

Tropical Cyclone Report
Hurricane Sergio
(EP212006)
13-20 November 2006

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Sergio was the strongest eastern North Pacific hurricane for so late in the season, and it was also the longest-lived November tropical cyclone on record for that basin. Since it was always embedded in weak steering currents, this tropical cyclone did not move very far during its lifetime. There was no direct impact on land.

a. Synoptic History

Sergio appears to have been spawned by a tropical wave that crossed southern Central America and entered the eastern North Pacific on 7 November. An area of cloudiness and showers associated with the wave moved slowly westward to the south of Central America and eastern Mexico over the next several days. Showers and thunderstorms became more concentrated by 12 November over an area centered roughly 350 n mi to the south of Acapulco, Mexico, and Dvorak classifications were initiated on the disturbance. By 1800 UTC 13 November, when the system was a little over 400 n mi to the south of Manzanillo, Mexico, it had acquired enough surface circulation and organized deep convection to be designated as a tropical depression. 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.

Initially the cyclone was moving northwestward, but it soon stalled while strengthening into a tropical storm on 14 November. Sergio then turned toward the southeast, apparently due to the flow associated with a mid- to upper-level trough to its northeast, and continued to intensify. While situated in an environment of light vertical shear, with anticyclonic flow aloft and a generally moist troposphere, the storm became a hurricane on 15 November, and it quickly strengthened to a peak intensity of 95 kt around 1800 UTC that day. Sergio exhibited a distinct and very small eye around that time. The hurricane then turned toward the northeast and north-northeast and weakened as westerly shear, associated with an upper-level trough to the northwest, increased over the tropical cyclone. By early on 17 November, the low-cloud circulation became partially exposed on the west side of the deep convection, and it is estimated that Sergio weakened to a tropical storm by 0600 UTC that day. During the next few days, an area of high pressure built to the northeast and north of the tropical cyclone, which forced the system to turn toward the northwest, west, and eventually west-southwest. Although there was some slight restrengthening on 18 November when deep convection reformed near the center, Sergio was mainly on a weakening trend as persistently strong shear took its toll. The cyclone weakened to a tropical depression by about 0000 UTC 20 November, and it dissipated later that day about 315 n mi southwest of Manzanillo, as the low-level circulation became stretched along a cyclonic shear axis.

b. Meteorological Statistics

Observations in Sergio (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). Microwave satellite imagery from NOAA polar-orbiting satellites, the NASA Tropical Rainfall Measuring Mission (TRMM), the NASA Aqua, the NASA QuikSCAT, and Defense Meteorological Satellite Program (DMSP) satellites were also useful in tracking Sergio. The peak intensity of this hurricane is based on a blend of Dvorak estimates from TAFB and SAB. Best track intensity estimates from late on 16 November through 17 November were based on a blend of Dvorak and microwave intensity estimates, with the former values being significantly higher than the latter.

No ship reports of winds of tropical storm force associated with Sergio have been received.

c. Casualty and Damage Statistics

There were no reports of damage or casualties associated with Sergio.

d. Forecast and Warning Critique

The Tropical Weather Outlook (TWO) from the National Hurricane Center first noted the area of disturbed weather that evolved into Sergio on 12 November, about 30 h prior to genesis. However, the TWO did not specifically acknowledge the potential for tropical cyclone development until 1800 UTC 13 November -- which was right around the time of actual formation as determined from post-storm analysis (operationally the system was designated as a tropical depression with a special advisory issued at 0500 UTC 14 November).

A verification of official and guidance model track forecasts is given in Table 2. Average official track errors for Sergio were 31, 65, 93, 128, 184, 224, and 228 n mi for the 12, 24, 36, 48, 72, 96, and 120 h forecasts, respectively. The number of forecasts ranged from 26 at 12 h to 8 at 120 h. These errors are comparable to or larger than the average long-term official track errors (Table 2). Among the individual dynamical track guidance models, the UKMI had an outstanding performance during Sergio; its average track error was lower than the GUNA, FSSE, and CONU consensus guidance at 48 h and beyond. On average, the GFNI was considerably worse than the GFDI, due at least in part to the much poorer performance of the NGPI vs. the GFSI global guidance (upon which those regional models respectively base their initial states and boundary conditions).

