



The probables Impact Flashes recorded by  
Sezione Nazionale di Ricerca Luna,  
Unione Astrofili Italiani, Italy,  
on 2019 and 2020 years

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# Dates of probables impacts events on the Moon

- Six probables impact flashes has been observed and recorded by Bruno Cantarella and Luigi Zanatta, members of Sezione Nazionale di Ricerca Luna UAI, Italy, in the 2019 and 2020 years, from observative site of Melazzo, Alessandria, Italy, at the terrestrials coordinates of  $44^{\circ}39'25''$  Latitude North, and  $8^{\circ}25'52''$  Longitude East, and more precisely:
- Two flashes on 2019 January 09
- One flash on 2019 August 03
- One flash on 2020 May 26
- Two flashes on 2020 July 24

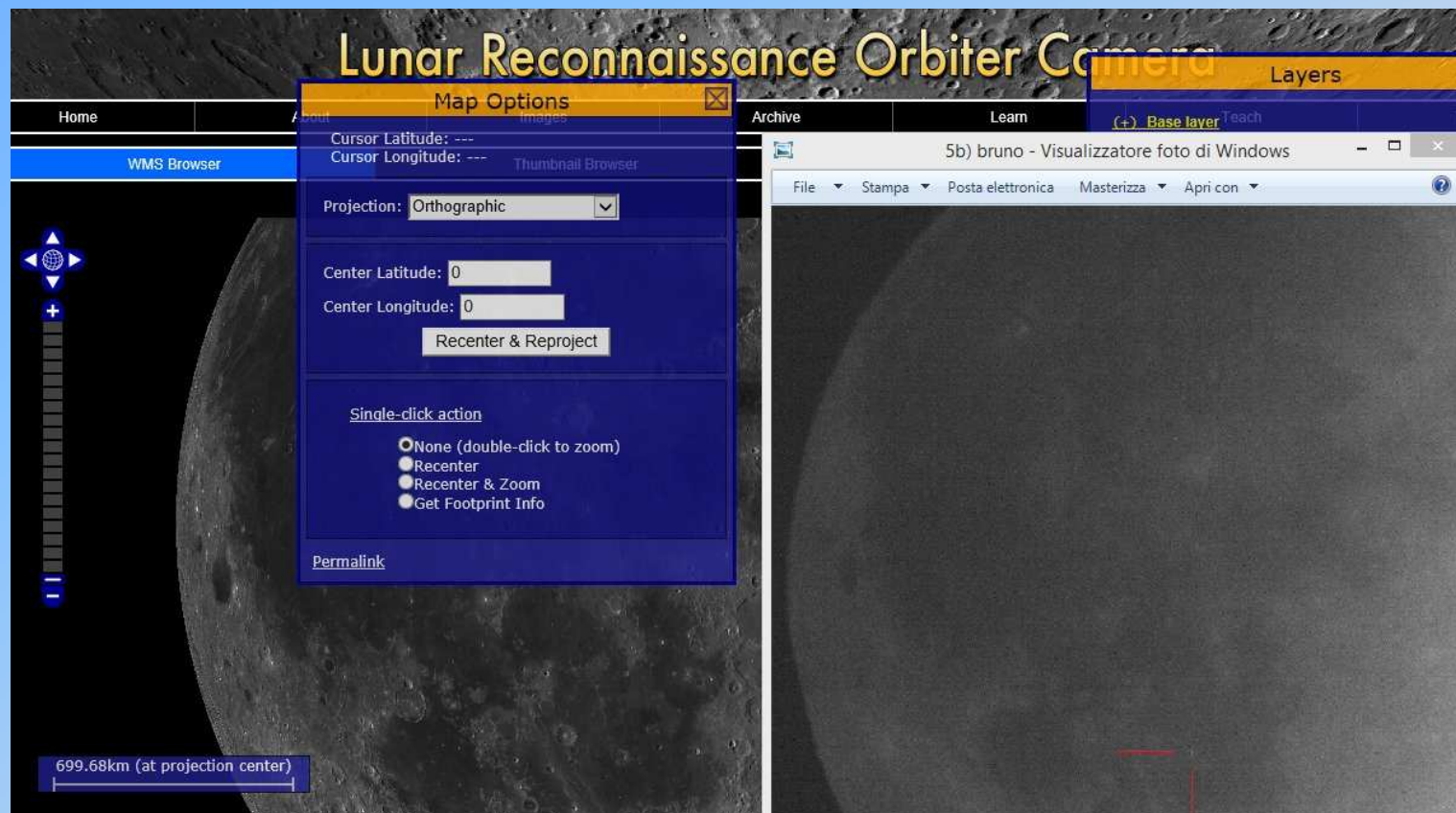
Note: all the flashes that are in the images in this work, are show at the luminosity peak.



