1987 Atlantic Verification Statistics

Miles Lawrence and Joel Cline
National Hurricane Center

In 1987, The National Hurricane Center issued track and intensity forecasts for all tropical cyclones in the Atlantic, Caribbean and Gulf of Mexico. These forecasts covered a 72-hour period and were updated every six hours while a tropical cyclone was in progress.

Forecasts for all tropical storms and hurricanes were verified by comparison with a "best track" which is a post-analysis of all available track and intensity data. Table 1 lists the official average track forecast errors for 1987. The largest errors were made during Hurricane Emily as a result of Emily's rapid acceleration across the north Atlantic. Despite these large errors, the 1987 averages were from six to ten percent less than the previous ten-year averages at all forecast periods, except for the initial position error which was six percent higher than the previous ten years.

Table 2 lists the average 1987 errors for a selection of track guidance models. These models were not all run for all forecast situations and it is not appropriate to use these errors to compare models. In order to compare models, they must be run on the same homogeneous set of cases as given in Table 3, which is a comparison of the official forecast and four models. NHC83, a statistical-dynamical model, out-performed the other models in this comparison and was even somewhat better than the official forecast at 24 and 48 hours. BAM, a dynamical model, did quite poorly at 12 and 24 hours, but improved to a respectable level at 48 and 72 hours. This poor performance at the early forecast periods is due to the fact that BAM does not weigh initial motion very highly.

Homogeneous comparisons were also made for other models, but this severely reduced the number of cases. In particular, when the MFM was included, only 16 cases were available as shown in Table 4. This comparison shows that the MFM did quite poorly this year, in contrast to its outstanding performance at 48 and 72 hours in prior years.

Table 5 lists 1987 official wind speed errors. There was a slight negative bias beyond 12 hours and the mean absolute errors were much lower than the previous ten-year average at all time periods. A homogeneous comparison between the official forecasts and the SHIFOR model forecasts is given in Table 6. The SHIFOR errors had a positive bias and its mean absolute errors were almost twice as large as the official at 72 hours.

Table 1

1987 official average track forecast errors (nautical miles)

storm	forecast period (hours) 0	12	24	48	72
Arlene	20	55	114	238	310
(no. of cases)	(46)	(46)	(44)	(40)	(32)
Bret	27	47	70	126	187
	(15)	(15)	(13)	(9)	(5)
Cindy	13	59	89	188	240
	(11)	(11)	(9)	(5)	(1)
Dennis	20	52	86	143	227
	(27)	(27)	(25)	(21)	(17)
Emily	17	60	156	352	660
	(22)	(22)	(20)	(16)	(12)
Floyd	12	41	103	339	580
	(11)	(11)	(9)	(5)	(1)
total	19	53	108	228	345
	(132)	(132)	(120)	(96)	(68)
1987 range	0-65	0-167	11-657	15-908	11-1337
1977-1986 avg.	18	59	120	245	366
(avg. no. of cases)	(126)	(122)	(108)	(76)	(54)
1987 departure from 1976-1985 avg.	+06%	-10%	-10%	-07%	-06%

Table 2

1987 average track forecast errors (nautical miles)

all models
all forecasts
non-homogeneous

model	forecast period (hours) 0	12	24	48	72
Official	19	53	108	228	345
(no. of cases)	(132)	(132)	(120)	(96)	(68)
NHC72	19	57	121	277	404
	(130)	(130)	(118)	(93)	(69)
CLIPER	19	58	124	290	448
	(131)	(131)	(119)	(95)	(71)
NHC73	18	47	110	287	447
	(35)	(35)	(32)	(27)	(23)
SANBAR	19	65	140	319	290
	(41)	(41)	(37)	(26)	(14)
MFM	17	109	185	426	716
	(16)	(16)	(14)	(11)	(8)
NHC83	20	53	96	208	348
	(130)	(130)	(119)	(95)	(71)
BAM	17	77	157	251	427
	(68)	(68)	(63)	(51)	(36)

Table 3

1987 average track forecast errors (nautical miles) homogeneous comparison					
	forecast period (hours)				
model	0	12	24	48	72
Official	18	51	107	240	390
NHC72	18	56	120	287	434
CLIPER	18	58	126	313	529
NHC83	18	51	101	231	393
BAM	18	77	157	251	427
no. of cases	(68)	(68)	(63)	(51)	(36)

Table 4

1987 average track forecast errors (nautical miles) homogeneous comparison					
	forecast period (hours)				
model	0	12	24	48	72
Official		45	123	258	483
NHC72		56	145	365	640
CLIPER		56	132	384	749
NHC83		51	111	265	475
MFM		109	185	426	716
no. of cases		(16)	(14)	(11)	(8)

Table 5

1987 official maximum sustained wind speed forecast errors (knots)

	forecast period (hours)				
	0	12	24	48	72
mean	+0.7	+0.3	-0.6	-0.9	-1.6
mean absolute	4.0	5.6	7.6	10.1	12.5
standard deviation	5.8	8.6	12.0	15.0	14.4
(no. of cases)	(132)	(132)	(119)	(96)	(67)
maximum error	+20	-30	-50	-55	-40
1977-1986 mean absolute	5.6	8.8	12.6	17.0	20.2
(avg. no. of cases)	(126)	(121)	(106)	(74)	(52)
1987 mean absolute departure from 1977-1986 avg.	-29%	-36%	-40%	-41%	-38%
Mean absolute error by storm					
Arlene	3.7	5.0	5.6	9.5	15.3
(no. of cases)	(46)	(46)	(44)	(40)	(31)
Bret	2.7	3.0	5.8	11.7	12.0
	(15)	(15)	(13)	(9)	(5)
Cindy	4.1	2.7	5.0	1.0	0.0
	(11)	(11)	(8)	(5)	(1)
Dennis	1.9	2.2	2.4	4.3	5.6
	(27)	(27)	(25)	(21)	(17)
Emily	7.7	14.1	20.3	21.9	16.3
	(22)	(22)	(20)	(16)	(12)
Floyd	4.1	6.4	9.4	8.0	15.0
	(11)	(11)	(9)	(5)	(1)

