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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
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NATIONAL METEOROLOGICAL CENTER

OFFICE NOTE 378

MEDIUM RANGE FORECAST MODEL
500MB FORECAST SKILL LEVELS
1982 - 1990

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INTRODUCTION

A seasonal evaluation of Spectral Medium-Range Forecast Model (MRF) 500mb forecast performance, over the hemispheres between 20 and 80 degrees, is summarized for the period from December 1981 to November 1990; at the start of the verification period, the Spectral model had 12 vertical layers and a rhomboidal 30 mode horizontal resolution. Initialized fields are used as the verifying field.

Climate Analysis Center (CAC) archived forecast and climatological data, based on 1978-85 means, are used; note that archived data are limited to 12 modes and all years are evaluated with the current climatology. Dr. Steve Tracton, CAC, provided the verification program. A brief discussion of anomaly correlation coefficient scores and potential skill levels is given.

RESULTS

In Tables 1-9, verification scores, anomaly correlation coefficient (ACOR) and root-mean-square error ratios, MRF or Persistence with respect to climatology (RMSR), are summarized for each year, 1982-1990. Results for Northern and Southern Hemispheres are given by December-February (DJF), March-May(MAM), June-August (JJA), and September-November (SON) seasons; forecast hours are given in in whole days.

Figure 1, day five seasonal ACOR for the two hemispheres, illustrates the improving trend in operational NWP forecasts. The net increase in ACOR over the Northern Hemisphere between 1982 and 1990 is 13, 17, 16, and 13 points for DJF, MAM, JJA, and SON seasons respectively. Southern Hemisphere improvement for the same seasons is much larger at 28, 28, 26, and 17 points; however, forecasts are poorer than over the Northern Hemisphere.

There are three important positive changes in the trend of the day five record. The first is found in the second half of 1985 after the operational Spectral model vertical resolution was increased to 18 layers and a Geophysical Fluid Dynamics Laboratory (GFDL) physics package was implemented in April 1985; there is an improvement in scores over both hemispheres.

The second improvement is found primarily over the Southern Hemisphere. This occurred after the operational MRF replaced a cruder version of the Spectral model in the Global Data Assimilation system in May 1986.

The final improvement, over both hemispheres, occurred in DJF 1989. This increase is a consequence of the conversion from a rhomboidal 40 mode to a triangular 80 mode horizontal resolution in August 1987 and refinements to model physics implemented throughout this period. Kalnay et al. (1990) attributes part of this gain to persistence in the flow patterns; their analysis is limited to the Northern Hemisphere in DJF; further discussion is presented in the following section.

SKILL LEVELS

An ACOR level of .60 (AC60) is considered to be the lower limit for synoptically useful forecasts. In Figure II, the seasonal record of this level is plotted as a function of the time, given in days, at which forecast ACOR declines to this level; MRF .60 values (FAC60) are plotted as squares and Persistence forecasts (PAC60) as crosses; Northern Hemisphere is on top and Southern Hemisphere on the bottom.

The trend in FAC60 is similar to the day five record shown in Figure I. Seasonal variation is much greater over the Northern than Southern Hemisphere; MRF performance is best in DJF and MAM over the Northern Hemisphere.

Yearly and seasonal variation in PAC60 is rather small. Over the Northern Hemisphere, there is a relatively large increase in DJF 1990, but not in DJF 1989; however, as in Kalnay et al. (1990), if Persistence forecast ACOR .40 level (PAC40) is inspected, there are comparable increase in both years. In the top half of Figure III, Northern Hemisphere PAC60 is replotted along with PAC40 values. The improvement in PAC40 between 1988 and 1989 during DJF and MAM is 1.2 and .6 days respectively; these higher levels are maintained in 1990; only small differences are found in JJA and SON. Increase in FAC60 between 1988 and 1989 is .8, .8, .5, and -.1 days for DJF, MAM, JJA, and SON respectively; since the relatively large FAC60 improvement in JJA is also found in 1990, this implies that about a third of the net gain in DJF and MAM is attributable to a persistence in the flow.

The lower half of Figure III is the Southern Hemisphere plot of PAC60 and PAC40. There is very little variation in DJF PAC40 and PAC60 between 1988 and 1989; FAC60, however, improves by .6 days; the conclusion stated above of a net change of about one-half day is not unreasonable.

Over the Southern Hemisphere in JJA 1986, PAC40 is 1.1 days larger than in JJA 1985; there is a relatively large increase of .4 days in PAC60 between the two years. The magnitude of the second improvement discussed in the previous section is enhanced by more persistent flow patterns during 1986. Note that in the day five record presented in Figure I, it is only in JJA 1986 that Southern Hemisphere ACOR exceeds Northern Hemisphere ACOR.

Also plotted on Figure II are forecast times, in days, when forecast root-mean-square error is equivalent to climatological values, i.e., when the ratio of the root-mean-square errors is one (RMS1); MRF (FRMS1) values are given as triangles and Persistence (PRMS1) as Xs. After mid-1985, improvement in the RMS1 level is much greater than for AC60 over both hemispheres.

Tables 10 and 11 are summaries of AC60 and RMS1 calculations, in forecast days and by seasons, for Northern and Southern Hemispheres respectively. The net gain between 1982 and 1990 is:

	ACOR.....				RMS1.....			
Hemisphere	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Northern	1.7	1.8	1.4	1.1	2.3	2.8	2.8	1.3
Southern	2.2	2.1	2.0	1.6	3.1	2.6	2.4	2.0

Over the Northern Hemisphere, DJF AC60 is 7.2 days. The fore-

cast at seven days may be somewhat useful, but probably not at a 60% level of perfection. Murphy and Epstein (1989) decomposed a climatological skill score and showed that the square of the ACOR is the potential skill of the forecast and that actual skill is considerably lower than the potential level defined by ACOR.

Potential skill levels of .50 and .60 (PS50 and PS60), in number of days, are also given in Tables 10 and 11. Figure IV is the time series plot of PS50 and PS60 data for the MRF (FPS50 and FPS60) and Persistence forecast (PPS50 and PPS60); Northern Hemisphere is on top and Southern Hemisphere on the bottom. Currently, Southern Hemisphere FPS50 is greater than four days for all seasons whereas over the Northern Hemisphere it varies between nearly six days in DJF to about five days in JJA and SON. Persistence forecast PS50 is one day for the Southern Hemisphere and about a half day greater for the Northern Hemisphere.

REFERENCES

Kalnay, E., M. Kanamitsu, and W. E. Baker. 1990. Global Numerical Weather Prediction at the National Meteorological Center. Bull. Amer. Met. Soc. 71: 1410-1428

Murphy, A. H. and E. S. Epstein. 1989. Skill Scores and Correlation Coefficients in Model Verification. Mon. Wea. Rev. 117: 572-581.

TABLE 1.

SPECTRAL MODEL 1982. ANOMALY CORRELATION COEFFICIENT (ACOR) AND RATIO OF ROOT MEAN SQUARES OF FORECAST AND PERSISTENCE WITH RESPECT TO CLIMATOLOGY (RMSR), BASED ON CAC 1978-85 MEANS. FOR: (1) 500MB FORECASTS, (2) DAYS 1-10, (3) WAVE NUMBERS 0-12, (4) DEC-FEB (DJF), MAR-MAY (MAM), JUN-AUG (JJA), AND SEP-NOV (SON) SEASONS, (5) NORTH AND SOUTH HEMISPHERES (BETWEEN 20-80 DEGREES LATITUDE).

	NORTH HEMISPHERE.....				SOUTH HEMISPHERE.....			
	FORECAST		PERSISTENCE		FORECAST		PERSISTENCE	
DAY	ACOR	RMSR	ACOR	RMSR	ACOR	RMSR	ACOR	RMSR
.DJF.								
1	.98	.23	.81	.60	.90	.45	.65	.83
2	.93	.38	.60	.89	.76	.69	.34	1.15
3	.87	.53	.46	1.04	.63	.85	.23	1.26
4	.77	.70	.34	1.15	.48	1.02	.19	1.30
5	.66	.82	.23	1.25	.36	1.13	.15	1.34
6	.54	.94	.16	1.32	.26	1.21	.07	1.41
7	.44	1.03	.11	1.36	.18	1.27	.02	1.45
8	.36	1.10	.05	1.40	.12	1.31	.05	1.44
9	.30	1.15	.03	1.43	-0.01	2.10	.05	1.44
10	.25	1.18	.02	1.44	-0.01	2.11	.03	1.46
.MAM.								
1	.97	.26	.79	.65	.90	.44	.70	.77
2	.91	.43	.55	.95	.76	.67	.44	1.05
3	.83	.61	.40	1.11	.62	.85	.28	1.20
4	.71	.82	.30	1.21	.48	1.01	.19	1.27
5	.58	.96	.22	1.27	.34	1.13	.14	1.31
6	.45	1.08	.15	1.34	.22	1.23	.12	1.32
7	.34	1.17	.10	1.38	.12	1.30	.14	1.30
8	.25	1.23	.08	1.40	.05	1.35	.18	1.28
9	.18	1.28	.06	1.42	-0.07	2.03	.18	1.27
10	.13	1.31	.04	1.44	-0.08	2.04	.18	1.28
.JJA.								
1	.96	.28	.83	.59	.90	.46	.70	.77
2	.90	.47	.59	.91	.76	.72	.45	1.05
3	.79	.66	.42	1.08	.62	.91	.31	1.17
4	.65	.85	.30	1.19	.49	1.06	.21	1.26
5	.53	.99	.21	1.26	.36	1.19	.15	1.31
6	.42	1.09	.17	1.30	.26	1.30	.10	1.35
7	.31	1.22	.14	1.33	.17	1.43	.04	1.39
8	.22	1.29	.11	1.35	.13	1.46	.02	1.40
9	.15	1.33	.09	1.37	-0.11	2.49	.00	1.41
10	.12	1.33	.07	1.39	-0.11	2.51	.02	1.40
.SON.								
1	.97	.26	.78	.66	.92	.41	.71	.76
2	.91	.43	.51	.98	.80	.64	.43	1.06
3	.83	.60	.33	1.15	.68	.81	.26	1.22
4	.71	.77	.19	1.26	.56	.94	.17	1.29
5	.58	.91	.10	1.33	.46	1.03	.14	1.32
6	.45	1.03	.06	1.36	.36	1.12	.13	1.33
7	.34	1.15	.04	1.38	.27	1.21	.12	1.35
8	.25	1.20	.03	1.38	.20	1.25	.12	1.35
9	.19	1.23	.03	1.38	-0.01	1.84	.12	1.34
10	.12	1.27	.02	1.39	-0.01	1.85	.11	1.35

