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## The density of small meteoroids

J.-B. Kikwaya (1, 2), M. Campbell-Brown (2), P. G. Brown (2).

(1) Vatican Observatory, V-00120 Vatican, City State; (2) Dept. of Physics and Astronomy, Univ. of Western Ontario, London, ON N6A 3K7, Canada

## Abstract

An important physical property of meteoroids is their density. Knowledge of meteoroid density can help determine the physical structure and potentially the composition of their parent bodies. Density also suggests which meteoroids may be asteroidal and which are cometary allowing exploration of the orbital evolution of the two populations.

We have recorded 111 optical meteors simultaneously at multiple stations using three different intensified video camera systems. The systems had image sizes ranging from 640 x 480 pixels to 1360 x 1036, with pixel scales from 0.01°

per pixel to  $0.05^{\circ}$  per pixel, and limiting meteor magnitudes ranging from Mv = 2.5 to 6.0. We find that 78% of our sample show noticeable deceleration, allowing more robust constraints to be placed on density estimates.

The density of each meteoroid is estimated by simultaneously fitting the observed deceleration and lightcurve using the ablation model of Campbell-Brown and Koschny1, a model based on thermal fragmentation, conservation of energy and momentum. The entire phase space of the model free parameters is explored for each event to find ranges of parameters which fit the observations within the measurement uncertainty. The physical parameters used in the model range from CI chondrites, IDPs, ordinary chondrites to iron meteorites. The orbits are computed following the method developed by Ceplecha2. Associations between bulk density and orbital parameters will be presented..

## References

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