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Radiant measurement accuracy of micrometeors detected by the Arecibo 430 MHz Dual-Beam Radar

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Abstract. Precise knowledge of the angle between the meteor vector velocity and the radar beam axis is one of the largest source of errors in the Arecibo Observatory (AO) micrometeor observations. In this paper we study ~250 high signal-to-noise ratio (SNR) meteor head-echoes obtained using the dual-beam 430 MHz AO Radar in Puerto Rico, in order to reveal the distribution of this angle. All of these meteors have been detected first by the radar first side lobe, then by the main beam and finally seen in the side lobe again. Using geometrical arguments to calculate the meteor velocity in the plane perpendicular to the beam axis, we find that most of the meteors are travelling within ~15° with respect to the beam axis, in excellent agreement with previous estimates. These results suggest that meteoroids entering the atmosphere at greater angles may deposit their meteoric material at higher altitudes explaining at some level the missing mass inconsistency raised by the comparison of meteor fluxes derived from satellite and traditional meteor radar observations. They also may be the source of the observed high altitude ions and metallic layers observed by radars and lidars respectively.

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