TABLE 2.

SPECTRAL MODEL 1983. ANOMALY CORRELATION COEFFICIENT (ACOR) AND RATIO OF ROOT MEAN SQUARES OF FORECAST AND PERSISTENCE WITH RESPECT TO CLIMATOLOGY (RMSR), BASED ON CAC 1978-85 MEANS. FOR: (1) 500MB FORECASTS, (2) DAYS 1-10, (3) WAVE NUMBERS 0-12, (4) DEC-FEB (DJF), MAR-MAY (MAM), JUN-AUG (JJA), AND SEP-NOV (SON) SEASONS, (5) NORTH AND SOUTH HEMISPHERES (BETWEEN 20-80 DEGREES LATITUDE).

	NORTH HEMISPHERE.....				SOUTH HEMISPHERE.....			
	FORECAST		PERSISTENCE		FORECAST		PERSISTENCE	
DAY	ACOR	RMSR	ACOR	RMSR	ACOR	RMSR	ACOR	RMSR
.DJF.								
1	.97	.26	.79	.64	.91	.44	.72	.74
2	.92	.42	.56	.93	.78	.66	.46	1.03
3	.84	.57	.43	1.07	.67	.81	.31	1.18
4	.76	.71	.36	1.14	.58	.92	.24	1.24
5	.65	.86	.30	1.19	.50	1.01	.23	1.25
6	.53	.97	.22	1.25	.42	1.09	.22	1.27
7	.43	1.08	.17	1.30	.36	1.14	.19	1.29
8	.35	1.14	.12	1.33	.30	1.18	.16	1.32
9	.27	1.18	.11	1.35	.13	2.00	.16	1.33
10	.21	1.21	.11	1.35	.15	1.96	.13	1.36
.MAM.								
1	.97	.26	.79	.64	.91	.44	.68	.80
2	.92	.42	.54	.96	.78	.67	.40	1.09
3	.84	.60	.41	1.09	.66	.83	.25	1.22
4	.72	.79	.31	1.18	.53	.97	.19	1.27
5	.59	.95	.23	1.26	.39	1.10	.18	1.28
6	.47	1.07	.19	1.29	.28	1.19	.15	1.30
7	.37	1.18	.19	1.30	.19	1.29	.11	1.32
8	.28	1.24	.16	1.33	.12	1.32	.10	1.33
9	.23	1.27	.13	1.35	-0.01	2.04	.13	1.31
10	.20	1.27	.11	1.37	-0.01	2.04	.11	1.32
.JJA.								
1	.96	.28	.81	.62	.90	.45	.69	.78
2	.90	.46	.55	.95	.77	.69	.42	1.09
3	.79	.64	.37	1.13	.63	.88	.23	1.25
4	.66	.83	.24	1.24	.50	1.03	.11	1.34
5	.52	.97	.15	1.32	.39	1.14	.06	1.39
6	.39	1.09	.09	1.37	.32	1.23	.03	1.41
7	.29	1.22	.06	1.40	.23	1.35	.03	1.41
8	.21	1.27	.03	1.42	.18	1.38	.03	1.41
9	.12	1.32	.00	1.45	.06	2.10	.02	1.42
10	.07	1.34	-0.02	1.46	.06	2.11	-0.01	1.44
.SON.								
1	.97	.28	.75	.70	.91	.43	.68	.80
2	.91	.44	.48	1.01	.80	.63	.41	1.09
3	.84	.60	.36	1.13	.69	.78	.26	1.22
4	.72	.77	.30	1.17	.57	.93	.17	1.30
5	.59	.92	.26	1.21	.43	1.06	.13	1.33
6	.45	1.05	.21	1.25	.32	1.16	.12	1.34
7	.34	1.16	.15	1.29	.23	1.26	.09	1.36
8	.27	1.20	.13	1.31	.16	1.33	.10	1.36
9	.20	1.24	.12	1.31	.05	1.69	.09	1.37
10	.13	1.27	.11	1.32	.04	1.71	.08	1.38

TABLE 3.

SPECTRAL MODEL 1984. ANOMALY CORRELATION COEFFICIENT (ACOR) AND RATIO OF ROOT MEAN SQUARES OF FORECAST AND PERSISTENCE WITH RESPECT TO CLIMATOLOGY (RMSR), BASED ON CAC 1978-85 MEANS. FOR: (1) 500MB FORECASTS, (2) DAYS 1-10, (3) WAVE NUMBERS 0-12, (4) DEC-FEB (DJF), MAR-MAY (MAM), JUN-AUG (JJA), AND SEP-NOV (SON) SEASONS, (5) NORTH AND SOUTH HEMISPHERES (BETWEEN 20-80 DEGREES LATITUDE).

	NORTH HEMISPHERE.....				SOUTH HEMISPHERE.....			
	FORECAST		PERSISTENCE		FORECAST		PERSISTENCE	
DAY	ACOR	RMSR	ACOR	RMSR	ACOR	RMSR	ACOR	RMSR
.DJF.								
1	.96	.29	.81	.62	.89	.47	.67	.82
2	.92	.43	.59	.90	.78	.67	.38	1.11
3	.84	.60	.44	1.06	.68	.81	.25	1.23
4	.73	.76	.31	1.17	.58	.93	.19	1.28
5	.61	.92	.23	1.24	.45	1.05	.14	1.32
6	.50	1.05	.18	1.29	.34	1.15	.10	1.35
7	.39	1.15	.14	1.32	.26	1.21	.09	1.37
8	.29	1.23	.10	1.35	.20	1.26	.09	1.38
9	.23	1.27	.07	1.37	.14	1.34	.08	1.39
10	.17	1.31	.05	1.40	.12	1.37	.05	1.41
.MAM.								
1	.97	.25	.81	.61	.91	.43	.67	.80
2	.92	.42	.57	.93	.78	.68	.36	1.12
3	.84	.61	.41	1.09	.65	.87	.22	1.24
4	.73	.79	.30	1.19	.52	1.03	.14	1.31
5	.61	.95	.22	1.26	.40	1.14	.08	1.36
6	.48	1.10	.15	1.32	.31	1.22	.05	1.38
7	.37	1.22	.11	1.36	.25	1.27	.04	1.38
8	.29	1.29	.07	1.39	.20	1.31	.04	1.38
9	.23	1.33	.05	1.41	.14	1.37	.00	1.40
10	.18	1.37	.05	1.42	.11	1.40	-0.03	1.42
.JJA.								
1	.96	.28	.83	.59	.91	.42	.69	.78
2	.91	.44	.58	.92	.79	.67	.39	1.11
3	.82	.64	.40	1.10	.68	.85	.22	1.25
4	.70	.82	.27	1.21	.56	1.01	.12	1.33
5	.58	.96	.18	1.29	.45	1.14	.06	1.38
6	.46	1.08	.11	1.34	.35	1.24	.04	1.39
7	.36	1.17	.08	1.37	.28	1.31	.04	1.39
8	.29	1.24	.06	1.39	.20	1.38	.05	1.37
9	.23	1.29	.04	1.41	.15	1.46	.05	1.37
10	.18	1.32	.01	1.44	.13	1.47	.02	1.39
.SON.								
1	.97	.24	.78	.66	.93	.38	.70	.78
2	.92	.41	.54	.96	.82	.61	.43	1.07
3	.85	.59	.38	1.11	.69	.79	.31	1.18
4	.72	.77	.28	1.20	.56	.94	.24	1.25
5	.59	.93	.21	1.25	.45	1.05	.18	1.30
6	.45	1.06	.15	1.30	.35	1.13	.16	1.32
7	.34	1.16	.10	1.34	.26	1.20	.15	1.33
8	.26	1.21	.05	1.37	.20	1.26	.13	1.35
9	.21	1.23	.04	1.38	.13	1.33	.09	1.38
10	.17	1.25	.03	1.38	.09	1.36	.06	1.40

TABLE 4.

