

ORIENTATION OF POLAR AURORAS*

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Weill (1958) has shown that the orientation of "homogeneous arc" auroras at Dumont d'Urville (see Fig. 1) exhibits definite diurnal variation, the arcs being aligned approximately on the azimuth of the Sun. Hatherton and Midwinter (1960), in considering morphology of the auroras near Scott Base and Hallett Station express the opinion that the Dumont d'Urville auroral behaviour seems unique. Observations presented below from Wilkes, Scott Base, and

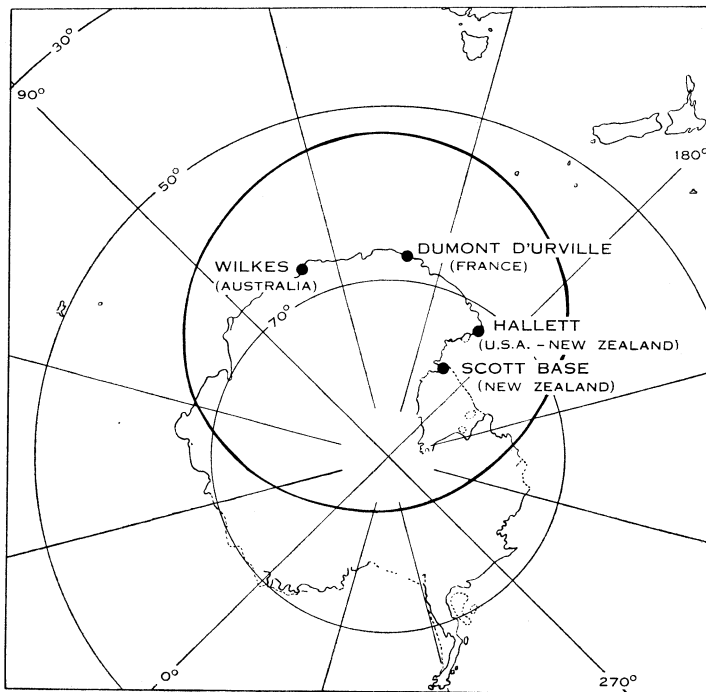


Fig. 1.—Station locations in relation to southern isoaurora of maximum frequency, after Bond and Jacka (1960).

Hallett indicate, however, that diurnal variation of orientation, a main feature of Weill's paper, is not peculiar to the vicinity of Dumont d'Urville.

Auroras observed from Scott Base and Hallett (using the visual observations examined by Hatherton and Midwinter), from Wilkes (using all-sky camera records obtained by the Australian National Antarctic Research Expedition in 1959), and from Dumont d'Urville (visual observations and all-sky camera

* Manuscript received November 18, 1960.

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records, July 1957–September 1958), have been plotted on synoptic maps, assuming the height of all auroral lower borders to be 105 km. The orientations of homogeneous arcs and simply shaped homogeneous bands near these stations have been examined, measurement being restricted to auroras within 3° of each station. Orientation was measured as the angle from geographic north to the tangent to the plan position of the aurora, clockwise being taken as positive.

