Characteristics of the 2012 Geminids

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The parent of the Geminids, 3200 Phaethon, is a unique body in that it is classified as an asteroid, however is responsible for one of the most prolific meteor showers of the year and has shown comet-like behavior in its past (Jewitt & Li 2010). The Geminid meteor shower is also anomalous as its rates have been increasing since it was first detected. Understanding the composition and properties of meteoroids that belong to this meteor shower is an important area of study and of interest to both theoreticians and experimentalists. Using the light curve and decelerations of ten double-station Geminids as seen in the Meteoroid Environment Office's wide-field meteor cameras, densities were able to be approximated using a model of meteoroid ablation by Campbell-Brown et al (2013) which employs thermal disruption to model the release of grains during ablation. Bulk densities of Geminids give unique insight into the composition of Phaethon that would only be derived by going to the asteroid itself. The bulk densities of these ten Geminids were found to be between 2.6 and 3.0 g/cm^3, supporting results from Babadzhanov (2009) and Borovicka et al (2010) which prove Phaethon has a much lower porosity than most other meteor shower parents.

NASA's Meteoroid Environment Office established these two wide-field meteor cameras to observe meteors in the milligram-mass-range. Each camera consists of a 17 mm focal length Schneider lens (f/0.95) on a Watec 902U2 Ultimate CCD video camera, producing a 21.7x15.5 degree field-of-view. This configuration sees meteors down to a magnitude of +6. Data from these cameras are currently being used to calculate daily automated meteor fluxes. On the first night of operation, December 13-14, 2012, 18 double-station and 53 unique single-station Geminids were detected. The Geminid flux results from this system will be presented as well as ZHR's over the peak of the Geminids. The average flux density over the night was 0.058, 0.052, and 0.062 meteors/km^2/hour down to a limiting magnitude of +6.5, for the double-station results and each single-station's results. This equates to ZHR's of 113, 102, and 122 respectively. Included in the flux algorithm is a process to find the collecting area per height and a method to find the limiting meteor magnitude per 10 minute time period.

Babadzhanov, P.B., and Kokhirova, G.I., 2009. Densities and porosities of meteoroids. *Astronomy and Astrophysics.* 495. 353-358.
Borovicka, J., Koten, P., Spurny, P., Capek, D., Shrbeny, L., and Stork, R. 2010. Material properties of transition objects 3200 Phaethon and 2003 EH1. *Proc. IAU Symp. 263.* vol 5, p 218
Campbell-Brown, M.D., Borovicka, J., Brown, P.G., and Stokan, E. 2013. High-resolution modeling of meteoroid ablation*. Astronomy and Astrophysics*. 557. A41. 13 pp.
Jewitt, David and Li, Jing. 2010 Activity in Geminid Parent (3200) Phaethon). *The Astronomical Journal*. 140. 1519-1527.