2000 NATIONAL HURRICANE CENTER FORECAST VERIFICATION

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March 2, 2001

Introduction

Every six hours, the National Hurricane Center issues 72-hour track and intensity forecasts for all tropical cyclones in the North Atlantic and eastern North Pacific basins. Official forecasts are verified by comparison with the final "best-track", derived from a post-storm analysis of all available position and intensity data. The best-track data used for verification excludes extratropical and tropical (subtropical) depression stages. Climatology and persistence forecasts are used as standards for skill in comparing forecasts: the CLIPER model forecasts for track and the SHIFOR model forecasts for intensity.

Track forecast errors are the great circle distance between a forecast position and a best-track position for the same time. A tropical cyclone's intensity is defined as the maximum one-minute sustained wind speed ten meters above the ground. This maximum speed can occur anywhere within the cyclone's circulation. Forecast and best-track intensities are rounded to the closest five knots. Intensity forecast errors are the absolute difference between the forecast wind speed and the best-track wind speed for the same time.

Model objective track guidance is of two types, "late" or "early". Late models require the completion of global numerical models. They are run every six or twelve hours. These models are initialized about three hours after synoptic time, about the same time the official forecast is issued. Therefore, their forecasts arrive too late for the forecaster to use. Various strategies are employed to provide the forecaster with more timely guidance derived from the late models. These are the early models and are available at any time. Table 1 defines model and other abbreviations used in this report.

North Atlantic

The 2000 North Atlantic hurricane season had 14 named tropical cyclones. This is more than the annual average of 10 and two more than the number that occurred in 1999. There were 228 official forecasts issued for tropical storms and hurricanes, actually less than the number issued last year. The average official forecast track errors by storm are listed in Table 2.1. Table 2.2 gives the average official and CLIPER track error for 2000 and the previous ten-year average. The 2000 official errors were nearly 16 percent smaller than the ten-year average at all time periods, except the 72-hour. The corresponding 2000 CLIP errors tend to be smaller than their long-term average at the 12- and 24-hour periods and are near their long-term average at the

mid-forecast period. The 2000 CLIP errors for the 72-hour forecast period are 10 percent greater than their long-term average and may explain why the official error for the this period was only 5 percent better than its ten-year average. This is most easily seen in the departure section of Table 2.2.

Table 3.1 and Table 3.2 show homogeneous comparisons of the late Atlantic track guidance models. One new development this year is the implementation of a new center-relocation method during initialization of the MRF model. As a result, the average errors for Aviation Run are the smallest on record for that model. Since this model provides guidance for the GFDL model, and others in the NHC guidance suite, an improvement in the guidance from these models is also seen. This year, the late models are broken into two tables to maximize the number of cases for selected groups. The AVNO and GFDL are run four times per day at a six hour interval while the NGPS and UKM are run at 00Z and 12Z and the GFDN is run at 06Z and 18Z. Both tables show that after 24 hours, the AVNO and GFDL models have the smallest errors.

Table 3.3 displays a comparison of the early Atlantic track models. A second new development, first proposed by Jim Goerss of Naval Research Laboratory, is the GUNS model. GUNS is a simple average of the track forecasts of the GFDI, UKMI and NGPI models. Note how this model has errors smaller than those which make it up, except for the GFDI at 72 hours. Also, this is the first year where many early guidance models have smaller errors than the official forecasts. For example, A98E, BAMD, BAMM, AVNI, GUNS and GFDI have smaller average errors than the official forecast beyond the 24-hour forecast period.

The average official absolute wind speed errors by storm are listed in Table 4.1. Table 4.2 gives the average official and SHFR absolute wind speed errors for 2000 and the previous ten-year average. The 2000 official and SHFR intensity forecast errors are larger than their long-term average, except the 72-hour forecast period. Thus, while the 2000 official absolute intensity forecasts are skillful, their errors being less than SHFR, they tend to be slightly larger than their long-term average, except at 72 hours.

Table 5 displays the absolute wind speed errors for the objective guidance from early models. A third new development was the introduction of the Decay SHIP (DSHP) model which produced intensity guidance with the smallest error at all forecast periods. DSHP is identical to the SHIP model, except if the cyclone is forecast to cross land, the intensity is reduced accordingly.

