PACIFIC REGION TECHNICAL NOTES

81 - 008

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FXCN05 VERIFICATION FOR THE PACIFIC REGION (PART A)

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INTRODUCTION

The FXCN05 message forecasts the probability of precipitation in 4 separate categories:

1. Nil: pr $\leq$ 0.25 mm (i.e. trace or less)
2. Light: 0.25 mm $<$ pr $\leq$ 2.0 mm
3. Moderate: 2.0 mm $<$ pr $\leq$ 10 mm
4. Heavy: pr $>$ 10 mm.

The forecasts are for specific stations. Nine such stations fall within the Pacific Weather Centre area of responsibility: YVR, YHE, YYJ, YZT, YPR, YXT, YXS, YRV and YYF. The forecasts are for five time periods; for 0-12, 12-24 and 24-36 hour forecasts the MDA method is used, while those for 36-48 and 48-60 hours are done using REEP (this has been true since 12Z December 22, 1980). MDA (Multiple Discriminant Analysis) and REEP (Regression Estimate of Event Probability) are both linear statistical methods. For further detail see references 1 through 5.

METHOD

Fifty-eight sets of forecasts based on data valid between 12Z December 22, 1980 and 12Z January 20, 1981 were examined. Actual precipitation amounts for the nine stations specified above were abstracted from the Weather Centre precipitation book, and were then classified into the four precipitation categories. These observed categories were then compared to forecast precipitation categories (determined by selecting the maximum probability category or, in the case of a tie, the category with greatest precipitation) through the use of contingency tables. For example, all the 12 hour forecasts for precipitation categories at YVR were compared with the corresponding observed categories and the results summarized in a contingency table. Separate tables were drawn up for each of the 12, 24, 36, 48 and 60 hour forecasts and this procedure was repeated for each of the other 8 stations. The resulting contingency tables for the six coastal stations are presented in the columns labelled "total" in figures 1 through 6. Tables for the 3 interior locations will be presented in Part B (PRTN 81-009).

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A stratification by precipitation regime was also carried out. The period December 22 through December 30 was a "wet" regime, with a moist southwesterly flow over B.C. December 31 through January 20 was, on the contrary, a "dry" regime with an upper ridge mostly deflecting frontal systems northeastward toward the Alaska panhandle. These differences are illustrated in Table 1 which, for the two regimes and for three groups of stations, shows the percentage of 12 hour periods between 00Z December 22 and 24Z January 20 in which more than a trace of precipitation was reported:

Table 1	YVR YYJ YHE Group 1	YZT YXT YPR Group 2	YXS YRV YYF Group 3
Dec. 22 - Dec. 30 (Wet)	81	78	59
Dec. 31 - Jan. 20 (Dry)	18	54	10

Table 1 shows clearly the differentiation between wet and dry regimes for groups 1 and 3. In particular, the wet period includes the heavy rain just after Christmas which caused flooding and mud slides, and blocked highway access to the B.C. Lower Mainland. The difference is not as marked for the group 2 locations, however. This is consistent with the fact that some of the frontal systems in the dry regime actually passed through or near the north and central coasts in their northeastward trajectory around the upper ridge. Therefore, the dry regime was not all that dry for the group 2 stations.

In figures 1 through 6, contingency tables under this wet and dry stratification have been included along with those for the "total" or sum of the two. Furthermore, these 6 sets of tables have been compressed into regional groups of tables to facilitate interpretation, since the data within each group were similar. These are figures 7 and 8.

SOUTH COAST YVR, YYJ, YHE

For the total data set, the correct forecasts are in the 64 - 74 % range. As in the interior case, there is an overabundance of 1-1 cases which is inflating these numbers as a measure of skill. In the dry regime, there is little skill shown in picking out the precipitation cases that do occur. This is shown by the low biases of categories 2 and 3. The wet regime, which includes a wide range of precipitation amounts, as well as 19% dry cases, represents a more realistic test of model skill in forecasting. Here, the percentage of correct forecasts decreases from 56% at 12 hours to 35% at 48 hours, and then rebounds to 44% at 60 hours.

The precipitation category is generally underforecast in more cases than it is overforecast, and the biases for category one are consistently

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greater than 1, while those of categories 2 and 4 are consistently less than 1. Interestingly, category 3 is, along with category 1, forecast more often than it is observed. A possible explanation for this lies in a closer examination of the category 4 situation. One good feature of the FXCN05 forecasts is that the extreme of heavy precipitation is at times forecast, although the observed frequency of occurrence is greater than that forecast. In fact, most of this difference is due to several forecasts of category 3 with corresponding observations of category 4. Apparently then, in a wet regime, category 1 and 3 forecasts are produced at the expense of categories 2 and 4. With respect to categories 3 and 4, it may be that the most vigorous, heavy rain producing systems on the coast are not carried with quite enough intensity, so that some moderate precipitation forecasts result when a forecast of heavy would be more appropriate. On the other hand, as noted in reference 5, this situation may reflect a bias of the statistical technique toward a precipitation - no precipitation classification, with a tendency to group the precipitation predictions into the middle of the range (category 3).

