

Preliminary Report
Tropical Storm Andres
1-7 June 1997

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18 June 1997

Tropical Storm Andres moved toward the east to southeast, near the coast of Central America, for several days. This evolution was unprecedented in the NHC data base comprising more than 700 eastern North Pacific tropical cyclone tracks during the period 1949-1997.

a. Synoptic History

The upper-level westerlies extended to rather low latitudes over the eastern North Pacific Ocean through most of the month of May. The associated westerly vertical wind shear helped inhibit tropical cyclone formation in that basin during May. Near the end of the month, however, the westerlies lifted northward slightly over the easternmost part of the basin. It was there that a distinct circulation of low- to mid-level clouds developed on 30 May, possibly in association with a tropical wave that crossed the Atlantic Ocean at low latitudes from 14-28 May. On the 31st, deep convection developed and became concentrated near the center of the cloud pattern. Satellite intensity estimates from the Dvorak technique reached T1.5-2.0 early on 1 June and are the bases for estimating that the disturbance became a tropical depression at 0000 UTC on 1 June, about 300 n mi south of the Gulf of Tehuantepec (Figs. 1-3, Table 1).

Satellite analyses imply that as the cloud pattern became elongated generally from north to south on 2-3 June, a second cloud center to the north-northwest of the original center became dominant. The cyclone strengthened slightly early in this period and became Tropical Storm Andres.

Andres initially moved toward the northwest. This track gradually brought the tropical storm into a pattern of westerly steering winds and, by midday of the 3rd, the storm was moving toward the east to east-northeast. This heading was toward the mainland and the first in a series of tropical storm warnings for southeastern Mexico and Central America was issued (Table 2). Andres moved to within about 30 n mi of the coast of Guatemala and strengthened a little, to its maximum intensity of 45 knots.

The axis of a short-wave trough passed a little to the north, over the Bay of Campeche, on the 4th. The northwesterly flow behind the axis steered Andres toward the southeast on a course roughly parallel to the coast. On this track, Andres' cloud pattern became rather shapeless while the cyclone interacted

increasingly with ITCZ clouds and a monsoon-like circulation associated with the ITCZ. The storm then weakened.

Late on 6 June, Andres began moving northward at the head of a band of convective cloudiness that extended southwestward to the ITCZ. Andres made landfall on the coast of El Salvador near 0000 UTC on the 7th as a tropical depression. It was the first landfall in that country (records begin 1949).

The surface circulation became disrupted by the high terrain of Central America and is estimated to have dissipated a few hours after landfall. A mid-level cloud remnant continued to circulate and move northward over land. When that feature reached the Gulf of Honduras, a weak surface low redeveloped. Eventually, the rejuvenated system contributed to heavy rain over western Cuba, the southern Florida peninsula and the northwestern Bahamas. The low gradually combined with a weak, non-tropical trough over the eastern Gulf of Mexico. The last "fix" on the low was over the eastern Gulf of Mexico on 10 June.

b. Meteorological Statistics

Figures 2 and 3 show the tropical storm's estimated central pressure and maximum one-minute wind speed, respectively, versus time and the associated satellite data. Position and intensity estimates from satellite pictures were provided by the Air Force Global Weather Center (AFGWC), NOAA Tropical Analysis and Forecast Branch (TAFB) and NOAA Synoptic Analysis Branch (SAB).

The NHC has not received official reports of surface observations of tropical storm force winds associated with Andres. The analysis of Andres' surface wind field was improved by near real-time wind speed and direction data received from a NASA scatterometer (NSCAT). This was the first operational use of this data by the NHC.

According to *El Nuevo Herald*, Andres generated torrential showers and locally enormous seas and inundations along the western Central America coast.

c. Casualty and Damage Statistics

A reprinting of Nicaragua's *La Prensa* by *El Nuevo Herald* indicated that two fisherman were missing. There were no other reports of casualties.

El Nuevo Herald attributed to Andres interruptions to electricity, overflowing rivers, automobile accidents and damage to about 10 homes in El Salvador and Nicaragua. Damage was noted in the Nicaragua municipalities of Chinandega, Corinto, El Realejo and El Viejo.

d. Forecast and Warning Critique

Some of the track model guidance normally used by the forecasters was not available for a variety of technical reasons (see Table 2).

When Andres approached the coast of Guatemala most of the available model forecasts and the NHC forecast track incorrectly showed a continued east to northeast movement, implying Andres would then cross Central America and emerge into the western Caribbean Sea. Several of the models showed a threat to Cuba, the Gulf of Mexico, and Florida, within the following two to three days. Some also showed cyclongenesis of a major storm over the eastern Gulf of Mexico. Neither occurred. With the exception of BAMS, track forecast errors were considerably larger than normal.