Eastern North Pacific

The 2000 eastern North Pacific hurricane season had 17 named tropical cyclones, one more than the long-term average. There were 195 official forecasts issued for tropical storms and hurricanes in the basin this year, about a third more than last year. The average official forecast track errors by storm are listed in Table 6.1. Table 6.2 gives the average official and CLIP track errors for 2000 and for the previous ten years. This year's error departures from the long-term average are given in the latter portion of the table. The Pacific official forecast track errors are smaller than their ten-year average for all forecast periods by an average 10 percent. The corresponding 2000 CLIP errors are near their ten-year average for all time periods. Thus, the average 2000 official forecasts demonstrate skill at all forecast periods and improvement over their long-term average.

Table 7.1 and Table 7.2 are homogeneous comparisons of various track guidance for the east Pacific late and early models, respectively. Like the Atlantic, the AVNO and GFDL late models

have the smallest error at all forecast periods. Again, the AVNO has the smallest errors on record for that model. Unfortunately, the UKM, NGPS and GFDN models would have significantly reduced the sample size for a homogeneous comparison, so they are not included. For the early models, Table 7.2 shows the new GUNS model has the smallest error for all forecast periods. Unlike the Atlantic, the Pacific official forecasts have errors nearly the same as the best guidance.

Table 8.1 gives the average official absolute wind speed errors by storm. The average official and SHFR absolute wind speed errors for 2000 and the previous ten-year averages are in Table 8.2. The official intensity forecast errors are smaller than their long-term averages at all time periods, as are this year's SHFR errors. Thus, while the official intensity forecasts have skill, their errors being less than SHFR, the improvement over the long-term average may be due to the improvement of SHIFOR, alone. This is easily seen in the departure section of Table 8.2.

The absolute wind speed errors for the objective guidance from early models are given in Table 9. SHFR, SHIP and DSHP are comparable in their forecast errors through the 36-hour forecast period. SHIP and DSHP are better than SHFR for the 48 and 72- hour periods. Unlike the Atlantic, there is not much difference between these two models since few tropical cyclones were forecast to make landfall over Mexico.

Conclusions

1. The official 2000 track forecasts have skill over CLIPER and have an error smaller than their 10-year average error for the North Atlantic and eastern North Pacific for all forecast periods.

2. The implementation of a new center-relocation method in the MRF model dramatically improved the skill of the Aviation Run. Its 2000 average errors were the smallest on record for that model for the North Atlantic and eastern North Pacific basins.

3. The new GUNS model demonstrated skill in both basins and was, on average, the best of all the early models for nearly all forecast periods for both basins.

4. For the North Atlantic, many early guidance models had smaller average errors than the official forecast. For the eastern North Pacific, the official forecast errors were comparable to the best early guidance.

5. The 2000 North Atlantic SHIFOR error departures averaged larger than their long-term average for all forecast periods, except the 72-hour. Thus, while the official intensity forecasts showed skill over this year's SHIFOR forecasts, their errors were larger than their long-term average, except at 72-hour. The 2000 eastern North Pacific SHIFOR error departures averaged 14 percent smaller than the long-term averages for all forecast time periods. Therefore, while the official intensity forecasts were better than their long-term average, the improvement may be due to climatology and persistence, alone.

6. The Decay SHIP model provide the best early intensity guidance for the North Atlantic and eastern North Pacific basins.

TABLE 1

MODEL ABBREVIATIONS

(Click here for model descriptions)

OFCL - Official track or intensity forecasts
OFCI - Official Track Forecast Interpolated from the previous 6 hours
CLIP - CLImatology and PERsistence track model - CLIPER (Atl and Pac)
A98E - NHC98 Statistical-Dynamical Model...early version (Atl)
P91E - NHC91 Statistical-Dynamical Model...early version (Pac)
BAMD - Beta Advection Model Deep (Global)
BAMM - Beta Advection Model Medium (Global)
BAMS - Beta Advection Model Shallow (Global)
LBAR - Limited-area sine transform BARotropic Model
GFDL - GFDL Model (Atl and Pac - track and intensity) AVN boundaries
GFDI - GFDL Interpolated Track and Intensity (6- and 12-hour)
GFDN - Navy GFDL Model (Atl and Pac - track and intensity) NOGAPS boundaries
GFNI - Navy GFDL Interpolated Track and Intensity (6- and 12-hour)
MRF - Medium Range Forecast model (Global)
AVNO - MRF Model Aviation Run (Global)
AVNI - AVNO Interpolated Track Model (6-hour)
UKM - UKMET Model (Global)
UKMI - UKMET Interpolated Track Model (6- and 12-hour)
NGPS - Navy Operational Global Atmospheric Prediction System - NOGAPS
NGPI - NOGAPS Interpolated Track Model (6- and 12-hour)
GUNS - GFDI, UKMI, NGPI Sum
SHFR - Statistical Hurricane Intensity Forecast Model - SHIFOR (Atl and Pac)
SHIP - Statistical Hurricane Intensity Prediction Scheme - SHIPS (Atl and Pac)
DSHP - Decay SHIPS (Atl and Pac)

