First Lunar Flash Detected from UAE by Sharjah Lunar Impact Observatory (SLIO) confirmed by far telescope.

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Introduction: About 10^6 kg of interplanetary micrometeoroids of cometary and asteroidal origin impact the Moon each year [1]. Since 1993, collisions between solar system bodies have been studied in detail. These include observational, experimental, and theoretical studies and involve natural or man-made collisions between a tiny object (meteoroid, comet, or spacecraft) [2]. For that a new observation unite establised in 2020 to observe lunar impact flashes at the Sharjah Academy for Astronomy, Space Sciences Technology (SAASST) called Sharjah Lunar Impact Observatory (SLIO) as a first lunar impact observatory in MENA region. The coordinates of the Observatory are 25°17' 02.1" N 55°27'48.4"E, with an altitude of 80 m above the sea level. This unit using a 14-inch reflector telescope figure1 . The telescope is attached with analog WATEC-902H CCD camera because of its super-high sensitivity near the IR and the red spectrum. Moreover, we using an f/3.3 and f/6.3 focal reducers to enhance the image for increasing the field of view. This new unit at SAASST give us a good understanding of the dangeures environment in space and add data for the reserchers around the world about these kind of flases detection. Analysis of the flash luminosity can determine the mass of the impacting rock, and hence a size-distribution can be estimated.

Figure 1: Sharjah Lunar Impact Observatory(SLIO)

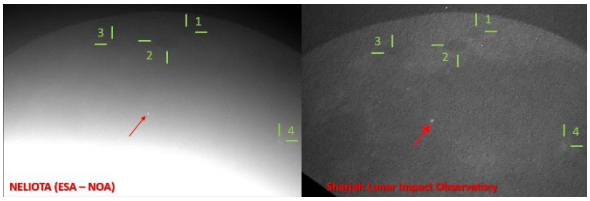

Figure 2:Left: The lunar image showing the 100th flash (red arrow) detected by the NELIOTA project on 1/3/2020 at 16:54:24.09 UT. Right: Partial (cropped, rotated and rescaled) lunar image from the Sharjah Lunar Impact Observatory showing the same flash (red arrow)

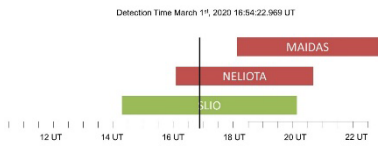

Figure 3: time observation overlapping between UAE(SLIO), Greece (NELIOTA) and Spain (MAIDAS).

First detection on March 01, 2020: Just a few days from starting the SLIO observations, the first lunar flash impact was detected at 16:54:22.969 UT on March 01, 2020. The database of NELIOTA was used to confirm our detection. The time difference between the two observations in the UAE and Greece was 1121 ms. This is due to the different instruments used to time the same lunar flash impact with NELIOTA using a very accurate GPS timing while SLIO using the computer timing stamping directly by Sharp cup recording video software. Figure 2 shows the lunar impact as recorded by NELIOTA and SLIO. To confirm a candidate lunar impact flash, two steps are performed to confirm the impact . The first one is to detect the same flash by two different telescopes at the same time. The second condition is to check if this flash produced a long duration event taken in more than one frame. These two steps will give more confidence that the lunar flash is real [3]. In our case, one telescope was used, and the impact was detected in just one frame. This posed us with a challenge to prove our observation of a lunar flash. Luckily, the NELIOTA (NEO Lunar Impacts ad Optical TrAnsients) team in Greece was observing the Moon at the same time for the same purpose [4].

Overlapping observation Time: With a two hours difference between SLIO in UAE and NELIOTA in Greece, a lunar flash impact was detected in the UAE on March 01, 2020, at 20:54:22.969 UAE local time with 1.53 airmass. In Greece, it was 18:54:24:090 with an airmass 1.12. Figure 3 shows the cross observation time between SLIO and NELIOTA on March 01, 2020 additional to the MIDAS program in spain .

References :

[1] Bouley, S. (2012). LUNAR FLASHES OBSERVATION: HOW TO CONSTRAIN THE IMPACT FLUX ON THE MOON? . *Asteroids, Comets, Meteors (ACM)*, (p. 6040). Niigata, Japan.[2] Moser1, D. E. (2011). Luminous Efficiency of Hypervelocity Meteoroid Impacts on the Moon Derived. *Meteoroids: The Smallest Solar System Bodies*, (p. 143).[3] Cook, A. C. (2017). ALFI – Automatic Lunar Flash Investigation. *European Planetary Science Congress*.[4] Xilouris, E. M. (2018). NELIOTA: The wide-field, high-cadence, lunar monitoring system at the prime focus of the Kryoneri telescope. *Astronomy & Astrophysics*.