SHORTER CONTRIBUTIONS

NOTE ON ESSA 6 PHOTOGRAPH OF A TROPICAL CYCLONE NEAR NEW HEBRIDES

By B. Bradshaw

Central Office, Bureau of Meteorology, Melbourne

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1. INTRODUCTION

Satellite data have been found most useful for location and tracking of tropical cyclones. A further application, developed overseas, provides an estimate of the maximum surface wind. This application is here discussed in relation to a tropical cyclone located over the southwest Pacific on 3 March 1968.

2. SOURCE OF DATA

Fig. 1 is an ESSA 6 photograph of a tropical cyclone centred at lat. 22°S, long. 172°E, taken at 2219Z, 3 March 1968, by the APT read-out station at Melbourne.

Features to note are:

(i) Pronounced banding with outer cumulus bands converging towards the central overcast area.

(ii) Central overcast area with diameter of approximately 5 degrees of latitude.

(iii) A canopy of cirrus with "streamers" evident in the northern sector, aligned in a near NW to SE direction.

(iv) Absence of characteristic "eye".

3. REVIEW OF INTERPRETATION CRITERIA

Storm centres according to the investigation by Timchalk, Hubert and Fritz (1965) have been separated into five different categories depending upon the organization exhibited by the clouds, particularly banding. Fig. 2 shows those categories with cloud patterns modified for the Southern Hemisphere. Category (0) represents a typical weak surface or upper air tropical disturbance with featureless cloud system. Category (1) has poorly organized, relatively large bands that spiral towards the storm centre at comparatively large angles. This "inverted comma" configuration is indicative of the early stage of intensification and at this stage cirrus "streamers", indicating anticyclonic outflow in the upper troposphere, may appear. Category (2) has more pronounced banding, with outer bands tending to be concentric. A favoured location for major bands is to the north and to the south of the centre. Increased cirrus cover is usually apparent and means more pronounced outflow at 200 mb. The masking effect of this cirrus prevents the detection of any "streamers". Category (3) shows tight coiling of the central cloud area, marked concentric banding and appearance of characteristic "eye". Finally in Category (4), the most intense stage, very intense coiling is evident, together with a larger central cloud area and bands having a high degree of circularity. There is also a distinctly visible "eye".

4. DISCUSSION

From examination of the major features of the Tropical Cyclone (see Fig. 1), it is reasonable to classify the cyclone as Category (2) of Fig. 2, and in this event the maximum sustained surface wind would be in the vicinity of 60 kt. Unfortunately, at the time of the
Fig. 1  Tropical cyclone showing streamers of high level outflow and convective bands of low level inflow (lat. 22° S, long. 172° E, 2219 GMT, 3 March 1968).
Fig. 2  Classification of tropical cyclones from coiling and banding character of cloud. (After Timchalk, Hubert and Fritz (1965), adapted for southern hemisphere.)
Fig. 3  MSL analysis, 2300 GMT, 3 March 1968.
Fig. 4 700 mb analysis, 2300 GMT, 3 March 1968. Note orientation of cumuliform band in lower troposphere shown as dashed line north of centre.
Fig. 5  200 mb analysis, 2300 GMT, 3 March 1968. Note orientation of cirrus streamers indicating direction of outflow, shown as dashed lines north of centre.
photograph the nearest surface report available was approximately 200 miles from the storm centre, with the result that no verification was possible (see Fig. 3).

The distinct overcast area of low level cumuliform cloud is covered by a canopy of "outflow" cirrus, which masks the low level convective inflow towards the centre of the storm. However, to the north of the overcast area cirrus "streamers" are an indication of the direction of outflow in the upper troposphere. Downward dispersion and evaporation of the streamer produces an observable cloud brightness "gradient" in the direction of the wind at cloud level. This means that the wind is blowing towards the less dense ends of the streamer. Interpretation studies (Widger, Sherr and Rogers 1964) indicate that these cirriform streamers are seldom individually visible, as they occur during the initial stages of deepening and are quickly obscured by the relative brightness of the canopy as a whole.

It will be seen that the cumuliform "band" beneath the streamers is lying almost east-west, indicating a considerable shear between the lower and upper tropospheric winds in this area. Reference to the 700 mb and 200 mb streamline charts (Figs. 4 and 5) demonstrates this fact. Although not as obvious from the photograph, a shear between lower cumulus and upper cirrus levels can be detected to the south and southeast of the storm, and this is also consistent with the upper charts.

This cyclone subsequently moved slowly southeast, becoming more intense over the next few days. A distinct "eye" formed, together with an enlarged central overcast area.

REFERENCES