# Estimate of duration time of flashes and their selenographic position

- For every flash recorded, Antonio Mercatali has made an estimate of the duration time using the VirtualDub program, and for some flashes the analysis of videoimagery with LunarScan Program, and then for all flashes the selenographic position using the LROC WMS Image Map, the image below show an example of method of work, this is the link of program:

<https://wms.lroc.asu.edu/lroc>







# The instrumental setup of Bruno Cantarella



The primary telescope is Newton 200/1000 with focal reducer at  $f/2.9$  with ASI 120MM astronomical videocamera, and the secondary is Newton 100/400 at  $f/4$  with second identical astronomical videocamera ASI120 MM, not filter has been used

# The instrumental setup of Luigi Zanatta

The telescope is  
Newton 200/1000  
with focal reducer at  
f/2.9 and  
astronomical  
videocamera ASI  
120MM,  
not filter has been  
used





The first flash on 2019 January 9 has been recorded at the time 17:30:43 UT by Bruno Cantarella (image 1 on the left), and Luigi Zanatta (image 2 on the right). The time of flash is indicate from timestamp in image 2, and the flash is indicate in the images with two red circle.



Image taken with Newton telescope 200/1000 at f/2.9 with ASI 120MM, image resolution 640x480 binning 2x2 at 25 fps



Image taken with Newton telescope 100/400 at f/4 with ASI 120MM, 512x480 binning 2x2 at 30 fps

- This first impact flash has had a **duration of ~ 0.8 tenths of second**;
- The selenographic position has been estimate at the selenographic coordinates of **latitude ~30.3° North, and longitude ~20.8° West** .



As we can to see the impact flash has the same selenographic position  
**in both the images!**



The second flash on 2019 January 9 has been recorded at the time 17:30:55 UT only by Bruno Cantarella and it is indicate in the image from two red lines

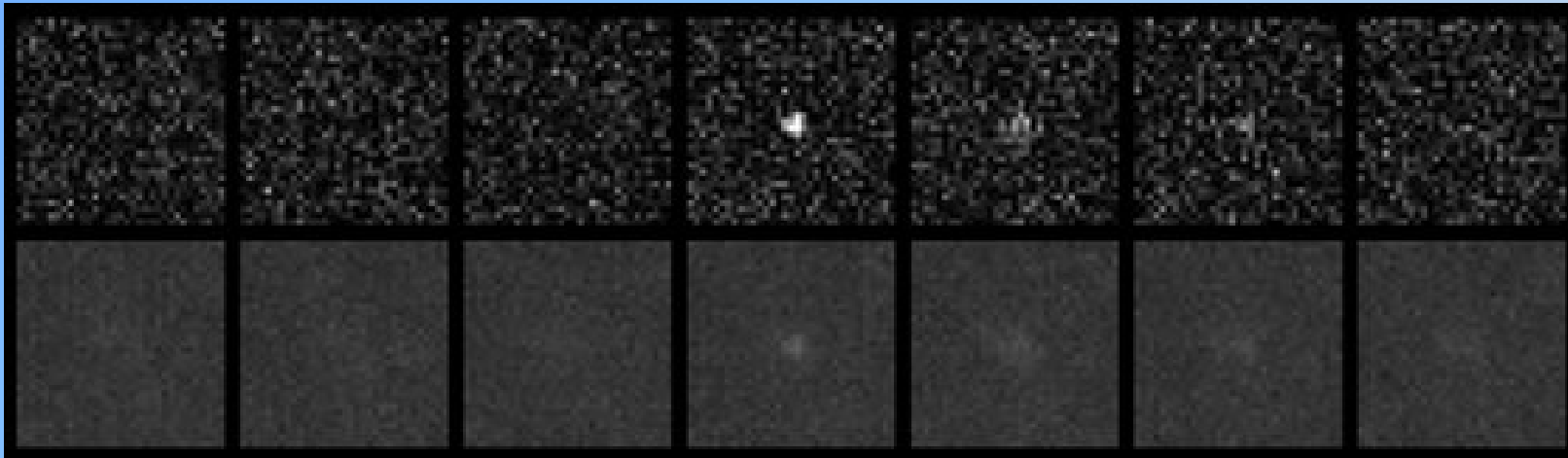


Image taken with Newton telescope 200/1000 at f/2.9 with ASI 120MM, with image resolution of 640x480 binning 2x2 at 25 fps





