A Comparison of Radiometric Calibration Techniques for Lunar Impact Flashes

R. Suggs
NASA Marshall Space Flight Center, Huntsville, Alabama (rob.suggs@nasa.gov)

Introduction

Video observations of lunar impact flashes have been made by a number of researchers since the late 1990's and the problem of determination of the impact energies has been approached in different ways (Bellot Rubio, et al., 2000 [1], Bouley, et al., 2012.[2], Suggs, et al. 2014 [3], Rembold and Ryan 2015 [4], Ortiz, et al. 2015 [5]) . The wide spectral response of the unfiltered video cameras in use for all published measurements necessitates color correction for the standard filter magnitudes available for the comparison stars. An estimate of the color of the impact flash is also needed to correct it to the chosen passband. Magnitudes corrected to standard filters are then used to determine the luminous energy in the filter passband according to the stellar atmosphere calibrations of Bessell et al., 1998 [6]. Figure 1 illustrates the problem. The camera pass band is the wide black curve and the blue, green, red, and magenta curves show the band passes of the Johnson-Cousins B, V, R, and I filters for which we have calibration star magnitudes. The blackbody curve of an impact flash of temperature 2800K (Nemtchinov, et al., 1998 [7]) is the dashed line. This paper compares the various photometric calibration techniques and how they address the color corrections necessary for the calculation of luminous energy (radiometry) of impact flashes. This issue has significant implications for determination of luminous efficiency, predictions of impact crater sizes for observed flashes, and the flux of meteoroids in the 10s of grams to kilogram size range.

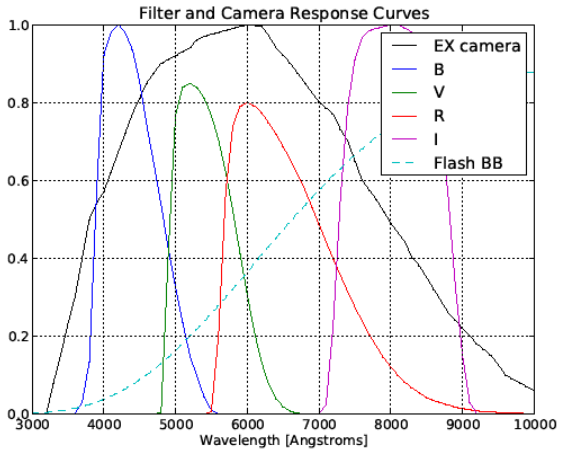

Fig 1 Camera and filter responses with 2800K flash blackbody

References

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