



PACIFIC REGION TECHNICAL NOTES

80-044
December 8, 1980

SECOND DAY FORECAST TRENDS - PART A

Pat Morin, Supervising Meteorologist
Pacific Weather Centre, Vancouver

INTRODUCTION

Many changes have taken place in weather forecasting and data collection in the last few years (See Appendix 'A'). This note examines the trend of the second day forecast for Vancouver to determine if changes in the "forecasting system" have helped to make improvements in the second day forecast.

Part B, a continuation of this study, attempts to measure how the users' confidence has been affected by the second day forecasts. As well, the relationship between the circulation pattern and the second day forecast score, and various verification methods are examined.

METHOD

Tech. Note #78-047 (Puss) suggested that improvements in the public forecast scores for Vancouver in the last few years were mainly due to better NWP products and increased skill in the use of the satellite pictures. The data sets used were the scores achieved by the early morning "two-day" forecasts for Vancouver. This note examines only the scores achieved on the second day portion of this forecast (See Appendix 'B').

For a city like Vancouver, wind and temperatures changes are insignificant in contrast to the quick fluctuations in the clouds and weather. Hence, from the hardcopy verification forms, the score achieved for the clouds and weather group for the second day was extracted and served as the basis of the data used. As well, the score achieved for the midnight - 6 a.m. period was also extracted (See Appendix 'B'). The period of analysis was for a series of three winter months for the winters of '75-6, '76-7, '77-8, '78-9 (approx. 400 days).

N.B.: Jan. 78 excluded as hardcopy data could not be located.

In addition, the isobaric skill scores of the 36hr. Spectral, U.S. PE, and subjective 30hr. PWC prog, calculated for the BC grid area (Morin, Tech. Note 79-034), was also analyzed for the same period. Furthermore, the circulation over B.C. for the days analyzed, was categorized either high or low index, and the scores achieved under these regimes were examined.

ANALYSIS OF DATA

Fig. 1(a) displays the monthly mean for the second day forecast and the midnight - 6 a.m. period of the second day. The mean score for each winter period is indicated by the "+" and the corresponding standard deviates "." is plotted.

In Fig. 1(a), the second day monthly mean score exhibits an increasingly harmful oscillatory behaviour towards the end of the analysis period. During the same period the mean score for each winter season shows a gradual decline which reached a minimum in 1978-79.

SCORE ANALYSIS BY CIRCULATION CATEGORIZATION

The data set was further broken into 2 groups based on the circulation. For days where weather systems moved across the B.C. coast, the data was placed in the H (high index) cycle group and the remainder under the L (low index) cycle group and the score achieved under these two regimes was calculated - Fig. 1(b).

Next, each regime was broken into 2 time periods to determine if a trend existed in the score between the start and end of the five year period under each circulation regime. That is, while H and L denote the score achieved under each circulation regime, H1 and L1 denote the score achieved during the first three winter seasons and H2 and L2 denote the score achieved during the last two winters under each circulation regime. From Fig. 1(b), the mean of the second day score (24hrs) denoted by AV is about 71%. For each circulation regime, the second day score is 68% under the H cycle and 76% under the L cycle. That is, the public score under "L" days is 8% better than under "H" days.

Similarly, the score for the 6hr. period (midnight - 6 a.m.), Fig. 1(b), shows a 9% difference between $\langle H \rangle$ and $\langle L \rangle$.

During the 5 winter seasons under the low index circulation regime, the second day score (Fig. 1(b)), improved from 73% (L1) to 80% (L2) and the midnight period score rose from 74 to 80%. Under the H regime, the score for the second day forecast decreased from 69% to 67% and for the midnight period from 74 to 63%. To further isolate the source of these changes the distribution of the forecast scores is examined.

To the right of the frequency of distribution lies the corresponding cumulative frequency diagram. In Fig. 2e, the large area between L1 and L2 shows that there has been a good improvement between the first past period (L1) and the last past period (L2). On the other hand, there is little improvement under the H index cycle as can be seen by H1 and H2, Fig. 2f, which is almost coincident. Since the midnight period is the first of four past periods that make up the second day, it was examined in detail to help determine if the lack of improvement under the H regime for the second day forecast is the result of a carry over of bad first day forecasting. Under the L cycle, the improvement in the 6hr. period (Fig. 2g) is quite strongly similar to the improvement achieved during the total second day (Fig. 2e). However, under the H cycle, the 6hr. midnight period score actually deteriorated during the 5 year period as exhibited by H2 which now lies to the left of H1 in contrast to L2 which lies to the right of L1 (Fig. 2e). Now since H2 and H1 are nearly coincident for the second day (Fig. 2f), then one can state that the deterioration of the midnight period is likely a carry over of bad forecasting from the first day. The deterioration also shows up in Fig. 2b where we see an increase in the number of bad forecasts in the 0 to 50% range - and a

corresponding decrease of good forecasts in the 50 to 100% range between curve H1 and H2.