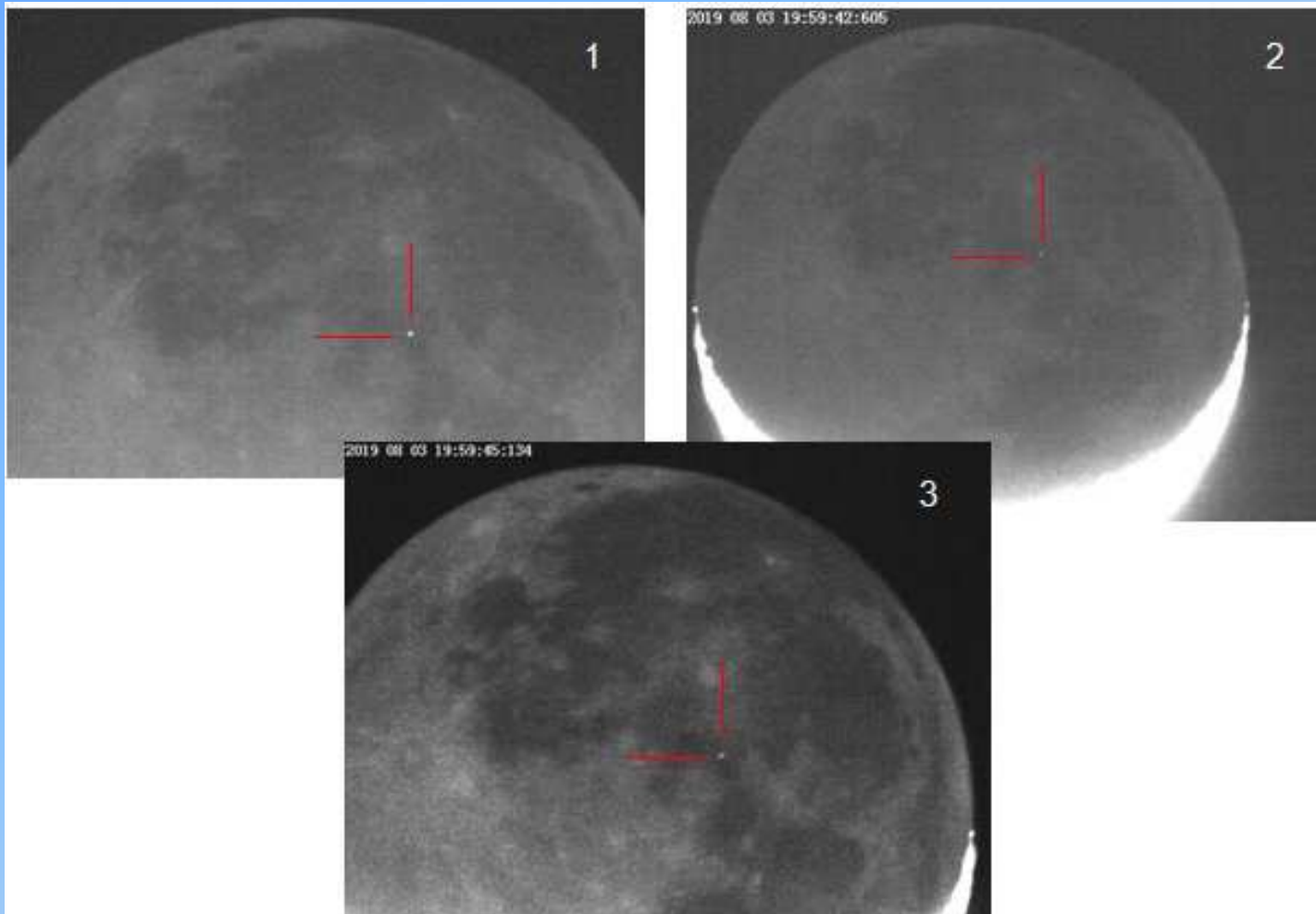
- This second impact flash has had a **duration of ~1.2 tenths of second**;
- The selenographic position has been estimate at the selenographic coordinates of **latitude ~28.3° North, and longitude ~34.7° West** .



In the upon image is show the sequence of flash obtained with the LunarScan program of Peter Gural, and as we can to see, the flash is good visible in three consecutive frames, and maybe also in the fourth frame.



The third flash on 2019 August 3 has been recorded at the time 19:59:42 UT by Bruno Cantarella with the Newton telescope 200/1000 at f/2.9 with ASI 120MM (image 1), and with second Newton 100/400 at f/4 with ASI 120MM (image 2). The same flash has been recorded also by Luigi Zanatta with Newton 200/1000 at f/2.9 with ASI 120MM (image 3), and therefore **with three telescope simultaneously!**



The binning resolution and number of fps setup are the same of previous flashes.  
The time of flash is indicate from timestamp in image 2.