The NHC intensity forecasts were mostly 5 to 15 knots too low, primarily due to the incorrect expectation that Andres would move inland and weaken (a few days before that actually occurred).

Table 3 lists the watches and warnings issued in association with Andres. The initial tropical storm warning was not preceded by a tropical storm watch. The possibility that either a watch or warning might soon be issued was, however, noted in each advisory during the 27 hours leading up to the warning.

Table 1. Preliminary best track, Tropical Storm Andres, 1-7 June 1997.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
01/0000	10.4	95.4	1009	25	Tropical Depr.
0600	10.5	95.5	1008	25	" "
1200	10.7	95.7	1007	30	" "
1800	10.8	95.8	1006	30	" "
02/0000	11.0	96.0	1005	30	" "
0600	11.2	96.2	1005	30	" "
1200	11.4	96.3	1005	35	Tropical Storm
1800	12.0	96.7	1005	35	" "
03/0000	13.0	97.1	1005	35	" "
0600	13.6	97.3	1005	35	" "
1200	14.1	97.1	1004	35	" "
1800	14.4	96.1	1002	40	" "
04/0000	14.6	95.1	1001	45	" "
0600	14.8	94.2	1000	45	" "
1200	14.8	93.8	999	45	" "
1800	14.7	93.5	998	45	" "
05/0000	14.5	93.0	999	45	" "
0600	14.1	92.4	1000	45	" "
1200	13.5	91.8	1000	40	" "
1800	12.9	91.2	1001	35	" "
06/0000	12.4	90.3	1001	35	" "
0600	12.0	89.6	1002	30	Tropical Depr.
1200	12.0	89.1	1002	30	" "
1800	12.3	88.8	1003	30	" "
07/0000	13.0	88.8	1003	25	" "
0600	13.7	88.7	1004	20	Dissipating
04/1200	14.7	93.5	998	45	Minimum Pressure
07/0100	13.2	88.8	1003	25	Landfall near San Salvador, El Salvador