TABLE 2.1

NORTH ATLANTIC
2000 OFFICIAL AVERAGE TRACK FORECAST ERRORS (NM) BY STORM

FORECAST ERRORS (NM) FOR AL0300 ALBERTO

	00	12	24	36	48	72
OFCL	7.7	38.1	72.1	100.6	137.7	250.0
#CASES	74	74	72	70	68	65

FORECAST ERRORS (NM) FOR AL0500 BERYL

	00	12	24	36	48	72
OFCL	33.9	51.8	136.7			
#CASES	3	3	1	0	0	0

FORECAST ERRORS (NM) FOR AL0600 CHRIS*

	00	12	24	36	48	72
OFCL						
#CASES	0	0	0	0	0	0

* Official forecasts issued did not span 12 hours.

FORECAST ERRORS (NM) FOR AL0700 DEBBY

	00	12	24	36	48	72
OFCL	6.5	43.1	75.5	90.0	85.3	131.9

#CASES	15	15	13	11	9	5

FORECAST ERRORS (NM) FOR AL0800 ERNESTO

	00	12	24	36	48	72
OFCL	16.4	37.5	64.2			
#CASES	4	4	2	0	0	0

FORECAST ERRORS (NM) FOR AL1000 FLORENCE

	00	12	24	36	48	72
OFCL	7.9	42.9	78.2	118.3	142.5	168.9
#CASES	24	24	22	20	18	14

FORECAST ERRORS (NM) FOR AL1100 GORDON

	00	12	24	36	48	72
OFCL	17.1	31.0	37.0	40.4	76.0	
#CASES	7	7	6	4	2	0

FORECAST ERRORS (NM) FOR AL1200 HELENE

	00	12	24	36	48	72
OFCL	4.6	28.9	36.5	76.1	53.9	115.1
#CASES	6	4	2	2	4	4

FORECAST ERRORS (NM) FOR AL1300 ISAAC

	00	12	24	36	48	72
OFCL	7.7	29.7	52.3	78.1	101.5	173.9
#CASES	37	37	35	33	31	27

FORECAST ERRORS (NM) FOR AL1400 JOYCE

	00	12	24	36	48	72
OFCL	14.4	37.3	67.9	103.4	129.2	208.2
#CASES	21	21	19	17	15	11

FORECAST ERRORS (NM) FOR AL1500 KEITH

	00	12	24	36	48	72
OFCL	4.8	32.1	73.6	138.0	214.6	329.2
#CASES	20	18	14	12	11	10

FORECAST ERRORS (NM) FOR AL1600 LESLIE

	00	12	24	36	48	72
OFCL	13.0	54.9	113.9	132.6	171.0	
#CASES	7	7	5	3	1	0

FORECAST ERRORS (NM) FOR AL1700 MICHAEL

	00	12	24	36	48	72
OFCL	6.1	58.0	110.1	164.1	197.8	
#CASES	10	10	8	6	4	0

FORECAST ERRORS (NM) FOR AL1800 NADINE

	00	12	24	36	48	72
OFCL	12.1	53.8	81.3			
#CASES	4	4	2	0	0	0

TABLE 2.2

NORTH ATLANTIC
2000 OFFICIAL AND CLIPER AVERAGE TRACK ERRORS

FOR A HOMOGENEOUS SAMPLE

PERIOD	00	12	24	36	48	72	(hr)
OFCL	8.9	38.5	70.7	101.6	131.7	220.7	(nm)
CLIP	8.9	47.9	102.9	168.2	236.3	372.9	(nm)
#CASES	232	228	201	178	163	136	