- This third impact flash has had a **duration of ~1.2 tenths of second**;
- The selenographic position has been estimate at the selenographic coordinates of **latitude ~11.0°North, and longitude ~6.0°West** .



In the upon image is show the sequence of flash obtained always with the LunarScan program on the images of Bruno Cantarella taken with Newton 200/1000, and the flash is good visible in two consecutive frames.



The fourth flash on 2020 May 26 has been recorded at the time 20:07:54 UT by Bruno Cantarella (image 1) and Luigi Zanatta (image 2).

The time of flash is indicate from timestamp in image 2.

In this case of this flash, as specified in the note below the images **the two Newton telescopes and their setup was perfectly identical.**

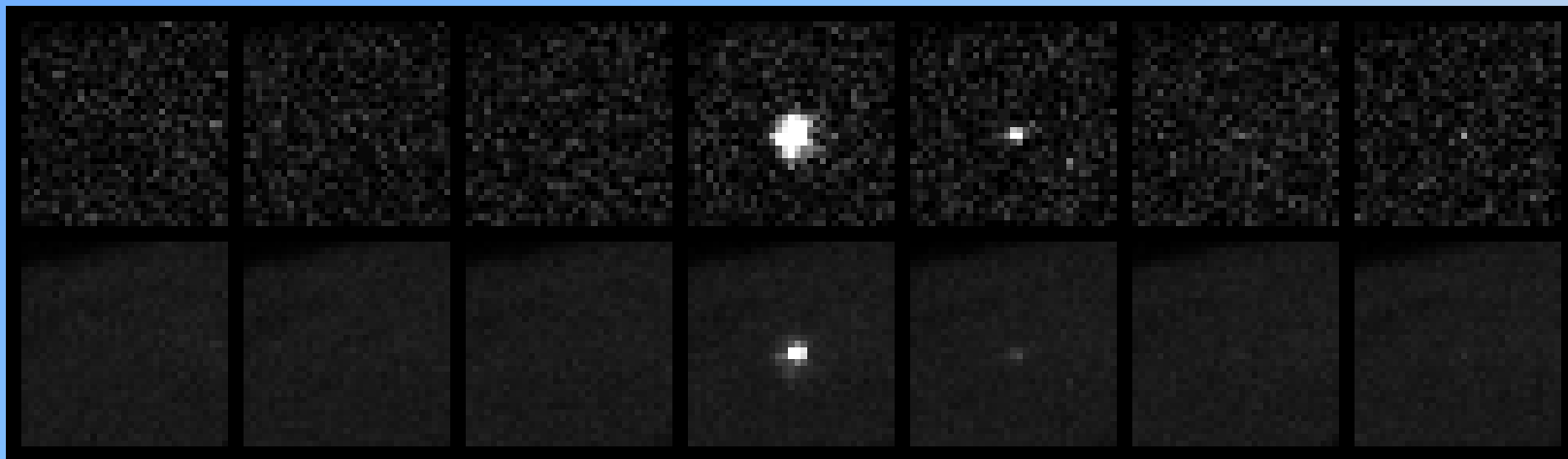


Image taken with Newton telescope 200/1000 at f/2.9 with ASI 120MM, image resolution 640x480 binning 2x2 at 25 fps

Image taken with Newton telescope 200/1000 at f/2.9 with ASI 120MM, always 640x480 binning 2x2 at 25 fps



