# Thermophysics of Lunar Impact Flashes

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During an impact event a tiny fraction of the impact energy is transformed to light. This phenomenon has been monitored on the lunar surface for 2 decades. By studying these impact flashes we can retrieve information for the impacting object. The lunar surface offers an excellent opportunity of capturing and studying impact because it provides a large, atmosphere-less collecting area constantly hit by meteoroid projectiles (dm-size). Our work advances from the previous studies as we use synchronous telescopic observations from the NELIOTA project obtained in two wavelengths to calculate for the first time the temperatures of the lunar impact flashes. These correspond to the temperature of the impact ejecta plume and in general agree with or even exceed the estimated temperatures of molten lunar regolith ejected by impact. This way we obtain direct measurement of the radiating area allowing a better constrain of the impactor's mass compared to previous studies that made assumption about temperatures.

We model our data under the assumption that they radiate as a black body and derive their luminous energy. Since several events are detected in more than 2 frames we are able to calculate the cooling rate and find diversities among the events.

In order to get better insight into the generation of the impact light we have launched an experimental campaign, performing hypervelocity impact experiments. We fire stainless steel projectiles onto targets made of different materials, such as lunar and asteroid simulant (in solid and regolith form), sandstones and ice/rock mixtures. We have developed a light-recording setup which consists of photodiodes of different wavelengths capturing the total phenomenon with good time resolution. Our goal is: to understand how different is an impact flash from the black body assumption; to advance our understanding of the mechanisms of shock synthesis, as well as shock modification and destruction of chemical compounds and to create a benchmark of data in order to give feedback to the lunar observations.