NORTH AND CENTRAL COASTS YPR, YXT, YZT

For the total data set, the correct forecasts are in the 51 - 59% range. In direct contrast to the previous case, here there is little difference between the percentage of correct cases in the wet as compared to the dry regimes. In fact, the forecasts are generally better in the wet than in the dry regimes. As previously mentioned, the difference between the wet and dry regimes was least pronounced in the north and central coast group. In the dry regime, the dry periods are fairly often broken by periods of precipitation, while in the wet regime the wet periods are occasionally broken by dry days. The result is that the statistical forecast technique has somewhat more trouble with the dry regime than with the wet regime. The percentage of correct forecasts is comparable to that observed for the wet regime in the interior, and is greater than that observed for the wet regime on the south coast. The biases for the total case are mixed, with the exception of category 4 which is consistently underforecast. Category 1 is mostly underforecast while category 3 is mostly overforecast. This pattern is not as clear as it was in the wet regime for the south coast, however.

In part B (PRTN 81-009), we will take a look at the performance of the FXCN05 guidance for the interior locations of Penticton, Revelstoke and Prince George.

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REFERENCES

1. "Two Statistical Techniques for Forecasting Probability of Precipitation Amount", T. Agnew, A.E.S., presented at 13th CMOS Congress.

2. "A Comparison of Two Statistical Techniques for Forecasting Probability of Precipitation Amount", T. Agnew, A.E.S., 6th Conference on Probability and Statistics in Atmospheric Sciences, 1979.

3. PWC Technical Information #9.

4. PWC Technical Information #23.

5. Statistical Probability of Precipitation Forecasts, L. Wilson, MSRB Unpublished Report.

VANCOUVER YVR — Fig. 1

FORECAST

12 HR

OBSERVED 'WET'

	1	2	3	4		
1	4	1	2		7	
2	1				1	
3		2	4		6	
4			1	2	3	% CORRECT
	5	3	7	2	17	59
BIASES	1.40	0.33	0.86		1.50	

OBSERVED 'DRY'

	1	2	3	4		
1	29	4	2		35	
2					0	
3	2		1		3	
4					0	% CORRECT
	31	4	3	0	38	79
BIASES	1.13	0	1.00		—	

OBSERVED TOTAL

	1	2	3	4		
1	33	5	4		42	
2	1				1	
3	2	2	5		9	
4			1	2	3	% CORRECT
	36	7	10	2	55	73
BIASES	1.17	0.14	0.90		1.50	

24 HR

OBSERVED 'WET'

	1	2	3	4		
1	3		1		4	
2					0	
3	2	3	5	2	12	
4					0	% CORRECT
	5	3	6	2	16	50
BIASES	0.80	0	2.00		0	

OBSERVED 'DRY'

	1	2	3	4		
1	28	4	2		34	
2			1		1	
3	2	1			3	
4					0	% CORRECT
	30	5	3	0	38	74
BIASES	1.13	0.20	1.00		—	

OBSERVED TOTAL

	1	2	3	4		
1	31	4	3		38	
2			1		1	
3	4	4	5	2	15	
4					0	% CORRECT
	35	8	9	2	54	67
BIASES	1.09	0.13	1.67		0	

36 HR

OBSERVED 'WET'

	1	2	3	4		
1	2		2		4	
2					0	
3	3	3	4	3	13	
4					0	% CORRECT
	5	3	6	3	17	35
BIASES	0.80	0	2.17		0	

OBSERVED 'DRY'

	1	2	3	4		
1	26	4	2		32	
2		1			1	
3	2	1	2		5	
4	1				1	% CORRECT
	29	6	4	0	39	74
BIASES	1.10	0.17	1.25		—	

OBSERVED TOTAL

	1	2	3	4		
1	28	4	4		36	
2		1			1	
3	5	4	6	3	18	
4	1				1	% CORRECT
	34	9	10	3	56	63
BIASES	1.06	0.11	1.80		0.33	

48 HR

OBSERVED 'WET'

	1	2	3	4		
1	4	1	2		7	
2	1				1	
3	1	1	4	3	9	
4					0	% CORRECT
	6	2	6	3	17	47
BIASES	1.17	0.50	1.50		0	

OBSERVED 'DRY'

	1	2	3	4		
1	25	4	2		31	
2					0	
3	4	1	2		7	
4					0	% CORRECT
	29	5	4	0	38	71
BIASES	1.07	0	1.75		—	

OBSERVED TOTAL

	1	2	3	4		
1	29	5	4		38	
2	1				1	
3	5	2	6	3	16	
4					0	% CORRECT
	35	7	10	3	55	64
BIASES	1.09	0.14	1.60		0	

60 HR

OBSERVED 'WET'