SUMMARY

While the frequency of correct forecasts has increased during the low circulation (L) regime, there has been some deterioration in our ability to forecast during the high circulation (H) regime - that regime which is more critical to the public. The gap between the average scores, initially 4% (L1-H1; Fig. 1(b)) during the first part of the period analyzed, increased to 13% by the end of the period. Even more dramatic is the widening gap for the midnight period - Fig. 1(b) (top). Initially, the gap is 1% (L1-H1; Fig. 1(b) (top) and this gap increases to 17% (L2-H2). The question then arises as to whether this diverging trend reduces the user's confidence in our forecast product. This and reasons behind this trend are examined in part B.

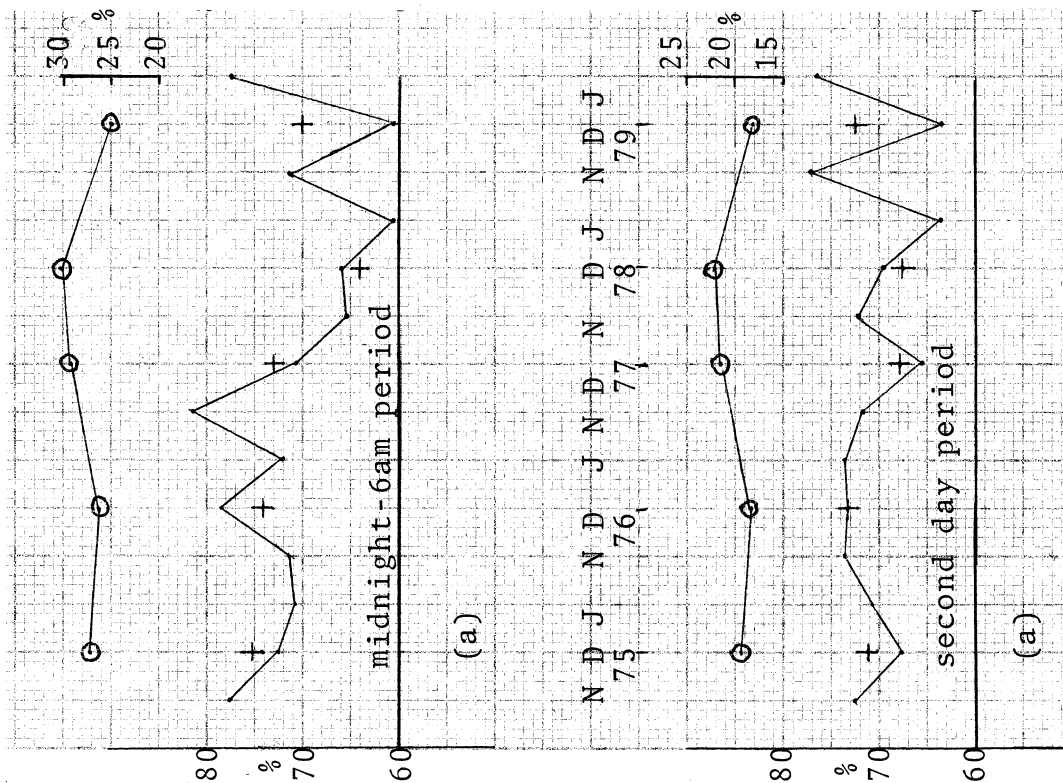


Fig. 1a: trend of monthly mean for midnight period and second day; season mean (+) and standard deviation (O).

