The Flux of Large Meteoroids Observed with Lunar Impact Monitoring

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8 Years of Observations

• The MSFC lunar impact monitoring program began in 2006 in support of environment definition for the Constellation (return to Moon) program.

• Work continued by the Meteoroid Environment Office after Constellation cancellation.

• Over 300 impacts have been recorded

• A paper published in Icarus reported on the first 5 years of observations and 126 calibrated flashes


Automated Lunar and Meteor Observatory

- Three 0.35m telescopes (Celestron/Meade)
- Detector - Watec 902H2 Ultimate ($\gamma = 0.45$, manual gain, shutter off)

MSFC, Huntsville, Alabama

Mayhill, New Mexico
300+ impacts since 2005

Subset of 126 flashes:
141 hrs evening - 81 flashes
126 hrs morning - 45 flashes

Average: 2.1 hrs/flash
evening/morning = 1.61:1

Photometric error ~0.2 mag
The flux to a limiting energy of $2.5 \times 10^{-6}$ kT TNT or $1.05 \times 10^7$ J is $1.03 \times 10^{-7}$ km$^{-2}$ hr$^{-1}$
The flux to a limiting mass of 30 g is $6.14 \times 10^{-10} \text{ m}^{-2} \text{ yr}^{-1}$
Summary

- Shower membership determined based on radiant visibility from impact location (zenith distance), time from maximum, and peak zhr

- Meteor showers significant contributor at cm sizes (>60%) - looking into radiant distribution as possible explanation for observed asymmetry

- Uncertainty in luminous efficiency dwarfs photometric errors

- We have used a rigorous photometric procedure (observation of standards, color and extinction corrections, etc) to derive flash magnitudes
  - Brightest flashes are saturated; energy/mass underestimated

- Results consistent with other observational studies