	1	2	3	4		
1	4				4	
2			1		1	
3	2	2	3	3	10	
4					0	% CORRECT
	6	2	4	3	15	47
BIASES	0.67	0.50	2.50		0	

OBSERVED 'DRY'

	1	2	3	4		
1	25	4	3		32	
2					0	
3	3		2		5	
4					0	% CORRECT
	28	4	5	0	37	73
BIASES	1.14	0	1.00		—	

OBSERVED TOTAL

	1	2	3	4		
1	29	4	3		36	
2			1		1	
3	5	2	5	3	15	
4					0	% CORRECT
	34	6	9	3	52	65
BIASES	1.06	0.17	1.67		0	

VICTORIA YYJ — Fig. 2

FORECAST

12 HR

OBSERVED 'WET'

	1	2	3	4		
1	3	1	1	1	6	
2					0	
3	1	2	2	1	6	
4		1		1	2	% CORRECT
	4	4	3	3	14	43
BIASES	1.50	0	2.00		0.67	

OBSERVED 'DRY'

	1	2	3	4		
1	33	4	3		40	
2					0	
3	1		1		2	
4					0	% CORRECT
	34	4	4	0	42	81
BIASES	1.18	0	0.50		—	

OBSERVED TOTAL

	1	2	3	4		
1	36	5	4	1	46	
2					0	
3	2	2	3	1	8	
4		1		1	2	% CORRECT
	38	8	7	3	56	71
BIASES	1.21	0	1.14		0.67	

24 HR

OBSERVED 'WET'

	1	2	3	4		
1	2	2	2		6	
2	1	1	1	1	4	
3	1		1	1	3	
4				1	1	% CORRECT
	4	3	4	3	14	36
BIASES	1.50	1.33	0.75		0.33	

OBSERVED 'DRY'

	1	2	3	4		
1	33	4	3		40	
2					0	
3	1		1		2	
4					0	% CORRECT
	34	4	4	0	42	81
BIASES	1.18	0	0.50		—	

OBSERVED TOTAL

	1	2	3	4		
1	35	6	5		46	
2	1	1	1	1	4	
3	2		2	1	5	
4				1	1	% CORRECT
	38	7	8	3	56	70
BIASES	1.21	0.57	0.63		0.33	

36 HR

OBSERVED 'WET'

	1	2	3	4		
1	2	2	1	1	6	
2		1	1		2	
3	1		2	2	5	
4				1	1	% CORRECT
	3	3	4	4	14	43
BIASES	2.00	0.67	1.25		0.25	

OBSERVED 'DRY'

	1	2	3	4		
1	32	3	2		37	
2		1			1	
3		1	2		3	
4	1				1	% CORRECT
	33	5	4	0	42	83
BIASES	1.12	0.20	0.75		—	

OBSERVED TOTAL

	1	2	3	4		
1	34	5	3	1	43	
2		2	1		3	
3	1	1	4	2	8	
4	1			1	2	% CORRECT
	36	8	8	4	56	73
BIASES	1.19	0.38	1.00		0.50	

48 HR

OBSERVED 'WET'

	1	2	3	4		
1	2	3	1	1	7	
2	1				1	
3		1	2	3	6	
4					0	% CORRECT
	3	4	3	4	14	29
BIASES	2.33	0.25	2.00		0	

OBSERVED 'DRY'

	1	2	3	4		
1	31	5	3		39	
2					0	
3	1	1	1		3	
4					0	% CORRECT
	32	6	4	0	42	76
BIASES	1.22	0	0.75		—	

OBSERVED TOTAL

	1	2	3	4		
1	33	8	4	1	46	
2	1				1	
3	1	2	3	3	9	
4					0	% CORRECT
	35	10	7	4	56	65
BIASES	1.31	0.10	1.29		0	

60 HR

OBSERVED 'WET'

	1	2	3	4		
1	4	2	1	1	8	
2					0	
3		1	1	3	5	
4					0	% CORRECT
	4	3	2	4	13	38
BIASES	2.00	0	2.50		0	

OBSERVED 'DRY'

	1	2	3	4		
1	31	4	3		38	
2					0	
3	1	1	1		3	
4					0	% CORRECT
	32	5	4	0	41	78
BIASES	1.19	0	0.75		—	

OBSERVED TOTAL

	1	2	3	4		
1	35	6	4	1	46	
2					0	
3	1	2	2	3	8	
4					0	% CORRECT
	36	8	6	4	54	69
BIASES	1.28	0	1.33		0	

HOPE YHE — Fig. 3

FORECAST

12 HR

OBSERVED 'WET'

