

Tropical Cyclone Report  
Hurricane Alex  
(AL012010)  
25 June–2 July 2010

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Alex, one of the most intense June tropical cyclones in the Atlantic basin record, made landfall in northeastern Mexico as a strong Category 2 hurricane.

a. Synoptic History

Alex's genesis does not appear to be directly associated with a tropical wave that can be traced back to the coast of Africa. Instead, the tropical cyclone originated from a perturbation within the Intertropical Convergence Zone and was first identifiable on 17 June at very low latitudes over the central Atlantic. Over the next few days this feature moved west-northwestward over the deep tropical Atlantic while intermittently enhancing deep convection in the ITCZ. By 20 June, the system had crossed the Windward Islands and produced a large area of disturbed weather that affected much of the southeastern Caribbean Sea. Over the next several days, the disturbed weather area moved west-northwestward across the Caribbean Sea while its organization waxed and waned. By 1800 UTC 24 June, a surface low had formed over the northwestern Caribbean Sea about 90 n mi northeast of Cabo Gracias a Dios, Nicaragua, but it lacked sufficient organized deep convection to be classified as a tropical cyclone at that time. The low drifted northwestward to west-northwestward for about a day while deep convection increased and became more organized near and around the center. It is estimated that the system became a tropical depression by 1800 UTC 25 June about 80 n mi north-northeast of Puerto Lempira, Honduras. 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<sup>1</sup>.

The tropical cyclone moved west-northwestward to westward with an increase in forward speed, and strengthened into a tropical storm around 0600 UTC 26 June. Alex's center passed about 30 to 60 n mi to the north of the Bay Islands of Honduras and approached the coast of Belize late on 26 June. Alex strengthened to an intensity of 55 kt shortly before the center made landfall very near Belize City around 0000 UTC 27 June.

Alex crossed Belize and the southern Yucatan Peninsula of Mexico on 27 June, and satellite images indicate that the system remained well organized as it traversed these land areas. The cyclone weakened to a minimal tropical storm just before moving back over water. By early

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<sup>1</sup> 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.

on 28 June, the center had moved over the southwestern Gulf of Mexico and the cyclone began to regain strength. There was a weakening of a deep-layer subtropical ridge that extended from the Bahamas across the Gulf of Mexico, and Alex slowed down as it turned toward the north-northwest over the eastern Bay of Campeche on 28 June while gradually intensifying. The subtropical ridge began to build to the north of the storm, and Alex turned toward the west-northwest at an increased forward speed on 29 June. The environment was conducive for additional strengthening, as sea surface temperatures of 29°C or warmer prevailed over the southwestern Gulf of Mexico along with weak northerly vertical shear. Prominent spiral banding features developed in association with the system, and Alex became a hurricane around 0000 UTC 30 June. The hurricane slowed its forward speed and jogged toward the north-northwest on 30 June, apparently in response to a temporary weakening of a mid-tropospheric ridge near the northwest Gulf of Mexico coast. Alex then turned toward the west and west-southwest on 1 July, as the ridge to the north of the hurricane strengthened, while steadily intensifying right up until landfall. Alex became a Category 2 hurricane by 0000 UTC 1 July and reached an estimated peak intensity of 95 kt as it made its final landfall near Soto la Marina, in a sparsely populated region of the state of Tamaulipas in northeastern Mexico around 0200 UTC 1 July. Figure 4 is a radar image of the hurricane at the time of final landfall, showing a well-defined eyewall.

Alex continued moving west-southwestward while rapidly weakening over land and became a tropical storm by 1200 UTC 1 July. After the center crossed the extreme southern part of the Mexican state of Nuevo León, Alex weakened to a tropical depression in the state of San Luis Potosí by 0000 UTC 2 July. The tropical cyclone dissipated over the high terrain of central Mexico a few hours later.

#### b. Meteorological Statistics

Observations in Alex (Figs. 2 and 3) include satellite-based Dvorak technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB) and the Satellite Analysis Branch (SAB), as well as flight-level, stepped frequency microwave radiometer (SFMR), and dropwindsonde observations from flights of the 53<sup>rd</sup> Weather Reconnaissance Squadron of the U.S. Air Force Reserve Command. Data and imagery from NOAA polar-orbiting satellites, the NASA Tropical Rainfall Measuring Mission (TRMM) and Aqua, the European Space Agency's Advanced Scatterometer (ASCAT), and Defense Meteorological Satellite Program (DMSP) satellites, among others, were also useful in constructing the best track of Alex.

The estimated maximum intensity of Alex, 95 kt at its final landfall in Mexico, is based on an SFMR-measured surface wind of 87 kt just to the east of the center a little over an hour prior to landfall and the assumption that stronger winds were occurring to the north of the center of this west-southwestward-moving hurricane. Furthermore, Doppler velocity data from the Brownsville WSR-88D radar indicated that the maximum winds were continuing to increase during the hour leading up to the final landfall.

Alex produced phenomenally heavy rains over extreme northeastern Mexico, where storm total precipitation estimates exceeded 20 in. over a fairly large area. Media reports

mentioned local amounts as high as 30 to 40 in. around Nuevo León state. Rainfall totals of 5 in. or more were observed over the eastern portions of south Texas, with local amounts to about 10 in. Figure 5 is a map of the estimated rainfall totals due to Alex.

Storm surge heights were generally below 5 ft along the lower Texas coast, but significantly greater storm surges must have occurred near the landfall location in Mexico.

Ship reports of winds of tropical storm force associated with Alex are given in Table 2, and selected surface observations from land stations and data buoys are given in Table 3. The highest official wind observation was at Port Isabel, Texas, where sustained winds of 44 kt with a gust to 54 kt were measured. No official meteorological observations were received near the landfall location in Mexico.

Nine tornadoes were reported in Texas -- two in Cameron County, one in Willacy County, two in Refugio County, one in Nueces County, one in Kleberg County, and two in Aransas County. All were rated as EF0 intensity and caused only minor damage.

