Proceedings Article

Six winters of photometry from Dome C, Antarctica: challenges, improvements, and results from the ASTEP experiment

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Abstract

abstract

ASTEP (Antarctica Search for Transiting ExoPlanets) is a pilot project that aims at searching and characterizing transiting exoplanets from Dome C in Antarctica and to qualify this site for photometry in the visible. Two instruments were installed at Dome C and ran for six winters in total. The analysis of the collected data is nearly complete. We present the operation of the instruments, and the technical challenges, limitations, and possible solutions in light of the data quality. The instruments performed continuous observations during the winters. Human interventions are required mainly for regular inspection and ice dust removal. A defrosting system is efficient at preventing and removing ice on the mirrors. The PSF FWHM is 4.5 arcsec on average which is 2.5 times larger than the specification, and is highly variable; the causes are the poor ground-level seeing, the turbulent plumes generated by the heating system, and to a lower extent the imperfect optical alignment and focusing, and some astigmatism. We propose solutions for each of these aspects that would largely increase the PSF stability. The astrometric and guiding precisions are satisfactory and would deserve only minor improvements. Major issues are encountered with the camera shutter which did not close properly after two winters; we minimized this issue by heating the shutter and by developing specific image calibration algorithms. Finally, we summarize the site testing and science results obtained with ASTEP. Overall, the ASTEP experiment will serve as a basis to design and operate future optical and near-infrared telescopes in Antarctica.

Topics

Domes ; Photometry ; Equipment and services ; Exoplanets ; Point spread functions ; Telescopes ; Algorithms ; Calibration ; Camera shutters ; Inspection

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