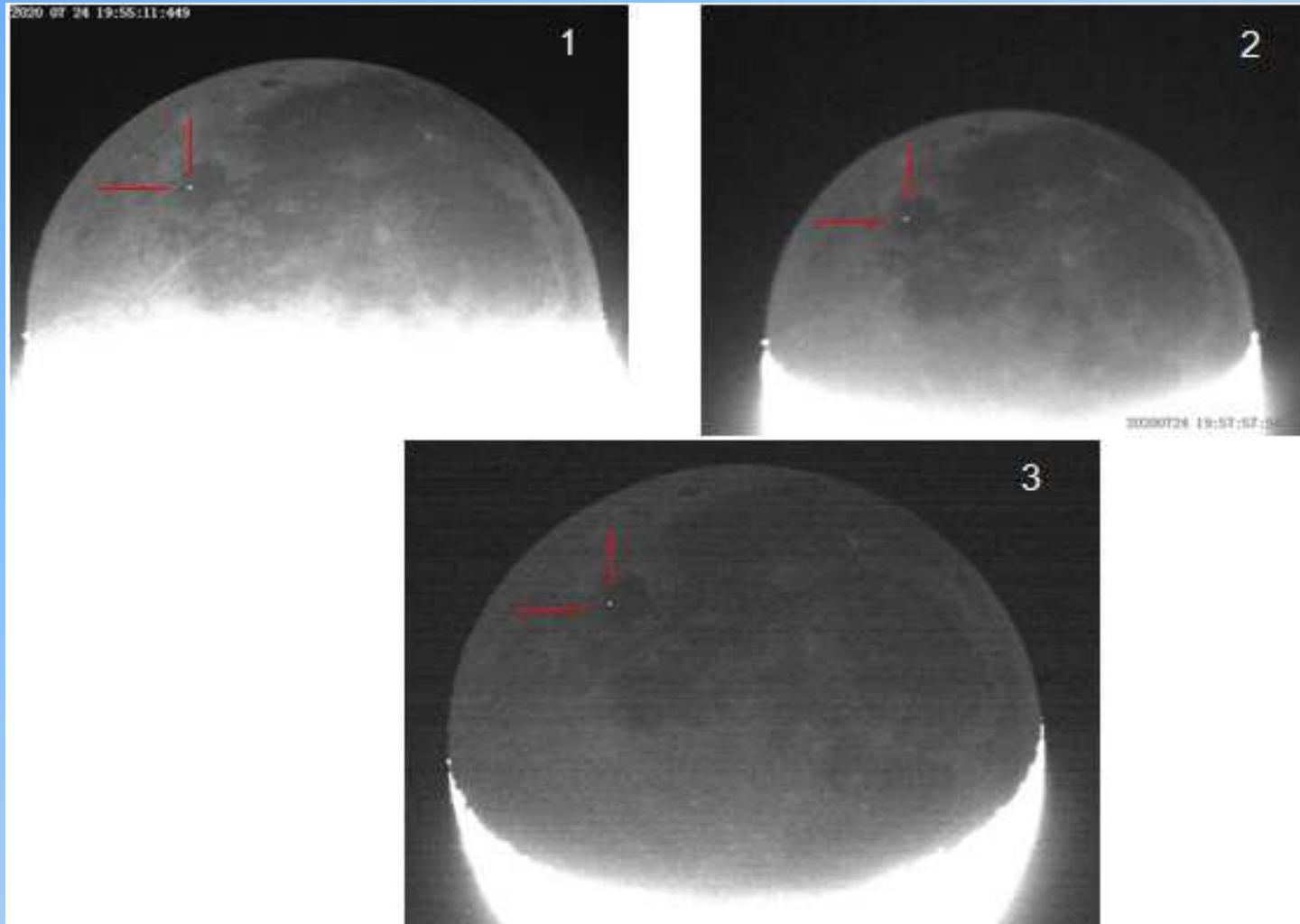
- This fourth impact flash has had a **duration of ~1.6 tenths of second**;
- The selenographic position has been estimate at the selenographic coordinates of **latitude ~9.2° South, and longitude ~77.1° West** .



