

# **Mondeinschlagblitze – Eine neue Detektionssoftware**

**... genannt FDS (Flash Detection Software)**

**Detlef Koschny, TU München (Germany,) Space  
Exploration Institute (Switzerland)**

**[Detlef.Koschny@tum.de](mailto:Detlef.Koschny@tum.de)**

# Warum? Siehe auch KPT 2022

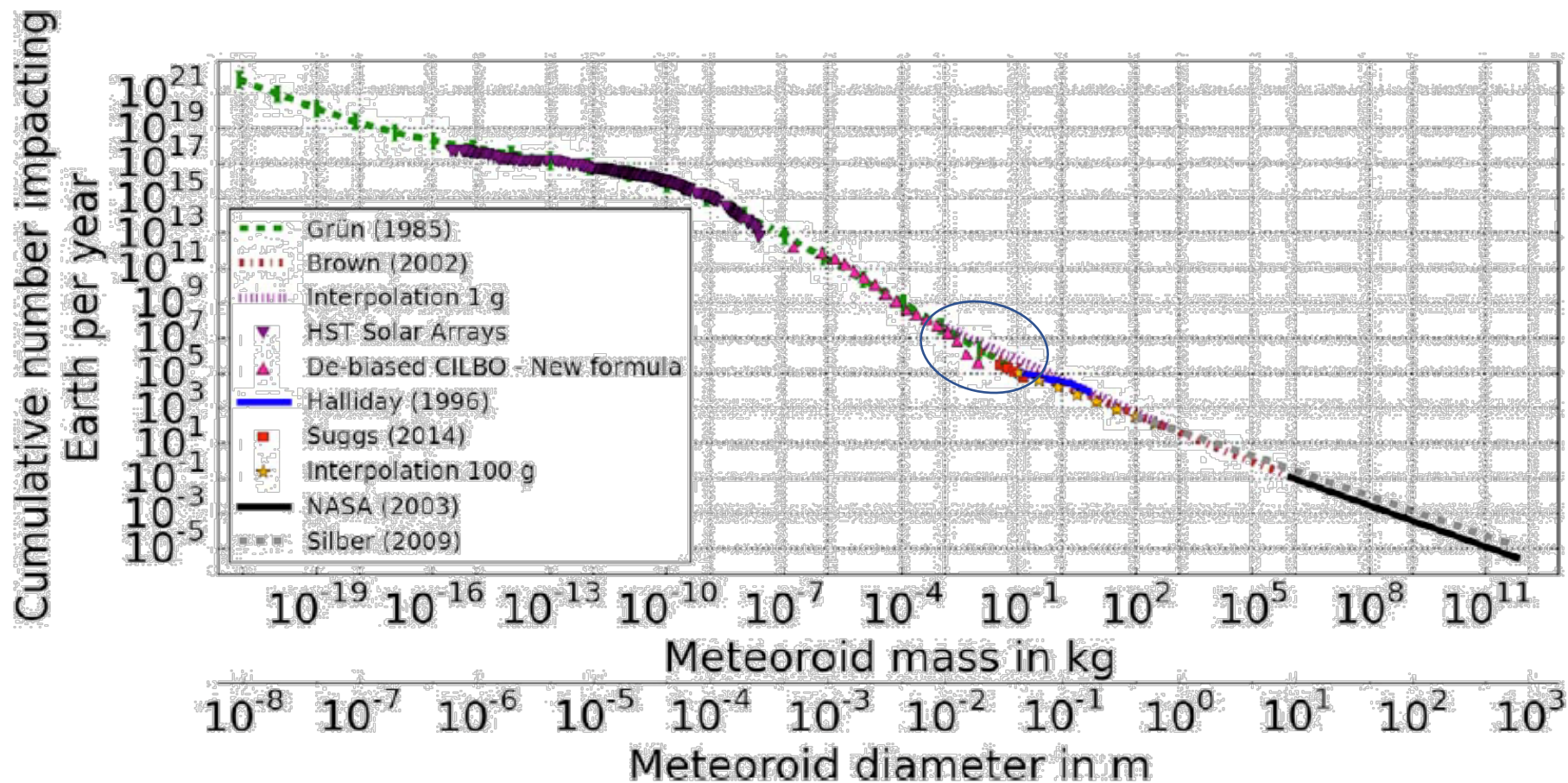


Fig. 10. All used flux density models in one plot including the estimated errors.



