A Spectral Analysis of Ablating Meteors

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When meteoroids collide with the atmosphere, they produce streaks of light, the result of excited and ionized atoms from both the meteoroid – specifically metals - and the atmosphere. Four of the main elements accessible through spectral observations of faint meteors are iron, sodium, magnesium, and calcium at the respective wavelengths of 394, 436, 520, and 589 nm. Though these elements normally do not represent the main constituents of the meteor, they are important tracers for different minerals that may be present. Borovicka (2007) used the ratio of the brightness of the iron, magnesium and sodium lines to categorise meteors of different origins.

The Canadian Automated Meteor Observatory (CAMO) observes meteors from two stations in white light, using image intensified video, allowing their light curves, trajectories, and orbits to be calculated. From September to December 2015, four additional intensified cameras were added to the system, each equipped with a notch filter, and set up to observe approximately the same volume of sky as the CAMO tracking system, so that meteors are fully characterized in white light as well as the most important meteor spectral lines.

This unique dataset will be used to investigate differential ablation and spectral line strength as functions of meteoroid speed, size and origin. The results will place additional constraints on meteoroid composition for ablation modelling, and inform studies of luminous efficiency, which depends strongly on the bright lines present in meteor spectra. Figure 1 shows an example of a complete set of light curves produced from an event captured on September 13, 2015 from the CAMO tracking system and the Fe, Na, and Mg cameras.

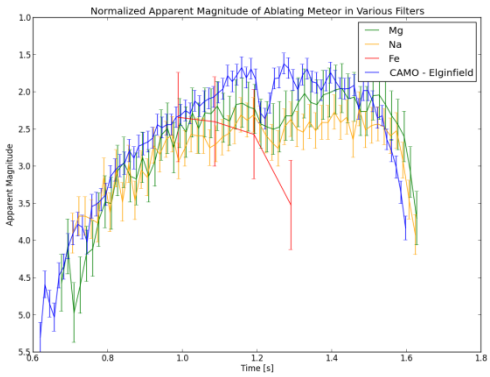

Figure 1: Comparison of the white light, Mg, Na, and Fe light curves captured from an event on Sept. 13, 2015. The three filtered light curves have been scaled to the white light curve observed by the CAMO tracking system.

References

Borovicka, J. (2007). Properties of meteoroids from different classes of parent bodies. Proceedings of IAU Symposium 236, 2, 107—120.