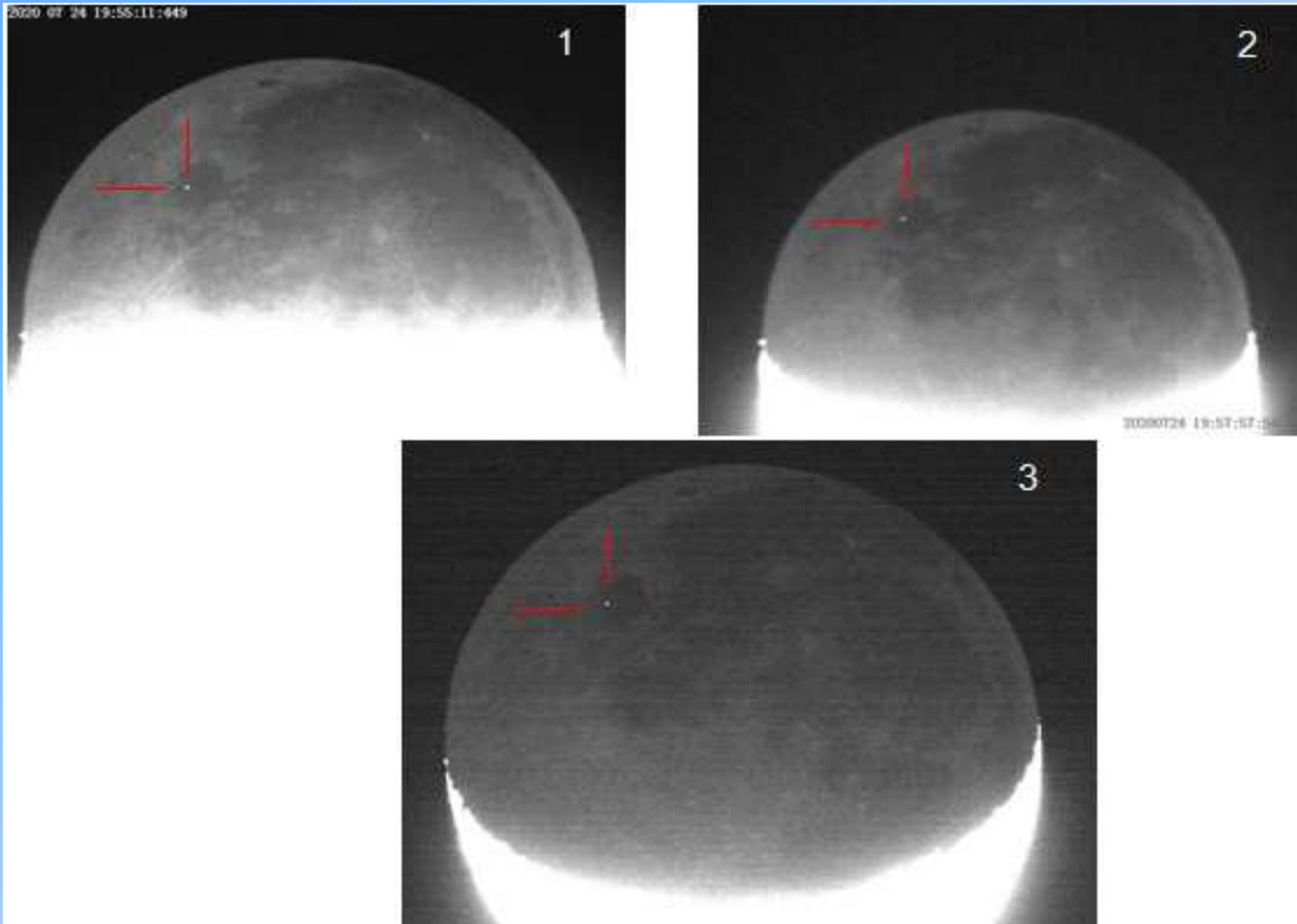
In the upon image is show the sequence of flash recorded by Luigi Zanatta and obtained always with the LunarScan program, and the flash is good visible in three consecutive frames.



The fifth flash on 2020 July 24 has been recorded at the time 19:55:11 UT by Bruno Cantarella with the Newton telescope 200/1000 at f/2.9 and ASI 178MM (image 1), and with Newton 100/400 at f/4 with ASI 120MM (image 2). The same flash has been recorded also by independent lunar observer Luigi Morrone (3) with Celestron C14 Edge HD with Hypestar system at f/1.9 and ASI 174 mono, binning 2x2 640x480 124 fps. Also for this flash, **the record has been made with three telescope simultaneously!**