SPECTRAL MODEL 1985. ANOMALY CORRELATION COEFFICIENT (ACOR) AND RATIO OF ROOT MEAN SQUARES OF FORECAST AND PERSISTENCE WITH RESPECT TO CLIMATOLOGY (RMSR), BASED ON CAC 1978-85 MEANS. FOR: (1) 500MB FORECASTS, (2) DAYS 1-10, (3) WAVE NUMBERS 0-12, (4) DEC-FEB (DJF), MAR-MAY (MAM), JUN-AUG (JJA), AND SEP-NOV (SON) SEASONS, (5) NORTH AND SOUTH HEMISPHERES (BETWEEN 20-80 DEGREES LATITUDE).

	NORTH HEMISPHERE.....				SOUTH HEMISPHERE.....			
	FORECAST		PERSISTENCE		FORECAST		PERSISTENCE	
DAY	ACOR	RMSR	ACOR	RMSR	ACOR	RMSR	ACOR	RMSR
.DJF.								
1	.98	.22	.81	.61	.92	.39	.67	.80
2	.93	.39	.61	.88	.81	.62	.40	1.10
3	.85	.58	.46	1.04	.68	.80	.28	1.20
4	.74	.75	.34	1.15	.55	.94	.20	1.27
5	.62	.91	.24	1.23	.43	1.05	.12	1.33
6	.46	1.05	.16	1.29	.34	1.12	.07	1.37
7	.35	1.15	.14	1.32	.27	1.18	.04	1.39
8	.27	1.19	.10	1.34	.21	1.21	.01	1.42
9	.22	1.23	.08	1.36	.17	1.30	.04	1.40
10	.15	1.27	.08	1.36	.13	1.33	.10	1.37
.MAM.								
1	.97	.23	.80	.64	.93	.38	.67	.81
2	.93	.39	.56	.94	.81	.62	.39	1.10
3	.86	.56	.42	1.09	.67	.82	.27	1.21
4	.75	.73	.32	1.18	.51	.99	.17	1.29
5	.62	.89	.23	1.26	.38	1.09	.08	1.36
6	.50	1.02	.16	1.32	.28	1.18	.01	1.41
7	.41	1.09	.12	1.36	.20	1.24	-0.03	1.43
8	.33	1.15	.10	1.38	.17	1.26	-0.04	1.43
9	.28	1.20	.08	1.40	.13	1.30	-0.04	1.43
10	.23	1.23	.05	1.43	.07	1.34	-0.02	1.42
.JJA.								
1	.96	.30	.82	.61	.93	.37	.68	.80
2	.87	.50	.56	.95	.81	.60	.38	1.11
3	.80	.62	.38	1.12	.68	.77	.23	1.25
4	.70	.74	.28	1.21	.56	.90	.17	1.31
5	.57	.87	.21	1.27	.45	1.00	.12	1.34
6	.45	.97	.15	1.32	.33	1.09	.10	1.36
7	.33	1.05	.10	1.36	.23	1.17	.10	1.36
8	.26	1.11	.05	1.40	.15	1.22	.11	1.36
9	.20	1.15	.01	1.43	.12	1.25	.06	1.39
10	.14	1.18	-0.02	1.46	.06	1.29	.03	1.42
.SON.								
1	.98	.21	.82	.60	.94	.35	.70	.77
2	.93	.36	.59	.90	.84	.56	.44	1.06
3	.88	.49	.44	1.05	.72	.72	.29	1.20
4	.79	.63	.35	1.13	.60	.84	.20	1.28
5	.70	.75	.28	1.18	.48	.96	.14	1.33
6	.60	.84	.22	1.23	.38	1.05	.10	1.36
7	.52	.92	.16	1.27	.30	1.10	.10	1.37
8	.42	.99	.12	1.30	.22	1.15	.10	1.37
9	.33	1.06	.09	1.32	.17	1.19	.09	1.37
10	.26	1.10	.06	1.33	.11	1.22	.09	1.37

TABLE 5.

SPECTRAL MODEL 1986. ANOMALY CORRELATION COEFFICIENT (ACOR) AND RATIO OF ROOT MEAN SQUARES OF FORECAST AND PERSISTENCE WITH RESPECT TO CLIMATOLOGY (RMSR), BASED ON CAC 1978-85 MEANS. FOR: (1) 500MB FORECASTS, (2) DAYS 1-10, (3) WAVE NUMBERS 0-12, (4) DEC-FEB (DJF), MAR-MAY (MAM), JUN-AUG (JJA), AND SEP-NOV (SON) SEASONS, (5) NORTH AND SOUTH HEMISPHERES (BETWEEN 20-80 DEGREES LATITUDE).

		NORTH HEMISPHERE.....				SOUTH HEMISPHERE.....			
		FORECAST		PERSISTENCE		FORECAST		PERSISTENCE	
	DAY	ACOR	RMSR	ACOR	RMSR	ACOR	RMSR	ACOR	RMSR
.DJF.									
	1	.98	.21	.80	.63	.93	.36	.69	.78
	2	.94	.35	.60	.89	.83	.57	.43	1.07
	3	.88	.49	.49	1.01	.73	.71	.34	1.15
	4	.79	.63	.39	1.11	.63	.82	.28	1.21
	5	.70	.75	.30	1.19	.52	.91	.18	1.28
	6	.60	.85	.24	1.24	.42	1.00	.15	1.31
	7	.52	.93	.20	1.27	.33	1.07	.14	1.32
	8	.44	1.00	.18	1.29	.27	1.12	.12	1.33
	9	.36	1.06	.15	1.31	.21	1.16	.09	1.36
	10	.30	1.10	.10	1.35	.17	1.19	.10	1.35
.MAM.									
	1	.98	.21	.81	.61	.93	.37	.69	.78
	2	.93	.36	.58	.91	.82	.59	.42	1.07
	3	.87	.49	.43	1.07	.70	.75	.26	1.21
	4	.80	.61	.34	1.16	.58	.89	.16	1.29
	5	.70	.74	.26	1.24	.46	1.00	.12	1.33
	6	.60	.84	.19	1.30	.36	1.08	.10	1.35
	7	.50	.92	.14	1.34	.30	1.13	.07	1.38
	8	.41	.99	.11	1.37	.24	1.18	.04	1.40
	9	.34	1.04	.07	1.40	.19	1.22	-0.01	1.44
	10	.28	1.09	.06	1.41	.16	1.26	-0.02	1.45
.JJA.									
	1	.97	.23	.82	.60	.96	.27	.78	.67
	2	.92	.40	.57	.94	.90	.44	.54	.96
	3	.84	.55	.39	1.11	.81	.60	.40	1.09
	4	.73	.71	.28	1.22	.72	.73	.30	1.18
	5	.60	.85	.20	1.28	.63	.84	.22	1.25
	6	.47	.96	.16	1.32	.53	.95	.17	1.29
	7	.37	1.04	.12	1.35	.44	1.04	.15	1.31
	8	.30	1.10	.09	1.37	.38	1.10	.14	1.31
	9	.25	1.13	.07	1.39	.30	1.17	.14	1.32
	10	.21	1.16	.04	1.41	.25	1.22	.13	1.32
.SON.									
	1	.98	.18	.80	.62	.96	.28	.71	.76
	2	.95	.32	.59	.89	.88	.48	.45	1.05
	3	.89	.46	.50	1.00	.78	.64	.33	1.17
	4	.81	.60	.41	1.08	.67	.77	.23	1.25
	5	.71	.74	.35	1.13	.56	.88	.15	1.32
	6	.60	.86	.31	1.16	.46	.97	.10	1.36
	7	.48	.96	.27	1.20	.37	1.04	.06	1.39
	8	.38	1.04	.24	1.23	.28	1.10	.03	1.41
	9	.29	1.11	.22	1.24	.21	1.16	.00	1.44
	10	.21	1.17	.19	1.27	.13	1.22	-0.01	1.45

TABLE 6.

SPECTRAL MODEL 1987. ANOMALY CORRELATION COEFFICIENT (ACOR) AND RATIO OF ROOT MEAN SQUARES OF FORECAST AND PERSISTENCE WITH RESPECT TO CLIMATOLOGY (RMSR), BASED ON CAC 1978-85 MEANS. FOR: (1) 500MB FORECASTS, (2) DAYS 1-10, (3) WAVE NUMBERS 0-12, (4) DEC-FEB (DJF), MAR-MAY (MAM), JUN-AUG (JJA), AND SEP-NOV (SON) SEASONS, (5) NORTH AND SOUTH HEMISPHERES (BETWEEN 20-80 DEGREES LATITUDE).

