LOW CLOUD AT MELBOURNE AIRPORT: A SYNOPTIC CLIMATOLOGY LEADING TO A FORECASTING TECHNIQUE

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1. INTRODUCTION

The present paper describes a "pilot" version of a new technique that may be used to predict the *probability of low cloud occurrence* at Melbourne Airport at 9am. It also describes the synoptic climatology of low cloud there at that time.

2. BACKGROUND

The main technique that is currently used to forecast low cloud for Melbourne Airport is one developed by Ross Keith. Keith's technique predicts the *low cloud onset time.*

Keith's technique is graphical in application. The expected pressure gradient across Victoria is used to determine whether or not a wake eddy is likely. If a wake eddy is found to be likely, the previous afternoon's Melbourne Airport temperature and Laverton dewpoint depression are combined to yield a forecast of the *low cloud onset time*.

3. SYNOPTIC CLIMATOLOGY

Low cloud occurs quite frequently at 9am at Melbourne Airport with some synoptic types, and only rarely with others (Figures 1 and 2). For example, there is low cloud associated with 21.0% of the occurrences of the synoptic type "strong ESE cyclonic". By contrast, on only 0.9% of the occurrences of the synoptic type "strong WNW anticyclonic", has there been low cloud.

4. THE NEW TECHNIQUE

The new technique uses logistic regression. In a logit regression model, the predicted values for the dependent variable will never be less than or equal to 0, nor greater than or equal to 1, regardless of the values of the independent variables. This is accomplished by applying the following regression equation

$$y=(\exp(a+\Sigma b_i x_i))/(1+(\exp(a+\Sigma b_i x_i)))$$

where 'y' is the dependent variable, the x_i are the independent variables, and a and the b_i are constants. In operation, where 'y' is a yes/no variable, the equation yields the probability of occurrence of a particular phenomenon.

In developing the new technique, the previous afternoon's dewpoint (x_1) and temperature (x_2) are combined with a "length of night" parameter, (x_3), defined as |month-6|, in a set of regression equations.

5. EVALUATION

Using four years of independent data, an evaluation of the technique is made. Its performance is then compared with corresponding available official forecasts of low cloud.

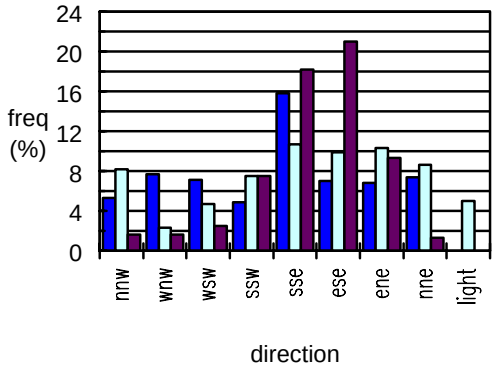

FIGURE 1 Frequency (%) of 9am low cloud associated with each direction for weak (left column), moderate (middle column), and strong (right column) cyclonic synoptic flow, and for light and variable cyclonic synoptic flow.

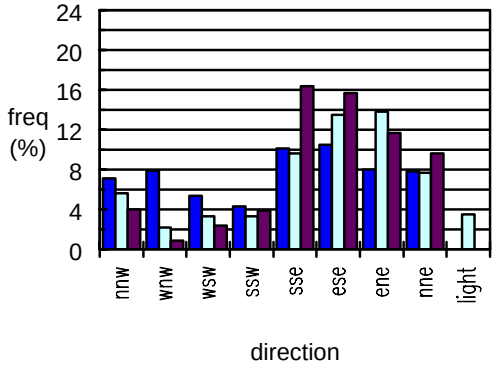

FIGURE 2 As for FIGURE 1, but for anticyclonic synoptic flow.

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