

Preliminary Report  
Hurricane Bonnie  
17-30 September 1992

Hurricane Bonnie formed at rather high latitudes and moved very slowly for a large part of its lifetime. It affected the Azores with tropical storm conditions, shortly before it became extratropical.

a. Synoptic History

Bonnie had its origins in a non-tropical weather system. A cold front moved off the east coast of the United States on September 11. The front continued moving southeast and then became stationary, with its western end in the vicinity of Bermuda by September 15. Surface pressures fell over an area a few hundred miles east-northeast of Bermuda the following day, and satellite pictures on the 17th showed that an area of cloudiness had become detached and isolated from the frontal cloud band. The cloud pattern quickly became organized, exhibiting cyclonically curved bands and a small circularly-shaped overcast feature. The tropical depression stage of Bonnie began at 1800 UTC September 17, as shown in Table 1 and Fig. 1.

The depression strengthened fairly rapidly, and became Tropical Storm Bonnie around 0600 UTC on the 18th. As is frequently the case in non-tropical-type developments, Bonnie was initially embedded within a larger-scale deep-layer cyclonic circulation. This provided an environment of relatively weak vertical shear and also controlled the steering of Bonnie during the early stages. Bonnie moved slowly along a counterclockwise path before strengthening into a hurricane at 1800 UTC September 18. The hurricane commenced an east-northeast to northeast motion on the 19th while exhibiting a fairly well-defined eye. The eye became indistinct at times on the 20th but on the 21st, satellite images showed that it had again become rather sharp in appearance. At 1800 UTC on September 21, Bonnie reached its peak intensity with estimated maximum winds of 95 knots. The forward motion, which was already slow, decreased even further on the 22nd. Bonnie was practically stationary from 1800 UTC on the 22nd until 1200 UTC on the 23rd, when it began drifting west-southwest. Bonnie weakened considerably as satellite imagery showed that the low-level center became exposed from the associated deep convection. Its winds had been reduced to tropical storm strength on the 24th. By the 25th, Bonnie had lost most of its deep convection and by 0000 UTC September 26 Bonnie weakened briefly to a tropical depression. However tropical storm strength was regained a little later on that same day as deep convection returned.

Bonnie began a southward motion on September 24th which continued until the 26th at which time Bonnie turned southeast and then east, while picking up some forward speed. The stalling and southwestward drift of Bonnie were caused by the northward retreat

of deep layer westerlies over the west-central Atlantic area and the formation of a blocking-type pattern in the steering currents. A building mid-tropospheric high to the northwest of Bonnie forced the tropical cyclone southwestward. Subsequently, a broad deep-layer trough developed over the Atlantic to the east of Bonnie. The combined effects of the trough and high guided Bonnie southward for a while. Later on, as the influence of the trough became dominant, Bonnie was steered southeastward and eastward.

Although Bonnie had restrengthened back to a tropical storm, it remained in a westerly shearing environment on the 26th and 27th. The circulation center was generally near the western edge of the deep convective overcast. However on the 27th, Bonnie's cloud pattern took on a non-tropical comma shape and the deep convection was confined to an area several degrees east of the center. By the 28th, convection had returned near the center and Bonnie looked more like a tropical storm again. The system was then moving toward the east-northeast and it maintained that course for the next couple of days with some increase in forward speed. The center of the storm, moving near 20 knots, passed through the Azores island group on September 30th. Not much deep convection was associated with the system and, shortly after passing through the Azores, Bonnie became an extratropical low. The low then decelerated and looped clockwise, eventually moving back towards the Azores while dissipating.

#### b. Meteorological Statistics

Table 1 lists the "best track" positions and intensities every six hours for Bonnie. This track is based on satellite-derived center fixes and intensity estimates from the National Hurricane Center (TSAF), the Synoptic Analysis Branch (SAB), and the Air Force Global Weather Center (USAF) as well as ship reports and surface synoptic analyses. Figure 1 shows the best track positions and Figs. 2 and 3 show the best track pressure and wind curves as a function of time, along with the observations on which the curves are based.

The unusually rapid development of a sharply-defined eye in Bonnie on September 19, along with its subsequent (temporary) disappearance on satellite images on the 20th, are the basis for the first peak in intensity shown in Figs. 2 and 3.

A number of ships reported winds of tropical storm force associated with Bonnie. Table 2 lists these reports. One ship, with call sign ELEO2, reported tropical storm force winds on four consecutive days while moving east-northeastward, paralleling the track of Bonnie.