	1	2	3	4		
1	3	2	1		6	
2					0	
3		1	4	2	7	
4				4	4	% CORRECT
	3	3	5	6	17	65

BIASES 2.0 | 0 | 1.40 | 0.67

OBSERVED 'DRY'

	1	2	3	4		
1	32	1	4		37	
2					0	
3	1		1		2	
4					0	% CORRECT
	33	1	5	0	39	85

BIASES 1.12 | 0 | 0.40 | —

OBSERVED TOTAL

	1	2	3	4		
1	35	3	5		43	
2					0	
3	1	1	5	2	9	
4				4	4	% CORRECT
	36	4	10	6	56	79

BIASES 1.19 | 0 | 0.90 | 0.67

24 HR

OBSERVED 'WET'

	1	2	3	4		
1	3	2	2		7	
2			1		1	
3		1	3	3	7	
4				2	2	% CORRECT
	3	3	6	5	17	47

BIASES 2.33 | 0.33 | 1.17 | 0.40

OBSERVED 'DRY'

	1	2	3	4		
1	33	2	4		39	
2					0	
3	1				1	
4					0	% CORRECT
	34	2	4	0	40	83

BIASES 1.15 | 0 | 0.25 | —

OBSERVED TOTAL

	1	2	3	4		
1	36	4	6		46	
2			1		1	
3	1	1	3	3	8	
4				2	2	% CORRECT
	37	5	10	5	57	72

BIASES 1.24 | 0.20 | 0.80 | 0.40

36 HR

OBSERVED 'WET'

	1	2	3	4		
1	2	2	3		7	
2					0	
3	1		3		4	
4	1			4	5	% CORRECT
	4	2	6	4	16	56

BIASES 1.75 | 0 | 0.67 | 1.20

OBSERVED 'DRY'

	1	2	3	4		
1	29	2	5		36	
2	1				1	
3	3				3	
4					0	% CORRECT
	33	2	5	0	40	73

BIASES 1.09 | 0.50 | 0.60 | —

OBSERVED TOTAL

	1	2	3	4		
1	31	4	8		43	
2	1				1	
3	4		3		7	
4	1			4	5	% CORRECT
	37	4	11	4	56	68

BIASES 1.16 | 0.25 | 0.64 | 1.25

48 HR

OBSERVED 'WET'

	1	2	3	4		
1	4	2	4		10	
2					0	
3	1			5	7	
4					0	% CORRECT
	5	2	5	5	17	29

BIASES 2.00 | 0 | 1.40 | 0

OBSERVED 'DRY'

	1	2	3	4		
1	31	2	6		39	
2					0	
3	1				1	
4					0	% CORRECT
	32	2	6	0	40	78

BIASES 1.22 | 0 | 0.17 | —

OBSERVED TOTAL

	1	2	3	4		
1	35	4	10		49	
2					0	
3	2		1	5	8	
4					0	% CORRECT
	37	4	11	5	57	63

BIASES 1.32 | 0 | 0.73 | 0

60 HR

OBSERVED 'WET'

	1	2	3	4		
1	5	1	4		10	
2					0	
3			1	3	4	
4				1	1	% CORRECT
	5	1	5	4	15	47

BIASES 2.00 | 0 | 0.80 | 0.25

OBSERVED 'DRY'

	1	2	3	4		
1	29	2	6		37	
2					0	
3	2				2	
4		1			1	% CORRECT
	31	3	6	0	40	73

BIASES 1.19 | 0 | 0.33 | —

OBSERVED TOTAL

	1	2	3	4		
1	34	3	10		47	
2					0	
3	2		1	3	6	
4		1		1	2	% CORRECT
	36	4	11	4	55	65

BIASES 1.30 | 0 | 0.55 | 0.50

PRINCE RUPERT YPR — Fig. 4

FORECAST

12 HR

OBSERVED 'WET'

	1	2	3	4		
1	4	1	1		6	
2			1		1	
3		1	5	2	8	
4				1	1	% CORRECT
	4	2	7	3	16	63

BIASES 1.5 | 0.5 | 1.14 | 0.33

OBSERVED 'DRY'

	1	2	3	4		
1	10		8		18	
2			2	1	3	
3	1	3	8	4	16	
4				1	1	% CORRECT
	11	3	18	6	38	50

BIASES 1.64 | 1.0 | 0.89 | 0.17

OBSERVED TOTAL

	1	2	3	4		
1	14	1	9		24	
2			3	1	4	
3	1	4	13	6	24	
4				2	2	% CORRECT
	15	5	25	9	54	54

BIASES 1.6 | 0.8 | 0.96 | 0.22

24 HR

OBSERVED 'WET'

	1	2	3	4		
1	4	2			6	
2						
3	1		7	1	9	
4				1	1	% CORRECT
	5	2	7	2	16	75

BIASES 1.2 | 0 | 1.29 | 0.5

OBSERVED 'DRY'

