

EVALUATION OF RAREPS AS AN AID TO SHORT TERM FORECASTING AT PERTH

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1. INTRODUCTION

Forecasts of the occurrence or non-occurrence of precipitation at Perth Weather Bureau during three hour periods have been made using the following data:

Rareps from Perth Airport

Type and heights of base and top of cloud precipitating

Upper wind velocity at the mid-height of the cloud. (No attempt was made to forecast wind. The velocity used was taken from the latest available upper wind report at Perth Airport.)

2. DISCUSSION

The rarep was plotted and the echoes projected by using the wind velocity at the mid-height of the cloud. The mid-height was determined visually, or from the Perth Airport temperature sounding when available. If the projected echoes passed over Perth Weather Bureau during the three hours following the time of the rarep the forecast was "rain" or "showers". Otherwise the forecast was "fine".

The index chosen was developed by Crossley (1954) and is of the form:

$$I = \frac{1}{2} (c + c'),$$

where c = proportion of fine periods correctly forecast,

c' = proportion of rain periods correctly forecast.

It is the mean of the accuracy of forecasting fine periods and the accuracy of forecasting rain periods. For useful forecasting its value must exceed $\frac{1}{2}$. When every forecast is correct the index equals unity.

Sixty-seven forecasts were investigated and the distribution of correct and incorrect forecasts are shown in Table 1. Using these figures, an index of "usefulness" was calculated for the technique of forecasting from rareps.

Table 1. Numbers of correct and incorrect short term forecasts based on rarep data

Weather	Correct Forecasts	Incorrect Forecasts	Totals
Fine	29	9	38
Rain	21	8	29
Totals	50	17	67

Substitution of the data from Table 1 gives the value of the index I as 0.74.

Errors in forecasting were considered to be due mainly to:

- (a) Changes in wind since the latest available upper wind report.

Rareps are generally sent from Perth Airport before and after the radar wind flight. Those rareps received at Perth Weather Bureau before the flight must be projected using the previous upper wind report which reached the mid-height of the cloud. As radar wind reports are calculated only every twelve hours, the intervening upper wind report is a visual flight which is generally limited to the height of the cloud base. Hence some of the forecasts were made using wind reports up to twelve hours old.

- (b) Development or cessation of precipitation after the time of the rarep.

Radar can give no indication of the development of precipitation.

- (c) Precipitation moving into the area which at the time of the rarep was beyond the range of the radar.

The range-height contours of the radar at Perth Airport is roughly in the shape of an ellipse with the major axis lying approximately north and south. The range at 15,000 feet is less than

100 nautical miles, and at 7,000 feet less than 60 nautical miles between 245° and 345°. At most rain at Perth falls from cloud moving from western quadrants, the contour pattern imposes a restriction on the length of time for which a confident forecast can be made, when based on rareps. This limitation is increased when upper winds of relatively high speed are present.

(d) Inaccuracies of coding or transmission.

Inadequacy or inaccuracy in coding or transmission is a variable and personal factor.

It may be concluded that rareps can be a useful aid to short-term forecasting when used in the manner outlined above. A possible improvement could be achieved by forecasting upper winds when the latest report is more than six hours old. It is intended to test this technique in future forecasts.

There is no doubt that the usefulness of radar observations could be greatly increased if a Plan Position Indicator were available to the forecaster for continuous reference. This would enable new developments to be observed and the forecast amended accordingly.

Reference:

Crossley, A.F. 1954 Met. Mag. No. 981, Vol.83, March