OPTICAL TRAIL WIDTHS OF METEORS RECORDED BY THE CANADIAN AUTOMATED METEOR OBSERVATORY. E. Stokan[1], M. D. Campbell-Brown[1], P. G. Brown[1], R. J. Weryk[1], R. L. Hawkes[1,2], [1]Department of Physics and Astronomy, University of Western Ontario, 1151 Richmond Street, London, Ontario, Canada, N6A 3K7, estokan@uwo.ca, [2]Physics Department, Mount Allison University, 67 York Street, Sackville, New Brunswick, Canada, E4L 1E6.

Introduction: The trail width of a meteor may indicate the gross structure of a meteoroid and give insight into the ablation process. Measuring meteor trail widths is also critical in removing bias due to destructive interference in specular radar observations, allowing for more accurate meteoroid mass and flux estimates. [1] The Canadian Automated Meteor Observatory (CAMO), set up at the University of Western Ontario, provides a large volume of high-resolution, two-station optical observations of meteors. We present initial observations and analysis of the optical meteor trail widths recorded using CAMO.

Instruments: CAMO is a two-station, automated, image intensified video optical system for observing meteors as faint as +5 magnitude, with spectral response peaking in the red. [2] The two stations, separated by 50 km, are each equipped with a wide-field camera, and a narrow-field tracking camera with resolutions of 145” per pixel and 6.6” per pixel, respectively. The wide-field cameras are used to determine the trajectory, velocity, and light curve of the meteoroid. The narrow-field cameras are used to study the morphology and trail width of each meteor in detail. Each camera operates at 110 frames per second with 12-bit image depth and automatically captures meteor events each clear night.

Discussion: This study uses thirty meteors observed over three nights. Measured velocities varied from 18 to 72 km/s; absolute magnitudes varied between +4.1 and –1.7, and meteor masses were of the order 10^{-2} g. Meteor trail widths up to 100 m were observed at heights above 110 km. To ensure observed meteor widths were not due to image bloom, the width of a star at equivalent brightness was subtracted from the meteor width. The widths of the meteor trails varied with the functional form of the collisional mean free path of the undisturbed atmosphere, λ_{fp}, but were nearly two orders of magnitude larger than λ_{fp} in most cases. This may provide support for the idea that the brightness from the observed meteors comes from radiative processes; that is, high energy photons emitted by the meteoroid and surrounding area are absorbed by ambient atmospheric particles and reemitted, as introduced in previous work by Stenbaek-Nielsen and Jenniskens, [3] and Popova et al. [4]

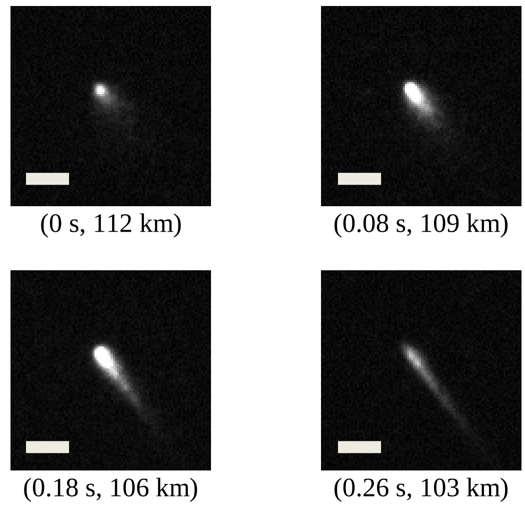

Figure 1 The evolution of a meteor as seen by a CAMO narrow-field camera; scale bars indicate 100 m for each frame; v = 66 km/s, $M_{peak,abs} = -0.15 \pm 0.16$

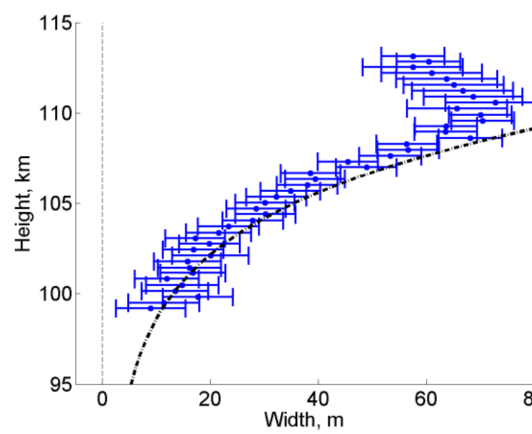

Figure 2 The maximum measured width for each frame of the meteor in Fig. 1 as a function of height; $80 \cdot \lambda_{fp}$ is the dash dotted line, included for reference

References: [1] Jones, J., Campbell-Brown, M. (2005) *Mon. Not. R. Astron. Soc.*, 359, 1131 – 1136. [2] Musci, R., et al. (2012) *ApJ*, 745, 161. [3] Stenbaek-Nielson, H. C. and Jenniskens, P. (2004) *Advances in Space Research*, 33, 1459–1465. [4] Popova, O. P., et al. (2003) *The Institute of Space and Astronautical Science Report SP No. 15*, 199–206.