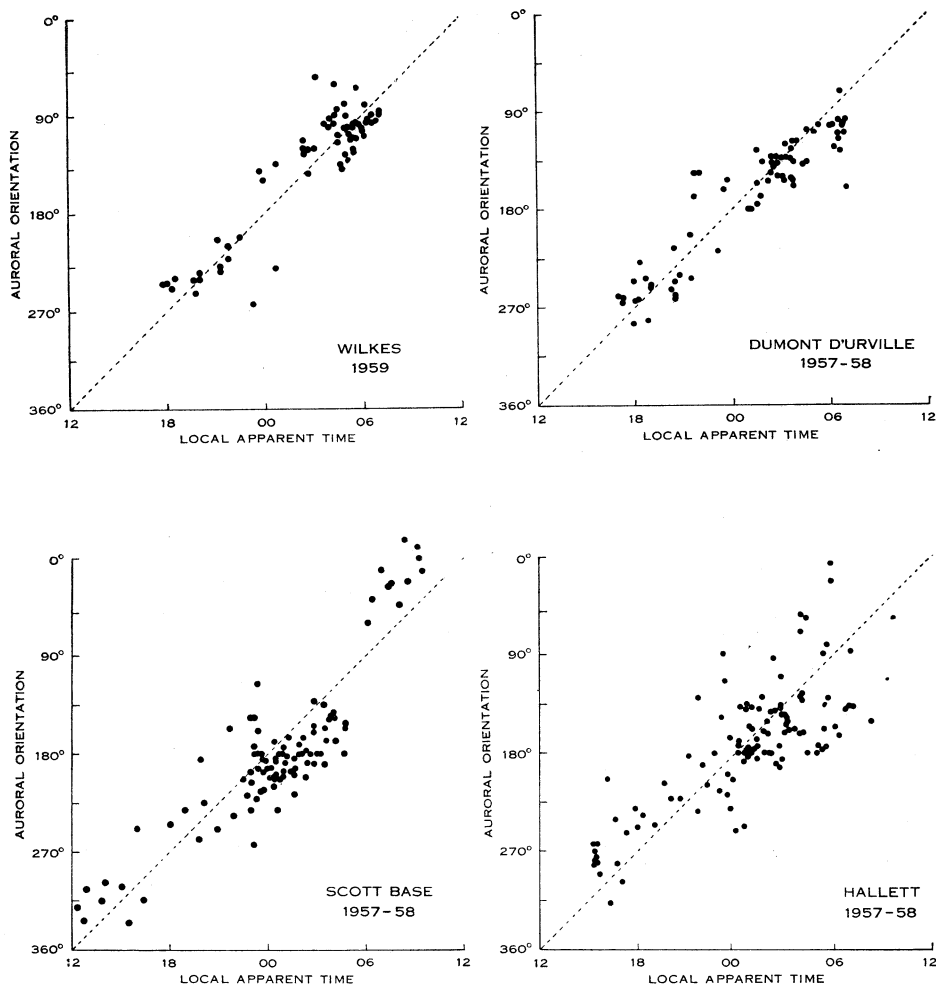


Fig. 2.—Auroral orientation versus local apparent time. Dotted lines represent annual mean azimuth of the Sun.

In Figure 2 orientations are plotted against local apparent time at the meridian at which orientation was measured. The plots from the other stations indicate a diurnal variation in orientation similar to that near Dumont d'Urville.

Wilkes, Dumont d'Urville, Hallett, and Scott Base are all well on the polewards side of the isoaurora of maximum frequency (Bond and Jacka 1960) reproduced in Figure 1. The data of Figure 2 suggest that rotation with the

Sun may be a general morphological feature of (homogeneous) auroras within the central polar region. This conclusion is supported also by Davis (1960) from a study of auroras over Resolute Bay, within the northern polar cap. (It is noted, however, that all auroras over Resolute Bay were rayed forms.)

Cole (1960) has suggested that auroral forms lie along the lines of flow of the geomagnetic disturbance current system. Davis's (1960) studies on and within the northern auroral zone strongly support Cole's suggestion.

Assuming a total current system of general form similar to that of the S_D current system derived from magnetic storm data by Vestine *et al.* (1947), with its intense electrojets along the maximum frequency isoaurora of Bond and Jacka, and with its lines of transpolar current flow approximately in the Sun-Earth direction (as in Chapman's (1956) idealized system), then the positions of Wilkes, Dumont d'Urville, Scott Base, and Hallett relative to the current system are such that the observed diurnal rotation is that to be expected from Cole's suggestion.

The writers are grateful to Geophysics Division, D.S.I.R., New Zealand, for permission to make use of data from the Hallett and Scott Base auroral logs and to G. Weill for permission to extract data from synoptic maps prepared by him from data of Dumont d'Urville. The all-sky camera at Wilkes is the property of the U.S. Air Force Cambridge Research Centre.

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