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Methodology for photometric calibration of infrared observations of Solar System Objects

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ABSTRACT

Excellent absolute infrared photometry is imperative for being able to adequately characterize the diameters of potentially hazardous Near-Earth Objects. The flux density of an asteroid at infrared wavelengths (F_{IR}) is proportional to the square of the diameter (thus the impact energy is proportional to $F_{IR}^{1.5}$). At mid-infrared wavelengths, space-based telescopes are now routinely absolutely calibrated to better than 5% using stellar standards. However, color correction terms for transferring stellar standards which are intrinsically blue in infrared passbands can be a significant source of error when applying the photometric calibration to intrinsically red objects such as asteroids and comets. Sources of photometric uncertainty to be considered are leaks at the edges of the filter bandpass and relative spectral response variations across the field of regard for modern, large format infrared detector arrays.

We present the methodology that will be used to calibrate the photometry of the Near-Earth Object Camera (NEOCam) space mission. NEOCam will conduct a synoptic survey for potentially hazardous near-Earth objects in two mid-infrared passbands. We will describe the network of stellar standards to be used for NEOCam and how these standards will be transferred to determine the flux densities of the observed solar system objects. The required calibration activities for determining the relative spectral response of NEOCam will be described and the photometric uncertainty budget will be presented. We will demonstrate that the NEOCam photometric calibration will meet the 7% requirement needed for the mission objectives.

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