1990 - 1999 OFFICIAL AND CLIPER AVERAGE TRACK ERRORS FOR A HOMOGENEOUS SAMPLE

PERIOD	00	12	24	36	48	72	(hr)
OFCL	11.9	45.9	85.2	122.1	157.1	233.1	(nm)
CLIP	11.9	54.1	111.4	172.5	232.0	339.1	(nm)
#CASES	2071	2054	1837	1644	1464	1160	

2000 OFFICIAL AND CLIPER AVERAGE ERROR DEPARTURE FROM THE 1990 - 1999 OFFICIAL AND CLIPER AVERAGE TRACK ERROR

PERIOD	00	12	24	36	48	72	(hr)
OFCL DEPARTURE	-25	-16	-17	-17	-16	-05	(%)
CLIP DEPARTURE	-25	-11	-08	-02	+02	+10	(%)

TABLE 3.1

NORTH ATLANTIC
2000 AVERAGE MODEL TRACK ERROR (NM) FOR A HOMOGENEOUS SAMPLE (LATE)

	00	12	24	36	48	72
OFCL	9.8	34.3	64.6	98.7	126.0	229.2
CLIP*	9.8	42.1	91.9	155.3	208.7	361.4
AVNO	9.8	46.7	76.2	98.9	108.9	164.9
GFDL	9.8	34.9	59.0	73.9	93.8	156.6
UKM	9.8	44.5	77.0	103.4	122.1	194.5
NGPS	9.8	53.8	79.5	112.5	133.7	228.1
#CASES	98	96	87	75	63	51

TABLE 3.2

NORTH ATLANTIC
2000 AVERAGE MODEL TRACK ERRORS (NM) FOR A HOMOGENEOUS SAMPLE (LATE)

	00	12	24	36	48	72
OFCL	7.0	40.7	73.4	104.0	134.5	209.3
CLIP*	7.0	47.6	96.4	153.0	207.0	318.8

AVNO	7.0	46.3	75.2	102.1	120.3	164.5
GFDL	7.0	35.3	58.5	77.0	105.5	157.0
GFDN	7.0	38.8	70.1	101.0	128.3	197.7
#CASES	88	86	77	69	63	49

* Although CLIP is an early model, it is include here for reference.

TABLE 3.3

NORTH ATLANTIC
2000 AVERAGE MODEL TRACK ERRORS (NM) FOR A HOMOGENEOUS SAMPLE (EARLY)

	00	12	24	36	48	72
OFCL	7.1	34.4	68.4	102.4	139.1	237.9
CLIP	7.1	40.4	84.6	135.2	189.9	312.6
A98E	7.1	35.4	62.4	94.2	124.4	215.3
BAMD	7.1	34.8	64.1	93.7	131.9	228.8
BAMM	7.1	36.1	67.5	101.1	133.5	216.8
BAMS	7.1	45.2	86.5	130.4	173.3	229.4
LBAR	7.1	34.9	73.8	117.9	167.5	289.3
OFCI	7.1	39.0	75.0	112.0	153.2	266.5
AVNI	7.1	40.7	68.7	99.6	117.7	200.0
GUNS	7.1	28.8	53.3	82.0	113.7	208.3
GFDI	7.1	34.2	60.0	93.1	125.2	185.9
UKMI	7.1	40.2	72.4	110.5	145.2	252.3
NGPI	7.1	41.9	79.3	103.8	146.6	293.3
GFNI	7.1	40.5	73.5	109.1	144.1	258.6
#CASES	106	105	97	87	80	66

TABLE 4.1

NORTH ATLANTIC
2000 OFFICIAL AVERAGE ABSOLUTE WIND SPEED FORECAST ERROR (KT) BY STORM

FORECAST ERRORS (KT) FOR AL0300 ALBERTO

	00	12	24	36	48	72
OFCL	2.6	4.9	6.9	8.1	11.0	14.4
#CASES	74	74	72	70	68	65

FORECAST ERRORS (KT) FOR AL0500 BERYL

	00	12	24	36	48	72
OFCL	3.3	10.0	0.0			
#CASES	3	3	1	0	0	0

FORECAST ERRORS (KT) FOR AL0600 CHRIS*

	00	12	24	36	48	72
OFCL						

#CASES	0	0	0	0	0	0

* Official forecasts issued did not span 12 hours.