		NORTH HEMISPHERE.....				SOUTH HEMISPHERE.....			
		FORECAST		PERSISTENCE		FORECAST		PERSISTENCE	
	DAY	ACOR	RMSR	ACOR	RMSR	ACOR	RMSR	ACOR	RMSR
.DJF.									
	1	.98	.18	.78	.66	.96	.29	.72	.75
	2	.95	.32	.57	.92	.89	.46	.47	1.02
	3	.89	.46	.44	1.05	.80	.61	.32	1.16
	4	.81	.60	.35	1.14	.69	.74	.25	1.22
	5	.71	.74	.28	1.20	.58	.86	.23	1.24
	6	.59	.88	.23	1.24	.47	.96	.21	1.26
	7	.49	.99	.19	1.26	.40	1.02	.17	1.29
	8	.39	1.09	.17	1.28	.34	1.07	.13	1.32
	9	.30	1.16	.14	1.30	.28	1.12	.11	1.34
	10	.25	1.21	.10	1.33	.23	1.15	.07	1.36
.MAM.									
	1	.98	.18	.81	.62	.96	.29	.69	.78
	2	.95	.31	.56	.94	.88	.48	.39	1.10
	3	.89	.46	.40	1.11	.78	.64	.21	1.26
	4	.80	.61	.27	1.23	.67	.79	.13	1.31
	5	.69	.75	.19	1.30	.55	.91	.11	1.34
	6	.57	.88	.15	1.34	.45	1.01	.11	1.34
	7	.46	.98	.12	1.36	.36	1.09	.11	1.34
	8	.37	1.06	.10	1.38	.30	1.15	.09	1.35
	9	.30	1.12	.09	1.40	.24	1.20	.07	1.37
	10	.24	1.17	.07	1.41	.18	1.25	.05	1.38
.JJA.									
	1	.98	.20	.84	.56	.96	.26	.75	.71
	2	.93	.36	.61	.88	.90	.44	.49	1.01
	3	.86	.52	.44	1.06	.81	.60	.31	1.18
	4	.75	.67	.34	1.16	.70	.74	.21	1.27
	5	.64	.80	.26	1.23	.59	.86	.13	1.33
	6	.54	.90	.20	1.28	.50	.95	.10	1.36
	7	.44	.99	.14	1.33	.42	1.03	.10	1.35
	8	.36	1.06	.09	1.38	.33	1.11	.10	1.36
	9	.29	1.10	.06	1.40	.27	1.17	.07	1.38
	10	.24	1.14	.05	1.41	.23	1.21	.05	1.39
.SON.									
	1	.99	.17	.78	.65	.96	.27	.70	.77
	2	.95	.30	.53	.95	.90	.44	.42	1.08
	3	.89	.46	.37	1.11	.81	.59	.28	1.20
	4	.79	.62	.27	1.20	.71	.72	.24	1.23
	5	.67	.77	.21	1.25	.61	.82	.22	1.25
	6	.55	.90	.17	1.27	.51	.92	.18	1.28
	7	.45	.99	.15	1.29	.40	1.01	.13	1.33
	8	.36	1.06	.13	1.30	.33	1.07	.09	1.36
	9	.29	1.11	.10	1.32	.28	1.11	.09	1.36
	10	.23	1.16	.07	1.34	.25	1.14	.09	1.36

TABLE 7.

SPECTRAL MODEL 1988. ANOMALY CORRELATION COEFFICIENT (ACOR) AND RATIO OF ROOT MEAN SQUARES OF FORECAST AND PERSISTENCE WITH RESPECT TO CLIMATOLOGY (RMSR), BASED ON CAC 1978-85 MEANS. FOR: (1) 500MB FORECASTS, (2) DAYS 1-10, (3) WAVE NUMBERS 0-12, (4) DEC-FEB (DJF), MAR-MAY (MAM), JUN-AUG (JJA), AND SEP-NOV (SON) SEASONS, (5) NORTH AND SOUTH HEMISPHERES (BETWEEN 20-80 DEGREES LATITUDE).

		NORTH HEMISPHERE.....				SOUTH HEMISPHERE.....			
		FORECAST		PERSISTENCE		FORECAST		PERSISTENCE	
	DAY	ACOR	RMSR	ACOR	RMSR	ACOR	RMSR	ACOR	RMSR
.DJF.									
	1	.99	.17	.78	.66	.96	.29	.69	.78
	2	.95	.30	.56	.94	.88	.47	.41	1.08
	3	.89	.45	.43	1.06	.79	.62	.26	1.21
	4	.81	.60	.35	1.13	.69	.75	.19	1.27
	5	.72	.73	.28	1.20	.58	.85	.15	1.30
	6	.62	.85	.23	1.24	.50	.93	.14	1.32
	7	.52	.94	.21	1.26	.42	.98	.16	1.30
	8	.43	1.03	.17	1.29	.36	1.03	.14	1.32
	9	.36	1.09	.14	1.32	.31	1.07	.12	1.33
	10	.30	1.14	.12	1.34	.25	1.11	.10	1.35
.MAM.									
	1	.98	.18	.79	.64	.97	.26	.74	.71
	2	.94	.33	.54	.96	.90	.43	.51	.99
	3	.88	.49	.40	1.10	.82	.58	.37	1.12
	4	.79	.64	.28	1.21	.72	.72	.27	1.21
	5	.68	.78	.18	1.30	.61	.84	.20	1.27
	6	.56	.91	.12	1.36	.50	.93	.15	1.30
	7	.45	1.02	.08	1.39	.41	1.00	.12	1.33
	8	.35	1.11	.07	1.41	.33	1.07	.09	1.35
	9	.27	1.17	.08	1.41	.24	1.14	.07	1.36
	10	.22	1.21	.09	1.41	.18	1.19	.07	1.37
.JJA.									
	1	.98	.20	.84	.57	.95	.31	.71	.76
	2	.93	.36	.61	.89	.86	.52	.44	1.06
	3	.87	.50	.42	1.08	.75	.70	.28	1.20
	4	.77	.65	.29	1.19	.64	.82	.21	1.26
	5	.64	.81	.21	1.27	.56	.91	.17	1.30
	6	.51	.93	.14	1.32	.46	1.00	.13	1.33
	7	.40	1.02	.10	1.35	.38	1.08	.10	1.36
	8	.31	1.09	.10	1.36	.30	1.15	.09	1.37
	9	.23	1.14	.10	1.36	.25	1.19	.09	1.37
	10	.18	1.18	.08	1.38	.20	1.22	.11	1.35
.SON.									
	1	.99	.17	.76	.68	.97	.26	.73	.73
	2	.95	.32	.49	1.00	.90	.43	.46	1.03
	3	.89	.46	.35	1.13	.83	.57	.31	1.17
	4	.80	.61	.29	1.18	.73	.70	.26	1.22
	5	.69	.76	.23	1.23	.62	.81	.27	1.21
	6	.58	.88	.19	1.26	.52	.91	.25	1.22
	7	.48	.98	.18	1.27	.43	.98	.20	1.26
	8	.39	1.05	.17	1.27	.35	1.04	.17	1.30
	9	.31	1.11	.16	1.28	.28	1.09	.17	1.30
	10	.26	1.15	.12	1.30	.23	1.13	.19	1.28

TABLE 8.

SPECTRAL MODEL 1989. ANOMALY CORRELATION COEFFICIENT (ACOR) AND RATIO OF ROOT MEAN SQUARES OF FORECAST AND PERSISTENCE WITH RESPECT TO CLIMATOLOGY (RMSR), BASED ON CAC 1978-85 MEANS. FOR: (1) 500MB FORECASTS, (2) DAYS 1-10, (3) WAVE NUMBERS 0-12, (4) DEC-FEB (DJF), MAR-MAY (MAM), JUN-AUG (JJA), AND SEP-NOV (SON) SEASONS, (5) NORTH AND SOUTH HEMISPHERES (BETWEEN 20-80 DEGREES LATITUDE).

		NORTH HEMISPHERE.....				SOUTH HEMISPHERE.....			
		FORECAST		PERSISTENCE		FORECAST		PERSISTENCE	
	DAY	ACOR	RMSR	ACOR	RMSR	ACOR	RMSR	ACOR	RMSR
.DJF.									
	1	.99	.14	.80	.62	.97	.25	.70	.76
	2	.97	.26	.60	.89	.91	.42	.43	1.07
	3	.92	.39	.50	.99	.83	.57	.28	1.20
	4	.86	.52	.43	1.05	.74	.70	.20	1.27
	5	.78	.65	.38	1.10	.64	.81	.17	1.30
	6	.69	.76	.36	1.12	.53	.92	.16	1.30
	7	.60	.87	.35	1.13	.43	1.01	.13	1.33
	8	.50	.97	.34	1.14	.35	1.08	.13	1.32
	9	.42	1.05	.32	1.16	.28	1.13	.17	1.30
	10	.36	1.11	.32	1.16	.22	1.17	.19	1.28
.MAM.									
	1	.99	.14	.84	.57	.97	.24	.72	.75
	2	.96	.27	.62	.87	.91	.41	.45	1.04
	3	.92	.41	.47	1.04	.83	.57	.31	1.16
	4	.84	.56	.36	1.16	.72	.73	.22	1.24
	5	.75	.70	.27	1.23	.60	.86	.17	1.27
	6	.65	.82	.21	1.29	.49	.97	.17	1.28
	7	.55	.93	.18	1.32	.41	1.04	.18	1.27
	8	.46	1.00	.13	1.36	.34	1.10	.16	1.28
	9	.40	1.07	.09	1.39	.29	1.14	.16	1.27
	10	.32	1.13	.07	1.41	.25	1.17	.17	1.27
.JJA.									
	1	.98	.19	.83	.58	.97	.26	.71	.75
	2	.94	.34	.58	.92	.90	.46	.47	1.02
	3	.88	.48	.39	1.11	.80	.64	.36	1.13
	4	.79	.63	.26	1.23	.69	.79	.26	1.21
	5	.68	.77	.18	1.29	.58	.91	.21	1.26
	6	.58	.89	.13	1.32	.48	1.02	.19	1.27
	7	.49	.99	.09	1.35	.37	1.12	.14	1.30
	8	.40	1.07	.07	1.38	.29	1.19	.10	1.34
	9	.32	1.15	.05	1.39	.22	1.24	.09	1.35
	10	.26	1.20	.04	1.41	.17	1.28	.06	1.37
.SON.									
	1	.99	.16	.78	.66	.97	.23	.73	.73
	2	.96	.29	.53	.97	.92	.40	.48	1.02
	3	.90	.44	.38	1.11	.84	.55	.35	1.15
	4	.81	.60	.25	1.21	.75	.69	.24	1.24
	5	.69	.76	.18	1.27	.65	.81	.16	1.31
	6	.57	.90	.14	1.30	.54	.93	.13	1.34
	7	.46	1.02	.11	1.33	.44	1.03	.10	1.36
	8	.36	1.11	.11	1.33	.35	1.11	.10	1.37
	9	.27	1.19	.12	1.31	.28	1.17	.11	1.37
	10	.19	1.25	.12	1.31	.22	1.22	.10	1.38

TABLE 9.