Contents lists available at ScienceDirect

Planetary and Space Science

journal homepage: [www.elsevier.com/locate/ps](http://www.elsevier.com/locate/ps)



Mass accumulation of earth from interplanetary dust, meteoroids, asteroids and comets

Gerhard Drolshagen<sup>a,\*</sup>, Detlef Koschny<sup>a,b</sup>, Sandra Drolshagen<sup>c</sup>, Jana Kretschmer<sup>c</sup>, Björn Poppe<sup>c</sup>

<sup>a</sup> ESA/ESTEC, Noordwijk, The Netherlands

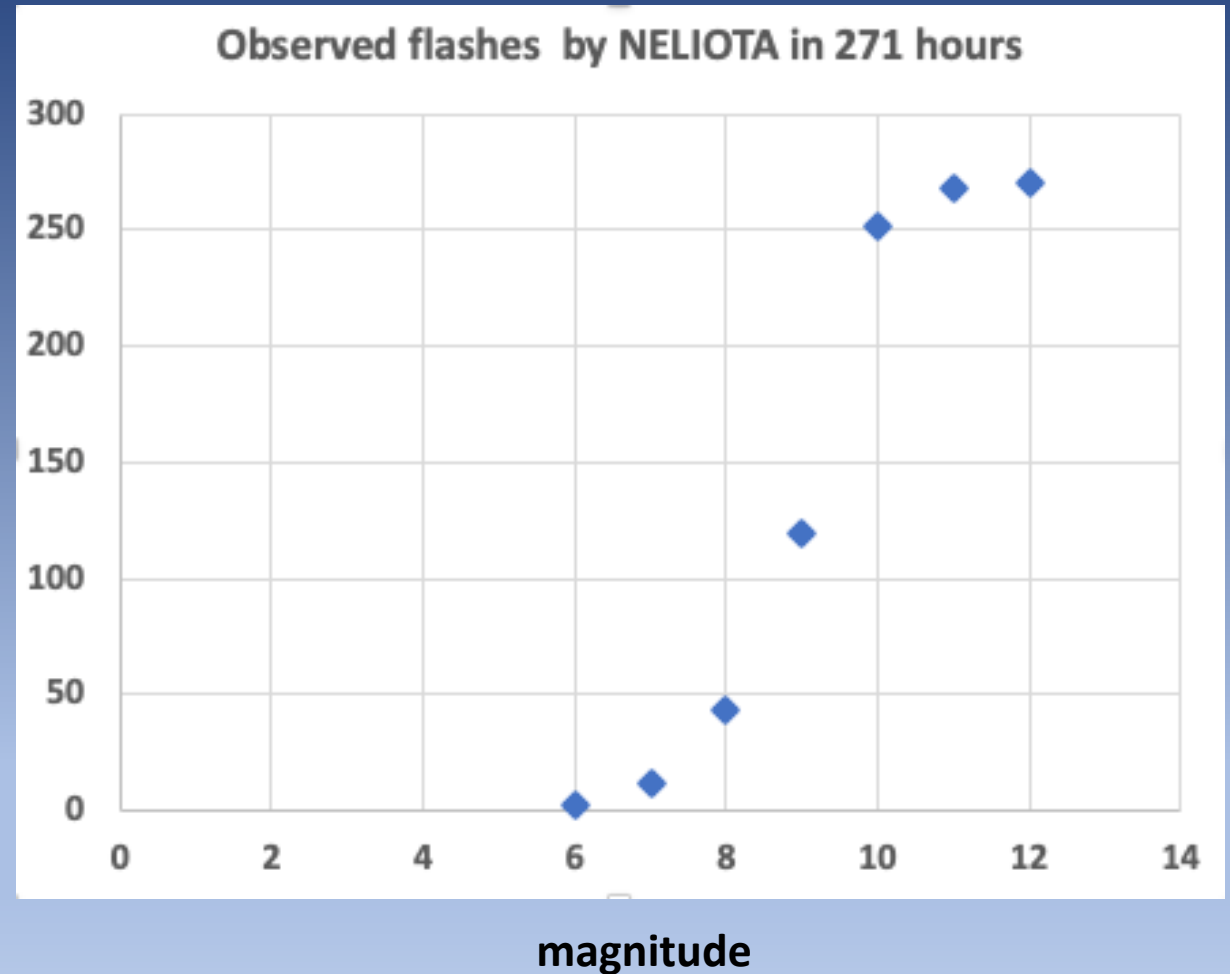
<sup>b</sup> Chair of Aeronautics, TU Munich, Munich, Germany

