AURORAL OCCURRENCE AT SANAE, ANTARCTICA, 1964

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Being the year of the quiet sun auroral activity during 1964 was not so marked than during other years of high solar activity. This fact, however, was no drawback as far as auroral observations were concerned but actually presented an opportunity for a better study of the aurora and related phenomena under these quiet conditions. This was also of importance for examining whether, as a result of the local magnetic anomaly, the auroral frequency was higher at SANAE than at similarly situated places.

It was found (1) that for 66·8 per cent of a total of about 2,770 nightly hours the possibility of aurora occurring was smaller than 0·5. For 15 per cent of the time aurora was definitely present in some part or other of the sky, usually above the south-eastern horizon. Aurora was visible (International brightness coefficient = 1; or comparable with milky way; or green 5577 A° line intensity = 1000 Rayleighs) in the zenith for about 5·3 per cent and had distinct forms (in zenith) for about 2·2 per cent of the nightly hours.

Fig. 1a shows the mean 3-hourly K_z-indices of magnetic activity (1 = 15 and 2 = 30 deflection of z-component) and fig. 1b the mean hourly auroral occurrence for the four winter months. The close correlation and the period of maximum activity is clearly noticeable.

Photometric observations of three characteristic "airglow" and auroral spectral lines i.e. the green 5577 A° [01], the red 6300 A° [01] and the blue 4278 A° (N_2^+) were done. The main contributors to the more constant but much weaker airglow night-sky emission are photochemical reactions as a result of the ultraviolet radiation from the sun. On the other hand, it was found useful to ascribe the excitation of the more intense auroral emission to particle influx only. Usually no definite line is drawn between airglow and aurora. The blue 4278 and also 3914 A° (N_2^+) lines are not easily excited photochemically (airglow) so that when they are detected one could talk about the influx of particles, i.e. auroral activity.

Usually the 4278 A° line only started to increase considerably when the green line exceeded an intensity of about 600 Rayleighs (2). During the South Atlantic Anomaly flights (3) with a Hercules C130 (October 1964) airglow observations showed enchancements of the green 5577 A° line in the anomaly regions while there was no increase in 3914 A° (N_2^+) intensity. Thus, there may well be a higher influx of particles in the anomaly regions than elsewhere under quiet conditions but not enough to excite the N_2^+ bands markedly or to cause a visible aurora. Under more disturbed conditions and periods of high solar activity it may however happen that the 3914 and 4278 A° lines are detected more easily.

From the observations at SANAE (4) it does not seem that the occurrence of aurora under quiet conditions is drastically influenced by the presence of the magnetic anomaly. Again, however, anomalous effects may be more marked during higher solar activity and for this reason it is now planned to install a photometer at Hermanus where auroral occurrence should also be affected by the anomalies.

As a result of the South Atlantic Anomaly regions South Africans may be able to see aurora more easily than they expected and should therefore be on the lookout during the next few years of sunspot maxima. Usually phenomena like these go by unobserved because they are not looked for.

REFERENCES:

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2, 3 and 4. Robertson, G. T., M.Sc. Thesis, University of Stellenbosch, 1966.

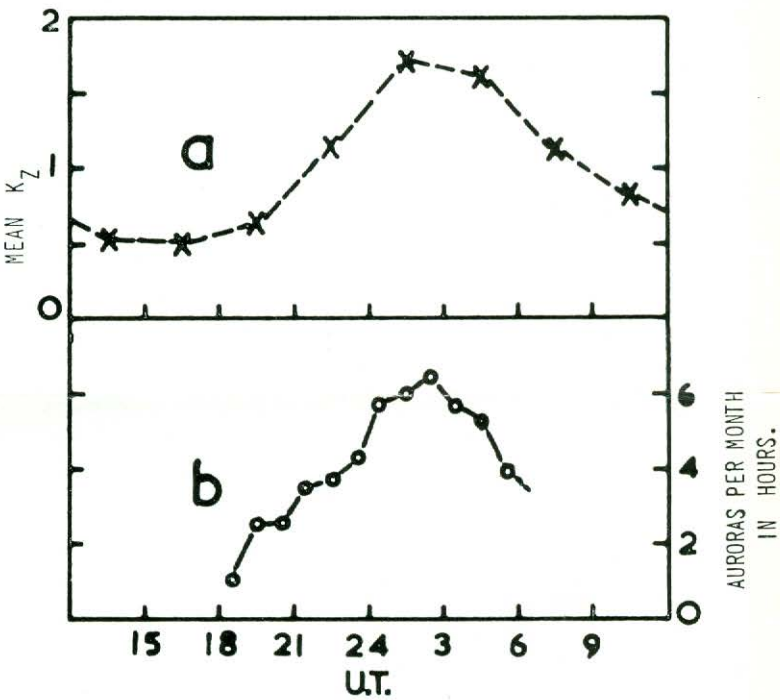

Fig. 1 (a) The distribution (with universal time) of the magnetic activity, K_z, of the vertical component of the earth's field and (b) the mean auroral occurrence (in hours with U.T.) for the four winter months during 1964. U.T. almost coincides with the local mean time at SANAE.