SPECTRAL MODEL 1990. ANOMALY CORRELATION COEFFICIENT (ACOR) AND RATIO OF ROOT MEAN SQUARES OF FORECAST AND PERSISTENCE WITH RESPECT TO CLIMATOLOGY (RMSR), BASED ON CAC 1978-85 MEANS. FOR: (1) 500MB FORECASTS, (2) DAYS 1-10, (3) WAVE NUMBERS 0-12, (4) DEC-FEB (DJF), MAR-MAY (MAM), JUN-AUG (JJA), AND SEP-NOV (SON) SEASONS, (5) NORTH AND SOUTH HEMISPHERES (BETWEEN 20-80 DEGREES LATITUDE).

	NORTH HEMISPHERE.....				SOUTH HEMISPHERE.....			
	FORECAST		PERSISTENCE		FORECAST		PERSISTENCE	
DAY	ACOR	RMSR	ACOR	RMSR	ACOR	RMSR	ACOR	RMSR
.DJF.								
1	.99	.14	.82	.59	.97	.24	.70	.77
2	.97	.25	.64	.83	.92	.41	.40	1.08
3	.93	.38	.54	.95	.84	.54	.26	1.21
4	.86	.51	.46	1.03	.74	.68	.16	1.29
5	.79	.64	.39	1.10	.64	.80	.09	1.34
6	.70	.74	.34	1.13	.55	.90	.10	1.34
7	.62	.85	.31	1.17	.44	1.00	.10	1.34
8	.53	.94	.28	1.19	.34	1.08	.07	1.37
9	.46	1.00	.27	1.20	.29	1.14	.03	1.40
10	.39	1.06	.26	1.21	.24	1.17	.03	1.40
.MAM.								
1	.99	.14	.81	.61	.97	.24	.71	.74
2	.97	.26	.58	.92	.91	.42	.49	1.00
3	.92	.39	.46	1.05	.83	.57	.39	1.11
4	.84	.54	.36	1.14	.73	.72	.30	1.18
5	.75	.68	.28	1.22	.62	.84	.24	1.23
6	.66	.80	.23	1.27	.52	.96	.20	1.27
7	.56	.91	.22	1.29	.43	1.04	.14	1.32
8	.47	.99	.20	1.31	.34	1.11	.11	1.33
9	.39	1.06	.17	1.34	.29	1.16	.10	1.34
10	.33	1.12	.15	1.36	.24	1.19	.08	1.36
.JJA.								
1	.98	.18	.83	.59	.97	.25	.72	.74
2	.95	.32	.57	.92	.91	.42	.44	1.05
3	.89	.46	.40	1.10	.83	.59	.28	1.19
4	.80	.61	.29	1.20	.72	.74	.19	1.26
5	.69	.76	.21	1.27	.62	.88	.17	1.28
6	.58	.88	.15	1.31	.51	1.00	.17	1.29
7	.48	.97	.11	1.34	.41	1.09	.17	1.29
8	.38	1.05	.06	1.38	.33	1.17	.16	1.30
9	.30	1.12	.04	1.40	.24	1.24	.14	1.32
10	.22	1.18	.02	1.41	.19	1.29	.11	1.34
.SON.								
1	.99	.15	.79	.65	.97	.25	.71	.77
2	.96	.28	.55	.94	.91	.42	.42	1.08
3	.90	.43	.43	1.06	.83	.58	.23	1.25
4	.82	.59	.33	1.15	.73	.73	.16	1.32
5	.71	.75	.26	1.21	.63	.85	.11	1.36
6	.59	.89	.22	1.23	.54	.94	.09	1.38
7	.48	.99	.20	1.25	.45	1.02	.08	1.38
8	.37	1.09	.17	1.27	.35	1.10	.08	1.38
9	.29	1.15	.16	1.28	.26	1.19	.06	1.40
10	.24	1.19	.16	1.28	.19	1.25	.07	1.40

TABLE 10.

NORTH HEMISPHERE SPECTRAL MODEL 500MB FORECAST SKILL LEVELS. IN NUMBER OF FORECAST DAYS, ANOMALY CORRELATION COEFFICIENT AT THE .60 LEVEL (AC60), ROOT-MEAN-SQUARE ERROR RATIO OF FORECAST WITH RESPECT TO CLIMATOLOGY OF UNITY (RMS1), AND POTENTIAL SKILL AT .50 AND .60 LEVELS (PS50 AND PS60) FOR DEC-FEB (DJF), MAR-MAY (MAM), JUN-AUG(JJA), AND SEP-NOV (SON) SEASONS.

