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Time-Domain Astronomy with the Chinese Small Telescope ARray (CSTAR)

The Chinese Small Telescope ARray (CSTAR) is the first telescope facility built at Dome A, Antarctica. It comprises four identical, fully automated, static 14.5 cm telescopes, and covers 20 deg<sup>2</sup> of sky around the South Celestial Pole. The installation is designed to provide high-cadence photometry for the purpose of monitoring the quality of the astronomical observing conditions at Dome A and detecting transiting exoplanets, as well as various types of photometric variability. In 2008 polar night, more than four months of high-duty-cycle observations with the CSTAR telescope provided about 0.3 million qualified photometric frames in the Sloan-i band. Photometric precision reaches ~4 mmag at 20 or 30s cadence at  $i = 7.5$  and is ~20 mmag at  $i = 12$ . From this data set, we report 10 promising transit exoplanet candidates. Four of these were found to be giants using spectroscopic follow-up. None of the six dwarf candidates show any RV variation beyond the intrinsic measurement scatter of 2 km/s, indicating all six therefore remain good candidates for future high-resolution RV follow-up and/or photometric follow-up. Moreover, we discovered and characterized a multitude of photometric variability from this data set, including two triple star systems inferred via eclipse timing variations, dozens of stellar flares, as well as hundreds of other type variables.