Astrophysics from Antarctica
Proceedings IAU Symposium No. 288, 2012
M. G. Burton, X. Cui & N. F. H. Tothill, eds.

doi:10.1017/S1743921312017048

Airglow and Aurorae from Dome A, Antarctica

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Abstract. Despite the absence of artificial light pollution at Antarctic plateau sites such as Dome A, other factors such as airglow, aurorae and extended periods of twilight have the potential to adversely affect optical observations. We present a statistical analysis of the airglow and aurorae at Dome A using spectroscopic data from Nigel, an optical/near-IR spectrometer operating in the 300–850 nm range. The median auroral contribution to the B, V and R photometric bands is found to be 22.9, 23.4 and 23.0 mag arcsec^{-2} respectively. We are also able to quantify the amount of annual dark time available as a function of wavelength; on average twilight ends when the Sun reaches a zenith distance of 102.6°.

Keywords. Dome A, site testing, airglow, aurora, sky brightness

1. Airglow and Aurorae

Using the Nigel spectrometer (Sims *et al.* 2010), we investigated the sky brightness contribution from the dominant emission lines in the optical photometric bands: B (391.4 and 427.8 nm); V (557.7 nm); and R (630.0 and 636.4 nm). A sample histogram for the V band is shown in Figure 1.

2. Twilight

At high latitudes the total amount of useable dark time is critically dependent on the solar zenith distance at which it becomes dark. One interesting consequences of the low aerosol content of the Antarctic atmosphere is that it results in the sky darkening

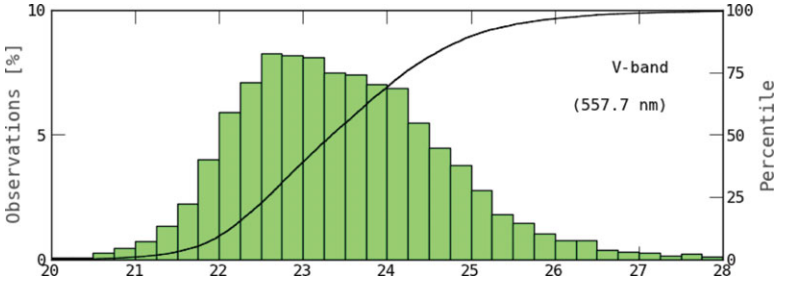

Figure 1. Probability histogram showing the contribution of the 557.7 nm line to sky brightness in the V band.

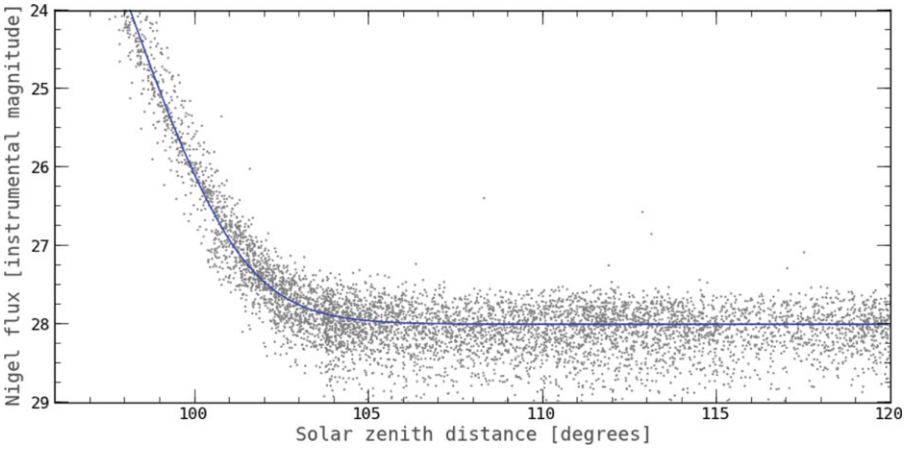

Figure 2. Determining the solar zenith distance at which twilight ends.

faster than at temperate latitudes. Figure 2 shows data from one wavelength interval, demonstrating that twilight effectively ends at a solar zenith distance of $\sim 103°$.

3. Future Work

Auroral statistics for 2009 from Nigel have recently been published (Sims *et al.* 2012). Our data also complement photometric images from the Gattini camera (Moore *et al.* 2010) which uses B, V and R filters. This will allow the background sky brightness at Dome A to be disentangled from the various airglow and auroral emission lines (Moore *et al.*, in prep.).

4. Acknowledgements

The author acknowledges the Astronomical Society of Australia (ASA) for providing travel support to attend this meeting.

References

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