	1	2	3	4		
1	8	1	3	1	13	
2			2		2	
3	3	2	12	6	23	
4					0	% CORRECT
	11	3	17	7	38	53

BIASES 1.18 | 0.67 | 1.35 | 0

OBSERVED TOTAL

	1	2	3	4		
1	12	3	3	1	19	
2			2		2	
3	4	2	19	7	32	
4				1	1	% CORRECT
	16	5	24	9	54	59

BIASES 1.19 | 0.4 | 1.33 | 0.11

36 HR

OBSERVED 'WET'

	1	2	3	4		
1	4	1			5	
2					0	
3	1		7	1	9	
4		1		1	2	% CORRECT
	5	2	7	2	16	75

BIASES 1.00 | 0 | 1.29 | 1.0

OBSERVED 'DRY'

	1	2	3	4		
1	3	1	3		7	
2	1		3		4	
3	6	2	12	7	27	
4				1	1	% CORRECT
	10	3	18	8	39	41

BIASES 0.7 | 1.33 | 1.5 | .13

OBSERVED TOTAL

	1	2	3	4		
1	7	2	3		12	
2	1		3		4	
3	7	2	19	8	36	
4		1		2	3	% CORRECT
	15	5	25	10	55	51

BIASES 0.8 | 0.8 | 1.44 | 0.3

48 HR

OBSERVED 'WET'

	1	2	3	4		
1	3				3	
2					0	
3	3	1	7	2	13	
4					0	% CORRECT
	6	1	7	2	16	63

BIASES 0.5 | 0 | 1.86 | 0

OBSERVED 'DRY'

	1	2	3	4		
1	4	1	8	4	17	
2					0	
3	4	2	11	5	22	
4					0	% CORRECT
	8	3	19	9	39	38

BIASES 2.13 | 0 | 1.16 | 0

OBSERVED TOTAL

	1	2	3	4		
1	7	1	8	4	20	
2					0	
3	7	3	18	7	35	
4					0	% CORRECT
	14	4	26	11	55	45

BIASES 1.43 | 0 | 1.35 | 0

60 HR

OBSERVED 'WET'

	1	2	3	4		
1	2				2	
2					0	
3	5		6	2	13	
4					0	% CORRECT
	7	0	6	2	15	53

BIASES 0.29 | 0 | 2.17 | 0

OBSERVED 'DRY'

	1	2	3	4		
1	5		6	5	16	
2					0	
3	2	3	13	4	22	
4					0	% CORRECT
	7	3	19	9	38	47

BIASES 2.29 | 0 | 1.16 | 0

OBSERVED TOTAL

	1	2	3	4		
1	7		6	5	18	
2					0	
3	7	3	19	6	35	
4					0	% CORRECT
	14	3	25	11	53	49

BIASES 1.29 | 0 | 1.4 | 0

TERRACE YXT — Fig. 5

FORECAST

12 HR

OBSERVED 'WET'

FORECAST	1	2	3	4		% CORRECT
1	6		1		7	
2	1				1	
3	2		1	4	7	
4				1	1	
	9	0	2	5	16	50
BIASES	0.78	—	3.50	0.20		

OBSERVED 'DRY'

FORECAST	1	2	3	4		% CORRECT
1	18	3	4		25	
2	1	5	5	2	13	
3			1	1	2	
4					0	
	19	8	10	3	40	60
BIASES	1.31	1.63	0.20	0		

OBSERVED TOTAL

FORECAST	1	2	3	4		% CORRECT
1	24	3	5		32	
2	2	5	5	2	14	
3	2		2	5	9	
4				1	1	
	28	8	12	8	56	57
BIASES	1.14	1.75	0.75	0.13		

24 HR

OBSERVED 'WET'

FORECAST	1	2	3	4		% CORRECT
1	6				6	
2	1				1	
3	1	1	3	3	8	
4				1	1	
	8	1	3	4	16	63
BIASES	0.75	1.00	2.67	0.25		

OBSERVED 'DRY'

FORECAST	1	2	3	4		% CORRECT
1	14	2	2		18	
2	3	5	4		12	
3	1	2	5	1	9	
4					0	
	18	9	11	1	39	62
BIASES	1.00	1.33	0.82	0		

OBSERVED TOTAL

FORECAST	1	2	3	4		% CORRECT
1	20	2	2		24	
2	4	5	4		13	
3	2	3	8	4	17	
4				1	1	
	26	10	14	5	55	62
BIASES	0.92	1.30	1.21	0.20		

36 HR

OBSERVED 'WET'

FORECAST	1	2	3	4		% CORRECT
1	4				4	
2	1				1	
3	2	1	3	4	10	
4	1				1	
	8	1	3	4	16	44
BIASES	0.50	1.00	3.33	0.25		

OBSERVED 'DRY'