#### c. Casualty and Damage Statistics

Although media accounts of fatalities associated with Alex are conflicting, the storm is believed to have caused 12 direct deaths in the state of Nuevo León, Mexico. Torrential rains produced by the weakening tropical cyclone resulted in severe flooding over northeastern Mexico. The city of Monterrey, in Nuevo León, was particularly hard hit with significant damage to the infrastructure of that municipality. Four bridges were destroyed and, according to the Associated Press, “major streets turned [in]to rampaging rivers that gashed ravines through the pavement down to sewage lines and buried vehicles window deep in rocks and sand”. A rough estimate based on media reports of the damage total in Mexico is 1.5 billion U.S. dollars. In Texas, damage was mostly minor, although there was about \$10 million worth of damage to agriculture in Hidalgo County. Some 9,000 customers lost power in extreme southern Texas during the height of the storm.

Based on reports from the Belize National Emergency Management Organization, Alex’s impacts on Belize were minimal.

#### d. Forecast and Warning Critique

The disturbance over the southeastern Caribbean Sea that eventually developed into Alex was first noted in the Tropical Weather Outlook at 0000 UTC 21 June, 114 h prior to genesis. This system was assigned a “low” (less than 30 percent) probability of tropical cyclogenesis within 48 h until 1800 UTC 21 June, when the formation probability was increased to “medium” (30 to 50 percent). The genesis probability was reduced to the low category at 1800 UTC 22 June and then set back to medium at 1200 UTC 23 June. A “high” (greater than 50 percent) probability of genesis was assigned to the pre-Alex disturbance at 0000 UTC 25 June, 18 h in advance of tropical cyclone formation.

A verification of NHC official track forecasts for Alex is given in Table 4a. The official track forecasts for Alex were generally quite good, with little northward or southward bias in most cases. At the 24- through 120-h forecast periods, the average official forecast track errors were lower than the mean official errors for the previous 5-yr period and were considerably lower than the 5-yr means at 72, 96, and 120 h. It should be noted that the mean climatology-persistence forecast errors were also lower than the long-term averages at these forecast periods. A homogeneous comparison of the mean official track errors with selected guidance models is given in Table 4b. The numerical guidance that had lower errors than the official forecast at the most forecast periods was the variable model consensus and its corrected version, TVCN and TVCC respectively. With regard to individual models, the EMXI was better than the official forecast at 12, 36, 48 and 72 h, and the GFSI was better than the official forecast at 12, 36, and 48 h.

A verification of NHC official intensity forecasts for Alex is given in Table 5a. The official forecasts generally had a low bias, particularly at 4 and 5 days. NHC intensity forecast errors were below the mean official errors for the previous 5-yr period at all forecast intervals except 120 h. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 5b. DSHP had lower average intensity errors than the official forecast at 48, 72, and 120 h. LGEM and GHMI were better than the official forecast at 96 and 120 h, and the fixed intensity model consensus ICON had lower average errors than the official forecast at 72 through 120 h.

Watches and warnings associated with Alex are given in Table 6. The hurricane warning for northeastern Mexico was issued 47 h in advance of the arrival of the center in that region.

#### *Acknowledgements.*

WFO Brownsville and WFO Corpus Christi provided most of the observations included in this report as well as information on impacts in their respective County Warning Areas. Rex Hervey of NDBC provided buoy and C-MAN station data. Barry Goldsmith of the WFO Brownsville provided damage information. David Roth of the Hydrometeorological Prediction Center produced the rainfall analysis.

Table 1. Best track for Hurricane Alex, 25 June-2 July 2010.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
24 / 1800	15.9	82.0	1007	25	low
25 / 0000	16.0	82.1	1006	25	"
25 / 0600	16.1	82.3	1006	25	"
25 / 1200	16.2	82.5	1005	30	"
25 / 1800	16.4	83.1	1005	30	tropical depression
26 / 0000	16.6	83.9	1004	30	"
26 / 0600	16.7	84.9	1004	40	tropical storm
26 / 1200	16.9	86.1	1004	40	"
26 / 1800	17.2	87.2	996	55	"
27 / 0000	17.5	88.2	995	55	"
27 / 0600	18.0	89.1	991	55	"
27 / 1200	18.5	90.0	992	45	"
27 / 1800	18.9	90.7	993	35	"
28 / 0000	19.2	91.1	991	40	"
28 / 0600	19.5	91.4	991	40	"
28 / 1200	20.0	91.6	989	50	"
28 / 1800	20.3	91.7	990	50	"
29 / 0000	20.7	91.7	987	55	"
29 / 0600	21.5	91.9	985	55	"
29 / 1200	22.4	92.7	983	60	"
29 / 1800	22.9	93.6	981	60	"
30 / 0000	23.0	94.4	973	65	hurricane
30 / 0600	23.1	94.8	966	70	"
30 / 1200	23.5	95.2	958	75	"
30 / 1500	24.0	95.5	958	75	"
30 / 1800	24.3	96.2	962	80	"
01 / 0000	24.3	97.3	948	90	"
01 / 0200	24.2	97.7	946	95	"
01 / 0600	24.1	98.4	963	75	"
01 / 1200	23.5	99.5	977	60	tropical storm
01 / 1800	23.1	100.7	987	40	"
02 / 0000	23.2	101.9	997	30	tropical depression
02 / 0600					dissipated
01 / 0200	24.2	97.7	946	95	minimum pressure and maximum wind
27 / 0000	17.5	88.2	995	55	landfall near Belize City, Belize
01 / 0200	24.2	97.7	946	95	landfall near Soto la Marina, Mexico

Table 2. Selected ship reports with winds of at least 34 kt for Hurricane Alex, 25 June-2 July 2010.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
26 / 1200	9HRJ9	20.8	85.3	100 / 39	1008.0
26 / 1800	C6JE2	21.6	85.3	100 / 35	1011.4
27 / 1000	C6FN4	22.3	85.5	130 / 35	1008.0
28 / 1200	C6FN5	20.6	86.9	100 / 37	1003.0
28 / 1900	H3VR	21.9	85.1	090 / 45	1006.0
29 / 0000	3ETA7	20.1	87.0	130 / 38	1005.0
29 / 0000	C6FN5	21.0	86.6	100 / 42	1002.0
30 / 1026	42055	22.0	94.0	196 / 47	993.5
30 / 1815	42362	27.8	90.7	160 / 35	1013.6
30 / 2100	WKAP	27.8	92.2	110 / 37	1009.5

Table 3. Selected surface observations for Hurricane Alex, 25 June-2 July 2010.