Lajes Air Base in the Azores had showers and squalls as Bonnie approached. They reported sustained winds of 35 knots with gusts to 51 knots as Bonnie passed nearby. Wind gusts to 59 knots were reported atop a 240-foot tower at Lajes.

### c. Casualty and Damage Statistics

Apparently, Bonnie did not have serious effects on the Azores. No reports of casualties or damage due to Bonnie have been received.

### d. Forecast and Warning Critique

The official track forecasts for Bonnie were, in general, fairly good in the one- to two-day time frame, and about average at 72 hours. In comparison to the long-term mean values, the average 12, 24, 36, and 48 hour position forecast errors were about 43, 34, 29, and 26 per cent lower, respectively. At 72 hours, the average error was only about 5 per cent below the long-term value, however. During much of its lifetime, Bonnie was moving rather slowly and the predicted positions were typically not very far from the initial positions. This conservative approach, for an erratically-moving storm, contributed to the relatively low forecast errors.

The initial rapid strengthening of Bonnie to a hurricane was underpredicted. For the first few days that Bonnie was a hurricane, it was predicted to weaken too soon. Later on in the hurricane stage, the forecasts did not show Bonnie weakening soon enough. The latter cases resulted in the largest intensity forecast errors.

A statement that tropical storm conditions associated with Bonnie were expected to spread over the Azores was contained in public advisories beginning at 2100 UTC September 29.

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Table 1. Preliminary best track, Hurricane Bonnie,  
17-30 September 1992.

Date/Time (UTC)	Position		Pressure (mb)	Wind Speed (kt)	Stage
	Lat. (°N)	Lon. (°W)			
17/1800	33.8	59.0	1009	30	Tropical Depression
18/0000	33.5	58.3	1008	30	" "
0600	33.7	58.0	1005	35	Tropical Storm
1200	34.0	57.9	1000	45	" "
1800	34.3	58.1	988	65	Hurricane
19/0000	34.2	57.8	980	75	"
0600	34.4	57.4	976	80	"
1200	34.7	57.1	973	85	"
1800	35.2	56.8	970	90	"
20/0000	35.6	56.6	970	90	"
0600	36.1	56.2	973	85	"
1200	36.5	56.0	974	85	"
1800	36.8	55.5	973	85	"
21/0000	37.0	54.6	972	90	"
0600	37.2	53.8	970	90	"
1200	37.3	53.0	968	90	"
1800	37.5	52.3	965	95	"
22/0000	37.7	51.5	966	95	"
0600	37.7	51.2	967	95	"
1200	37.8	51.0	968	90	"
1800	37.8	50.9	969	90	"
23/0000	37.7	50.7	970	90	"
0600	37.6	50.7	972	85	"
1200	37.6	50.8	974	85	"
1800	37.5	51.0	977	80	"
24/0000	37.5	51.1	979	75	"
0600	37.5	51.2	983	70	"
1200	37.4	51.4	987	65	"
1800	37.2	51.5	992	60	Tropical Storm
25/0000	36.8	51.8	995	55	" "
0600	36.3	51.8	1000	45	" "
1200	35.7	51.8	1005	40	" "
1800	35.1	51.8	1007	35	" "
26/0000	34.6	51.7	1009	30	Tropical Depression
0600	34.1	51.3	1009	30	" "
1200	33.8	50.8	1008	30	" "
1800	33.3	49.9	1006	35	Tropical Storm
27/0000	33.2	48.4	1005	35	" "
0600	33.1	46.9	1003	40	" "
1200	33.0	45.4	1001	40	" "
1800	33.0	44.0	999	45	" "
28/0000	33.1	43.0	996	50	" "
0600	33.4	42.0	994	55	" "
1200	33.9	41.0	993	60	" "
1800	34.5	39.8	992	60	" "
29/0000	35.0	38.5	992	60	" "
0600	35.2	37.6	993	60	" "
1200	35.5	36.6	994	55	" "
1800	36.1	34.8	995	55	" "
30/0000	36.6	32.1	995	55	" "
0600	37.3	29.4	995	55	" "
1200	38.4	26.4	997	50	" "
1800	39.0	24.2	1002	40	" "
01/0000	39.0	22.8			Extratropical
0600	39.0	21.6			"
1200	38.5	21.2			"
1800	38.2	21.5			"
02/0000	38.1	21.8			"
0600	37.9	22.2			"
1200	37.8	22.7			"
1800	38.0	24.0			Dissipated
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21/1800	37.5	52.3	965	95	Minimum Pressure

Table 2. Ship encounters of winds of 34 knots or higher associated with Hurricane Bonnie.

