



PACIFIC REGION TECHNICAL NOTES

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Experiment in Forecasting without Numerical Models (Verification - Isobaric Prognoses)

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INTRODUCTION

During the periods November 29-December 3 and December 6-10 the Pacific Weather Centre carried out a forecast experiment. The original intent of the experiment had been to try to determine the value of satellite information in the forecasting process. However, just before the experiment was to begin the GOES-West satellite failed. Since the experiment was already planned and meteorologists were available, it was decided to carry out a somewhat different project of which the object was:

1. To assess the usefulness of numerical prognoses.
2. To assess and encourage the use of synoptic skills.

For further background and information regarding this experiment see Pacific Region Technical Note 83-007.

The verification results of the experiment will be published in five Technical Notes.

1. Verification of Forecast Experiment
Isobaric Prognoses (Surface).
2. Verification of Forecast Experiment
Marine Forecasts.
3. Verification of Forecast Experiment
Public Forecasts - Sky conditions and precipitation.
4. Verification of Forecast Experiment
Public Forecasts - Temperatures.
5. Verification of Forecast Experiment
Aviation aerodrome forecasts.

Needless to say from a statistical point of view the verification results will not be very meaningful due to the smallness of the samples. Therefore, discussions of the results and comments should be treated with this in mind. However, it is still hoped that some of the observations that are made will shed some light on the forecasting process which now exists in major weather centres.

SYNOPTIC REGIME DURING EXPERIMENT

At 500 mbs an extremely strong zonal flow over the Eastern Pacific between 35° North and 50° North on the 29th of November began to change (by December 1st) with a strong, broad ridge building near 150° West. In response to this building ridge a trough was established from Northern B.C. to Arizona by December 1st. This finally resulted in a cut-off low over the Western U.S. and a split flow off the B.C. coast on Dec. 2nd. This split flow progressed eastward across B.C. on the 3rd producing an extremely strong westerly flow across the B.C. coast between a ridge to the south of B.C. and a low in the northern Gulf of Alaska. A trough south westward from this low also progressed eastward amplifying somewhat and crossing B.C. on the 4th of December. A building ridge off the B.C. coast followed the passage of the trough into Alberta on the 5th of December. Intensification of troughs occurred on the 6th of December near 160W and the Great Lakes. This effect moved B.C. under the eastern portion of a long wave ridge position which was establishing just off the B.C. coast. The ridge continued to amplify on the 7th and became oriented more northeast - southwest on the 8th. With this orientation a cut-off was produced over California on the 8th. This basic pattern persisted to the 11th of December. As the cut-off in California weakened after this period the upper pattern again became progressive on the 12th of December.

At the surface the first 5 days produced rapidly changing synoptic features responding to changes in the upper circulation from zonal flow to digging trough to split flow. Many systems during this period were sub-synoptic in nature often with life spans of less than 12 hrs. The second five days reflected the stability of the upper flow patterns with generally ridge conditions over B.C. and outflow winds over most of the B.C. coast.

The weather over B.C. was generally cloudy and wet (rain or snow) on the first 5 days of the experiment and generally sunny and cold on the last five days.

PROCEDURE FOR VERIFYING ISOBARIC PROGNOSSES

1. The data on S_1 scores and RMSE were taken from the CMC (Canadian Meteorological Centre) summary "Verification of Pacific Region" December 1982. These scores are displayed in Table 1.
2. The "Best available prog based on S_1 scores" column in Table 1 only reflects the S_1 scores of the LFM, Can. Spectral and U.S. 48 hr progs. It excludes the U.S. 36 hr Spectral because this prog was not available.
3. The official prognoses were examined together with the FXs (Forecast Discussion) issued by the prognostician and in the column "Choice of Office" in Table 1 the choice of the prognostician was indicated. In one instance the comment "all rejected" was taken from the FX.