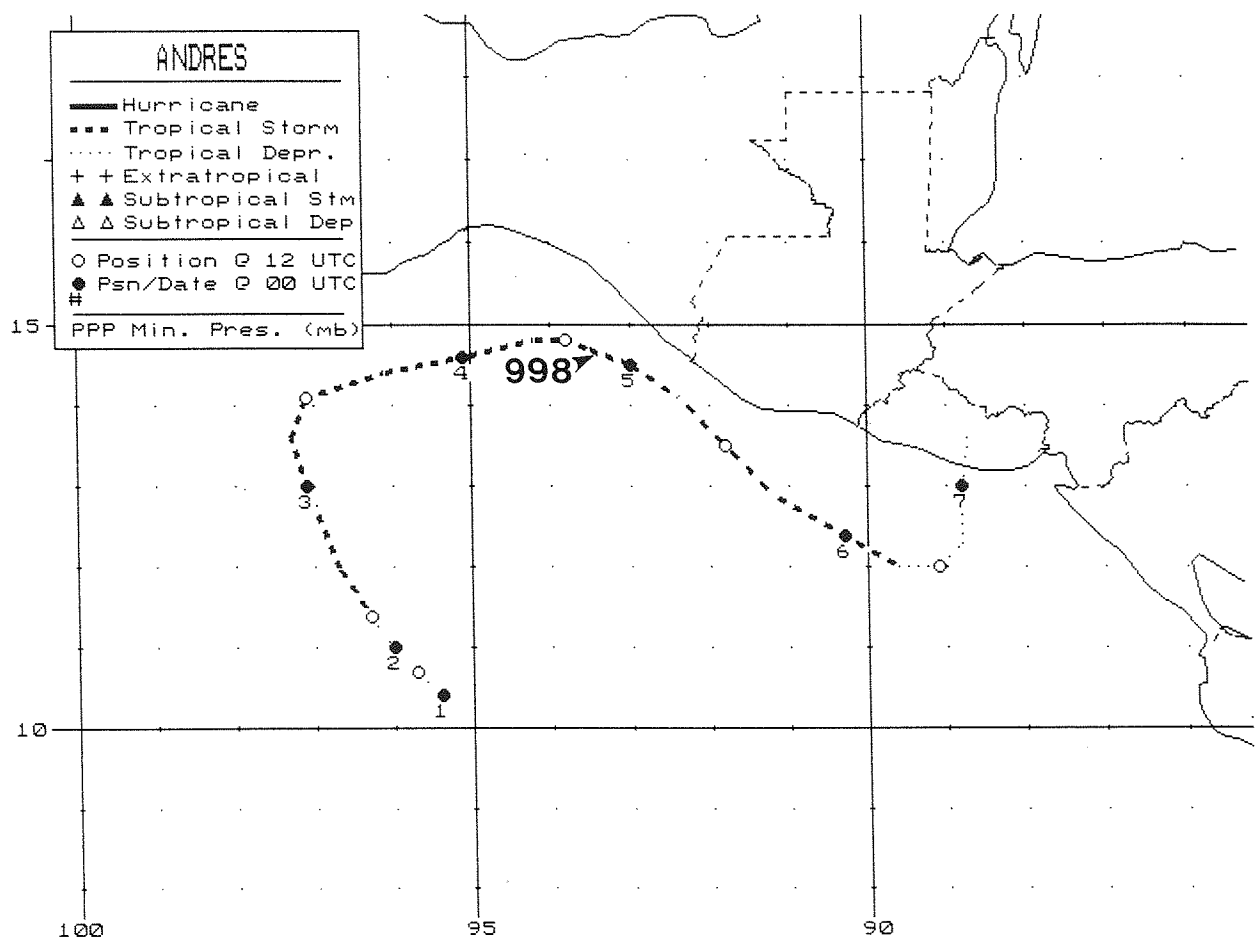


Figure 1. Best track positions for Tropical Storm Andres.

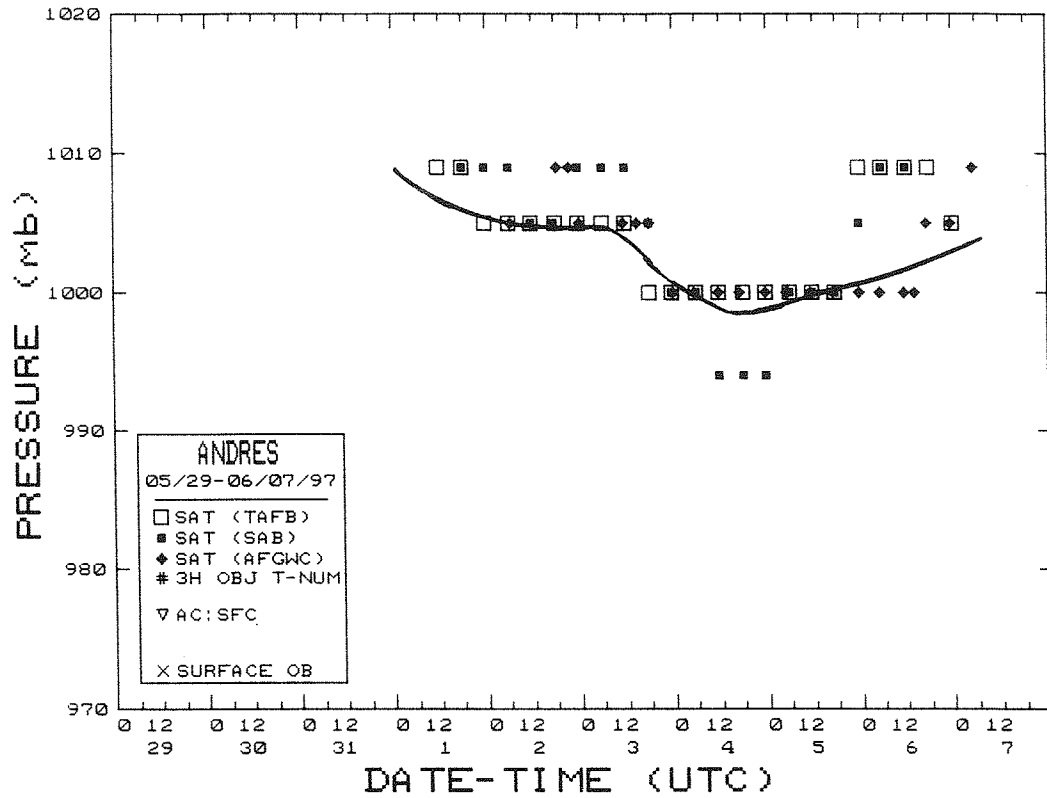


Figure 2. Best track central pressure curve for Tropical Storm Andres, 1-7 June 1997.

