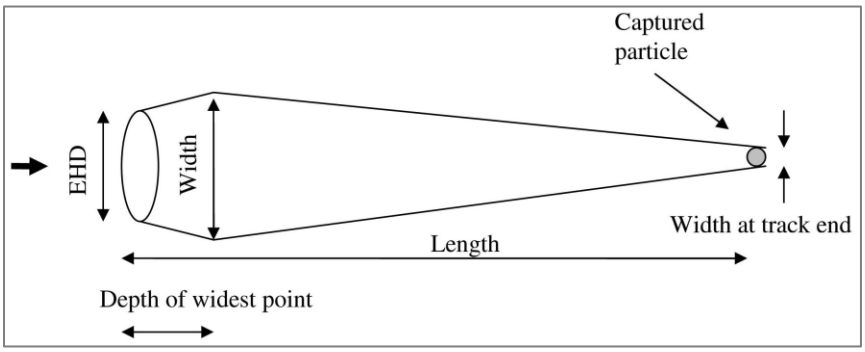
DATA DICTIONARY



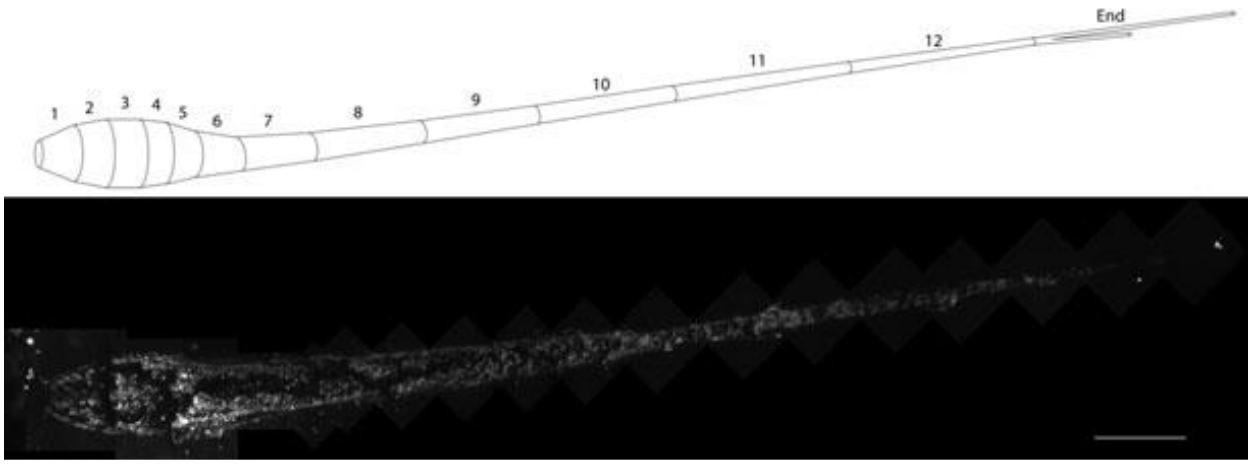
"Schematic of typical carrot-shaped track observed in laboratory impacts of glass beads in aerogel. Key dimensions are labeled. EHD = entrance hole diameter. Note that the width at track end is not always the same as the mean diameter of the captured particle. Impact direction was from left." Excerpted from: Burchell M. J. et al. (2008) Characteristics of cometary dust tracks in Stardust aerogel and laboratory calibrations. *Meteoritics & Planetary Science, 43*(1)*,* 23-40.

The following are key terms and information excerpted from the two Greenberg & Ebel papers (MaPS 2012 and Geosphere 2010).

Parameters measured: track length (μm), number of terminal particles, volume (μm^3), entrance hole area (μm^2), entrance hole eccentricity, track maximum area (μm^2), track maximum eccentricity, total axial drift (μm), impact angle (degrees), total Fe mass in track (fg)

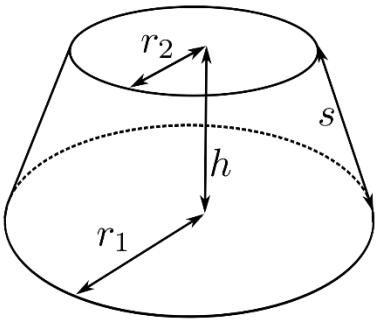
- Penetration Depth: distance from the entry hole
- Skewness: the deviation of the centroid of a single cross-sectional slice normal to a straight line drawn from the center of the entry hole to the center of the terminal particle. Used to quantify nonlinear motion of the impactor as a function of time and position.
- Eccentricity: measure of how elliptical (noncircular) a circle is
- For each slice orthogonal to the track axis, a cross-sectional area is calculated, and a Gaussian ellipse is fitted (Gander W., Golub G. H., & Strebel R. (1994) Least squares fitting of circles and ellipses. *Bit 34*(4)*,* 558–578.), from which major and minor axes, eccentricity, and a rotational orientation can be derived.
- Local minimum and maximum of cross-sectional area at different depths are adopted as the entrance hole diameter and the maximum track width and can be used to calculate track volume, and cumulative volume. (See also Frustum method below.)
- Axial deviation: deviation of the centroid of any given slice from a normal (true 0°) impact. (A track with an impact angle of 0° will have a total axial drift of zero.) This parameter can be used to quantify track motion in three dimensions and any fine scale angular shifts. The total axial deflection is used to calculate the impact angle parameter. These data are presented as a function of Z, the penetration of impactor depth, or distance from the entrance hole. (Note: the location of the entrance hole may differ from the actual top surface of the aerogel.)
- The entrance area should be a focus of primary concern, for it is the initial structure created by the pristine impactor. Entrance hole area and shape, measured in 3D, provide a first, best indicator of original impactor size and shape.

Frustum method of volume calculation



(Top) Cartoon of frustum divisions used to calculated morphology parameters on Track 152.
(Bottom) LSCM reflectance intensity map, 8-bit grayscale image in line with frustum cartoon.

$$V = \frac{\pi h}{3}({r_1}^2 + r_1 r_2 + {r_2}^2)$$



V: volume
h: height or perpendicular distance between the planes of the two bases
r_1 & ***r_2***: radii of the two bases
s: "slant height" or length of the surface between the two bases (not required for volume calculation)