

The status of NASA's wide-field meteor camera network and preliminary results

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1. Introduction

NASA's Meteoroid Environment Office (MEO) recently established two wide-field cameras to detect meteors in the millimeter-size-range. This paper outlines the concepts of the system, the hardware and software, and results of 3,440 orbits seen from December 13, 2012 until May 14, 2014.

2. Equipment

The cameras each consist of a 17 mm focal length Schneider lens ($f/0.95$) on a Wattec 902H2 Ultimate CCD video camera, producing a 21.7×15.5 degree field of view. They are located 31.7 km apart, pointed to optimize the common volume of the atmosphere seen. This configuration detects meteors down to a magnitude of +6. Figure 1 shows the distribution of magnitudes seen by these cameras. Video from the cameras is processed with ASGARD (All Sky and Guided Automatic Real-time Detection), which performs the meteor detection/photometry, and invokes the MILIG and MORB [1] codes to determine the trajectory, speed, and orbit of the meteor. A subroutine in ASGARD allows for approximate shower identification in single-station detections.

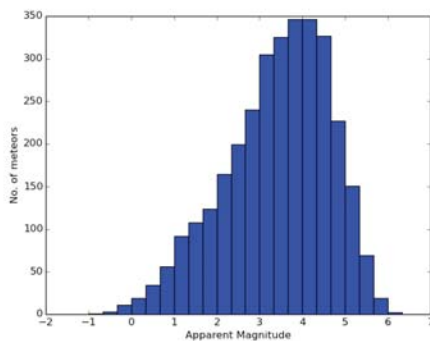


Figure 1: Distribution of meteor magnitudes as seen in the MEO's wide-field cameras.

3. Results

From the first night of observations, December 13, 2014, until May 14, 2014, 3,440 meteor orbits were recorded. 3050 of those were identified as sporadic, and 390 identified as belonging to a shower, showing that at this magnitude range, sporadics greatly dominate over shower populations. The directionality and velocity distributions will be discussed, as well as the populations from which these 3,440 meteors originate. This count includes meteors from 46 different meteor showers, the most active of which have been the Southern Taurids (61 meteors in 2013) and Orionids (51 meteors in 2013). The Geminids have had the most overall shower meteors detected (76), in two years of Geminid data.

A radiant map of all meteors, color-coded by speed, is presented in Figure 2. The figure is in heliocentric coordinates, with the center of the plot being the direction of Earth's motion. The color is scaled by geocentric velocity.

Comparison of the shower distribution and other characteristics to the MEO's all-sky fireball network will also be shown, as well as a discussion of the future plans of the network. A primary purpose of the system is to calculate daily sporadic and shower meteor fluxes using automated routines, though the fluxes have rather large uncertainties due to low number statistics. This can be improved by increasing the number of cameras beyond the current two.

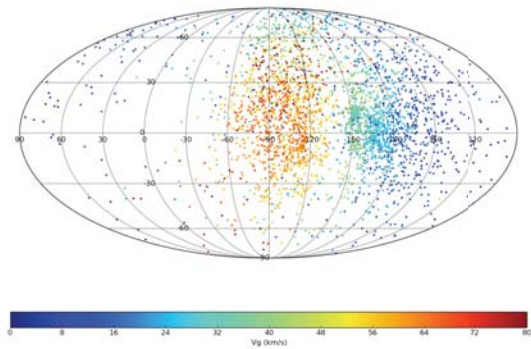


Figure 2: Radiant distribution of 3,440 double-station meteors seen in the Meteoroid Environment Office's wide-field camera system.

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References

- [1] Borovick, J.: The comparison of two methods of determining meteor trajectories from photographs, Bulletin of the Astronomical Institutes of Czechoslovakia, vol 41, pp 391-396, 1990.