FORECAST ERRORS (KT) FOR AL0700 DEBBY

	00	12	24	36	48	72
OFCL	7.0	10.0	15.0	12.7	13.3	28.0
#CASES	15	15	13	11	9	5

FORECAST ERRORS (KT) FOR AL0800 ERNESTO

	00	12	24	36	48	72
OFCL	0.0	1.3	5.0			
#CASES	4	4	2	0	0	0

FORECAST ERRORS (KT) FOR AL1000 FLORENCE

	00	12	24	36	48	72
OFCL	4.2	7.7	12.7	16.0	16.4	11.8
#CASES	24	24	22	20	18	14

FORECAST ERRORS (KT) FOR AL1100 GORDON

	00	12	24	36	48	72
OFCL	2.1	5.0	9.2	20.0	17.5	
#CASES	7	7	6	4	2	0

FORECAST ERRORS (KT) FOR AL1200 HELENE

	00	12	24	36	48	72
OFCL	3.3	17.5	20.0	15.0	11.3	23.8
#CASES	6	4	2	2	4	4

FORECAST ERRORS (KT) FOR AL1300 ISAAC

	00	12	24	36	48	72
OFCL	3.0	8.0	13.6	17.7	19.7	17.8
#CASES	37	37	35	33	31	27

FORECAST ERRORS (KT) FOR AL1400 JOYCE

	00	12	24	36	48	72
OFCL	3.8	5.2	13.7	22.6	30.7	33.6
#CASES	21	21	19	17	15	11

FORECAST ERRORS (KT) FOR AL1500 KEITH

	00	12	24	36	48	72
OFCL	3.0	13.1	21.8	22.5	18.2	22.5
#CASES	20	18	14	12	11	10

FORECAST ERRORS (KT) FOR AL1600 LESLIE

	00	12	24	36	48	72
OFCL	4.3	5.7	1.0	5.0	10.0	
#CASES	7	7	5	3	1	0

FORECAST ERRORS (KT) FOR AL1700 MICHAEL

	00	12	24	36	48	72
OFCL	4.0	12.5	15.0	20.0	27.5	
#CASES	10	10	8	6	4	0

FORECAST ERRORS (KT) FOR AL1800 NADINE

	00	12	24	36	48	72
OFCL	1.3	8.8	5.0			
#CASES	4	4	2	0	0	0

TABLE 4.2

NORTH ATLANTIC
2000 AVERAGE ABSOLUTE WIND SPEED ERROR FOR A HOMOGENEOUS SAMPLE

PERIOD	00	12	24	36	48	72	(hr)
OFCL	3.3	7.3	11.2	14.1	16.1	17.7	(kt)
SHFR	3.3	8.6	13.3	17.2	19.4	18.6	(kt)
#CASES	232	228	201	178	163	136	

1990 - 1999 AVERAGE ABSOLUTE WIND SPEED ABSOLUTE ERROR FOR A HOMOGENEOUS SAMPLE

PERIOD	00	12	24	36	48	72	(hr)
OFCL	3.4	6.9	10.7	13.5	16.1	19.5	(kt)
SHFR	3.4	8.5	12.4	15.1	17.7	20.5	(kt)
#CASES	2066	2050	1831	1642	1458	1158	

2000 OFFICIAL AND SHIFOR AVERAGE ABSOLUTE WIND SPEED ERROR DEPARTURE FROM THE 1990 - 1999 OFFICIAL AND SHIFOR AVERAGE ABSOLUTE WIND SPEED ERROR

PERIOD	00	12	24	36	48	72	(hr)
OCFL DEPARTURE	-03	+06	+05	+04	0	-09	(%)
SHFR DEPARTURE	-03	+01	+07	+14	+10	-09	(%)

TABLE 5

NORTH ATLANTIC
2000 AVERAGE MODEL ABSOLUTE WIND SPEED ERROR (KT) FOR A HOMOGENEOUS SAMPLE

	00	12	24	36	48	72
OFCL	3.3	7.3	12.0	15.2	18.1	19.3
SHFR	3.3	8.4	14.1	18.0	20.1	18.7
OFCI	3.3	7.8	12.9	16.3	19.1	20.0
SHIP	3.3	8.0	12.8	16.3	17.2	20.3
DSHP	3.3	7.8	11.9	14.9	16.2	17.8
GFDI	3.3	9.9	15.0	18.6	19.5	21.0
GFNI	3.3	9.7	15.1	18.6	20.4	22.7
#CASES	145	142	128	120	110	94