FORECAST	1	2	3	4		% CORRECT
1	12	3	2	1	18	
2	5	4	6	1	16	
3		2	3		5	
4				1	1	
	17	9	11	3	40	50
BIASES	1.06	1.78	0.45	1.67		

OBSERVED TOTAL

FORECAST	1	2	3	4		% CORRECT
1	16	3	2	1	22	
2	6	4	6	1	17	
3	2	3	6	4	15	
4	1			1	2	
	25	10	14	7	56	48
BIASES	0.88	1.70	1.07	0.29		

48 HR

OBSERVED 'WET'

FORECAST	1	2	3	4		% CORRECT
1	3				3	
2	3			1	4	
3	2	1	3	3	9	
4					0	
	8	1	3	4	16	38
BIASES	0.38	4.00	3.00	0		

OBSERVED 'DRY'

FORECAST	1	2	3	4		% CORRECT
1	14	3	8	1	26	
2	2	5	1		8	
3		1	3	1	5	
4					0	
	16	9	12	2	39	56
BIASES	1.63	0.89	0.42	0		

OBSERVED TOTAL

FORECAST	1	2	3	4		% CORRECT
1	17	3	8	1	29	
2	5	5	1	1	12	
3	2	2	6	4	14	
4					0	
	24	10	15	6	55	51
BIASES	1.21	1.20	0.93	0		

60 HR

OBSERVED 'WET'

FORECAST	1	2	3	4		% CORRECT
1	5				5	
2	2			2	4	
3		1	3	1	5	
4					0	
	7	1	3	3	14	57
BIASES	0.71	4.00	1.67	0		

OBSERVED 'DRY'

FORECAST	1	2	3	4		% CORRECT
1	11	6	7	2	26	
2	4	2	1	1	8	
3			3	1	4	
4					0	
	15	8	11	4	38	42
BIASES	1.73	1.00	0.36	0		

OBSERVED TOTAL

FORECAST	1	2	3	4		% CORRECT
1	16	6	7	2	31	
2	6	2	1	3	12	
3		1	6	2	9	
4					0	
	22	9	14	7	52	46
BIASES	1.41	1.33	0.64	0		

PORT HARDY YZT — Fig. 6

FORECAST

12 HR

OBSERVED 'WET'

FORECAST	1	2	3	4		% CORRECT
1	3				3	
2	2				2	
3	1	2	7		10	
4				1	1	
	6	2	7	1	16	69
BIASES	0.50	1.00	1.43	1.00		

OBSERVED 'DRY'

FORECAST	1	2	3	4		% CORRECT
1	24	3	4	1	32	
2	3		1	1	5	
3				3	3	
4				0	0	
	27	3	5	5	40	60
BIASES	1.19	1.67	0.60	0		

OBSERVED TOTAL

FORECAST	1	2	3	4		% CORRECT
1	27	3	4	1	35	
2	5		1	1	7	
3	1	2	7	3	13	
4				1	1	
	33	5	12	6	56	63
BIASES	1.06	1.40	1.08	0.17		

24 HR

OBSERVED 'WET'

FORECAST	1	2	3	4		% CORRECT
1	2				2	
2	4	1	1		6	
3	1		6	1	8	
4				0	0	
	7	1	7	1	16	56
BIASES	0.29	6.00	1.14	0		

OBSERVED 'DRY'

FORECAST	1	2	3	4		% CORRECT
1	22	3	2	2	29	
2	1		3	1	5	
3	3			3	6	
4				0	0	
	26	3	5	6	40	55
BIASES	1.12	1.67	1.00	0		

OBSERVED TOTAL

FORECAST	1	2	3	4		% CORRECT
1	24	3	2	2	31	
2	5	1	4	1	11	
3	4		6	4	14	
4				0	0	
	33	4	12	7	56	55
BIASES	0.94	2.75	1.17	0		

36 HR

OBSERVED 'WET'

FORECAST	1	2	3	4		% CORRECT
1	3				3	
2	3	1	2		6	
3	1		4	1	6	
4				1	1	
	7	1	6	2	16	56
BIASES	0.43	6.00	1.00	0.50		

OBSERVED 'DRY'

FORECAST	1	2	3	4		% CORRECT
1	20	2	3	1	26	
2	2	1	2		5	
3	2		2	5	9	
4				0	0	
	24	3	7	6	40	58
BIASES	1.08	1.67	1.29	0		

OBSERVED TOTAL

FORECAST	1	2	3	4		% CORRECT
1	23	2	3	1	29	
2	5	2	4		11	
3	3		6	6	15	
4				1	1	
	31	4	13	8	56	57
BIASES	0.94	2.75	1.15	0.13		

48 HR

OBSERVED 'WET'

