

# Forbidden mass ranges for shower meteoroids

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## ABSTRACT

Burns et al. (1979) use the parameter  $\beta$  to describe the ratio of radiation pressure to gravity for a particle in the Solar System. The central potential that these particles experience is effectively reduced by a factor of  $(1 - \beta)$ , which in turn lowers the escape velocity. Burns et al. (1979) derived a simple expression for the value of  $\beta$  at which particles ejected from a comet follow parabolic orbits and thus leave the Solar System; we expand on this to derive an expression for critical  $\beta$  values that takes ejection velocity into account, assuming geometric optics. We use our expression to compute the critical  $\beta$  value and corresponding mass for cometary ejecta leading, trailing, and following the parent comet's nucleus for 10 major meteor showers. Finally, we numerically solve for critical  $\beta$  values in the case of non-geometric optics. These values determine the mass regimes within which meteoroids are ejected from the Solar System and therefore cannot contribute to meteor showers.