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Storm surge (ft) <sup>c</sup>	Storm tide (ft) <sup>d</sup>	Total rain (in)
	Date/time (UTC)	Press. (mb)	Date/time (UTC) <sup>a</sup>	Sustained (kt) <sup>b</sup>	Gust (kt)			
<b>United States</b>								
<b>Texas</b>								
<b>International Civil Aviation Organization (ICAO) Sites</b>								
Brownsville (KBRO)	30/2326	997.3	30/2200	33	42			6.79
Harlingen Valley (KHRL)	30/2322	999.7	01/0132	35	43			3.87
McAllen Miller (KMFE)	01/0219	1001.0	01/0244	27	40			7.58
Port Isabel (KPIL)	30/2349	998.6	01/0112	34	46			5.30
Weslaco (KT65)	01/0025	1000.3	30/2205	26	36			5.86
Edinburg (KEBG)	01/0005	1002.4	30/2045	27	36			4.63
Brooks County (KBKS)	01/0010	1004.7	01/0010	20	28			4.55
Laredo (KLRD)	30/2256	1007.7	01/2056	22	27			3.74
Kingsville NAS (KNQI)	30/0956	1006.2	30/1632	23	30			4.33
Alice (KALI)	30/2353	1007.2	30/2353	22	30			8.27
South Padre Island (KSPL)	30/2315	998.3	01/0035	40	49			
Corpus Christi (KCRP)			01/0223	28	38			
Victoria (KVCT)			30/1640	24	30			
Port Aransas (KRAS)			30/2200	34	53			
NAS Corpus Christi (KNGP)			01/0318	34	51			
Beeville (KBEA)	30/2203	1008.7	30/2203	21	30			
Port Lavaca (KPKV)	30/2210	1008.4	30/2130	21	30			
<b>Marine Observations</b>								
Tabs K (42045)	30/1000	1001.6	30/1130	27	33			
Port Isabel (PTIT2)	30/2300	998.5	30/1842	44	54			
Rincon Del San Jose (RSJT2)			30/1742	31	41			
Baffin Bay (BAPT2)			30/2206	36	56			
Realitos Pen (RLPN2)			30/1942	39	56			
South Padre (SPIT2)	30/2200	999.5	01/0000	31	40			

Bob Hall Pier NOS			30/1542	39	47	3.89	4.76	
South Bird Island			30/2206	35	49			
Port Aransas			30/2200	34	53	2.97	3.05	
Port Aransas (PTAT2)	01/0000	1006.4	30/2300	35	43			
Port O'Connor			30/2200	34	42	3.11	3.34	
Ingleside			30/2206	22	30	3.01	2.96	
Packery Channel			30/1548	35	49	2.93	2.81	
Buoy 42019			30/0740	30	37			
Buoy 42020			30/1720	33	43			
Copano Bay						2.40	2.59	
Sea Drift						2.63	2.70	
Port Lavaca						4.94	5.31	
TX State Aquarium						3.28	3.39	
<b>Public/Other</b>								
Rancho Viejo (CMR1 ) 26.03 N -97.55 W								9.79
Rancho Viejo (CMR6) 26.00 N -97.52 W								8.83
Brownsville (CMR38) 25.96 N -97.43 W								9.10
Alamo (HDL6) 26.20 N -98.11 W								8.34
Edinburg (HDL17) 26.28 N -98.18 W								8.22
Los Fresnos (CMR2 ) 26.07 N -97.47 W								8.14
McCook ( MCOT2 ) 26.48 N -98.38 W								8.25
Brownsville (CMR17) 25.92 N -97.42 W								8.02
Weslaco (WEST2) 26.16 N -97.95 W								7.96
Brownsville (CMR15) 25.97 N -97.54 W								7.67
San Benito (CMR19) 26.06 N -97.61 W								7.62
Brownsville (CMR23) 25.91 N -97.45 W								7.79
McAllen (KMFE) 26.21 N -98.24 W								7.58
Brownsville (CMR16) 25.97 N -97.48 W								7.28
Brownsville (CMR42) 25.96 N -97.43 W								7.14
Brownsville (CMR13) 25.92 N -97.52 W								7.12
Lyford (WC01)								7.05



