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Astrometry and Photometry for Images of All-sky Cameras with KLCAM

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All-sky cameras are widely used in site testing, fireball triangulation, meteorite recovery, and time-domain astronomy. However, they intrinsically require optics with nonlinear projections, making it challenging to use traditional astrometric and photometric methods. Based on the all-sky camera KunLun Cloud and Aurora Monitor (KLCAM) in Dome-A, we have developed a method to analyse cloud cover and aurora contamination using extinction and sky brightness from photometry. The photometry accuracy we achieve is typically 0.1 mag for stars < 4.5 mag and 0.2 mag for stars < 5.5 mag, while the astrometry accuracy is 0.4 pixels in (x, y). We automate the process that allows us to monitor the real-time distribution of cloud and aurora. Our astrometric method has been generalised and applicable to images of super-wide fields of view.

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