**PDC2015**
**Frascati, Roma, Italy**

- [ ] **Planetary Defense – Recent Progress & Plans**
- [ ] **NEO Discovery**
- [x] **NEO Characterization**
- [ ] **Mitigation Techniques & Missions**
- [ ] **Impact Effects that Inform Warning, Mitigation & Costs**
- [ ] **Consequence Management & Education**

**IAA-PDC-15-02-19**

# CONSTRAINING PHYSICAL PROPERTIES USING METEOR OBSERVATIONS

**R.J. Weryk[(1)], P.G. Brown[(2)], and R.L. Hawkes[(3)]**
[(1)]*Institute for Astronomy, University of Hawaii, 2680 Woodlawn Dr.,*
*Honolulu HI 96822, USA, +1-808-956-3903,*
[(2)]*Dept. of Physics and Astronomy, Univ. of Western Ontario, 1151 Richmond St.,*
*London ON N6A 3K7, Canada,*
[(3)]*Physics Department, Mount Allison University, 67 York St.,*
*Sackville NB E4L 1E6, Canada,*

***Keywords:*** *physical properties, parent bodies, meteors, modeling, observations*

## ABSTRACT

Meteoroids represent the most primitive material in the solar system. While most may pose no direct impact threat to the Earth, they provide a means to better understand those objects which do. Produced through the disruption of a much larger asteroid or comet, their study can help infer the chemical and physical properties (composition, structure, mass, porosity, density, thermal, etc.) [1] of these parent bodies. Unfortunately, their non-destructive collection is a complicated and expensive task, meaning they cannot easily be directly studied in a laboratory. However, they can interact with the atmosphere to create ionised trails of electrons and photons: meteors. These can be detected by ground-based instruments, allowing for the study of meteoroids that are much smaller (mm to cm sized) than those directly visible in space, without the expense of a sample return mission. The current physical picture of a meteoroid is best described as a dust-ball [3], which is a collection of solid grains held together by a volatile 'glue' (a necessary model construct, even though its nature is not known). As a meteoroid enters the atmosphere, it heats up due to collisions with atmospheric molecules. Upon reaching its melting point, it releases the grains which then independently undergo thermal ablation. The resulting emission of the entire body is a composite of all grains. This work highlights improvements [5] that can be applied to ablation models that currently do not reproduce the micro-physical details resolvable by modern instruments. We present sample meteor observations using the multi-station, multi-instrument radar system CMOR [2] and video system CAMO [6]. By numerically modeling these observations, physical properties can be linked to orbital distributions [4], ultimately leading to an improved understanding of the chemical and physical properties of the parent asteroids and comets.

[1] Campbell-Brown and Koschny (2004) A&A. 418. 751-758.
[2] Jones et al. (2005) P&SS, 53, 413-421.
[3] Hawkes and Jones (1975) MNRAS,173, 339-356.
[4] Kikwaya et al. (2011) A&A, 530, 113-129.
[5] Weryk and Brown (2013) P&SS, 81, 32-47.
[6] Weryk et al. (2013) Icarus, 225, 614-622.

****************************************