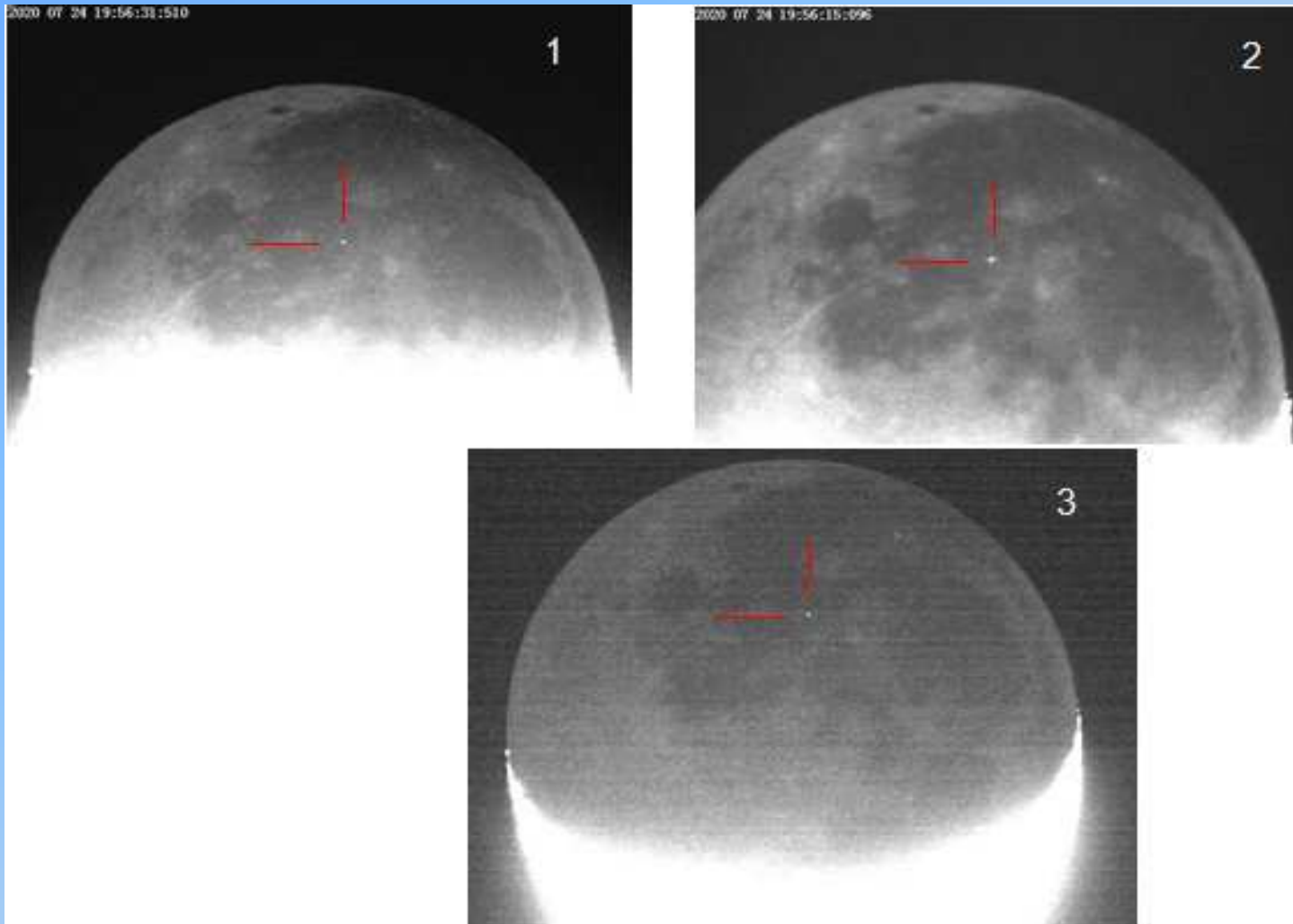


- This fifth impact flash has had a **duration of ~1.2 tenths of second**;
- The selenographic position has been estimate at the selenographic coordinates of **latitude ~27.1° South, and longitude ~39.7° West** .