Table 3 lists the average official and guidance model intensity forecast errors for Sergio. Average official intensity errors were 8, 13, 16, 18, 22, 22, and 24 kt for the 12, 24, 36, 48, 72, 96, and 120 h forecasts, respectively. For comparison, the average long-term official intensity errors are 6, 11, 14, 17, 19, 18, and 19 kt, respectively. The first few official forecasts had a large negative bias through 48 h as they failed to anticipate the rapid strengthening that was to take place during the 13-15 November time frame. On average, the SHIPS guidance had smaller errors than the official forecasts for 36 through 120 h. The GFDI did not do so well, with some large overforecasts of Sergio's intensity; several of the individual GFDI predictions were too high by 50 kt or more at 48-120 h.

No watches or warnings were issued for Sergio.

Table 1. Best track for Hurricane Sergio, 13-20 November 2006.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
13 / 1800	12.3	103.6	1009	25	tropical depression
14 / 0000	12.7	104.0	1008	25	"
14 / 0600	12.9	104.2	1007	30	"
14 / 1200	13.0	104.3	1006	35	tropical storm
14 / 1800	13.0	104.5	1000	50	"
15 / 0000	12.8	104.4	994	55	"
15 / 0600	12.6	104.3	992	60	"
15 / 1200	12.3	104.0	985	80	hurricane
15 / 1800	12.0	103.7	965	95	"
16 / 0000	12.1	103.3	970	90	"
16 / 0600	12.3	103.1	970	90	"
16 / 1200	12.8	102.9	975	85	"
16 / 1800	13.2	102.8	980	70	"
17 / 0000	13.5	102.8	982	70	"
17 / 0600	13.7	102.7	985	60	tropical storm
17 / 1200	13.8	102.6	997	50	"
17 / 1800	14.0	102.6	1002	40	"
18 / 0000	14.3	102.9	1005	40	"
18 / 0600	14.6	103.3	1000	45	"
18 / 1200	15.0	103.8	1000	45	"
18 / 1800	15.3	104.4	1000	45	"
19 / 0000	15.5	104.9	1002	40	"
19 / 0600	15.5	105.1	1002	40	"
19 / 1200	15.4	105.4	1004	35	"
19 / 1800	15.2	105.8	1005	35	"
20 / 0000	15.0	106.2	1005	30	tropical depression
20 / 0600	14.9	106.5	1005	30	"
20 / 1200	14.8	106.9	1005	30	"
20 / 1800	14.8	107.6	1006	25	"
21 / 0000					dissipated
15 / 1800	12.0	103.7	965	95	minimum pressure

Table 2. Preliminary track forecast evaluation (heterogeneous sample) for Hurricane Sergio, 13-20 November 2006. 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.

Forecast Technique	Forecast Period (h)						
	12	24	36	48	72	96	120
CLP5	38 (27)	88 (25)	141 (23)	188 (21)	262 (17)	274 (13)	306 (9)
GFNI	44 (20)	94 (18)	152 (16)	238 (14)	399 (10)	543 (6)	743 (2)
GFDI	35 (25)	65 (23)	87 (21)	109 (19)	210 (14)	375 (11)	496 (6)
GFSI	42 (26)	78 (23)	112 (22)	145 (20)	173 (16)	162 (12)	138 (8)
AEMI	44 (27)	81 (25)	115 (23)	149 (21)	200 (17)	235 (13)	205 (9)
NGPI	45 (25)	92 (22)	146 (20)	203 (16)	305 (12)	427 (6)	490 (1)
UKMI	37 (23)	69 (21)	91 (19)	102 (17)	94 (13)	90 (9)	120 (5)
BAMD	68 (27)	123 (25)	169 (23)	211 (21)	310 (17)	432 (13)	576 (9)
BAMM	42 (27)	73 (25)	104 (23)	143 (21)	236 (17)	320 (13)	369 (9)
BAMS	63 (27)	112 (25)	171 (23)	224 (21)	307 (17)	361 (13)	365 (9)
CONU	34 (27)	65 (25)	93 (23)	131 (19)	202 (15)	262 (11)	273 (7)
GUNA	33 (21)	60 (18)	85 (17)	115 (15)	177 (11)	273 (5)	337 (1)
FSSE	31 (24)	57 (22)	78 (20)	106 (18)	183 (14)	229 (10)	234 (6)
OFCL	31 (26)	65 (24)	93 (22)	128 (20)	184 (16)	224 (12)	228 (8)
NHC Official (2001-2005 mean)	35 (1300)	60 (1152)	83 (1009)	103 (877)	145 (652)	192 (465)	231 (313)

Table 3. Preliminary intensity forecast evaluation (heterogeneous sample) for Hurricane Sergio, 13-20 November 2006. Forecast errors (kt) 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.

