Determination of the Meteor Limiting Magnitude

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Introduction

The limiting meteor magnitude of a meteor camera system will depend on the camera hardware and software, sky conditions, and the location of the meteor radiant. Some of these factors are constants for a given meteor camera system, but many change between meteor shower or sporadic source and on both long and short timescales. Since the limiting meteor magnitude ultimately gets used to calculate the limiting meteor mass for a given data set, it is important to have an understanding of these factors and to monitor how they change throughout the night, as a 0.5 magnitude uncertainty in limiting magnitude translates to a uncertainty in limiting mass by a factor of two.

NASA Widefield Meteor Camera Network

There are four widefield cameras at two sites in northern Alabama, spaced 32 km apart. The primary purpose of the system is to automatically compute the flux of mm-sized meteoroids from any active showers or sporadic sources via algorithms which run daily. The need to autonomously compute fluxes each morning requires an auxiliary program to determine the change in limiting magnitude for each camera throughout the night. This program examines images from each station every 10 minutes in order to measure how the limiting magnitude changes throughout the night and from camera to camera (figure 1).

Discussion

We will discuss our method for determining the limiting stellar magnitude. A star catalog is used to determine which stars brighter than magnitude 7 are in the field of view, and aperture photometry is performed on these stars for each image. The signal to noise is calculated and compared to a threshold value. The magnitude distribution of the stars that were and were not detected is then examined to find the limiting stellar magnitude. This is converted to a meteor limiting magnitude in a fashion similar to that of Hawkes [1], the details of which will be discussed.

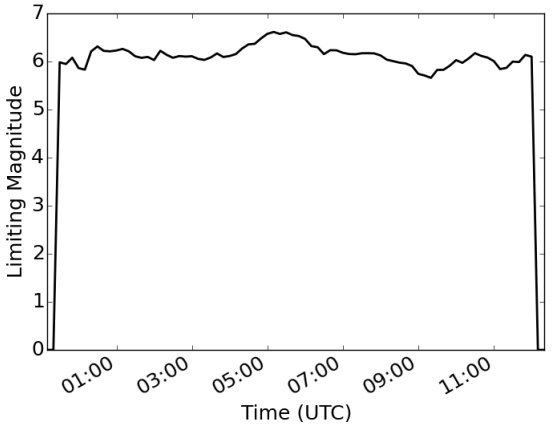

Figure 1: Limiting stellar magnitude for a widefield meteor camera throughout a night.

References

[1] Hawkes, R. L., Mason, K. I., Fleming, D. E. B., & Stultz, C. T. 1993, Proceedings of the International Meteor Conference, 11th IMC, Smolenice, Slovakia, 1992, 28