FORECAST	1	2	3	4		% CORRECT
1	4		1		5	
2					0	
3	4	1	3	2	10	
4				0	0	
	8	1	4	2	15	47
BIASES	0.63	0	2.50	0		

OBSERVED 'DRY'

FORECAST	1	2	3	4		% CORRECT
1	24	3	6	4	37	
2					0	
3	1			2	3	
4				0	0	
	25	3	6	6	40	60
BIASES	1.48	0	0.50	0		

OBSERVED TOTAL

FORECAST	1	2	3	4		% CORRECT
1	28	3	7	4	42	
2					0	
3	5	1	3	4	13	
4				0	0	
	33	4	10	8	55	56
BIASES	1.27	0	1.30	0		

60 HR

OBSERVED 'WET'

FORECAST	1	2	3	4		% CORRECT
1	6				6	
2					0	
3	2	1	4	2	9	
4				0	0	
	8	1	4	2	15	67
BIASES	0.75	0	2.25	0		

OBSERVED 'DRY'

FORECAST	1	2	3	4		% CORRECT
1	22	3	6	4	35	
2	1				1	
3			2		2	
4				1	1	
	23	3	8	5	39	64
BIASES	1.52	0.33	0.25	0.20		

OBSERVED TOTAL

FORECAST	1	2	3	4		% CORRECT
1	28	3	6	4	41	
2	1				1	
3	2	1	6	2	11	
4				1	1	
	31	4	12	7	54	65
BIASES	1.32	0.25	0.92	0.14		

SOUTH COAST — YYJ YVR YHE

Fig. 7

FORECAST

12 HR

OBSERVED 'WET'

	1	2	3	4		
1	10	4	4	1	19	
2	1				1	
3	1	5	10	3	19	
4		1	1	7	9	% CORRECT
	12	10	15	11	48	56
BIASES	1.58	0.10	1.27	0.82		

OBSERVED 'DRY'

	1	2	3	4		
1	94	9	9		112	
2					0	
3	4		3		7	
4					0	% CORRECT
	98	9	12	0	119	82
BIASES	1.14	0	0.58	—		

OBSERVED TOTAL

	1	2	3	4		
1	104	13	13	1	131	
2	1				1	
3	5	5	13	3	26	
4		1	1	7	9	% CORRECT
	110	19	27	11	167	74
BIASES	1.19	0.05	0.96	0.82		

24 HR

OBSERVED 'WET'

	1	2	3	4		
1	8	4	5		17	
2	1	1	2	1	5	
3	3	4	9	6	22	
4				3	3	% CORRECT
	12	9	16	10	47	45
BIASES	1.42	0.56	1.38	0.30		

OBSERVED 'DRY'

	1	2	3	4		
1	94	10	9		113	
2			1		1	
3	4	1	1		6	
4					0	% CORRECT
	98	11	11	0	120	79
BIASES	1.15	0.09	0.55	—		

OBSERVED TOTAL

	1	2	3	4		
1	102	14	14		130	
2	1	1	3	1	6	
3	7	5	10	6	28	
4				3	3	% CORRECT
	110	20	27	10	167	69
BIASES	1.18	0.30	1.03	0.30		

36 HR

OBSERVED 'WET'

	1	2	3	4		
1	6	4	6	1	17	
2		1	1		2	
3	5	3	9	5	22	
4	1			5	6	% CORRECT
	12	8	16	11	47	45
BIASES	1.41	0.25	1.38	0.55		

OBSERVED 'DRY'

	1	2	3	4		
1	87	9	9		105	
2	1	2			3	
3	5	2	4		11	
4	2				2	% CORRECT
	95	13	13	0	121	77
BIASES	1.10	0.23	0.84	—		

OBSERVED TOTAL

	1	2	3	4		
1	93	13	15	1	122	
2	1	3	1		5	
3	10	5	13	5	33	
4	3			5	8	% CORRECT
	107	21	29	11	168	68
BIASES	1.14	0.24	1.14	0.73		

48 HR

OBSERVED 'WET'

	1	2	3	4		
1	10	6	7	1	24	
2	2				2	
3	2	2	7	11	22	
4					0	% CORRECT
	14	8	14	12	48	35
BIASES	1.71	0.25	1.57	0		

OBSERVED 'DRY'

	1	2	3	4		
1	87	11	11		109	
2					0	
3	6	2	3		11	
4					0	% CORRECT
	93	13	14	0	120	75
BIASES	1.17	0	0.79	—		

OBSERVED TOTAL

	1	2	3	4		
1	97	17	18	1	133	
2	2				2	
3	8	4	10	11	33	
4					0	% CORRECT
	107	21	28	12	168	64
BIASES	1.24	0.10	1.18	0		

60 HR

OBSERVED 'WET'