26.41 N -97.79 W								
South Padre Island 26.07 N -97.18 W								6.87
Mercedes ( MCDT2) 26.14 N -97.92 W								7.08
Harlingen (CMR32) 26.17 N -97.75 W								6.64
Harlingen ( CMR36 ) 26.16 N -97.76 W								6.40
La Joya (LJAT2) 26.24 N -98.48 W								6.35
Harlingen (HGNT2) 26.19 N -97.69 W								6.61
Brownsville ( CMR50) 25.97 N -97.54 W								6.06
Brownsville (CMR44) 25.96 N -97.43 W								7.31
Harlingen (CMR18) 26.16 N -97.78 W								5.93
San Manuel ( SMLT2) 26.57 N -98.12W								5.91
Port Mansfield ( PSFT2) 26.55 N -97.43 W								5.83
Hebbronville (HBBT2) 27.31 N -98.69 W								7.51
Raymondville ( PYMT2) 26.47 N -97.78 W								5.67
Mission ( HDL9) 26.22 N -98.29 W								5.90
Edinburg ( EDIT2) 26.29 N -98.16 W								7.53
Sarita (SRTT2) 27.21 N -97.69 W								5.84
Brownsville (CMR51 ) 25.92 N -97.48 W								5.64
Harlingen 26.18 N -97.72 W								5.50
Brownsville 25.96 N -97.50 W								6.76
Mission 26.21 N -98.28 W								6.00
Sebastian 26.34 N -97.80 W								5.00
San Manuel (LSRT2 ) 26.57 N -98.12 W								5.42
Weslaco (KT65) 26.17 N -97.95 W								5.86
Armstrong Coop (ARMT2) 26.83 N -97.70 W								5.52
Falfurrias (FAFT2 ) 27.22 N -98.18 W								5.73
Edinburg (KEBG) 26.42 N -98.10 W								4.63

Sarita (KNQI) 27.50 N -97.81 W								4.33
Falfurrias ( KBKS) 27.20 N -98.12 W								4.55
Santa Ana NWR COOP ( LWRT ) 26.07 N -98.16 W								7.94
Falfurrias (KALI) 27.74 N -98.27 W								8.27
Orange Grove 28.00 N -98.06 W								9.19
Seadrift 28.37 N -96.69 W								8.61
Bishop 27.58 N -97.79 W								8.28
Alice 27.75 N -98.06 W								8.19
Odem 27.92 N -97.53 W								7.43
Concepcion 27.38 N -98.30 W								7.43
Encinal 27.86 N -99.26 W								6.83
Woodsboro 28.19 N -97.31 W								6.73
Mathis 28.12 N -97.86 W								6.81
Woodsboro 28.19 N -97.31 W								6.73
Beeville 28.32 N -97.75 W								6.55
Kamay 28.58 N -96.70 W								6.54
Rockport 28.05 N -97.05 W								6.22
Tuloso ( NU-19 ) 27.85 N -97.60 W								6.09
Bloomington 28.73 N -97.00 W								6.05
<b>Mexico</b>								
<b>Tamaulipas</b>								
<b>Public/Other</b>								
Ciudad Victoria	01/0026	1000.0	30/2144	35	37			0.67

<sup>a</sup> Date/time is for sustained wind when both sustained and gust are listed.

<sup>b</sup> Except as noted, sustained wind averaging periods for C-MAN and land-based ASOS reports are 2 min; buoy averaging periods are 8 min.

<sup>c</sup> Storm surge is water height above normal astronomical tide level.

<sup>d</sup> Storm tide is water height above National Geodetic Vertical Datum (1929 mean sea level).

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Alex, 25 June-2 July 2010. Mean errors for the five-year period 2005-9 are shown for comparison. Official errors that are smaller than the five-year means are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL (Alex)	34.3	<b>51.4</b>	<b>67.2</b>	<b>84.3</b>	<b>105.8</b>	<b>104.7</b>	<b>103.8</b>
OCD5 (Alex)	53.3	96.8	129.6	161.4	183.7	179.5	246.8
Forecasts	24	22	20	18	14	10	6
OFCL (2005-9)	31.8	53.4	75.4	96.8	143.8	195.6	252.1
OCD5 (2005-9)	46.9	97.3	155.4	211.6	304.8	387.9	467.8

Table 4b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Alex, 25 June-2 July 2010. 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	33.9	48.2	70.5	83.1	106.6	109.1	153.5
OCD5	52.0	93.4	134.8	172.4	194.2	204.4	272.6
GFSI	<b>30.4</b>	49.5	<b>51.1</b>	<b>60.4</b>	152.6	234.2	<b>115.6</b>
GFDI	36.4	64.5	93.0	106.4	151.9	274.3	1261.1
HWFI	41.0	64.0	88.1	104.1	168.3	247.0	723.8
NGPI	47.4	69.4	97.9	107.5	137.4	124.1	174.6
EMXI	<b>33.8</b>	50.8	<b>56.0</b>	<b>63.7</b>	<b>101.7</b>	151.7	249.2
CMCI	<b>31.1</b>	50.7	72.0	94.3	168.2	312.0	<b>82.6</b>
AEMI	36.0	54.1	<b>61.3</b>	<b>74.3</b>	152.7	283.7	570.5
TVCN	<b>33.3</b>	<b>45.4</b>	<b>55.4</b>	<b>56.0</b>	<b>83.9</b>	<b>107.9</b>	<b>24.0</b>
TVCC	<b>31.2</b>	<b>38.4</b>	<b>43.1</b>	<b>50.2</b>	<b>82.3</b>	<b>106.7</b>	<b>84.0</b>
LBAR	45.6	87.8	144.3	202.2	285.5	319.9	456.1
BAMS	47.8	76.7	82.6	96.9	148.2	203.3	<b>43.7</b>
BAMM	43.7	73.0	79.5	103.2	159.4	179.1	<b>72.2</b>
BAMD	39.2	68.8	72.9	101.4	157.4	172.2	<b>78.0</b>
Forecasts	12	12	11	11	9	7	1

Table 5a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Alex, 25 June-2 July 2010. Mean errors for the five-year period 2005-9 are shown for comparison. Official errors that are smaller than the five-year means are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL (Alex)	<b>3.8</b>	<b>6.4</b>	<b>5.3</b>	<b>6.1</b>	<b>10.7</b>	<b>17.5</b>	25.0
OCD5 (Alex)	6.3	9.5	13.9	14.7	26.2	36.7	32.5
Forecasts	24	22	20	18	14	10	6
OFCL (2005-9)	7.0	10.7	13.1	15.2	18.6	18.7	20.1
OCD5 (2005-9)	8.6	12.5	15.8	18.2	21.0	22.7	21.7