<sup>c</sup> University of Oldenburg, Germany

# Wieviel Ereignisse erwarten wir?

- Heller als 8 mag: 48  
in 271 Stunden =>  
Alle 5.6 Stunden
- Heller als 9 mag: 119  
in 271 Stunden =>  
Alle 2.3 Stunden (10" bis 12" Öffnung?)

Kumulative Anzahl von Ereignissen heller  
als die Magnitude, in 271 Stunden





# Flash Detection Software

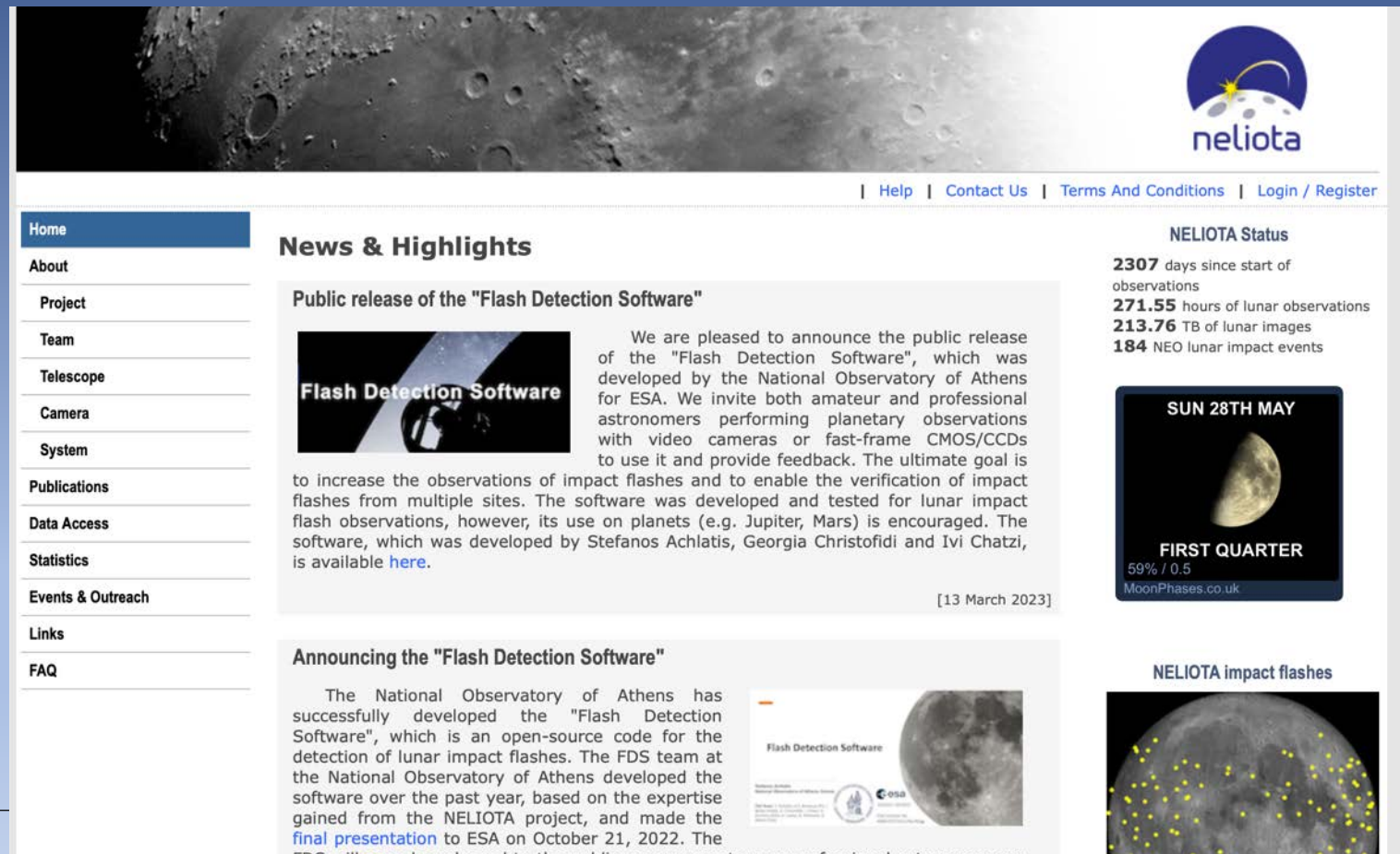
[Home](#) / [Flash Detection Software](#)