	1	2	3	4		
1	13	3	5	1	22	
2			1		1	
3	2	3	5	9	19	
4				1	1	% CORRECT
	15	6	11	11	43	44
BIASES	1.47	0.17	1.73	0.09		

OBSERVED 'DRY'

	1	2	3	4		
1	85	10	12		107	
2					0	
3	6	1	3		10	
4		1			1	% CORRECT
	91	12	15	0	118	75
BIASES	1.18	0	0.67	—		

OBSERVED TOTAL

	1	2	3	4		
1	98	13	17	1	129	
2			1		1	
3	8	4	8	9	29	
4		1		1	2	% CORRECT
	106	18	26	11	161	66
BIASES	1.22	0.06	1.12	0.18		

NORTH AND CENTRAL COAST YPR YXT YZT

Fig. 8

FORECAST

12 HR

OBSERVED 'WET'

	1	2	3	4		
1	13	1	2		16	
2	3		1		4	
3	3	3	13	6	25	
4				3	3	% CORRECT
	19	4	16	9	48	60
BIASES	0.84	1.00	1.56	0.33		

OBSERVED 'DRY'

	1	2	3	4		
1	52	6	16	1	75	
2	4	5	8	4	21	
3	1	3	9	8	21	
4				1	1	% CORRECT
	57	14	33	14	118	57
BIASES	1.32	1.50	0.64	0.07		

OBSERVED TOTAL

	1	2	3	4		
1	65	7	18	1	91	
2	7	5	9	4	25	
3	4	6	22	14	46	
4				4	4	% CORRECT
	76	18	49	23	166	58
BIASES	1.20	1.39	0.94	0.17		

24 HR

OBSERVED 'WET'

	1	2	3	4		
1	12	2			14	
2	5	1	1		7	
3	3	1	16	5	25	
4				2	2	% CORRECT
	20	4	17	7	48	65
BIASES	0.70	1.75	1.47	0.29		

OBSERVED 'DRY'

	1	2	3	4		
1	44	6	7	3	60	
2	4	5	9	1	19	
3	7	4	17	10	38	
4				0	0	% CORRECT
	55	15	33	14	117	56
BIASES	1.09	1.27	1.15	0		

OBSERVED TOTAL

	1	2	3	4		
1	56	8	7	3	74	
2	9	6	10	1	26	
3	10	5	33	15	63	
4				2	2	% CORRECT
	75	19	50	21	165	59
BIASES	0.99	1.37	1.26	0.10		

36 HR

OBSERVED 'WET'

	1	2	3	4		
1	11	1			12	
2	4	1	2		7	
3	4	1	14	6	25	
4	1	1		2	4	% CORRECT
	20	4	16	8	48	58
BIASES	0.60	1.75	1.56	0.50		

OBSERVED 'DRY'

	1	2	3	4		
1	35	6	8	2	51	
2	8	5	11	1	25	
3	8	4	17	12	41	
4				2	2	% CORRECT
	51	15	36	17	119	50
BIASES	1.00	1.67	1.14	0.12		

OBSERVED TOTAL

	1	2	3	4		
1	46	7	8	2	63	
2	12	6	13	1	32	
3	12	5	31	18	66	
4	1	1		4	6	% CORRECT
	71	19	52	25	167	52
BIASES	0.89	1.68	1.27	0.24		

48 HR

OBSERVED 'WET'

	1	2	3	4		
1	10		1		11	
2	3			1	4	
3	9	3	13	7	32	
4					0	% CORRECT
	22	3	14	8	47	49
BIASES	0.50	1.33	2.29	0		

OBSERVED 'DRY'

	1	2	3	4		
1	42	7	22	9	80	
2	2	5	1		8	
3	5	3	14	8	30	
4				0	0	% CORRECT
	49	15	37	17	118	52
BIASES	1.63	0.53	0.81	0		

OBSERVED TOTAL

	1	2	3	4		
1	52	7	23	9	91	
2	5	5	1	1	12	
3	14	6	27	15	62	
4					0	% CORRECT
	71	18	51	25	165	51
BIASES	1.28	0.67	1.22	0		

60 HR

OBSERVED 'WET'

	1	2	3	4		
1	13				13	
2	2			2	4	
3	7	2	13	5	27	
4					0	% CORRECT
	22	2	13	7	44	59
BIASES	2.59	2.00	2.08	0		

OBSERVED 'DRY'

	1	2	3	4		
1	38	9	19	11	77	
2	5	2	1	1	9	
3	2	3	18	5	28	
4				1	1	% CORRECT
	45	14	38	18	115	51
BIASES	1.71	0.64	0.74	0.06		

OBSERVED TOTAL

	1	2	3	4		
1	51	9	19	11	90	
2	7	2	1	3	13	
3	9	5	31	10	55	
4				1	1	% CORRECT
	67	16	51	25	159	53
BIASES	1.34	0.81	1.08	0.04		