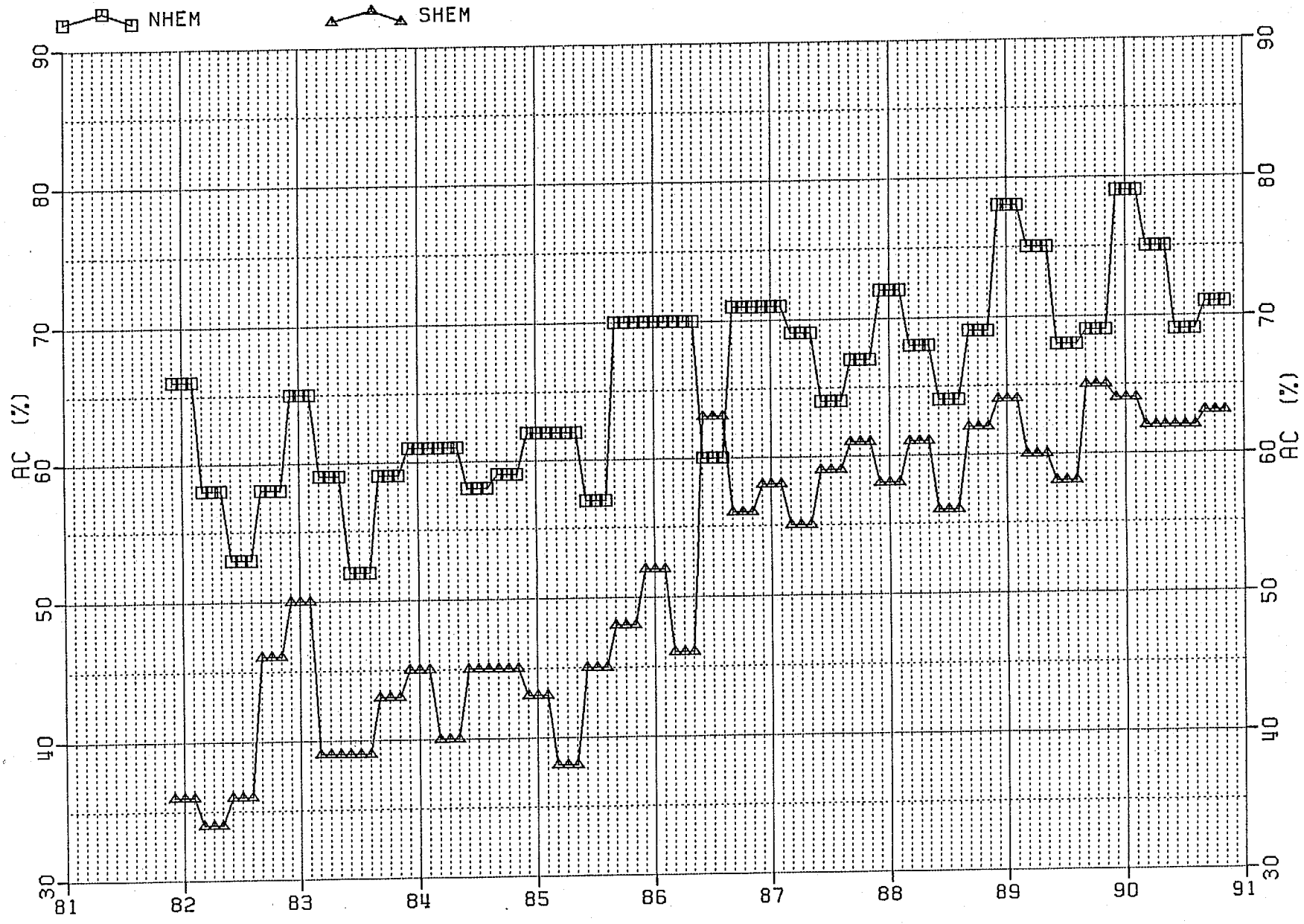
	FORECAST.....				PERSISTENCE.....			
	AC60	RMS1	PS50	PS60	AC60	RMS1	PS50	PS60
DJF								
1982	5.5	6.7	4.6	4.0	2.0	2.7	1.5	1.2
1983	5.4	6.3	4.5	3.8	1.8	2.5	1.4	1.1
1984	5.1	5.6	4.2	3.6	2.0	2.6	1.5	1.2
1985	5.1	5.6	4.3	3.7	2.1	2.8	1.5	1.2
1986	6.0	8.0	4.9	4.2	2.0	2.9	1.5	1.1
1987	5.9	7.1	5.0	4.4	1.9	2.6	1.4	1.0
1988	6.2	7.7	5.1	4.4	1.8	2.5	1.4	1.0
1989	7.0	8.4	5.8	5.1	2.0	3.2	1.5	1.1
1990	7.2	9.0	5.9	5.2	2.4	3.6	1.7	1.3
MAM								
1982	4.8	5.3	4.0	3.5	1.8	2.3	1.4	1.1
1983	4.9	5.4	4.1	3.6	1.8	2.3	1.4	1.1
1984	5.1	5.3	4.2	3.6	1.9	2.4	1.5	1.2
1985	5.2	5.8	4.4	3.8	1.8	2.4	1.4	1.1
1986	6.0	8.2	4.9	4.3	1.9	2.6	1.5	1.2
1987	5.7	7.2	4.9	4.2	1.8	2.4	1.5	1.2
1988	5.7	6.8	4.8	4.1	1.8	2.3	1.4	1.1
1989	6.5	8.0	5.4	4.7	2.1	2.8	1.6	1.3
1990	6.6	8.1	5.5	4.7	1.9	2.6	1.5	1.2
JJA								
1982	4.4	5.1	3.6	3.1	2.0	2.5	1.6	1.3
1983	4.4	5.2	3.7	3.1	1.8	2.3	1.4	1.2
1984	4.8	5.3	3.9	3.4	1.9	2.4	1.5	1.3
1985	4.8	6.4	3.9	3.3	1.8	2.3	1.5	1.2
1986	5.0	6.5	4.2	3.6	1.9	2.4	1.5	1.2
1987	5.4	7.1	4.4	3.8	2.1	2.7	1.6	1.3
1988	5.3	6.8	4.5	4.0	2.1	2.6	1.6	1.3
1989	5.8	7.1	4.8	4.1	1.9	2.4	1.5	1.3
1990	5.8	7.4	4.9	4.2	1.9	2.4	1.5	1.2
SON								
1982	4.8	5.8	4.0	3.5	1.7	2.1	1.3	1.0
1983	4.9	5.6	4.1	3.6	1.6	2.0	1.2	0.9
1984	4.9	5.5	4.1	3.6	1.7	2.3	1.3	1.0
1985	6.0	8.1	4.9	4.2	2.0	2.7	1.5	1.2
1986	6.0	7.5	5.0	4.4	2.0	3.0	1.5	1.1
1987	5.6	7.1	4.7	4.1	1.7	2.3	1.3	1.0
1988	5.8	7.3	4.9	4.2	1.6	2.0	1.2	0.9
1989	5.7	6.8	4.9	4.3	1.7	2.2	1.3	1.0
1990	5.9	7.1	5.0	4.4	1.8	2.5	1.4	1.1

TABLE 11.

SOUTH HEMISPHERE SPECTRAL MODEL 500MB FORECAST SKILL LEVELS. IN NUMBER OF FORECAST DAYS, ANOMALY CORRELATION COEFFICIENT AT THE .60 LEVEL (AC60), ROOT-MEAN-SQUARE ERROR RATIO OF FORECAST WITH RESPECT TO CLIMATOLOGY OF UNITY (RMS1), AND POTENTIAL SKILL AT .50 AND .60 LEVELS (PS50 AND PS60) FOR DEC-FEB (DJF), MAR-MAY (MAM), JUN-AUG(JJA), AND SEP-NOV (SON) SEASONS.

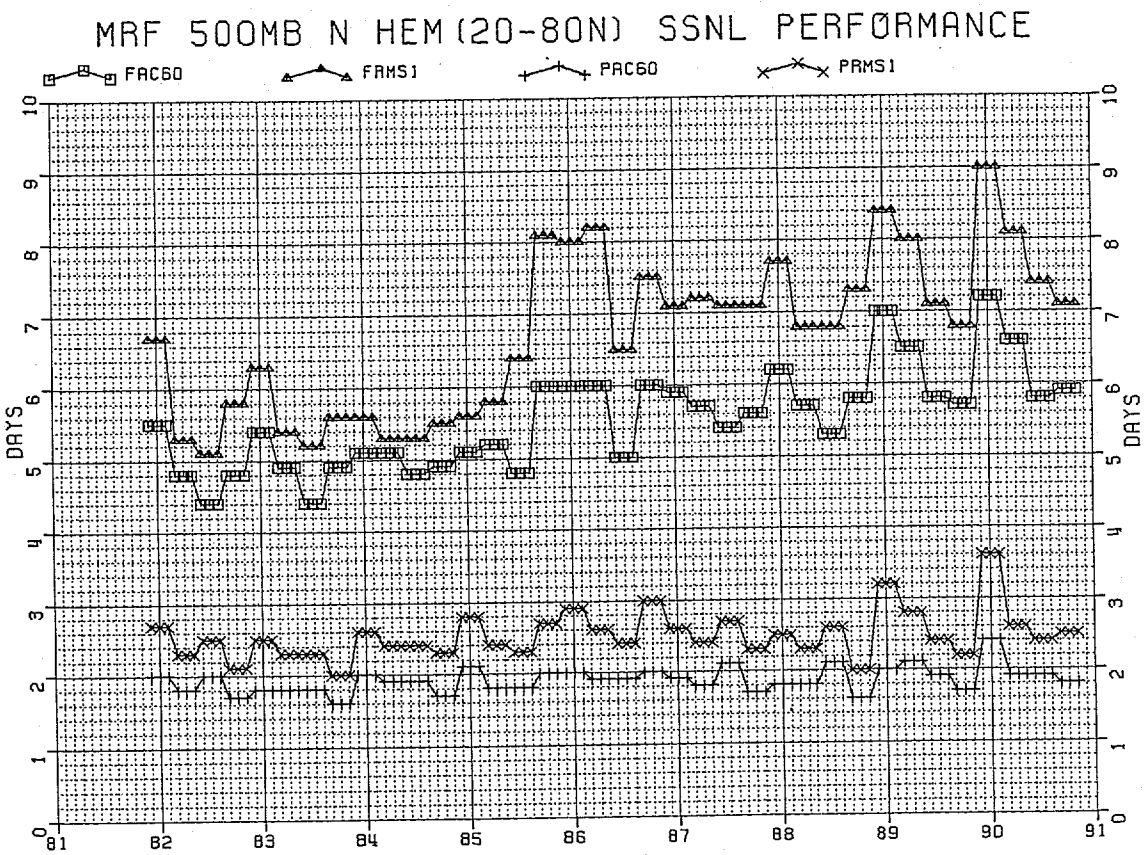
	FORECAST.....				PERSISTENCE.....			
	AC60	RMS1	PS50	PS60	AC60	RMS1	PS50	PS60
DJF								
1982	3.2	3.9	2.4	1.9	1.2	1.5	0.7	0.4
1983	3.8	4.9	2.7	2.1	1.5	1.9	1.1	0.7
1984	3.8	4.6	2.7	2.1	1.2	1.6	0.8	0.5
1985	3.6	4.5	2.8	2.3	1.3	1.7	0.8	0.5
1986	4.3	6.0	3.2	2.6	1.3	1.8	0.9	0.6
1987	4.8	6.7	3.9	3.2	1.5	1.9	1.1	0.7
1988	4.8	7.4	3.8	3.2	1.3	1.7	0.9	0.6
1989	5.4	6.9	4.3	3.6	1.4	1.8	1.0	0.6
1990	5.4	7.0	4.3	3.7	1.3	1.7	1.0	0.7
MAM								
1982	3.1	3.9	2.4	1.9	1.4	1.8	1.0	0.6
1983	3.5	4.2	2.6	2.0	1.3	1.7	0.9	0.5
1984	3.4	3.8	2.6	2.0	1.2	1.6	0.8	0.5
1985	3.4	4.1	2.8	2.3	1.2	1.7	0.8	0.5
1986	3.8	5.0	2.9	2.4	1.3	1.8	0.9	0.6
1987	4.6	5.9	3.7	3.1	1.3	1.7	0.9	0.6
1988	5.1	7.0	4.1	3.5	1.6	2.1	1.2	0.8
1989	5.0	6.4	4.1	3.5	1.4	1.9	1.1	0.7
1990	5.2	6.5	4.2	3.6	1.5	2.0	1.0	0.6
JJA								
1982	3.2	3.6	2.4	1.9	1.4	1.8	1.0	0.6
1983	3.2	3.8	2.5	2.0	1.3	1.7	0.9	0.6
1984	3.7	3.9	2.8	2.1	1.3	1.7	0.9	0.6
1985	3.7	5.0	2.8	2.3	1.3	1.6	0.9	0.6
1986	5.3	6.6	4.2	3.4	1.7	2.3	1.3	1.0
1987	4.9	6.6	3.9	3.3	1.6	2.0	1.2	0.9
1988	4.5	6.0	3.4	2.8	1.4	1.8	1.0	0.7
1989	4.8	5.8	3.9	3.2	1.5	1.9	1.0	0.7
1990	5.2	6.0	4.1	3.5	1.4	1.8	1.1	0.7
SON								
1982	3.7	4.7	2.8	2.2	1.4	1.8	1.0	0.7
1983	3.7	4.5	2.9	2.2	1.3	1.7	0.9	0.5
1984	3.7	4.5	2.9	2.4	1.4	1.8	1.0	0.6
1985	4.0	5.4	3.1	2.6	1.4	1.8	1.0	0.6
1986	4.6	6.4	3.7	3.1	1.4	1.8	1.0	0.7
1987	5.1	6.9	4.0	3.4	1.4	1.7	1.0	0.6
1988	5.2	7.3	4.2	3.6	1.5	1.9	1.1	0.8
1989	5.5	6.7	4.4	3.7	1.5	1.9	1.1	0.8
1990	5.3	6.7	4.2	3.6	1.4	1.7	1.0	0.7