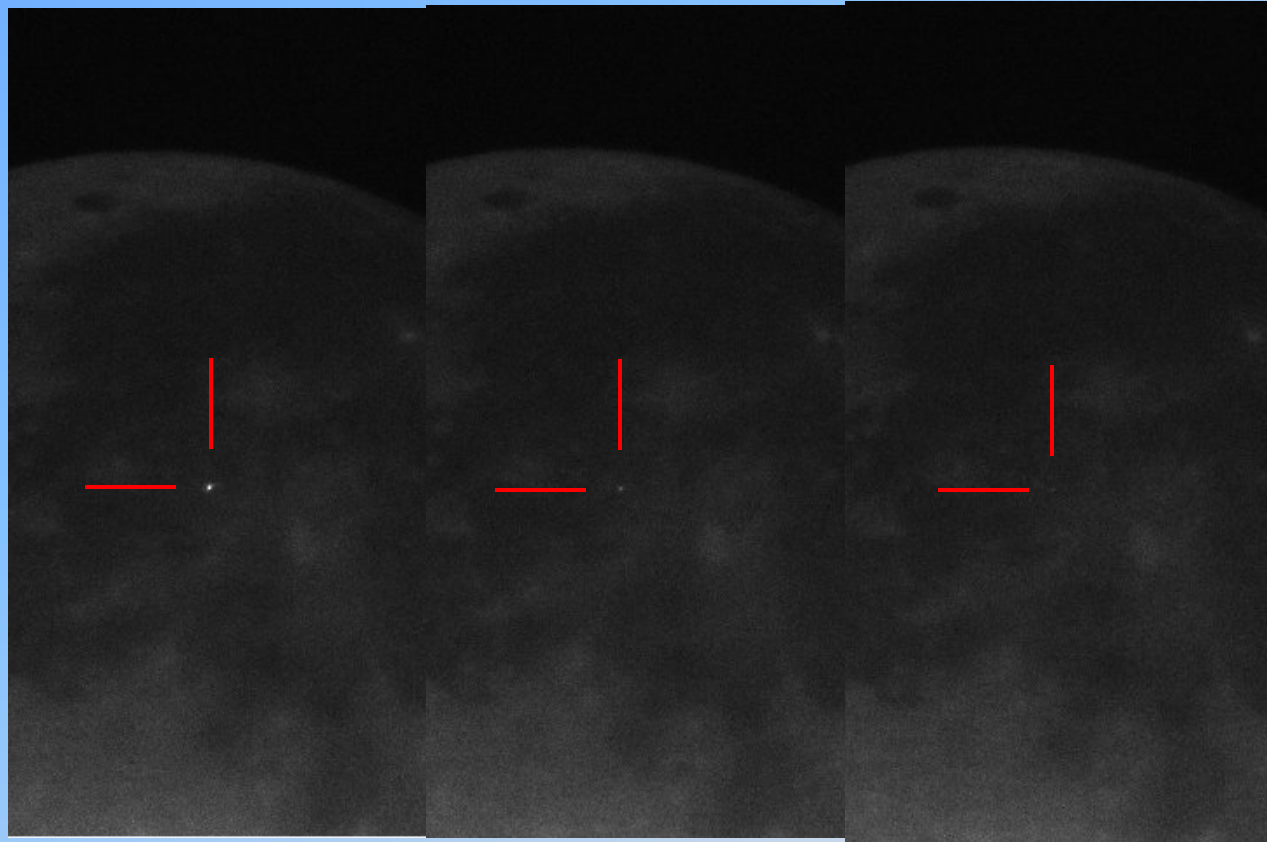
The sixth flash on 2020 July 24 has been recorded at the time 19:56:31 UT by Bruno Cantarella (image 1 with timestamp of UT) and Luigi Morrone (image 3), both with the same instrumental setup, and recorded also by Luigi Zanatta (image 2) with Newton 200/1000 with focal reducer at f/2.5 with ASI 120MM.

Also for this flash, **the record has been made with three telescope simultaneously, and more by three different observers!**





- This sixth impact flash has had a **duration of ~0.7 tenths of second**;
- The selenographic position has been estimate at the selenographic coordinates of **latitude ~1.5°North, and longitude ~26.7°West** .



In the three upon images is show the decreasing luminosity of flash (from left to right) recorded by Luigi Zanatta, and the flash is good visible in three consecutive frames.

# Others developments of Research on a flash impact

- Obtainment of **light curve** of impact flash on the time;
- From the estimate of magnitude of flash is possible to obtain the value of **luminosity energy**;
- From velocity of the meteoroid is possible to obtain the value of **luminosity efficiency**;
- From ratio **luminosity energy / luminosity efficiency** is possible to obtain the value of **kinetic energy**;
- Then is possible to obtain the estimate of **mass of meteoroid**;
- And finally can be possible to obtain the estimate of **crater size** that has been made from the meteoroid impact.



# Final consideration on the Flash Impact Program

- The program of observation and record of Lunar Impacts made by Sezione Nazionale di Ricerca Luna UAI has obtained in this period of two years 2019-2020 important results as record of six probables impact flashes;
- Also, the our SNdR Luna UAI in the year 2016 (when has been started our Program of Impact flash), and 2017, 2018 and 2022 years, has recorded other probables impact flashes, for more information to see here: [http://luna.uai.it/index.php/Candidati\\_Impatti\\_registrati\\_Recorded\\_Impact\\_flashes](http://luna.uai.it/index.php/Candidati_Impatti_registrati_Recorded_Impact_flashes)
- This can be important for to consolidate and to continue the collaboration in this activity between Professional Astronomer and non Professional Astronomer, and also with Association, independent lunar observers and other, that are sparses in all the World.



# Thanks

- Many thanks to Dr. Detlef Koschny of European Space Agency ESA SCI-SCP/OPS-SP for to invitation to me and our SNdR Luna UAI, Italy;
- Many thanks to all yourselves participants to this important 3° Fireballs Workshop, for the attention at this my work;
- Many thanks to Euro Planet Society for the Organization of this event.





# References of SNdR Luna UAI

- Web site: [http://luna.uai.it/index.php/Pagina\\_principale](http://luna.uai.it/index.php/Pagina_principale)
- Facebook page: <https://it-it.facebook.com/Sezione.Luna.UAI/>
- e-mail address: [luna@uai.it](mailto:luna@uai.it)

Thank you again for attention, and clear skies!

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