## Modelling non-fragmenting meteoroids

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Meteoroid ablation models are used to gain insight into the composition and fragmentation behaviour of meteoroids. In particular, the equations of meteor ablation are used to match measured meteor light curves and deceleration, with the fragmentation and thermal and physical properties of the meteoroid being adjusted to produce the best match.

The Canadian Automated Meteor Observatory (CAMO) tracking system is capable of imaging faint meteors with a resolution on the scale of meters, revealing details of the meteoroids' fragmentation. Attempts to match thermal disruption and thermal erosion models of meteor ablation to CAMO meteors revealed that the models greatly overpredict the amount of wake seen in the high-resolution system [1]. This indicates that the models rely too much on fragmentation to match light curves.

Non-fragmenting meteors produce a characteristic, late-peaked light curve in standard ablation models, while meteors showing little or no fragmentation on the CAMO tracking system have light curves which are symmetric overall [2]. Symmetric light curves, then, cannot be taken as evidence of fragmentation for meteoroids in this size range.

A single body model which includes chemical inhomogeneities and which allows the shape and/or porosity of the meteoroid to change with time has been developed to produce non-classical light curves with non-fragmenting meteoroids. The model allows the physical and thermal properties of each of the component minerals to be specified, including the density, boiling point, specific heat, heat of ablation and luminous efficiency. It takes into account the changing porosity when more volatile materials ablate early in the trajectory, and allows the shape of the meteoroid to change with time. The model will be used to investigate the range of light curves which can be produced with non-homogenous, non-fragmenting meteoroids.



Figure 1: High-resolution image of a non-fragmenting meteor observed with the Canadian Automated Meteor Observatory.

## References

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- [2] Subasinghe, D., Campbell-Brown, M. D., Stokan, E., (2016). Physical characteristics of faint meteors by light curve and high-resolution observations, and the implications for parent bodies. Monthly Notices of the Royal Astronomical Society, 457, 1289-1298.