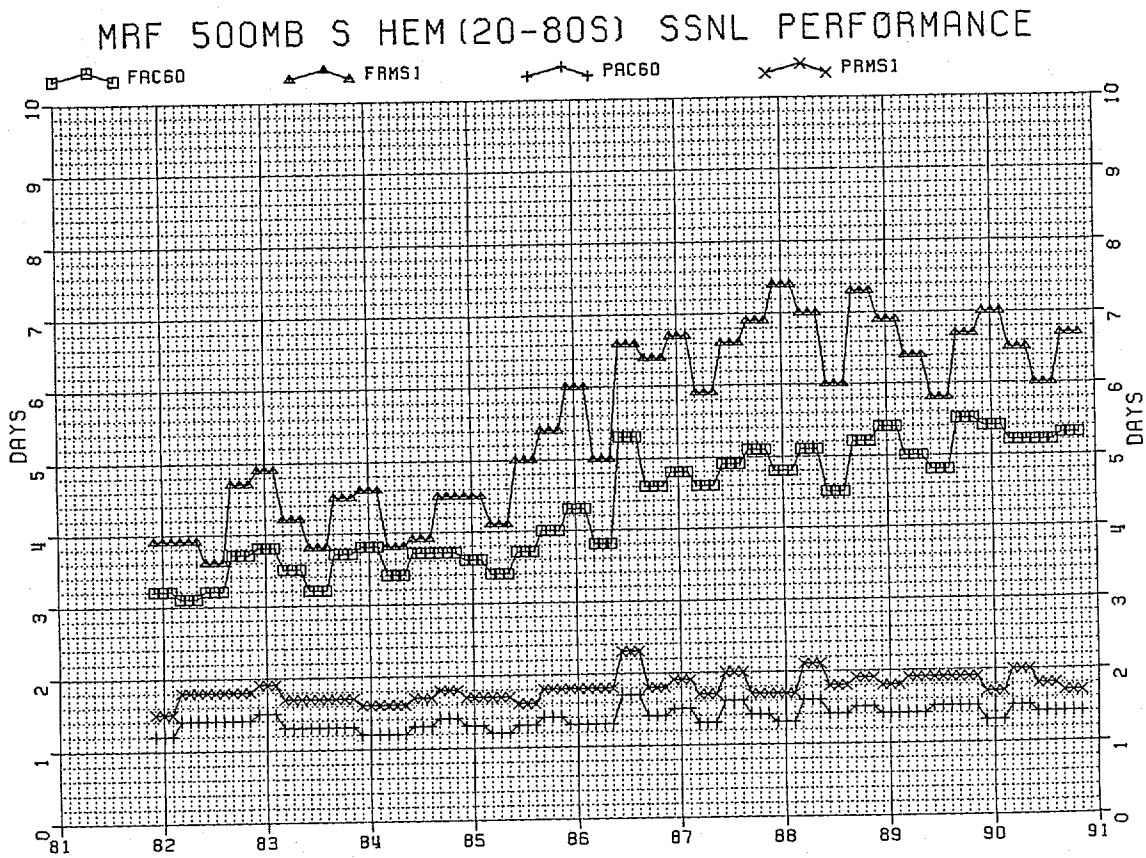
MRF SSNL DAY05 ANØCØR FØR N AND S HEM (20-80DEG)



H

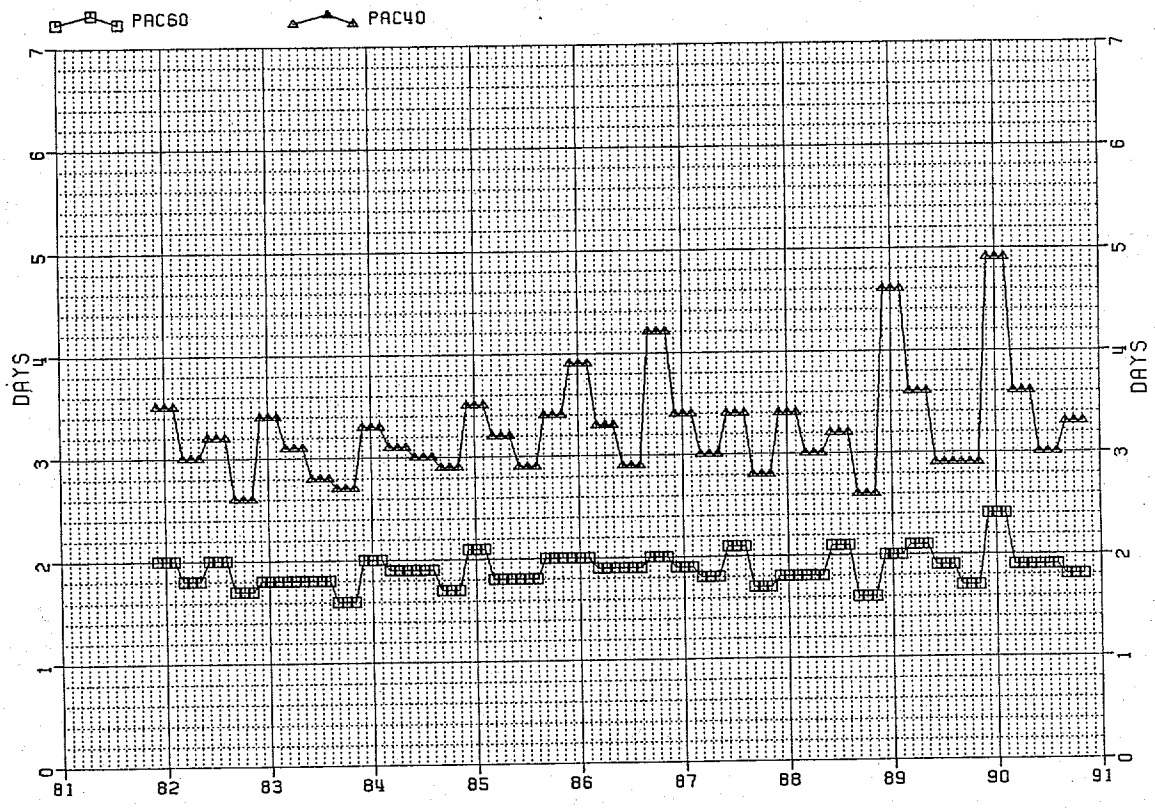
II


MRF 500MB N HEM (20-80N) SSNL PERFORMANCE
FAC60
FRMS1
PAC60
PRMS1
DAYS
0
1
2
3
4
5
6
7
8
9
10
81
82
83
84
85
86
87
88
89
90
91