4. A subjective verification of the computer guidance was made to determine the best prognoses by comparing it to the Pacific Weather Centre Analysis. The appropriate choice is indicated in the Column "Best Prog Subjective Evaluation" in Table 1. It should be noted that particular emphasis was placed on the Pacific Region's area of responsibility and this accounts for the discrepancy between "Best Subjective Evaluation." The areas for comparison were not the same.
5. The guidance was evaluated subjectively and comments as to its value were made in the column headed "Evaluation of Guidance Subjective" in Table 1.
6. Although only S_1 scores and RMSE are listed for 36 and 48 hour progs by CMC the 24 hour prognoses of the office and the experimental team were also evaluated. The results are listed on the right hand side of Table 1.
7. The final column in Table 1 "Comparison of best "person" prog to best guidance" relates to the 36 hour prognoses only.

COMMENTS

1. Based on the S_1 scores it would appear that during the period of the experiment the U.S. 36 hr computer prognoses performed better than the other models. Unfortunately, these prognoses were not available in time to be used.
2. It would appear that S_1 scores which are representative of large geographic areas should not be used to infer success of isobaric prognoses over smaller areas contained within the larger geographic areas. The following example will illustrate this point. The computer prognoses valid for December 3, 0000Z are displayed on Figure 1; the analyses and the prognoses of the office and the experimental team are displayed on Figure 2. It is readily seen that the LFM S_1 score of 37.6 (Table 1) in no way resembles the usefulness of the isobaric prognoses for the B.C. coast.
3. The December 3 illustration (2 above) also shows that meteorologists can be strongly influenced by the computer guidance. It also shows that it is possible to produce a better isobaric prognoses without the guidance.
4. On the date that the meteorologists rejected all guidance (prog valid Dec. 10, 0000Z; see Table 1) the isobaric prognoses was not better than the best computer guidance at the surface. However, the models treated the upper circulation differently, and he picked the one that gave the best upper air prognoses. This resulted in an excellent Public Forecast. The Experimental Team in this particular case did much worse.
5. During the experiment 40% of the computer isobaric surface guidance was bad. When the guidance was bad the office did not improve it significantly; when the guidance was good the office did not improve it.

Table 1
Forecasting Experiment
Propagative Verification - Confidence Only - November 29-December 3, December 6-10

Valid Time	LMN	Can. Spectral	U.S. Spectral	U.S. Spectral	Best available	Choice of	Best prog.	Evaluation of	Office better	Office worse	Office about	Comparison of
of Prog	36 hour	36 hour	36 hour	48 hour	prog. based	Office	subjective	guidance	than expect-	than expect-	same as expect-	best "person"
00Z Dec. 1	48.8	44.7	43.9	37.5	Can. Spec.	Can. Spec.	Can. Spec.	All guidance very good. Can. Spec. slightly better than U.S. Spec.	24 hr. 36 hr.	24 hr. 36 hr.	24 hr. 36 hr.	prog. to best
00Z Dec. 2	58.3	6.9	56.1	5.3	LMN	Can. Spec.	LMN	All guidance poor. U.S. Spec. All guidance bad. Major storm center missed.			1	0 (much better)
00Z Dec. 3	37.6	4.7	38.2	4.4	LMN	Can. Spec.	LMN	Excellent guidance all prog.	1	1		0 (much better)
00Z Dec. 4	54.2	7.0	54.4	4.6	U.S. Spec.	Can. Spec.	U.S. Spec.	Excellent guidance all prog.				0 (much better)
00Z Dec. 5	53.5	5.3	50.5	5.5	LMN	Can. Spec.	Can. Spec.	All guidance excellent.	1	1		0 (much better)
Total and	50.3	6.0	54.3	5.6	1 LMN 48 hr.	4 Can. Spec.	2 Can. Spec.	Can. Spec. best.	1	2	3	0
Ranking	(2)	(4)	(1)	(3)	1 Can. Spec.	1 LMN	2 U.S. 48 hr.					
00Z Dec. 8	53.8	8.3	53.9	8.8	LMN	LMN	LMN	Very good guidance. Can. Spec. worse. U.S. Spec. very bad guidance all prog.			1	0 (better)
00Z Dec. 9	67.2	6.9	69.3	7.8	U.S. Spec.	LMN	U.S. Spec.	Very bad guidance all prog.			1	0 (worse) [36 hr.]
00Z Dec. 10	61.1	6.9	69.3	8.1	LMN	All rejected	Can. Spec.	All guidance for coast bad. U.S. Spec. very bad.	1	1		0 (much worse)
00Z Dec. 11	54.0	6.6	44.8	5.0	Can. Spec.	LMN	Can. Spec.	All guidance stellar and very good.			1	0 (worse)
00Z Dec. 12	39.0	4.9	37.0	37.4	Can. Spec.	Can. Spec.	Can. Spec.	All guidance stellar and very good.	1			0 (worse)
Total and	55.0	6.8	55.3	7.0	2 LMN 48 hr.	3 LMN 48 hr.	3 Can. Spec.		1	2	0	4
Ranking	(2)	(3)	(1)	(4)	1 Can. Spec.	1 U.S. 48 hr.	3 LMN 48 hr.					3
Grand Total	51.8	6.4	54.8	6.3	2 U.S. 48 hr.	4 LMN 1 none	2 U.S. 48 hr.		2	4	3	6
and Ranking	(2)	(3)	(1)	(4)	2 U.S. 48 hr.	1 none	2 U.S. 48 hr.					
					2 U.S. 48 hr.							
					1 U.S. 48 hr.							