Table 6

1987 average wind speed forecast errors (knots)

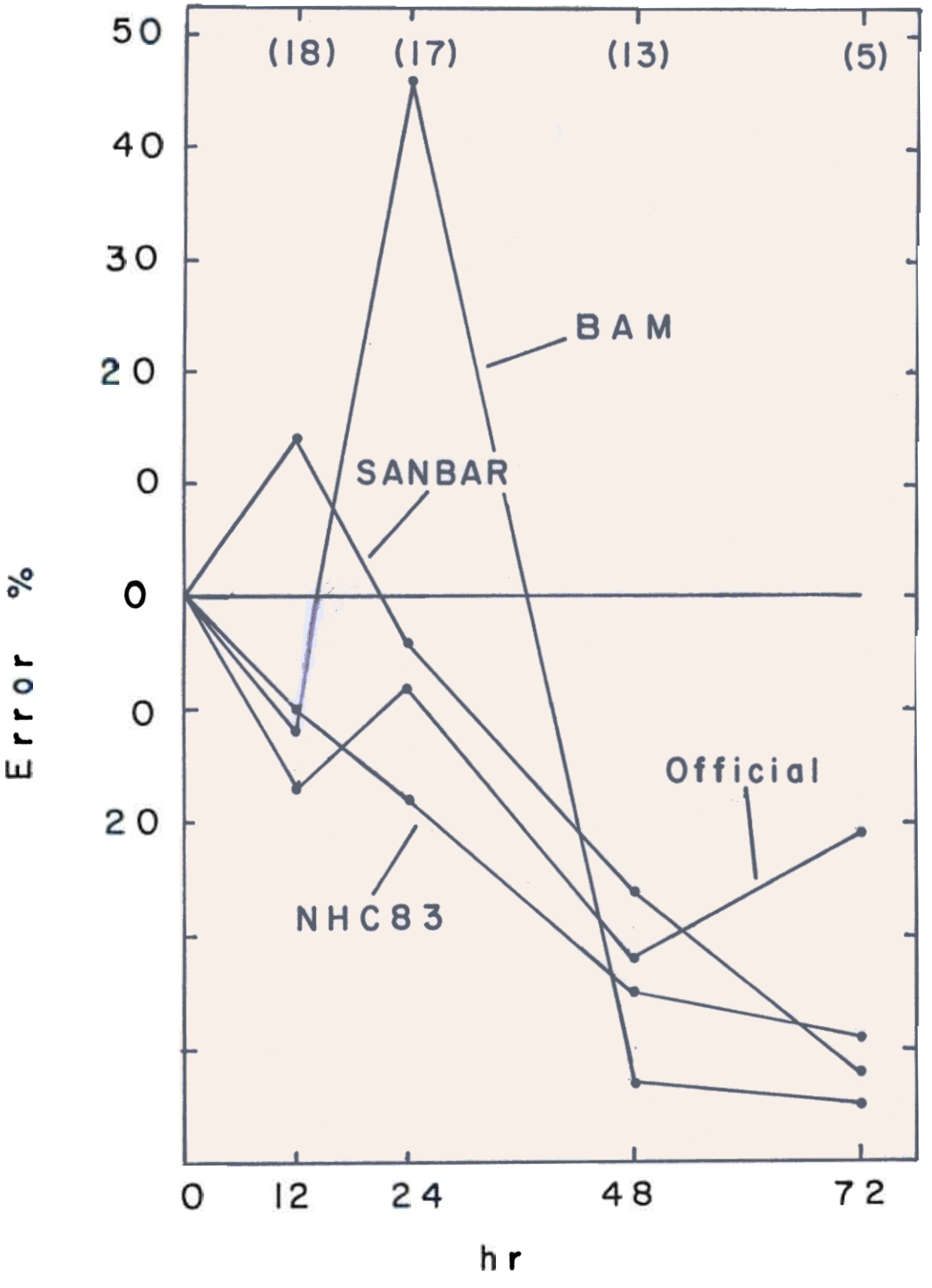
homogeneous comparison

	forecast period (hours)				
model	0	12	24	48	72
Official					
mean	+1.3	+0.1	-1.5	-4.8	-7.4
mean absolute	4.3	5.6	6.4	8.3	10.7
standard deviation	6.2	8.4	9.6	10.7	12.0
SHIFOR					
mean	+1.3	+1.1	+2.2	+7.0	+12.9
mean absolute	4.2	6.1	8.1	14.5	20.2
standard deviation	6.2	7.8	10.0	15.2	20.9
(No. of cases)	(101)	(101)	(87)	(60)	(38)

1987 average track forecast errors (nautical miles)

homogeneous comparison

	forecast period (hours)				
model	0	12	24	48	72
Official		49	134	311	497
NHC72		54	149	425	635
CLIPER		59	146	458	630
SANBAR		67	140	338	364
NHC83		53	119	296	385
BAM		52	213	260	346
no. of cases		(18)	(17)	(13)	(5)


50
40
30
20
0
0
20
(18)
(17)
(13)
(5)
BAM
SANBAR
Official
NHC83
Error %
0
12
24
48
72
hr