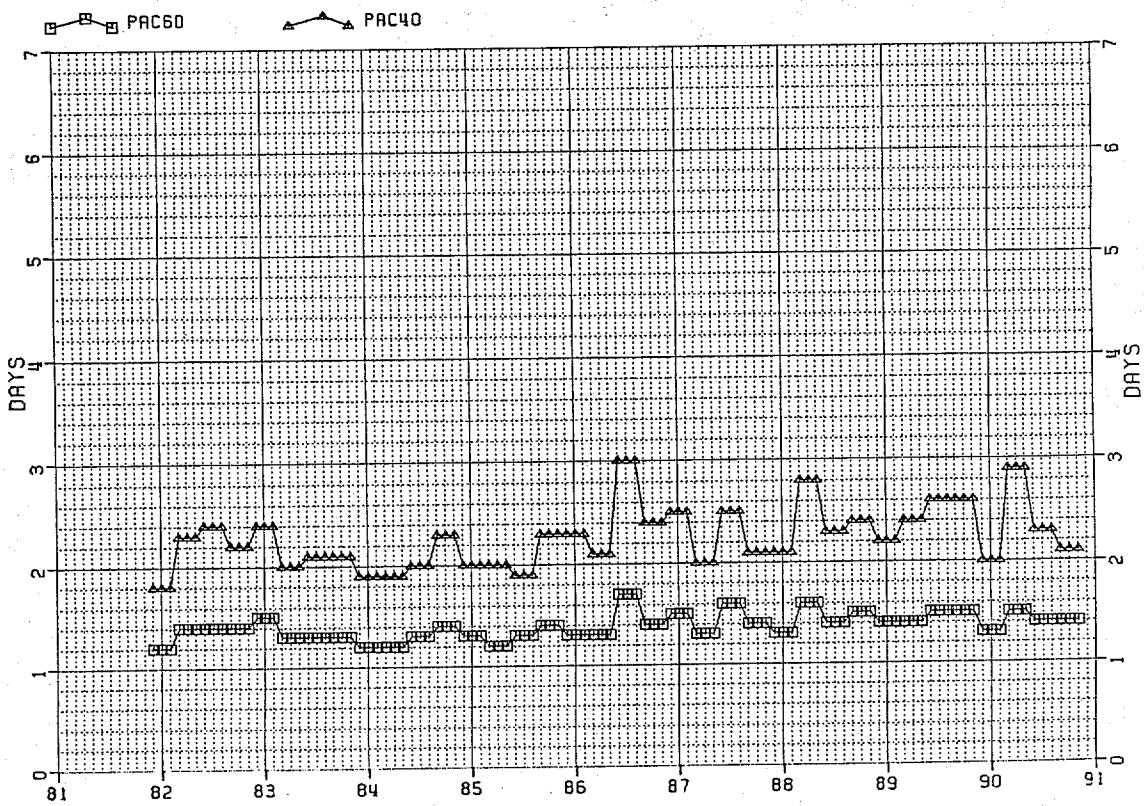

MRF 500MB S HEM (20-80S) SSNL PERFORMANCE
FAC60
FRMS1
PAC60
PRMS1
DAYS
0
1
2
3
4
5
6
7
8
9
10
81
82
83
84
85
86
87
88
89
90
91

III

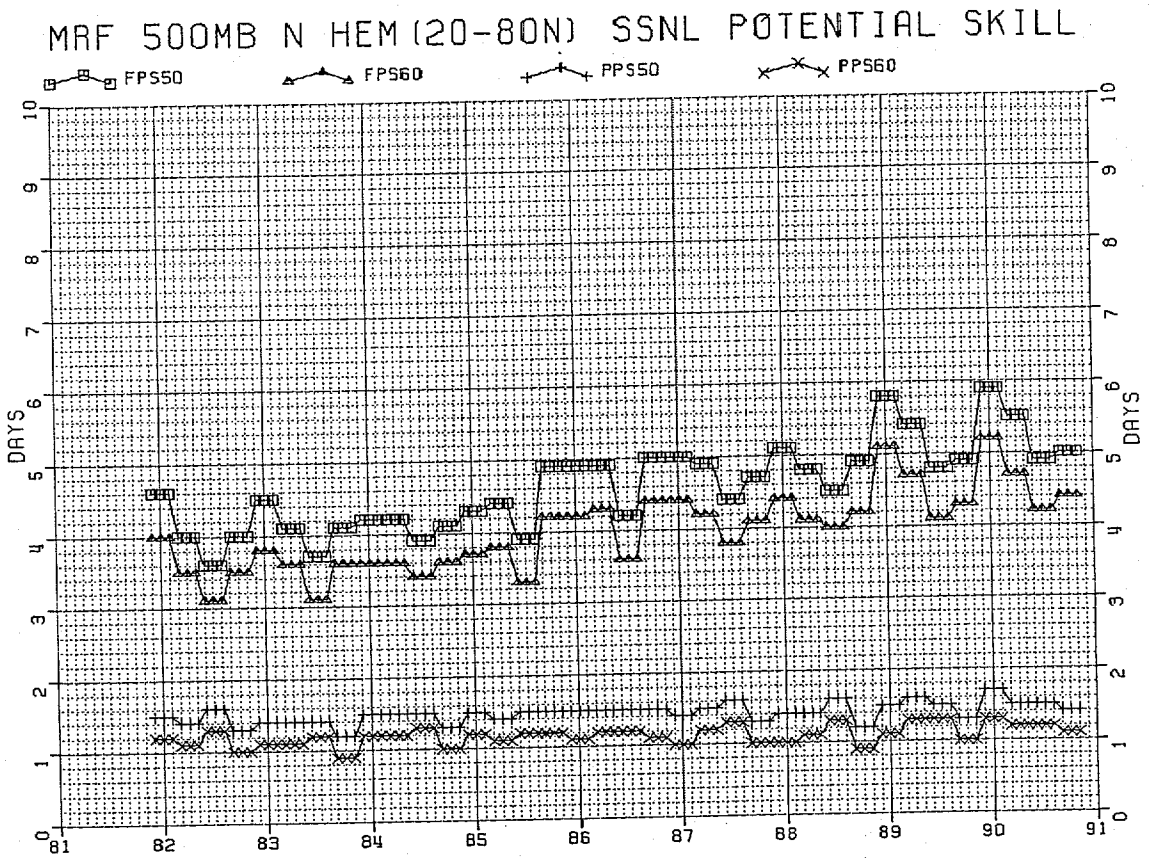
NORTHERN HEMISPHERE PERSISTENCE ANOCOR

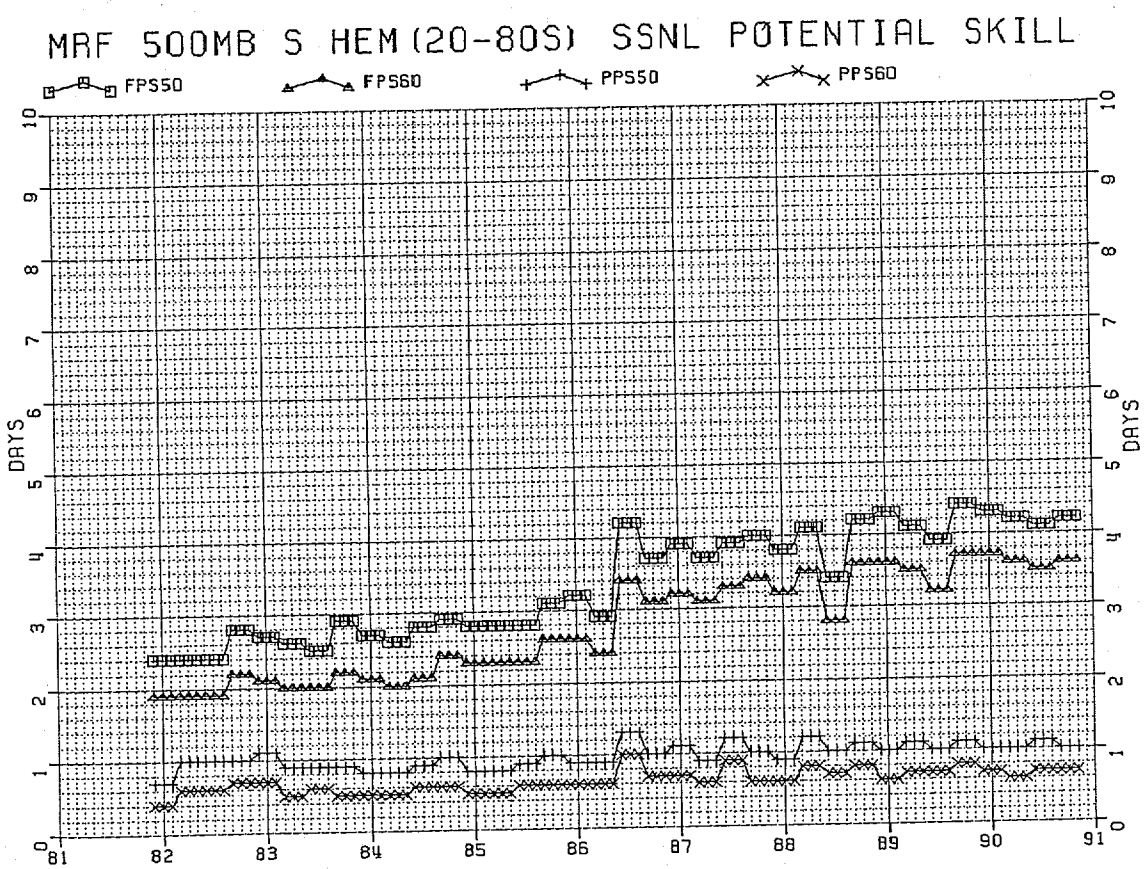


SOUTHERN HEMISPHERE PERSISTENCE ANOCOR



IV


MRF 500MB N HEM (20-80N) SSNL POTENTIAL SKILL
FPS50
FPS60
PPS50
PPS60
DAYS
0
1
2
3
4
5
6
7
8
9
10
81
82
83
84
85
86
87
88
89
90
91


MRF 500MB S HEM (20-80S) SSNL POTENTIAL SKILL
FPS50
FPS60
PPS50
PPS60
DAYS
0
1
2
3
4
5
6
7
8
9
10
81
82
83
84
85
86
87
88
89
90
91