

Observation of Impact flash at the wavelength of 10 μm using Thermal infrared camera

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Since Apollo's mission, lunar inner structure models at the depth of $<\sim 1000$ km have been proposed based on the observation of seismic signals caused by meteorite impacts. Accuracy of the model depends on the accuracy of location and epoch of the seismic source identified by the observation. Ground based observations of impact flash with visible wavelength recently become valuable to identify its location and epoch precisely. However, the visible observation cannot detect the direct flash except for the event occurring at the night side. Meanwhile, thermal infrared observation, which detects thermal infrared emission from the target, can observe the impact not only at the nightside but also at the dayside, by which coverage can be expanded. The thermal observation also would detect residual hot spot caused by the impact. When the temperature variation is derived from the continuous observation of the residual hot spot, thermal inertia, from which an energy budget correlated with size of the crater, would be obtained. Epoch of the impact may be estimated from the thermal relaxation profile even if the impact could not be directly detected. We propose a thermal infrared camera to be mounted to a future explorer to detect lunar impact flash. The uncooled microbolometer array (UMBA) detecting the thermal infrared wavelengths at 10 μm (8 -14 μm) is a potential thermal detector, which enable the lightweight and small camera without a cryogenic system. The UMBA for the ground telescope with high spatial resolution is applied to a pilot study, which will be carried out next year at the observatory located at the dry region to avoid the thermal infrared emission being disturbed by the water vapor. A laboratory experiment for the artificial impact has been carried out in the vacuum environment, and the temperature variation at the crater has been obtained from the continuous measurement. Thermal inertia preliminary obtained from the experiment contributes to the insight discussion of the ground observation.