Tropical Cyclone	Ship ID	Date Mo/Da	Time UTC	Position		Wind (kt) Dir/Speed	Pressure (mb)
				LatN	LonW		
Bonnie	LGG6	9/18	1200	31.0	55.3	200/35	1017.0
	Y5LS	9/27	1200	30.7	42.1	230/42	1006.0
	ELEO2	9/27	1500	29.6	44.0	240/36	1006.3
	ELEO2	9/28	0600	30.2	40.6	230/35	1007.5
	ELEO2	9/28	1200	30.9	39.5	240/38	1010.1
	GJMS	9/28	1200	35.8	40.9	040/45	1007.4
	OUUR5	9/28	1200	34.5	39.5	120/34	1003.0
	GJMS	9/28	1500	35.2	41.5	020/45	1007.7
	OUUR5	9/28	1800	34.5	41.0	020/60	1002.0
	GQEH	9/28	2100	35.2	40.4	020/40	999.7
	ELEO2	9/29	0300	32.7	36.6	240/37	1009.3
	ELEO2	9/29	1200	33.9	34.8	220/40	1006.5
	ELEO2	9/29	1500	34.1	34.2	210/48	1004.5
	ELEO2	9/30	0600	34.9	30.5	250/44	1009.9
	KADC	9/30	0600	38.8	30.1	030/58	1000.1
	4XGU	9/30	1200	35.8	26.9	260/47	1010.0

