A statistical analysis of automated-search meteor results from radar observations at Arecibo, non-decelerating events and their implication in meteor mass flux estimates

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While much progress has been made in understanding the radio science and meteor physics implications of the meteor "head-echo" observed with high power, large aperture (HPLA) radars, one remaining issue involves mass flux estimates of the sporadic meteor population. We investigate observed meteoroid deceleration values through three observation periods from the 430 MHz Arecibo radar. The meteors observed were detected and analyzed using the automated FFT periodic micrometeor searching algorithm reported by Mathews et al (JASTP **65**, 1139-1149 (2003)). Using the non-linear fitting routines developed by Briczinski et al (TGARS **44**, 3490-3496 (2006)) we are able to obtain micrometeoroid Doppler velocity measurements with errors on the order of 0.1 kilometers per second. These Doppler measurements allow us to obtain linear deceleration measurements with extremely low error estimates. We divide our results into decelerating and non-decelerating events. Mass distributions for the decelerating events are obtained from momentum considerations. While the same analysis can not be applied to the non-decelerating population, we discuss the mass flux implications for the events whose decelerations can not be determined. Previous mass distributions have assumed a constant meteoroid mass density of 3 grams per cubic centimeter. Using statistical interpretations of the parameters obtained from the AO datasets, the meteoroid mass density has been revised to a constant mass density of 1 gram per cubic centimeter. This update of meteoroid mass densities represents a significant revision in mass estimates. We discuss this result in the broader context of meteoroid mass flux estimates.