Forecast Technique	Forecast Period (h)						
	12	24	36	48	72	96	120
SHF5	10.3 (27)	17.7 (25)	21.7 (23)	26.0 (21)	24.1 (17)	23.8 (13)	19.1 (9)
GFDI	11.7 (25)	17.5 (23)	21.0 (21)	25.5 (19)	37.6 (13)	26.1 (11)	25.0 (5)
SHIP	8.2 (27)	13.0 (25)	15.0 (23)	15.9 (21)	13.6 (17)	17.6 (13)	18.7 (9)
DSHP	8.2 (27)	13.0 (25)	15.0 (23)	15.9 (21)	13.6 (17)	17.6 (13)	18.7 (9)
FSSE	9.2 (24)	13.5 (22)	13.8 (20)	16.0 (18)	20.2 (14)	22.1 (10)	22.2 (6)
ICON	9.8 (25)	15.2 (23)	19.5 (21)	21.3 (19)	26.8 (13)	21.6 (11)	12.2 (5)
OFCL	7.9 (26)	12.9 (24)	15.7 (22)	18.3 (20)	21.9 (16)	22.1 (12)	23.8 (8)
NHC Official (2001-2005 mean)	6.2 (1300)	10.8 (1152)	14.3 (1009)	16.5 (876)	18.7 (652)	18.3 (465)	19.3 (313)

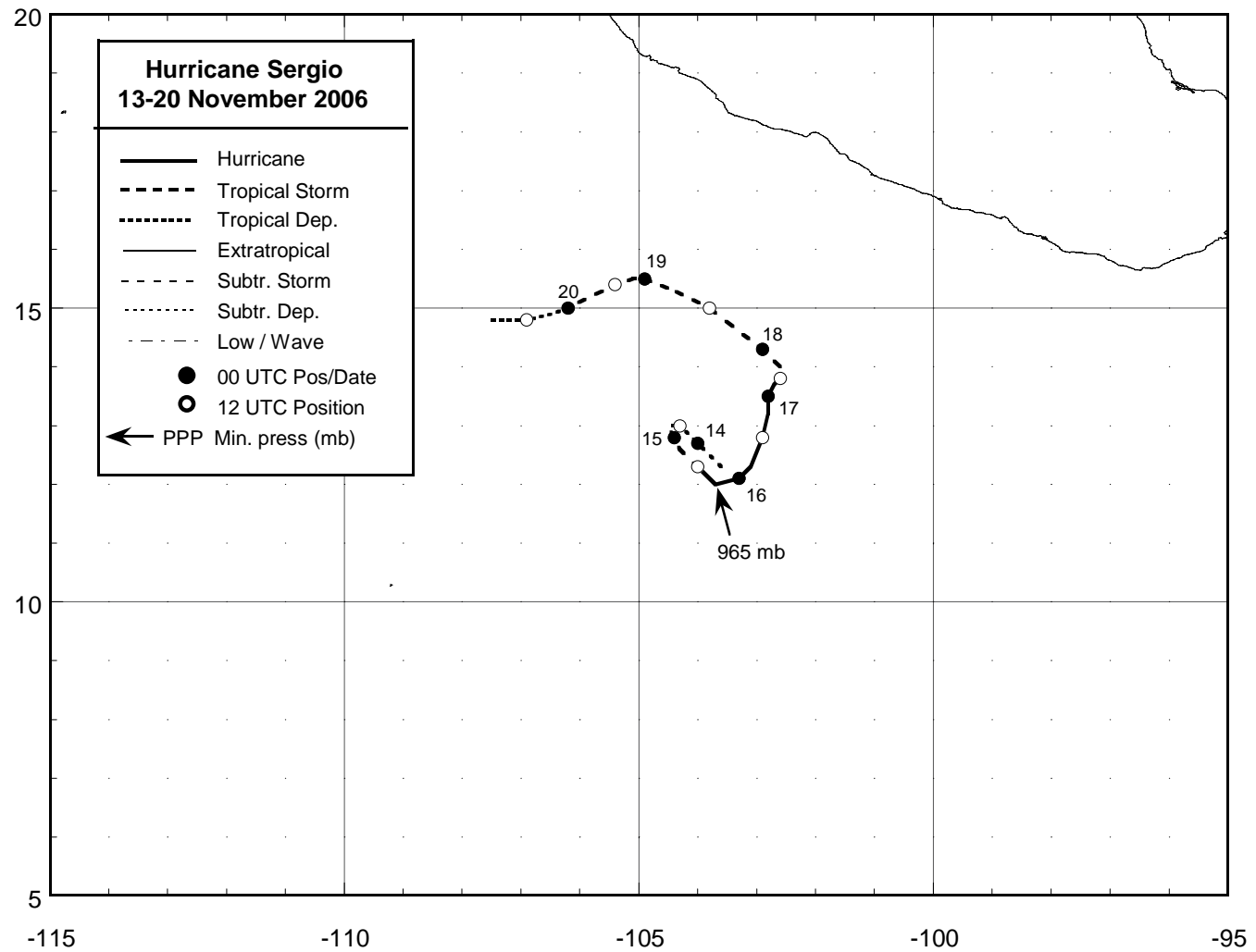


Figure 1. Best track positions for Hurricane Sergio, 13-20 November 2006.

