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Optical sky brightness at Dome C, Antarctica

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1. Introduction

Dome C, Antarctica is a prime site for astronomical observations in terms of climate, wind speeds, turbulence, and infrared and terahertz sky backgrounds (for example, see Aristidi *et al.* 2005; Storey *et al.* 2005). However, at present little is known about the optical sky brightness and atmospheric extinction. Using a variety of modelling techniques, together with data from the South Pole, the brightness of the night sky at Dome C is estimated in Kenyon & Storey (2006) including the contributions from scattered sunlight, moonlight, aurorae, airglow, zodiacal light, integrated starlight, diffuse Galactic light and artificial sources. The results are compared to Mauna Kea, Hawaii. We summarise the main conclusions.

2. Discussion

The high latitude of Dome C has an impact on the number of formal astronomical dark hours that the site experiences. Although Dome C has less total dark time than sites closer to the equator, when cloud-cover is taken into account Dome C may have a comparable number of cloud-free dark hours to Mauna Kea. The atmosphere at Dome C is very clear and this should lead to reduced sky brightness contributions from scattered sunlight and moonlight, and should reduce the atmospheric extinction in the optical. At Dome C the Moon never rises higher than between about 33° and 43°, depending on the 18 yr lunar nodal cycle. Modelling shows that moonlight is expected to contribute less at Dome C than at Mauna Kea because of the lower elevation angles. Dome C is close to the centre of the annular auroral region in the southern hemisphere. Aurora will generally be no higher than 7° above the horizon and further than about 1,200 km away. Aurorae are expected to have a minor impact in the optical. Zodiacal light is expected to be less at Dome C than at Mauna Kea because the ecliptic plane is always close to the horizon. Airglow emissions at Dome C are thought to be about the same brightness as those at temperate sites. Integrated starlight is anticipated to be negligible because of the excellent seeing and low atmospheric extinction at Dome C. Diffuse Galactic light may be brighter at Dome C than Mauna Kea because the Galactic plane is always close to the zenith, however this contribution is not large when compared to other sources of sky brightness. Sky brightening by artificial light sources should be non-existent at Dome C, if proper planning is put into place.

We conclude that Dome C is a very promising site not only for infrared and terahertz astronomy, but for optical astronomy as well.

References

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