The Flash Detection Software (FDS) is a tool for detecting impact flashes on the Moon. This software can be used by any amateur or professional astronomer performing planetary observations with video cameras or fast-frame CMOS/CCDs for data processing and flagging all potential flash events. The ultimate goal is to encourage and increase the observations of impact flashes from both professional and amateur astronomers and to enable verification of impact flashes from multiple sites. The software was developed and tested for lunar impact flash observations, however, its use on planets (e.g. Jupiter, Mars) is encouraged.

**<https://kryoneri.astro.noa.gr/en/flash-detection-software/>**

# Flash Detection Software (FDS)

- Entwickelt vom Obs. Athens – Betreiber des NELIOTA Systems.  
<https://neliota.astro.noa.gr>



The screenshot shows the NELIOTA website interface. At the top right is the NELIOTA logo, which features a stylized sun and a comet. Below the logo is a navigation bar with links for Help, Contact Us, Terms And Conditions, and Login / Register. On the left side, there is a vertical menu with links for Home, About, Project, Team, Telescope, Camera, System, Publications, Data Access, Statistics, Events & Outreach, Links, and FAQ. The main content area is titled "News & Highlights" and contains two news items. The first item is "Public release of the 'Flash Detection Software'", dated [13 March 2023]. It features a thumbnail image of a telescope and text explaining the software's development and public release. The second item is "Announcing the 'Flash Detection Software'", which provides more details about the software's development and its availability to the public. To the right of the news items is a "NELIOTA Status" section with statistics: 2307 days since start of observations, 271.55 hours of lunar observations, 213.76 TB of lunar images, and 184 NEO lunar impact events. Below this is a "Moon Phases" widget for "SUN 28TH MAY" showing a "FIRST QUARTER" moon with 59% illumination and a magnitude of 0.5. At the bottom right, there is a "NELIOTA impact flashes" section with a thumbnail image of the moon showing numerous yellow impact flash locations.



# Flash Detection Software

TKO

The Koschny Observatory

The screenshot displays the FireCapture v2.6.08 software interface. On the left, there are several control panels: 'Control' with sliders for Gain (296), Exp. (ms) (27.00), and Bright (0); 'Capture' showing the current capture name 'Moon\_TIME\_20220610\_Gain=296(off)\_Exposure=27.0ms'; 'Status' with FPS and RAM indicators; 'Histogram'; and 'Options' with checkboxes for various processing features like Histogram, AutoAlign, Reticle, etc. The main window shows a live video feed of the Moon. A 'FDS parameters' dialog box is open in the foreground, showing 'Event Record Frames' (Number of frames before: 10, Number of frames after: 10) and 'Detection algorithm parameters' (Average frame alpha: 0.35). The 'Event record format' is set to 'DAT', and the 'Event records directory' is 'C:\Users\Detlef Koschny'. The 'FDS properties file' is './plugins/x86/FDS/conf/FoPluginNeliotaFds.properties'. At the bottom, a 'PreProcessing' panel shows 'NELIOTA\_FDS v0.4', a threshold of 0, and a status of 'PASSIVE Stage: A'. The bottom left corner of the screenshot contains the text 'TKO-110-008/1.2 - FDS testing'.