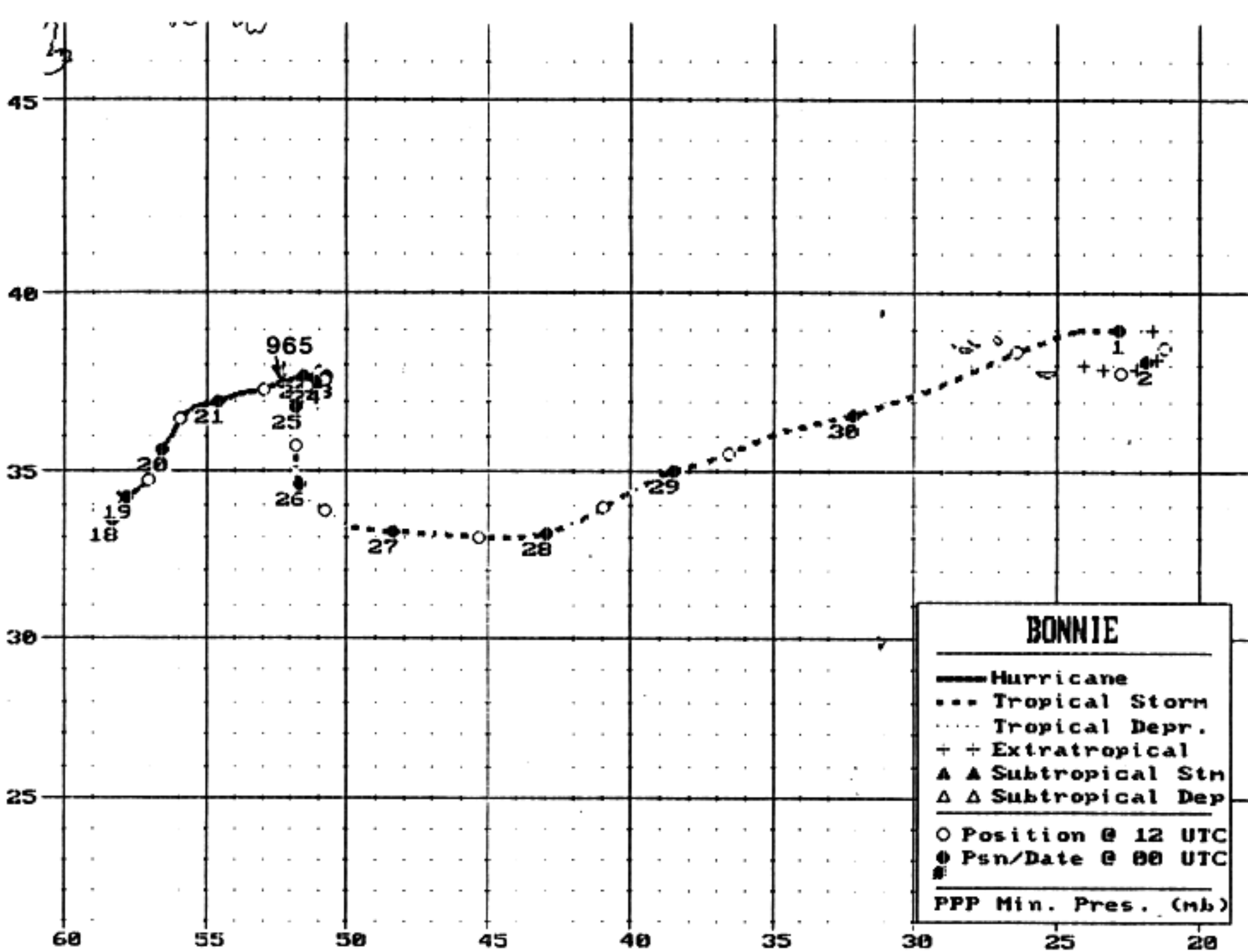


Fig. 1. Best track positions for Hurricane Bonnie, 1992.

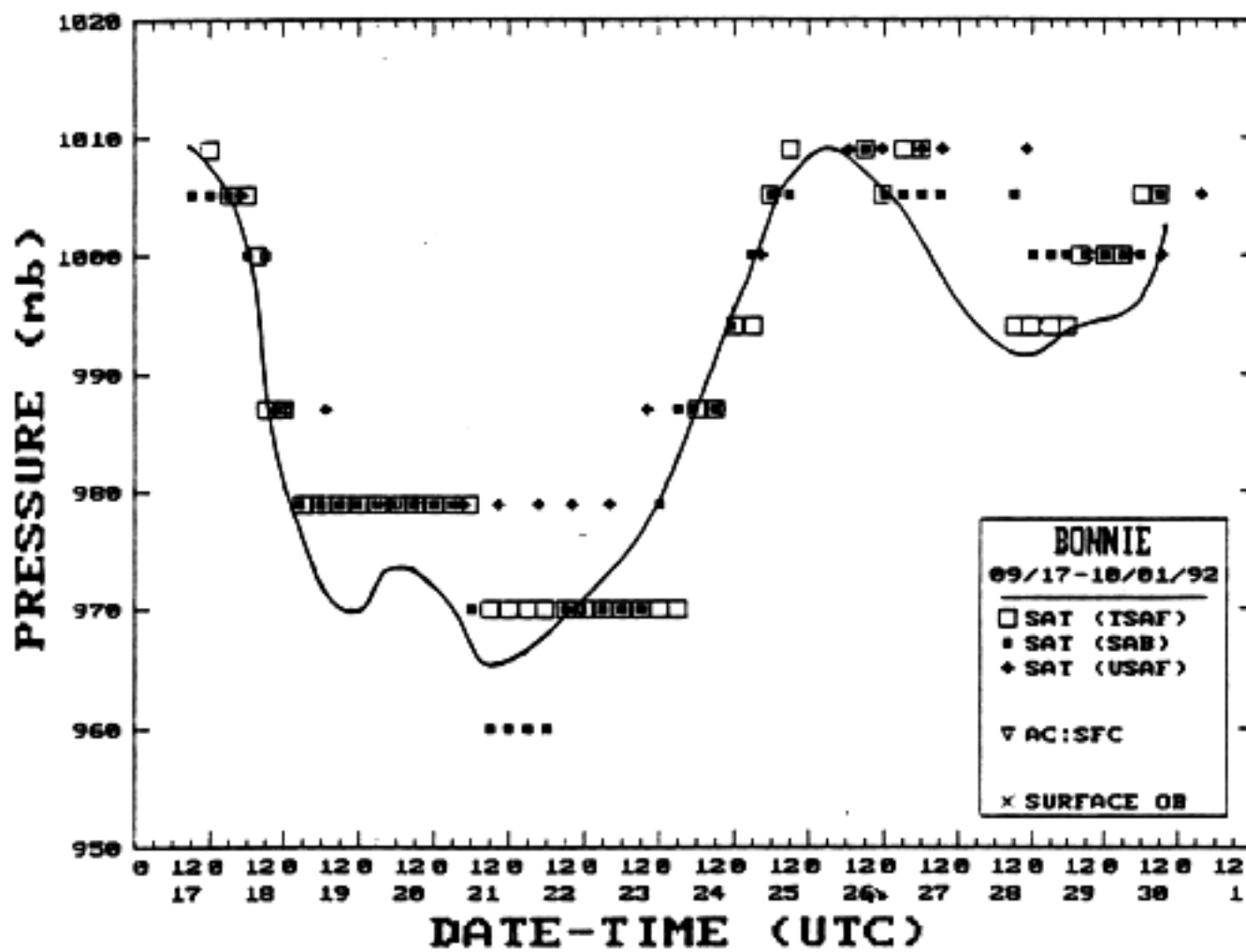


Fig. 2. Best track minimum central pressure curve for Hurricane Bonnie, 1992.