Best Prog. if it had been available
LMN - Office
O - Office
E - Experiment Team
LMN - Root Mean Square Error
Note: All 24 hour prog. are valid 12 hours before 00Z

FIGURE 1.

CMC AND LFM PROGNoses FOR DEC. 3, 1982 0000Z

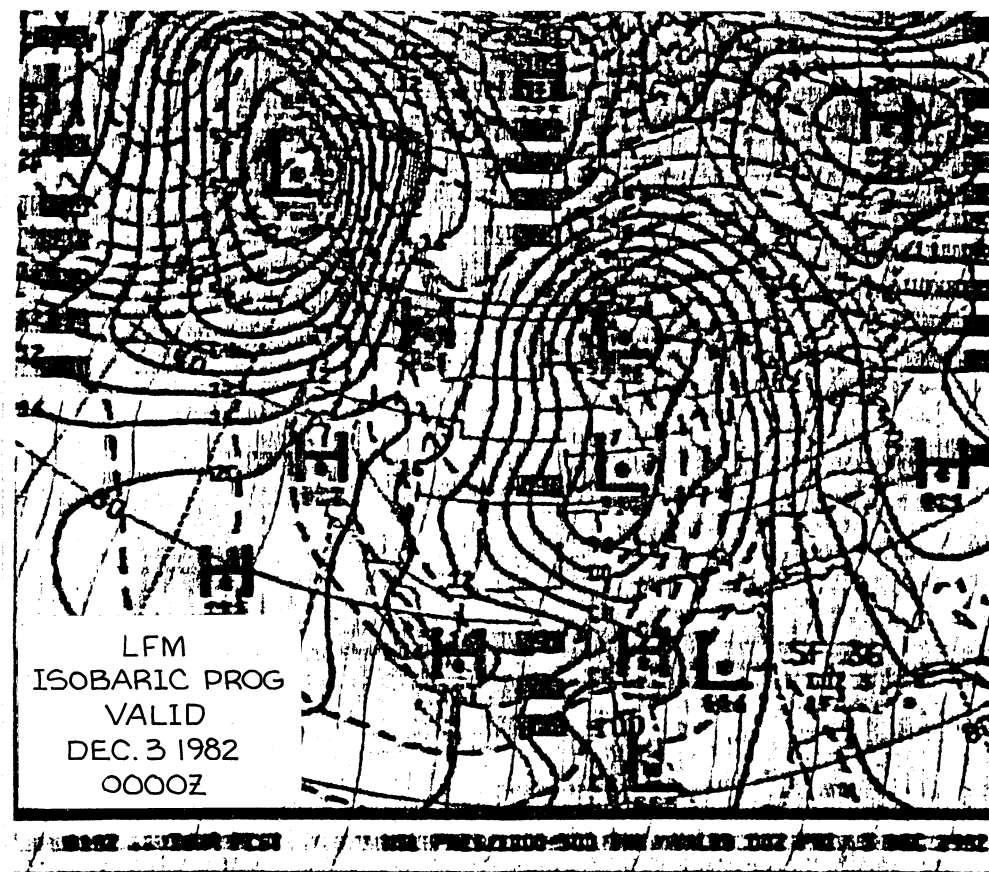
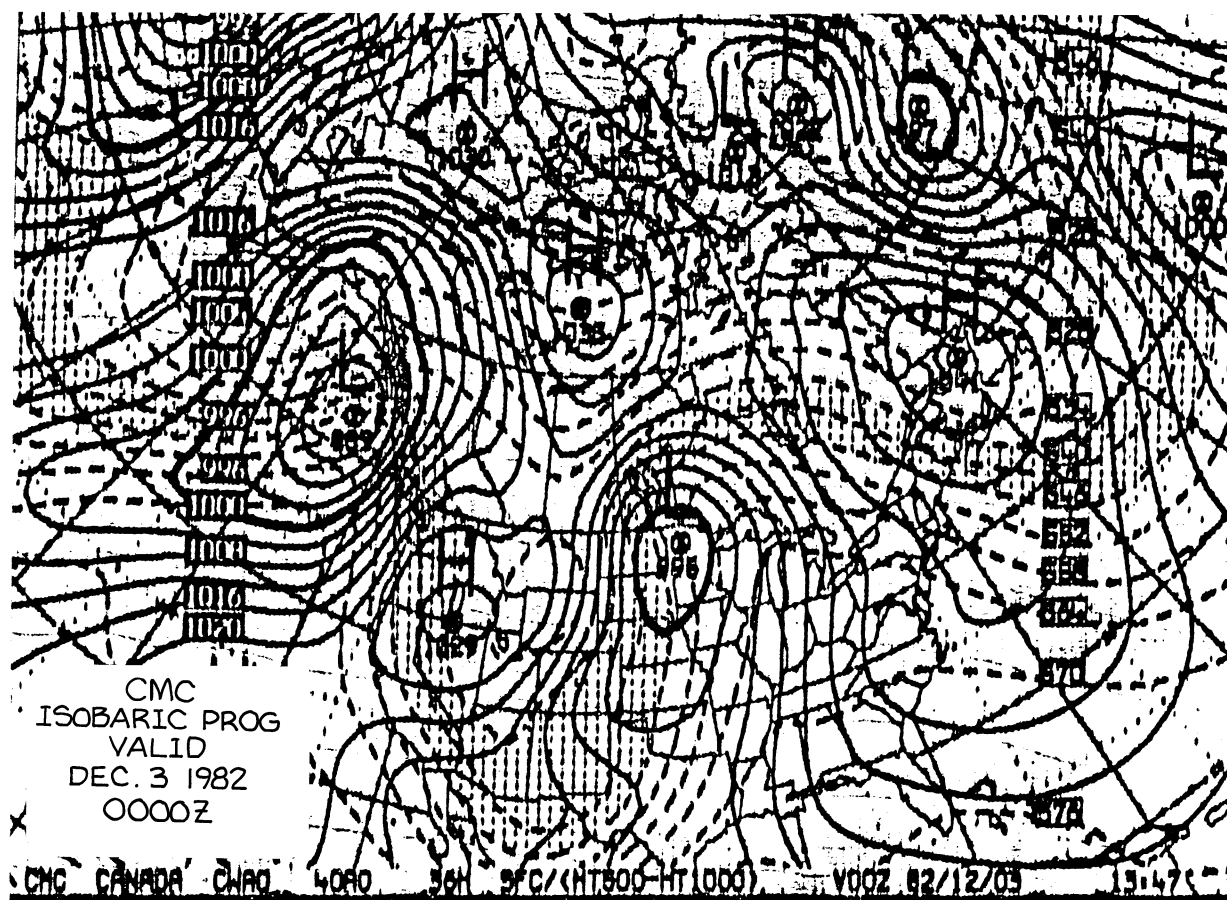
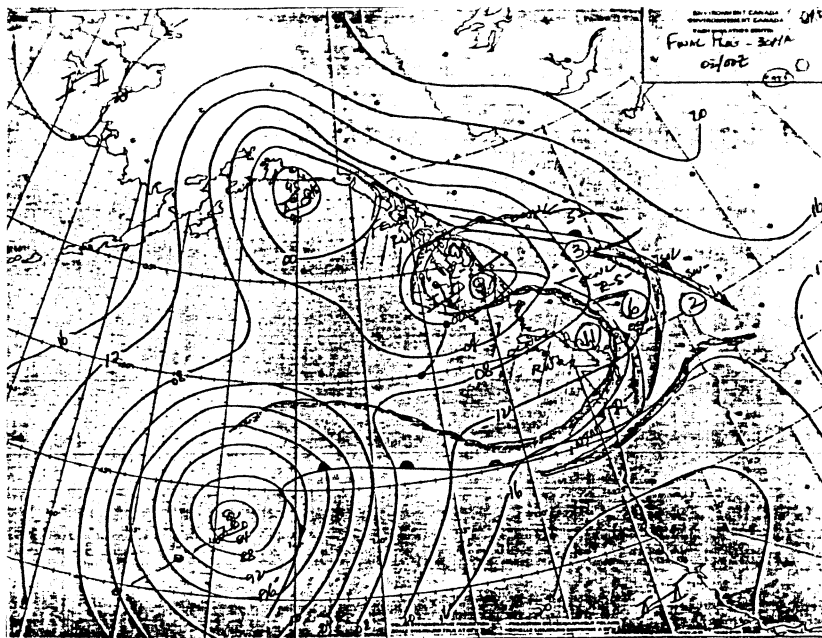