TABLE 6.1

EAST PACIFIC
2000 OFFICIAL AVERAGE TRACK FORECAST ERRORS (NM) BY STORM

FORECAST ERRORS (NM) FOR EP0100 ALETTA

	00	12	24	36	48	72
OFCL	9.7	30.3	59.5	85.9	93.3	71.0
#CASES	16	16	14	12	10	6

FORECAST ERRORS (NM) FOR EP0200 BUD

	00	12	24	36	48	72
OFCL	21.2	44.0	83.0	133.8	194.4	
#CASES	10	10	8	6	4	0

FORECAST ERRORS (NM) FOR EP0300 CARLOTTA

	00	12	24	36	48	72
OFCL	7.7	29.3	59.2	92.2	110.9	124.9
#CASES	22	22	20	18	16	12

FORECAST ERRORS (NM) FOR EP0600 DANIEL

	00	12	24	36	48	72
OFCL	3.5	25.8	50.5	64.8	79.6	130.3
#CASES	21	21	21	21	21	21

FORECAST ERRORS (NM) FOR EP0700 EMILIA

	00	12	24	36	48	72
OFCL	9.8	37.1	54.9	57.6	62.4	
#CASES	10	10	8	6	4	0

FORECAST ERRORS (NM) FOR EP0800 FABIO

	00	12	24	36	48	72
OFCL	7.3	22.6	33.2	58.2		
#CASES	6	6	4	2	0	0

FORECAST ERRORS (NM) FOR EP0900 GILMA

	00	12	24	36	48	72
OFCL	7.1	27.6	49.2	61.5	82.2	93.3
#CASES	12	12	10	8	6	2

FORECAST ERRORS (NM) FOR EP1000 HECTOR

	00	12	24	36	48	72
OFCL	9.3	38.0	74.6	119.1	183.8	290.2
#CASES	15	15	13	11	9	5

FORECAST ERRORS (NM) FOR EP1100 ILEANA

	00	12	24	36	48	72
OFCL	6.2	31.5	52.6	56.6	54.1	
#CASES	9	9	7	5	3	0

FORECAST ERRORS (NM) FOR EP1200 JOHN

	00	12	24	36	48	72
OFCL	15.3	22.8	34.9	49.5	65.0	103.4
#CASES	6	6	6	6	6	2

FORECAST ERRORS (NM) FOR EP1300 KRISTY

	00	12	24	36	48	72
OFCL	21.5	8.4				
#CASES	1	1	0	0	0	0

FORECAST ERRORS (NM) FOR EP1400 LANE

	00	12	24	36	48	72
OFCL	10.3	42.8	84.2	129.0	177.1	277.9
#CASES	30	30	28	26	24	20

FORECAST ERRORS (NM) FOR EP1500 MIRIAM*

	00	12	24	36	48	72
OFCL						
#CASES	0	0	0	0	0	0

* Official forecasts issued did not span 12 hours.

FORECAST ERRORS (NM) FOR EP1600 NORMAN

	00	12	24	36	48	72
OFCL	0.0	40.3				
#CASES	1	1	0	0	0	0

FORECAST ERRORS (NM) FOR EP1700 OLIVIA

	00	12	24	36	48	72
OFCL	16.3	33.0	51.9	70.3	93.3	134.0
#CASES	23	23	21	19	17	13

FORECAST ERRORS (NM) FOR EP1800 PAUL

	00	12	24	36	48	72
OFCL	8.8	38.6	62.1			
#CASES	4	4	2	0	0	0

FORECAST ERRORS (NM) FOR EP1900 ROSA

	00	12	24	36	48	72
OFCL	17.7	43.8	85.6	111.0	140.4	
#CASES	9	9	7	6	4	0

TABLE 6.2

EAST PACIFIC
2000 OFFICIAL AND CLIPER AVERAGE TRACK ERRORS FOR A HOMOGENEOUS SAMPLE

PERIOD	00	12	24	36	48	72	(hr)
OFCL	10.4	33.7	62.3	89.4	117.0	170.4	(nm)
CLIP	10.4	37.3	74.1	114.3	157.1	225.9	(nm)
#CASES	195	195	169	146	124	81	