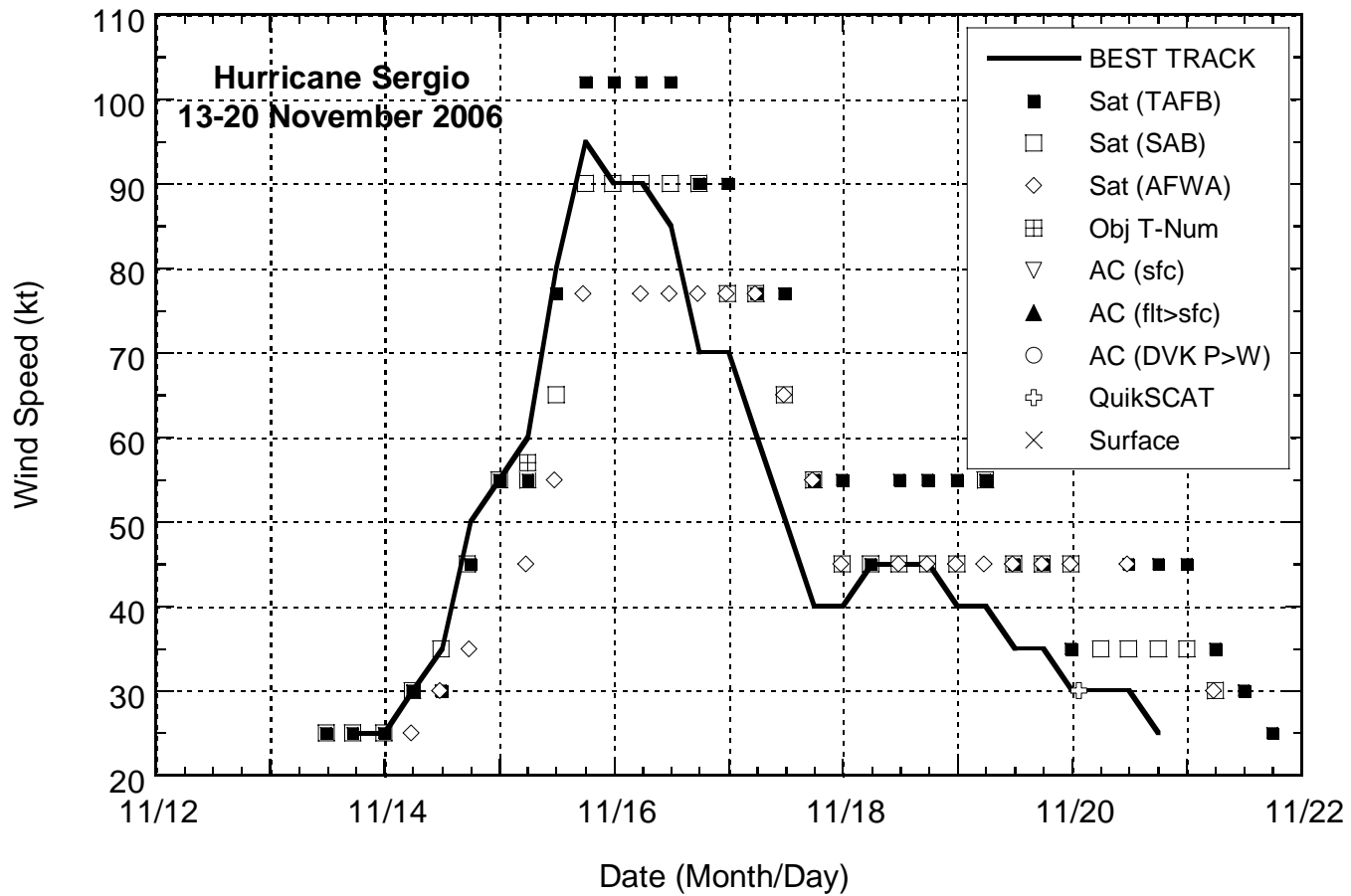


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Sergio, 13-20 November 2006. Objective Dvorak estimate represents a linear average over a three-hour period centered on the nominal observation time.

