Analysis of luminous efficiencies of lunar impact flashes from two methods and consequences for the influx of large meteoroids on Earth

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Introduction

An In several past articles we have determined the luminous efficiency of different meteor showers with very different impact speeds, ranging from 30 km/s to 72 km/s. From the five different meteor showers that we have studied thus far we conclude that in all cases the luminous efficiency is around 2 10^{-3} and there is basically no dependence with impact speed. All these determinations of luminous efficiencies are based on the same method, but one can also put constraints on the luminous efficiency by a different approach. By comparing the size of the crater formed after the impact on September 11th 2013 [1] with theoretical calculations, one can put constraints on the kinetic energy of the impactor, and because we measured the emitted energy, the luminous efficiency can also be constrained. Even though the method is also dependent on various assumptions the result for the luminous efficiency is even smaller than what the analysis of lunar impact meteor showers gives. One of the important consequences is that the influx of meteoroids on Earth is even larger than what was derived before based on the rates of impact flashes on the Moon.

References

[1] Madiedo J.M., Ortiz J.L., Morales N., Cabrera-Caño, J., MNRAS, Vol. 439, pp. 2364-2369, 2014.