

Photometry of Variables from Dome A, Antarctica

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Abstract. Dome A on the Antarctic plateau is likely one of the best observing sites on Earth (Saunders *et al.* 2009). We used the CSTAR telescope (Yuan *et al.* 2008) to obtain time-series photometry of 10^4 stars with $i < 14.5$ mag during 128 days of the 2008 Antarctic winter season (Wang *et al.* 2011). During the 2010 season we observed 2×10^4 stars with $i < 15$ mag for 183 days (Wang *et al.* 2012). We detected a total of 262 variables, a $6 \times$ increase relative to previous surveys of the same area and depth carried out from temperate sites (Pojmanski 2004). Our observations show that high-precision, long-term photometry is possible from Antarctica and that astronomically useful data can be obtained during 80% of the winter season.

1. Photometry and site statistics

We used CSTAR#1 (equipped with a SDSS i filter) to obtain over 6.3×10^5 images with exposure times ranging from 20 to 40s during 128 and 183 days of the 2008 & 2010 Antarctic winter seasons, respectively. The raw images were de-biased, flat-fielded and fringe-corrected. We carried out aperture photometry using DAOPHOT (Stetson 1987) and transformed the measurements to the standard system.

Our master frame contained $\sim 1.5 \times 10^5$ stars with $i < 21$ mag. We selected the brightest 10^4 objects in 2008 (2×10^4 in 2010) to search for variability and calculate site statistics. We determined that favourable conditions (defined as extinction due to clouds being below 0.4 mag) occur for 80% of the dark time(left panel of Fig. 1).

Representative phased light curves are presented in the right panel of Fig. 1.

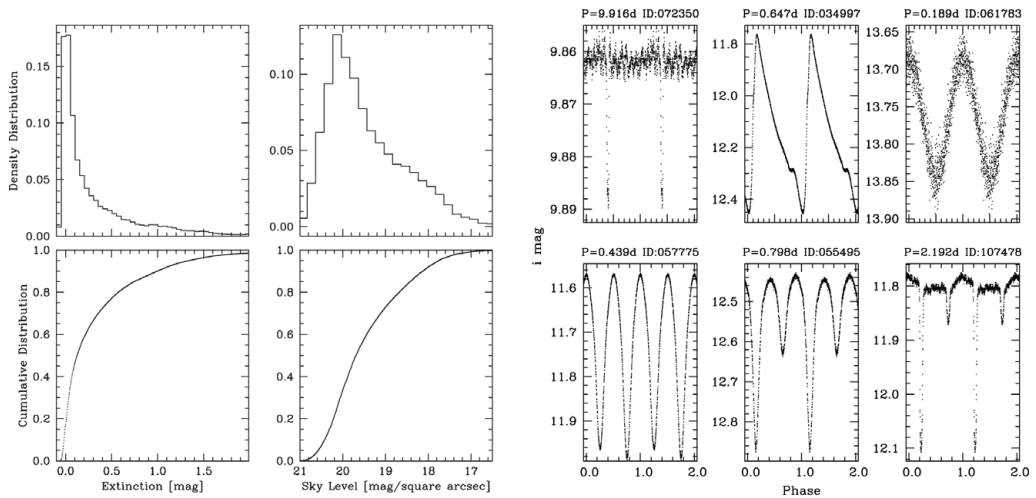


Figure 1: Left panel: Combined site statistics for the 2008 and 2010 Antarctic winter seasons based on CSTAR photometry (the total number of frames is 547,482). Note that the sky brightness histogram includes all Moon phases. Right panel: Phased light curves of six representative variables from Wang *et al.* (2011). Top row (left to right): exoplanet candidate; RR Lyrae; δ Scuti. Bottom row (left to right): contact; semi-detached and detached binaries.

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