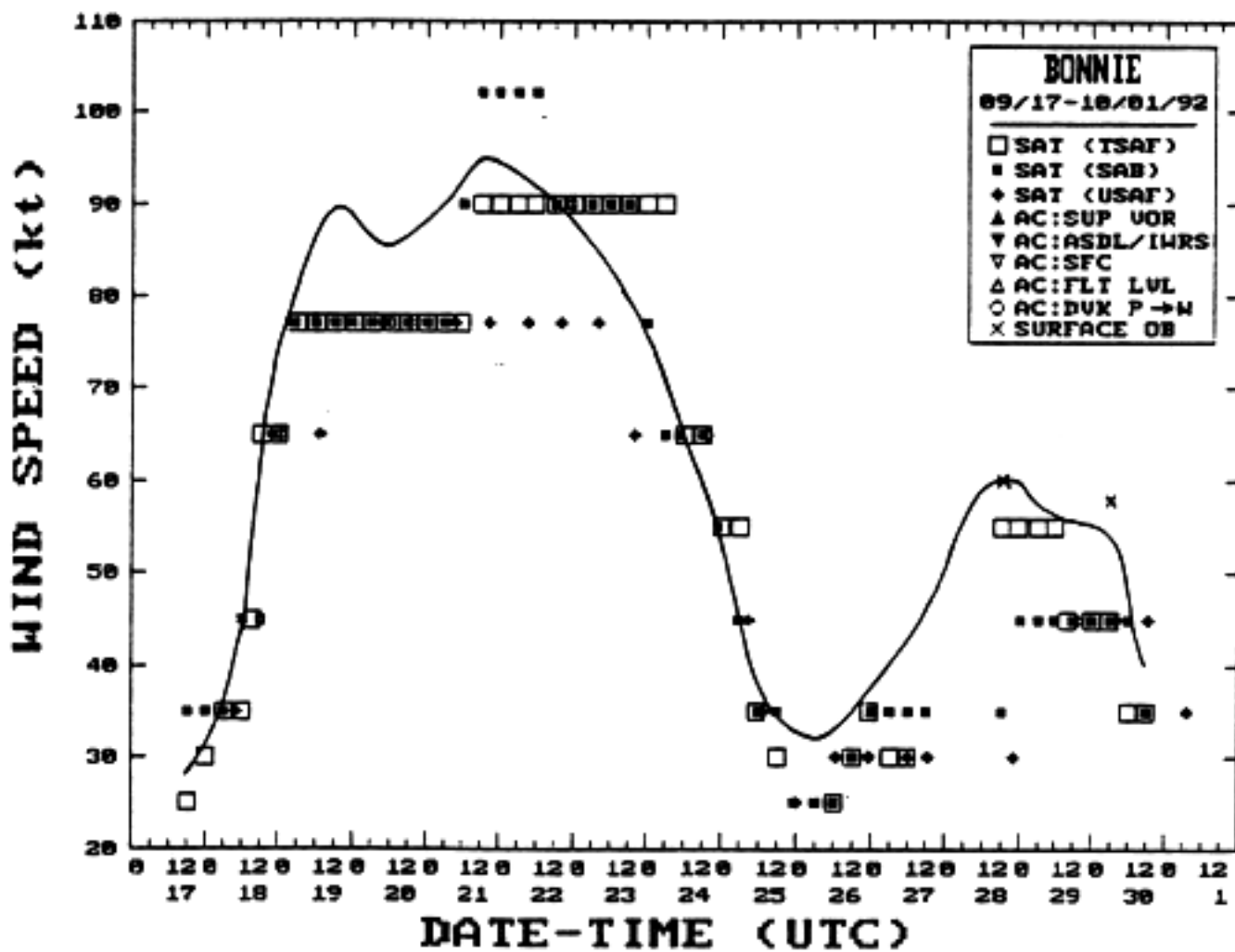


Fig. 3. Best track maximum sustained wind speed curve for Hurricane Bonnie, 1992.