Table 5b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Alex, 25 June-2 July 2010. 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	3.8	6.4	5.3	6.1	10.7	17.5	26.0
OCD5	6.3	9.5	13.9	14.7	26.2	36.7	36.4
DSHP	4.5	<b>5.1</b>	6.1	<b>4.2</b>	<b>8.6</b>	22.5	<b>25.8</b>
LGEM	5.6	7.6	7.3	6.6	11.6	<b>12.5</b>	<b>13.2</b>
GHMI	7.4	10.7	10.0	12.4	15.0	<b>12.3</b>	<b>22.4</b>
HWFI	8.2	15.0	17.0	18.9	22.2	32.2	38.4
IVCN	5.5	7.9	8.9	10.0	<b>10.6</b>	17.5	<b>19.6</b>
ICON	5.0	7.3	8.3	8.3	<b>9.4</b>	<b>16.5</b>	<b>17.4</b>
Forecasts	24	22	20	18	14	10	5

Table 6. Watch and warning summary for Hurricane Alex, 25 June-2 July 2010.

Date/Time (UTC)	Action	Location
25 / 2100	Tropical Storm Warning issued	Chetumal to Cancun
26 / 0000	Tropical Storm Warning issued	Belize
26 / 0300	Tropical Storm Watch issued	Limon to Honduras/Guatemala border
26 / 0300	Tropical Storm Warning issued	Roatan/Guanaja/Utila
27 / 0000	Tropical Storm Watch modified to	Tela to Honduras/Guatemala border
27 / 0000	Tropical Storm Warning discontinued	Roatan/Guanaja/Utila
27 / 0300	Tropical Storm Watch discontinued	All
27 / 1500	Tropical Storm Warning discontinued	All
28 / 1500	Hurricane Watch issued	La Cruz to Baffin Bay
28 / 2100	Tropical Storm Watch issued	Baffin Bay to Port O'connor
29 / 0300	Tropical Storm Watch changed to Tropical Storm Warning	Baffin Bay to Port Oconnor
29 / 0300	Hurricane Watch changed to Hurricane Warning	La Cruz to Baffin Bay
29 / 2100	Tropical Storm Warning issued	Cabo Rojo to La Cruz
1 / 0300	Tropical Storm Warning modified to	Brownsville to Port O'connor
1 / 0300	Hurricane Warning modified to	La Cruz to TX/MX border
1 / 0900	Tropical Storm Warning discontinued	Brownsville to Port O'connor
1 / 0900	Tropical Storm Warning issued	Rio San Fernando to TX/MX border
1 / 0900	Hurricane Warning modified to	La Cruz to Rio San Fernando
1 / 1200	Hurricane Warning changed to Tropical Storm Warning	La Cruz to Rio San Fernando
1 / 1200	Tropical Storm Warning modified to	La Cruz to Rio San Fernando
1 / 1500	Tropical Storm Warning discontinued	All