1990 - 1999 OFFICIAL AND CLIPER AVERAGE TRACK ERRORS FOR A HOMOGENEOUS SAMPLE

PERIOD	00	12	24	36	48	72	(hr)
OFCL	11.6	37.1	69.1	101.3	131.6	188.6	(nm)
CLIP	11.6	39.5	76.1	115.8	155.2	227.4	(nm)
#CASES	2500	2494	2245	1993	1760	1353	

2000 OFFICIAL AND CLIPER AVERAGE ERROR DEPARTURE FROM THE 1990 - 1999 OFFICIAL AND CLIPER AVERAGE TRACK ERROR

PERIOD	00	12	24	36	48	72	(hr)

OFCL DEPARTURE	-10	-09	-10	-12	-11	-10	(%)
CLIP DEPARTURE	-10	-06	-03	-01	+01	-01	(%)

TABLE 7.1

EAST PACIFIC
2000 AVERAGE MODEL TRACK ERROR (NM) FOR A HOMOGENEOUS SAMPLE (LATE)

	00	12	24	36	48	72
OFCL	10.4	34.0	62.3	90.4	121.7	195.6
CLIP*	10.4	37.4	75.1	117.7	160.2	233.9
GFDL	10.4	78.8	62.4	91.0	115.2	186.6
AVNO	10.4	46.8	70.2	102.8	129.8	158.5
#CASES	158	158	125	100	75	43

* Although CLIP is an early model, it is include here for reference.

TABLE 7.2

EAST PACIFIC
2000 AVERAGE MODEL TRACK ERRORS (NM) FOR A HOMOGENEOUS SAMPLE (EARLY)

	00	12	24	36	48	72
OFCL	10.9	31.9	56.0	78.1	98.6	128.4
CLIP	10.9	36.1	67.7	104.0	127.4	194.5
P91E	10.9	35.2	61.5	90.3	116.6	214.1
BAMD	10.9	40.6	74.0	111.6	149.1	236.3
BAMM	10.9	36.9	65.3	102.4	132.1	161.9
BAMS	10.9	34.9	59.0	95.3	134.6	182.3
LBAR	10.9	34.1	66.4	110.6	148.0	197.5
OFCI	10.9	35.5	60.3	82.9	104.7	140.0
GUNS	10.9	29.9	53.7	73.6	96.5	126.8
GFDI	10.9	35.6	65.1	98.9	137.7	211.5
UKMI	10.9	33.8	58.4	85.0	107.6	166.2
NGPI	10.9	40.5	77.6	103.9	141.9	178.6
GFNI	10.9	36.1	64.6	88.0	109.5	145.9
#CASES	102	102	87	73	59	30

