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Kinetic Damage From Meteorites

Peter Brown⁽¹⁾, **William Cooke**⁽²⁾, and **Mark Matney**⁽³⁾

⁽¹⁾ *Dept. of Physics and Astronomy, University of Western Ontario, London, Ontario, Canada N6A 3K7, +1 519 661 2111, pbrown@uwo.ca*

⁽²⁾ *NASA Meteoroid Environments Office/EV44, Marshall Space Flight Center AL 35812 USA, +1 256 544 9136, william.j.cooke@nasa.gov*

⁽³⁾ *NASA Orbital Debris Program Office, Johnson Space Center Houston TX 77058 USA, +1 281 483 2258, mark.matney-1@nasa.gov*

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ABSTRACT

A Near Earth object impacting into Earth's atmosphere may produce damaging effects at the surface due to airblast, thermal pulse, or kinetic impact in the form of meteorites. At large sizes (>many tens of meters), the damage is amplified by the hypersonic impact of these large projectiles moving with cosmic velocity, leaving explosively produced craters. However, much more common is simple "kinetic" damage caused by the impact of smaller meteorites moving at terminal speeds. As of this date a handful of instances are definitively known of people or structures being directly hit and/or damaged by the kinetic impact of meteorites. Meteorites known to have struck humans include the Sylacauga, Alabama fall (1954) and the Mbale meteorite fall (1992). Much more common is kinetic meteorite damage to cars, buildings, and even a post box (Claxton, Georgia - 1984). Historical accounts indicate that direct kinetic damage by meteorites may be more common than recent reports suggest (Yau et al., 1994). In this talk we will examine the contemporary meteorite flux and estimate the frequency of kinetic damage to various structures, as

well as how the meteorite flux might affect the rate of human casualties. This will update an earlier study by Halliday et al (1985), adding variations expected in meteorite flux with latitude (Le Feuvre and Wieczorek, 2008) and validating these model predictions of speed and entry angle with observations from the NASA and SOMN fireball networks. In particular, we explore the physical characteristics of bright meteors which may be used as a diagnostic for quantifying which fireballs produce meteorites and hence how early warning of such kinetic damage may be estimated in advance through observations and modelling.
