Temperature of lunar flashes measured for the first time

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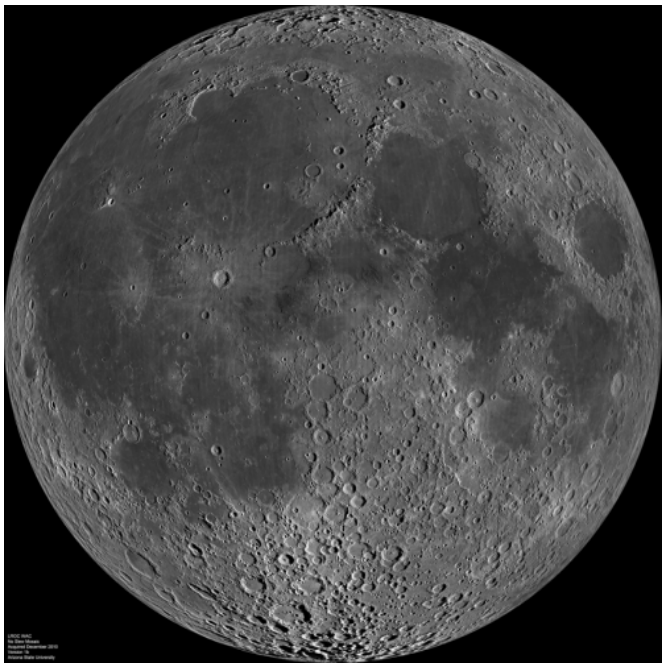

This is a composite image of the lunar nearside taken by the Lunar Reconnaissance Orbiter in June 2009, note the presence of dark areas of maria on this side of the moon. Credit: NASA

When small pieces of rock hit the moon's surface at incredibly high speeds, they produce flashes of light detectable from Earth. Now, astronomers have measured their temperature for the first time, using a telescope funded by the European Space Agency (ESA). The new observations are helping scientists find out more about these flashes and the near-Earth space objects that cause them.

During the first- and last-quarter moon phases, as most people are busy admiring the sunlit part of the moon, astronomers use telescopes to look at the dark fraction, hoping to see tiny flashes of light. These lunar impact flashes are due to meteoroids and small asteroids that hit the lunar surface. While on Earth these rocks would burn in the atmosphere, appearing as shooting stars, on the moon they sprint through the extremely thin layer of gases around it. Without a thick atmosphere to slow them down, they strike the surface at stunning speeds of around 25 kilometers per second.

By observing these lunar flashes, astronomers can learn about near-Earth small asteroids and how they can affect satellites. Until earlier this year, scientists used only small telescopes, of up to 40 cm in diameter, to monitor lunar impacts. But the new ESA-funded NELIOTA (Near-Earth object Lunar Impacts and Optical TrAnsients) project, running since March at the Kryoneri Observatory in Greece, uses a 1.2-meter telescope to do the job. With the larger aperture and an advanced camera system, NELIOTA can detect fainter flashes than other lunar-monitoring telescopes. It has recorded nearly 30 events since it started operating, and is also helping astronomers find out more about the flashes.

"The telescope has two eyes: one observes in red light and the other in the infrared. By combining the data from the two cameras we can measure the temperature of the lunar flashes, which we have now done for the first time," says Dr. Chrysa Avdellidou, an ESA Research Fellow who is reporting these results this week at the 49th annual meeting of the American Astronomical Society (AAS) Division for Planetary Sciences (DPS) in Provo, Utah. "By having the temperature, we can better estimate the density of the impacting body, which gives us clues about where the material comes from. Does it originate from asteroids or comets? Since asteroids and comets have different composition and density, the measurements we are doing now will help us answer this question."

Another mystery that scientists are hoping to unravel with NELIOTA is the physical mechanism that produces the lunar flashes. "We hope the new data, which are publicly available to the entire scientific community, will help improve our

knowledge of what happens when an asteroidal body hits the moon at such high speed and how its energy is distributed," says Avdellidou.

Impacts are among the most important processes in our solar system, but it is hard to study the type of impacts that cause lunar flashes in the lab because the impact speeds are too high to replicate. With NELIOTA, astronomers can use the moon as a large-scale high-velocity impact laboratory to learn about lunar flashes and near-Earth objects.

Provided by European Space Agency