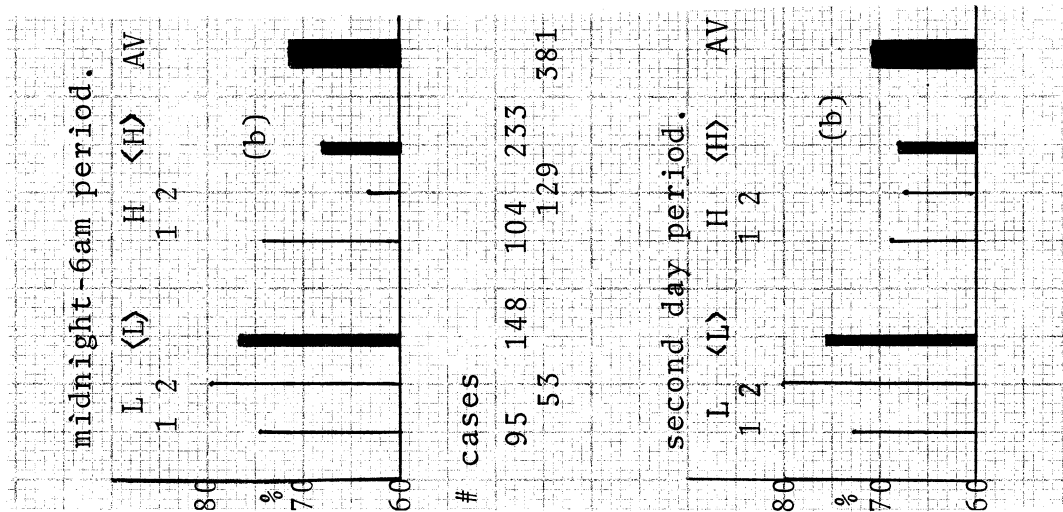


Fig. 1b: mean of scores under two types of circulation regimes (L,H); mean during the first and last part of regime (H1,H2,L1,L2); and overall average (AV).

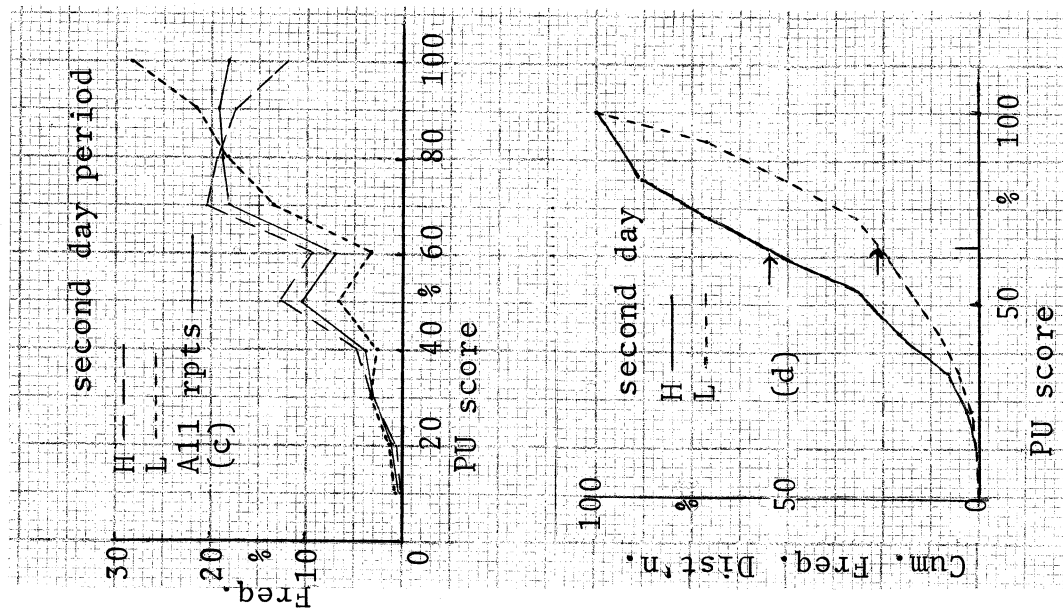


Fig. 1c: frequency distribution of scores (above) and cumulative frequency distribution below (fig 1d).