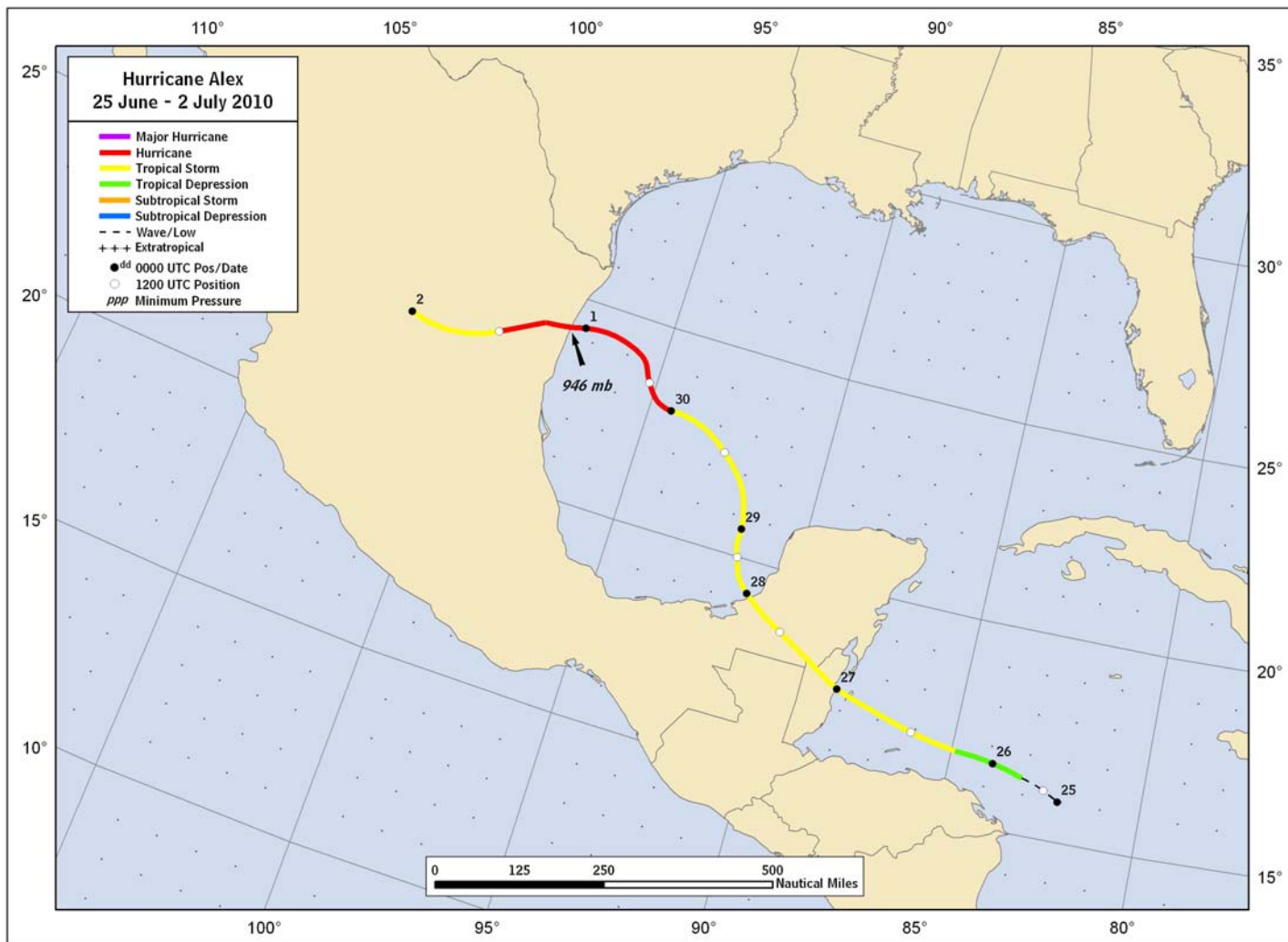


Figure 1. Best track positions for Hurricane Alex, 25 June-2 July 2010.

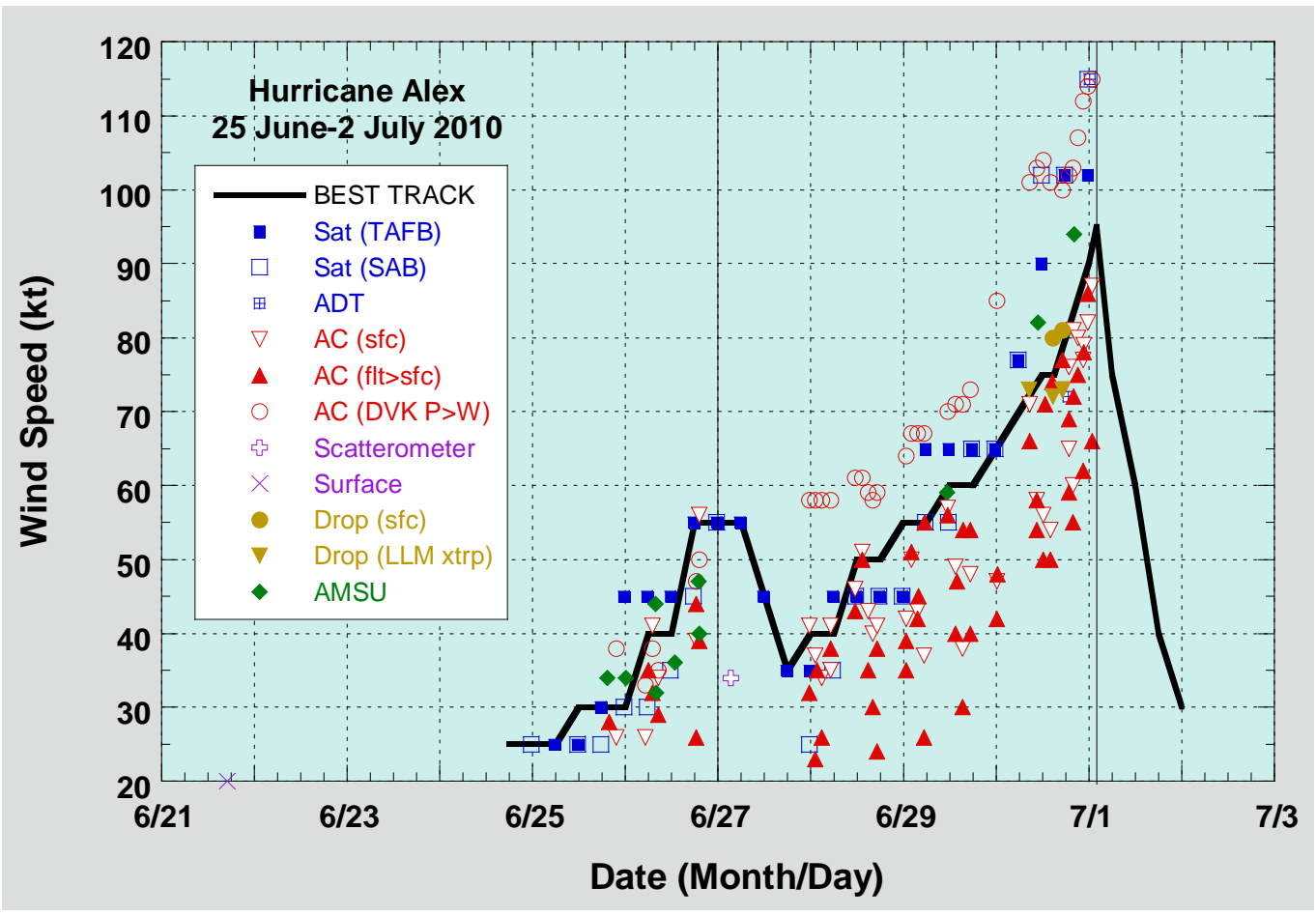


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Alex, 25 June-2 July 2010. Aircraft observations have been adjusted for elevation using 90%, 80%, and 80% adjustment factors for observations from 700 mb, 850 mb, and 1500 ft, respectively. Dropwindsonde 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 xtrp). Advanced Dvorak Technique estimates represent linear averages over a three-hour period centered on the nominal observation time. Dashed vertical lines correspond to 0000 UTC. Landfalls in Belize and Mexico are indicated by thin solid vertical lines.



