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PII: S0032-0633(16)30268-9
DOI: http://dx.doi.org/10.1016/j.pss.2017.02.002
Reference: PSS4282

To appear in: *Planetary and Space Science*

Received date: 13 September 2016
Revised date: 2 February 2017
Accepted date: 6 February 2017

Cite this article as: Althea V. Moorhead, Peter G. Brown, Margaret D. Campbell-Brown, Denis Heynen and William J. Cooke, Fully correcting the meteor speed distribution for radar observing biases, *Planetary and Space Science* http://dx.doi.org/10.1016/j.pss.2017.02.002

Fully correcting the meteor speed distribution for radar observing biases

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Abstract

Meteor radars such as the Canadian Meteor Orbit Radar (CMOR) have the ability to detect millions of meteors, making it possible to study the meteoroid environment in great detail. However, meteor radars also suffer from a number of detection biases; these biases must be fully corrected for in order to derive an accurate description of the meteoroid population. We present a bias correction method for patrol radars that accounts for the full form of ionization efficiency and mass distribution. This is an improvement over previous methods such as that of Taylor (1995), which requires power-law distributions for ionization efficiency and a single mass index. We apply this method to the meteor speed distribution observed by CMOR and find a significant enhancement of slow meteors compared to earlier treatments. However, when the data set is severely restricted to include only meteors with very small uncertainties in speed, the fraction of slow meteors is substantially reduced, indicating that speed uncertainties must be carefully handled.

Keywords: Meteors

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