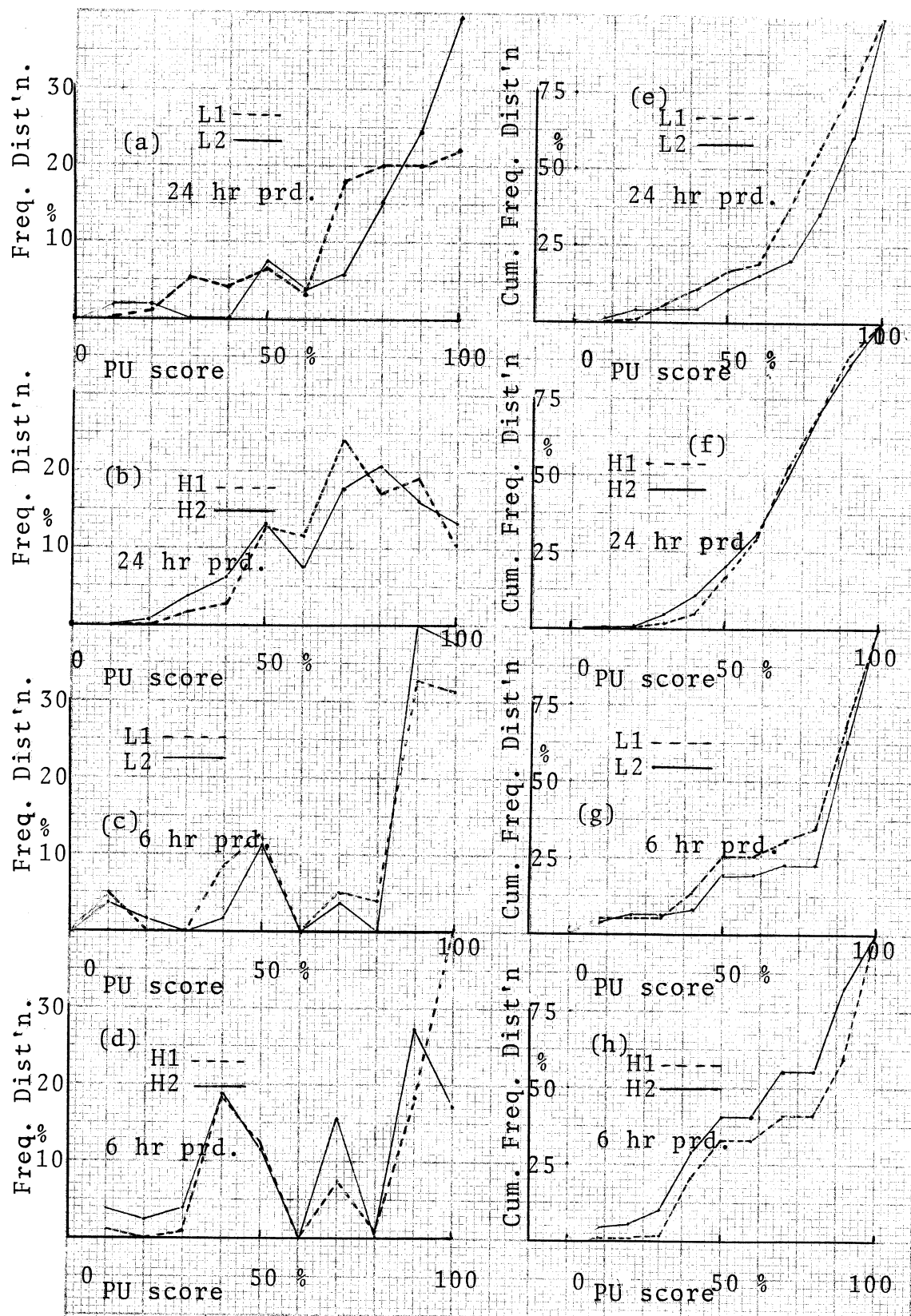


Fig. 2: frequency distribution of second day and midnight period scores during the first and last part of each regime; to the right is the corresponding cumulative frequency distribution diagram.

Changes in Forecasting Aids of The Last Few Years

Can. Baroclinic(d)	Spectral-29 wave-10 lv1. (1/2 d)
U.S. P.E.(d)	Spectral-30 wave-12 lv1 (1/2 d)
LFM 1 (1/2 d)	LFM 2 (1/3 d)

SAT. DATA

TOVS(sat. vertical soundings)

FXCN3	FXCN3
---	FOUS76

APPENDIX B

First day-0600-2400; second day-2400-2400; midnight period-2400-0600
Point distribution for a 6hr period:

a) If sky and wx condition correctly called, the maximum points awarded is $6(3+3)$,

it predicted parameter is one group removed from mean observed, then points awarded is 2 and if two groups removed then points awarded is 0 (eg. if overcast is called but mean condition is cloudy, points awarded is 2 and if mean condition is scattered cloud, then points awarded is 0; if rain is called and showers occur, then points awarded is 2 etc.)

Possible point distribution is therefore 6.5, 4.3, 2.0. Minimum points required for forecast to be of practical usefulness to the general public is 4 (2, 2) or 67. Without loss of generality, the second day forecast must achieve at least 67% to be of any use.

Total Time	PRACTICE			OASSTED			SCORE	
	SET	WT	NO	SET	WT	NO	SET	WT
0600								
700								
1800								
2400								
TOTAL							9	9

TODAY =

Sun x2
Fri x2
x2

[illegible]

Sum	
Pobl	

	PAVE	POST	ACT		SCORE	BONUS
PAVE						
POST						
ACT						
TOTAL						

	Sum	
	Paol	

ALL Score 7abl	GRAND TOTAL
----------------------	-------------