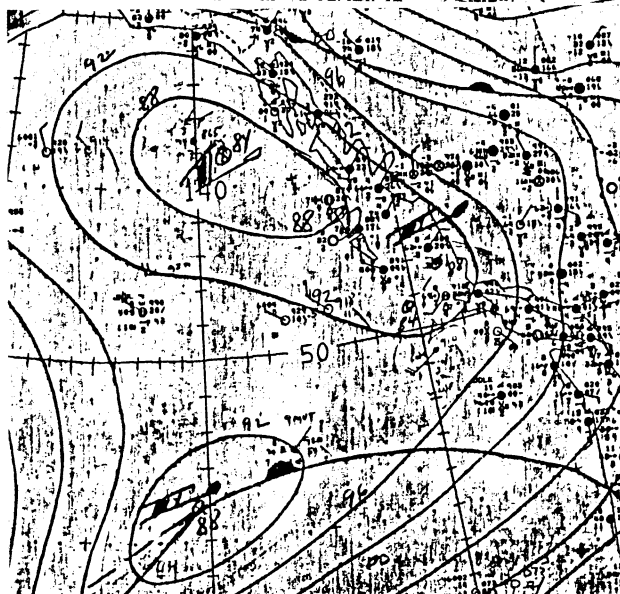


FIGURE 2.

EXPERIMENTAL TEAM
ISOBARIC PROG
VALID DEC 3/82 00Z



ANALYSIS
VALID DEC 3/82 00Z



PACIFIC WEATHER CENTRE
ISOBARIC PROG
VALID DEC 3/82 00Z

