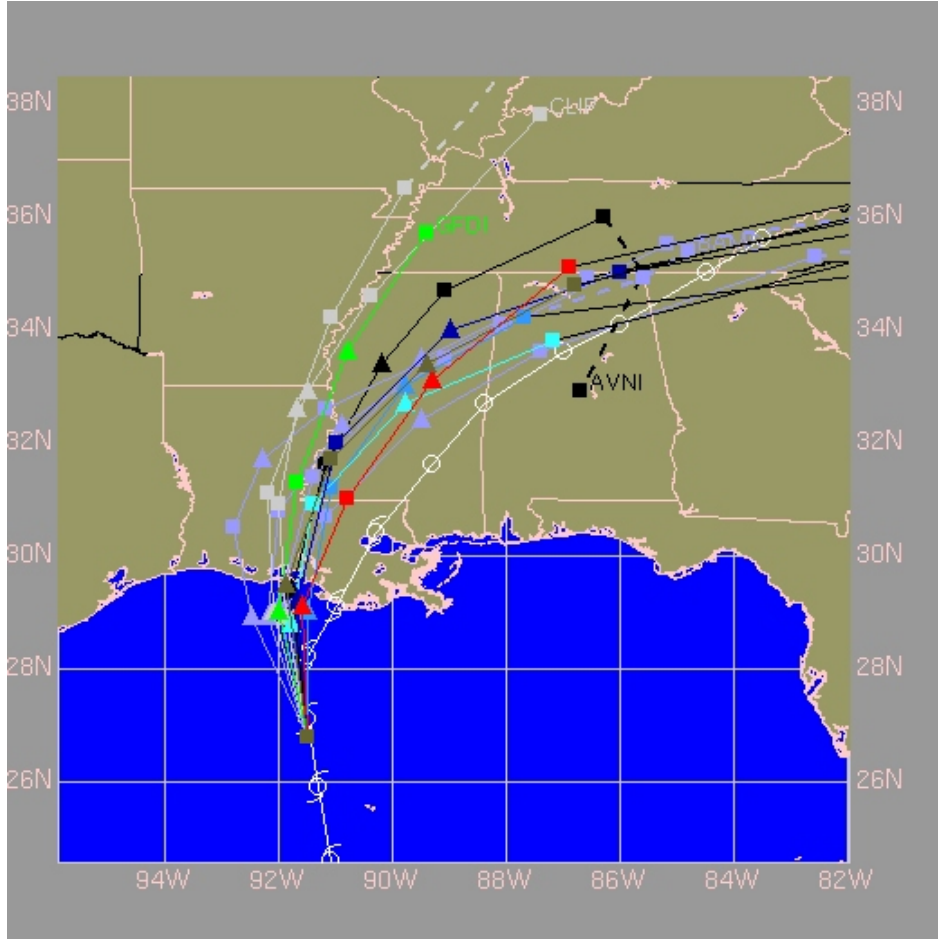


Figure 4. Available track guidance for Bill at 0600 UTC 30 June. The best track is given by the easternmost gray line with positions given at 6 h intervals. Note that 12 hour prior to landfall, none of the models indicated the north-northeastward turn of Bill.