

Abstract for the Stanford Meteor Environments and Effects (SMEE) Workshop, held in Stanford, California, 14-16 July 2015.

A Bright Lunar Impact Flash Linked to the Virginid Meteor Complex

D. E. Moser⁽¹⁾, R. M. Suggs⁽²⁾, R. J. Suggs⁽²⁾

⁽¹⁾Jacobs, ESSSA Group, Marshall Space Flight Center, Meteoroid Environment Office, EV44 Natural Environments Branch, Huntsville, Alabama 35812 USA. E-mail: danielle.e.moser@nasa.gov

⁽²⁾NASA, Marshall Space Flight Center, Meteoroid Environment Office, EV44 Natural Environments Branch, Huntsville, Alabama 35812 USA.

Since early 2006, NASA's Marshall Space Flight Center (MSFC) has observed over 330 impact flashes on the Moon, produced by meteoroids striking the lunar surface. On 17 March 2013 at 03:50:54.312 UTC, the brightest flash of a 9-year routine observing campaign was observed by two 0.35 m telescopes at MSFC. The camera onboard the Lunar Reconnaissance Orbiter (LRO), a NASA spacecraft mapping the Moon from lunar orbit, discovered the fresh crater associated with this impact [1] approximately 3 km from the location predicted by a newly developed geolocation technique [2].

The meteoroid impactor responsible for this event may have been part of a stream of large particles encountered by the Earth/Moon associated with the Virginid Meteor Complex, as evidenced by a cluster of five fireballs seen in Earth's atmosphere on the same night by the NASA All Sky Fireball Network [3] and the Southern Ontario Meteor Network [4]. Crater size calculations based on assumptions derived from fireball measurements yielded an estimated crater diameter of 10-23 m rim-to-rim using the Holsapple [5] and Gault [6] models, a result consistent with the observed crater measured to be 18 m across. This is the first time a lunar impact flash has been associated with fireballs in Earth's atmosphere and an observed crater.

References

- [1] Robinson, M. S. et al. (2014) *45th LPSC*, 2164.
- [2] Moser, D. E. et al. "Lunar Impact Flash Locations From NASA's Lunar Impact Monitoring Program." *NASA TM*, submitted.
- [3] Cooke, W. J. and Moser, D. E. (2012) *WGN, Proceedings of IMC 2011*, 9-12.
- [4] Weryk, R. J. et al. (2008) *Earth Moon and Planets* 102, 241-246.
- [5] Holsapple, K. A. (1993) *Annu. Rev. Earth Planet. Sci.* 21, 333.
- [6] Gault, D. E. (1974) In: *A Primer in Lunar Geology*, 137.