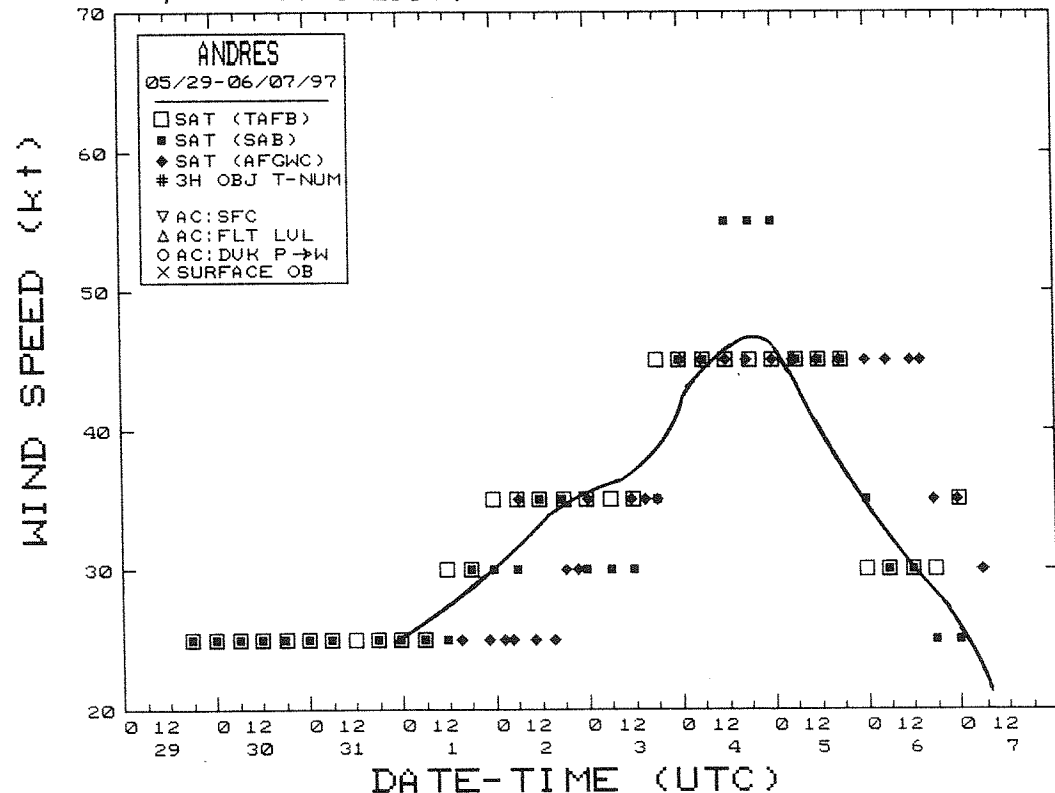


Figure 3. Best track maximum wind speed curve for Tropical Storm Andres, 1-7 June 1997.

Table 2

Preliminary forecast evaluation of Tropical Storm Andres
Heterogeneous sample

(Errors in nautical miles for tropical storm
and hurricane stages with number
of forecasts in parenthesis)

Technique	Period (hours)				
	12	24	36	48	72
CLIP	78 (13)	144 (11)	215 (9)	297 (7)	534 (3)
GFDI	98 (13)	141 (11)	134 (9)	217 (7)	398 (3)
GFDL*	110 (7)	158 (6)	167 (5)	133 (3)	283 (2)
VBAR	NA	NA	NA	NA	NA
LEBAR	72 (13)	121 (11)	163 (9)	193 (7)	313 (3)
AVNI	NA	NA	NA	NA	NA
BAMD	95 (13)	188 (11)	298 (9)	459 (7)	724 (3)
BAMM	71 (13)	98 (11)	117 (9)	186 (7)	401 (3)
BAMS	73 (13)	108 (11)	131 (9)	162 (7)	117 (3)
A90E	NA	NA	NA	NA	NA
NGPI	NA	NA	NA	NA	NA
UKMI	NA	NA	NA	NA	NA
NHC OFFICIAL	69 (13)	111(11)	144 (9)	176 (7)	333 (3)
NHC OFFICIAL (1988-1995 8-year average)	39 (2180)	71 (1970)	105 (1752)	139 (1553)	196 (1198)

* GFDL output not available until after forecast issued. VBAR
output sometimes not available until after forecast issued

NA indicates data not available to forecasters.

Table 3
Tropical Cyclone watch and warning summary, Tropical Storm Andres

Date/Time (UTC)	Action	Location
03/1800	Tropical Storm Warning issued	Punta Galera, Mexico to Guatemala border
04/0300 Unknown	Tropical Storm Warning recommended Tropical Storm Warning issued	Guatemala coast Champerico, Guatemala to Mexico border
05/0600	Tropical Storm Warning discontinued	Punta Galera to Puerto Arista, Mexico
05/2100	Tropical Storm Warning discontinued	Mexico and Guatemala
05/2100	Tropical Storm Watch issued	Guatemala and El Salvador
06/0300	Tropical Storm Watch discontinued	Guatemala and El Salvador