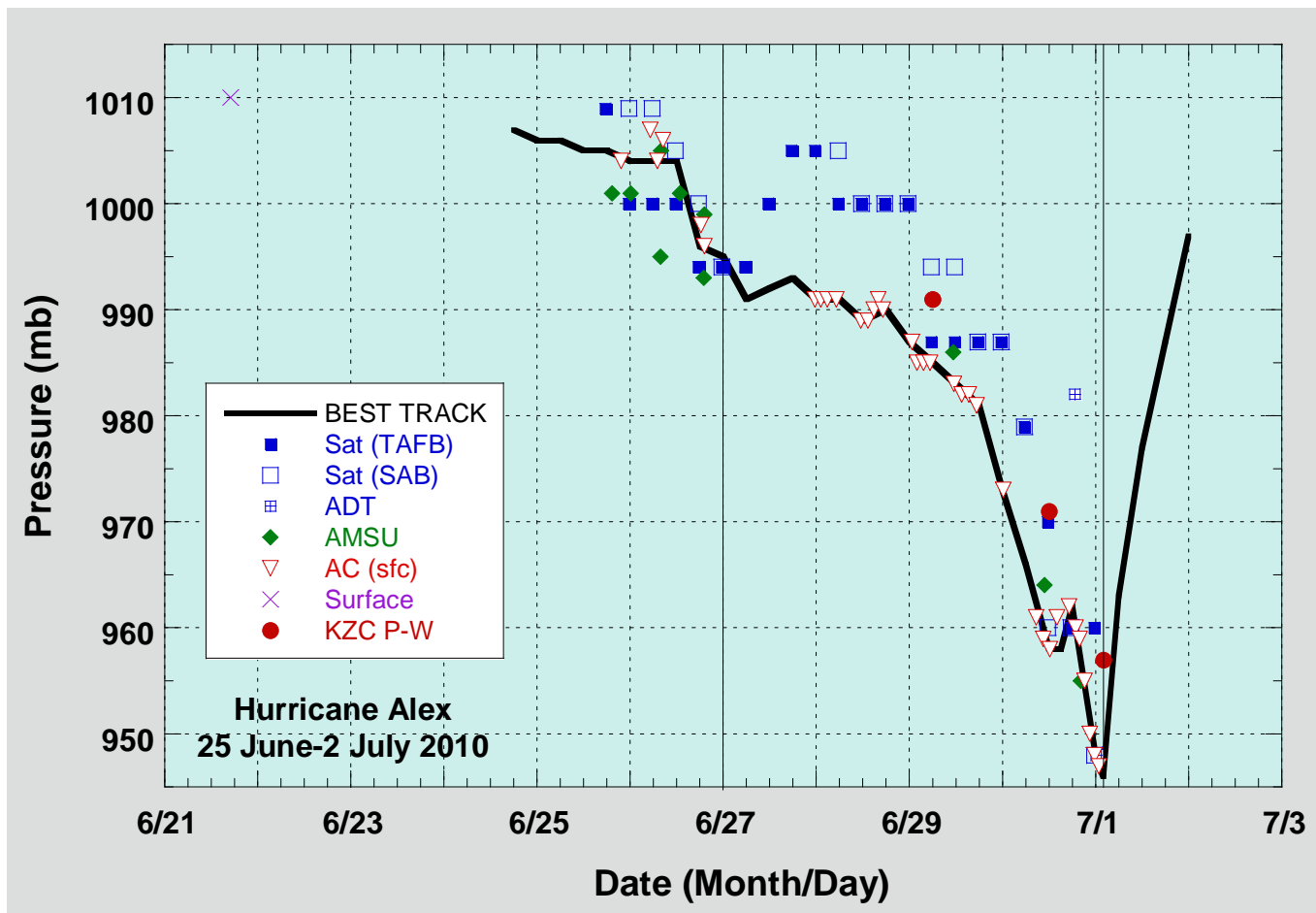


Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Alex, 25 June-2 July 2010. Advanced Dvorak Technique estimates represent linear averages over a three-hour period centered on the nominal observation time. Dashed vertical lines correspond to 0000 UTC. Landfalls in Belize and Mexico are indicated by thin solid vertical lines. KZC P-W denotes minimum pressures estimated by the Knaff-Courtney-Zehr pressure-wind relationship.