TABLE 8.1

EAST PACIFIC
2000 OFFICIAL AVERAGE ABSOLUTE WIND SPEED FORECAST ERROR (KT) BY STORM

FORECAST ERRORS (KT) FOR EP0100 ALETTA

	00	12	24	36	48	72
OFCL	4.4	10.6	18.2	22.9	22.5	15.8
#CASES	16	16	14	12	10	6

FORECAST ERRORS (KT) FOR EP0200 BUD

	00	12	24	36	48	72
OFCL	4.5	7.0	11.9	19.2	21.3	
#CASES	10	10	8	6	4	0

FORECAST ERRORS (KT) FOR EP0300 CARLOTTA

	00	12	24	36	48	72
OFCL	4.1	8.6	14.8	19.7	20.0	20.8
#CASES	22	22	20	18	16	12

FORECAST ERRORS (KT) FOR EP0600 DANIEL

	00	12	24	36	48	72
OFCL	1.0	7.1	11.4	14.0	12.9	10.0
#CASES	21	21	21	21	21	21

FORECAST ERRORS (KT) FOR EP0700 EMILIA

	00	12	24	36	48	72
OFCL	1.5	4.0	8.1	17.5	25.0	
#CASES	10	10	8	6	4	0

FORECAST ERRORS (KT) FOR EP0800 FABIO

	00	12	24	36	48	72
OFCL	2.5	5.8	10.0	15.0		
#CASES	6	6	4	2	0	0

FORECAST ERRORS (KT) FOR EP0900 GILMA

	00	12	24	36	48	72
OFCL	0.4	7.1	9.0	5.6	11.7	12.5
#CASES	12	12	10	8	6	2

FORECAST ERRORS (KT) FOR EP1000 HECTOR

	00	12	24	36	48	72
OFCL	2.3	3.7	5.0	8.2	10.6	7.0
#CASES	15	15	13	11	9	5

FORECAST ERRORS (KT) FOR EP1100 ILEANA

	00	12	24	36	48	72
OFCL	0.6	8.3	15.0	14.0	13.3	
#CASES	9	9	7	5	3	0

FORECAST ERRORS (KT) FOR EP1200 JOHN

	00	12	24	36	48	72
OFCL	0.8	9.2	9.2	10.0	13.3	17.5
#CASES	6	6	6	6	6	2

FORECAST ERRORS (KT) FOR EP1300 KRISTY

	00	12	24	36	48	72
OFCL	5.0	0.0				
#CASES	1	1	0	0	0	0

FORECAST ERRORS (KT) FOR EP1400 LANE

	00	12	24	36	48	72
OFCL	4.2	6.0	10.5	14.2	14.2	13.5
#CASES	30	30	28	26	24	20

```
        FORECAST ERRORS (KT) FOR EP1500  MIRIAM
           00     12     24     36     48     72
OFCL
#CASES      0      0      0      0      0      0

* Official forecasts issued did not span 12 hours.

        FORECAST ERRORS (KT) FOR EP1600  NORMAN
           00     12     24     36     48     72
OFCL        0.0    0.0
#CASES      1      1      0      0      0      0

        FORECAST ERRORS (KT) FOR EP1700  OLIVIA
           00     12     24     36     48     72
OFCL        2.6    6.3   11.2   12.6   13.8   18.1
#CASES     23     23     21     19     17     13

        FORECAST ERRORS (KT) FOR EP1800  PAUL
           00     12     24     36     48     72
OFCL        1.3    0.0    5.0
#CASES      4      4      2      0      0      0

        FORECAST ERRORS (KT) FOR EP1900  ROSA
           00     12     24     36     48     72
OFCL        1.1    7.8   10.0   11.7    7.5
#CASES      9      9      7      6      4      0
```

TABLE 8.2

EAST PACIFIC
2000 AVERAGE ABSOLUTE WIND SPEED ERROR FOR A HOMOGENEOUS SAMPLE

```
PERIOD      00     12     24     36     48     72  (hr)
  OFCL       2.6    6.8   11.3   14.5   15.2   14.3  (kt)
  SHFR       2.6    8.1   12.1   14.6   16.2   15.1  (kt)

#CASES     195    195    169    146    124     81
```

1990 - 1999 AVERAGE ABSOLUTE WIND SPEED ABSOLUTE ERROR FOR A HOMOGENEOUS SAMPLE

```
PERIOD      00     12    24     36     48     72    (hr)
  OFCL      3.0    7.1   12.1   15.9   18.6   21.3  (kt)
  SHFR      3.0    8.0   13.2   17.2   20.2   23.7  (kt)

#CASES     2491   2486   2236   1992   1755   1352
```

2000 OFFICIAL AND SHIFOR AVERAGE ABSOLUTE WIND SPEED ERROR DEPARTURE FROM THE 1990 - 1999 OFFICIAL AND SHIFOR AVERAGE ABSOLUTE WIND SPEED ERROR

```
        PERIOD    00     12     24     36     48     72  (hr)
```

OFCL DEPARTURE	-13	-04	-07	-09	-18	-32	(%)
SHFR DEPARTURE	-13	+01	-08	-15	-20	-36	(%)

TABLE 9

EAST PACIFIC
2000 AVERAGE MODEL ABSOLUTE WIND SPEED ERROR (KT) FOR A HOMOGENEOUS SAMPLE

	00	12	24	36	48	72
OFCL	2.1	6.6	11.6	14.6	14.3	14.6
SHFR	2.1	7.3	11.9	14.9	15.8	14.1
OFCI	2.1	7.1	12.5	14.7	14.7	13.9
SHIP	2.1	7.0	11.9	15.1	14.3	13.1
DSHP	2.1	7.0	11.9	15.0	14.0	13.1
GFDI	2.1	10.5	16.6	21.0	23.0	26.4
GFNI	2.1	8.7	13.6	18.1	19.7	25.2
#CASES	122	122	105	89	71	37