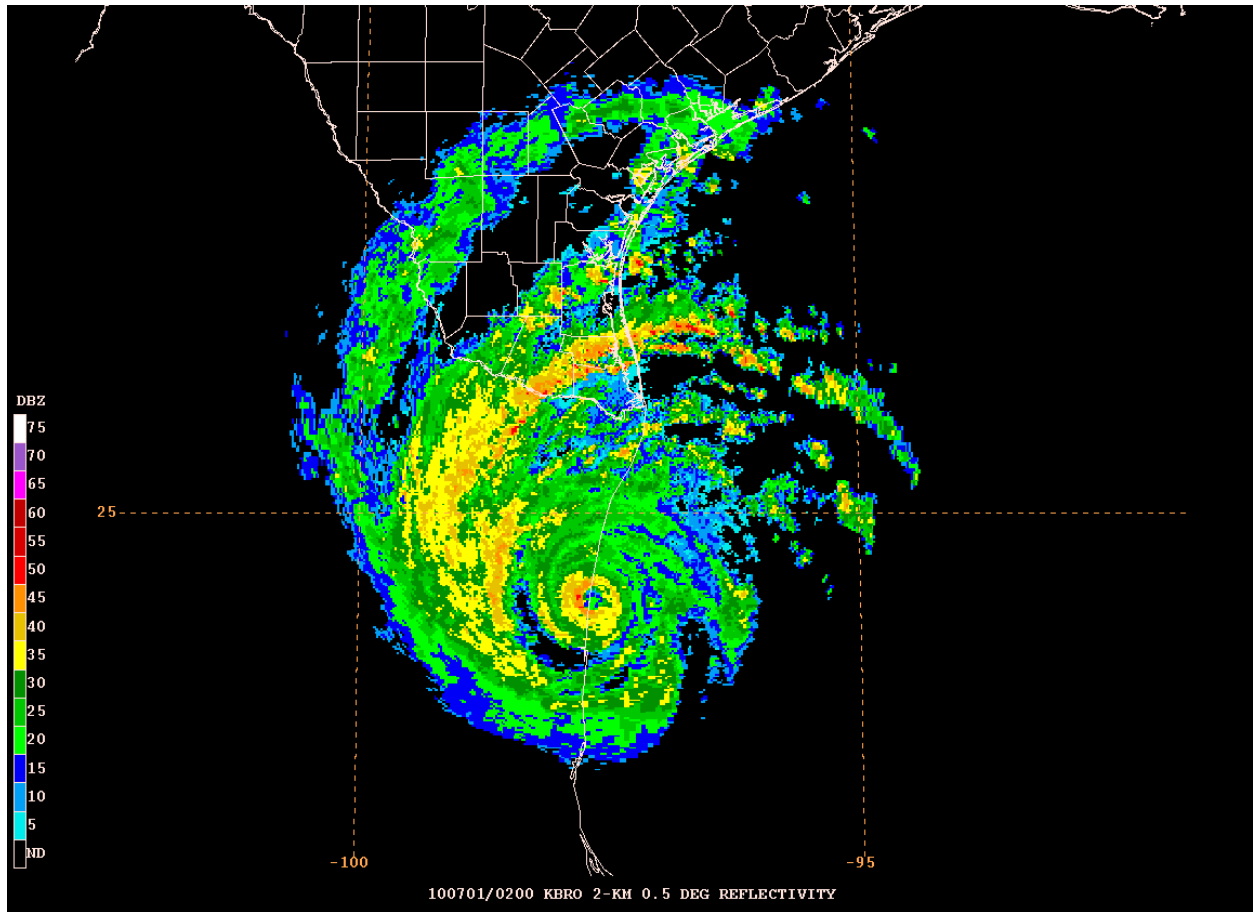


Figure 4. Image from the Brownsville WSR-88D radar of Hurricane Alex at 0200 UTC 1 July 2010 as the center was making landfall in northeastern Mexico.

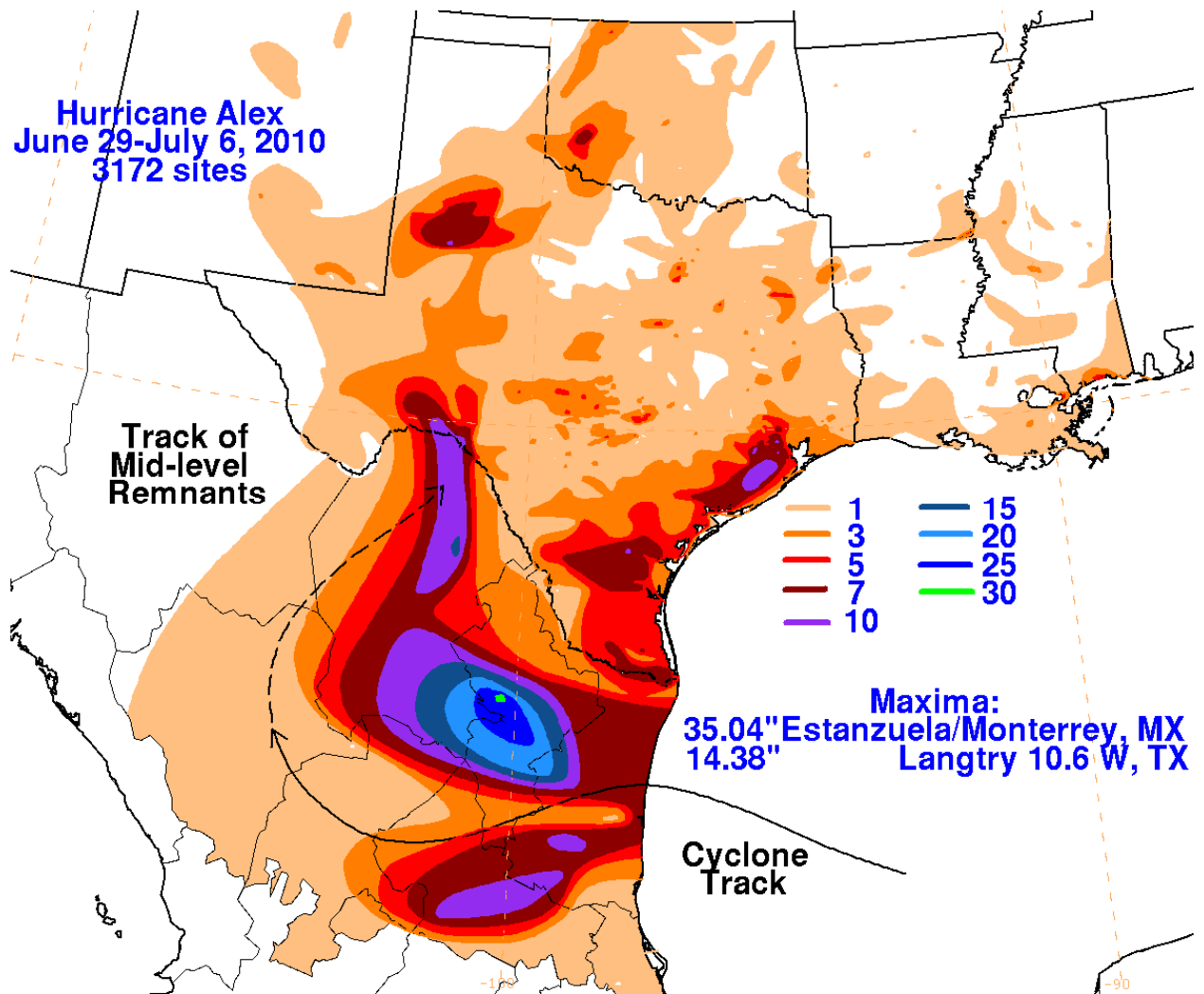


Figure 5. Estimated rainfall totals (in.) due to Hurricane Alex. Figure was produced by David Roth of the Hydrometeorological Prediction Center.