Based on FireCapture – see  
<https://firecapture.de>

# Flash Detection Software

TKO

The Koschny Observatory

Clipboard Organize New Open S

Documents > Images > LIF\_detections > observations > 2023.03.27

Name	Date modified	Type
Detection_Results	11/05/2023 19:15	File folder
event_0001_2023.03.27.19.22	11/05/2023 19:16	File folder

2023.03.27, ... Properties

General Customize

20,856 Files, 2,485 Folders

Type: All of type File folder

Location: All in C:\Users\Detlef Koschny\Documents\Images

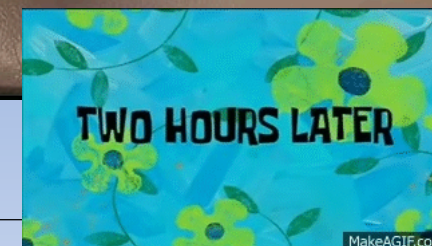
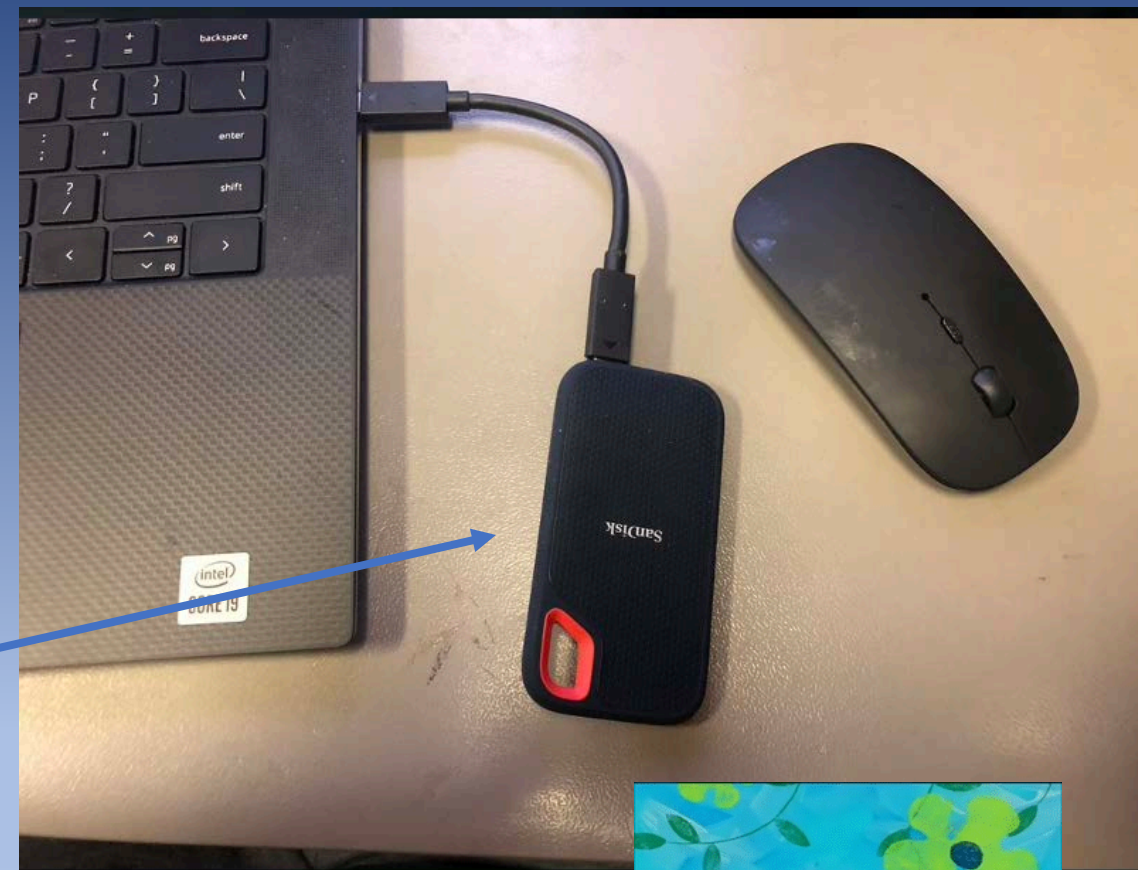
Size: 5.20 GB (5,592,898,979 bytes)

Size on disk: 5.24 GB (5,633,818,624 bytes)

Attributes  Read-only  Hidden Advanced...

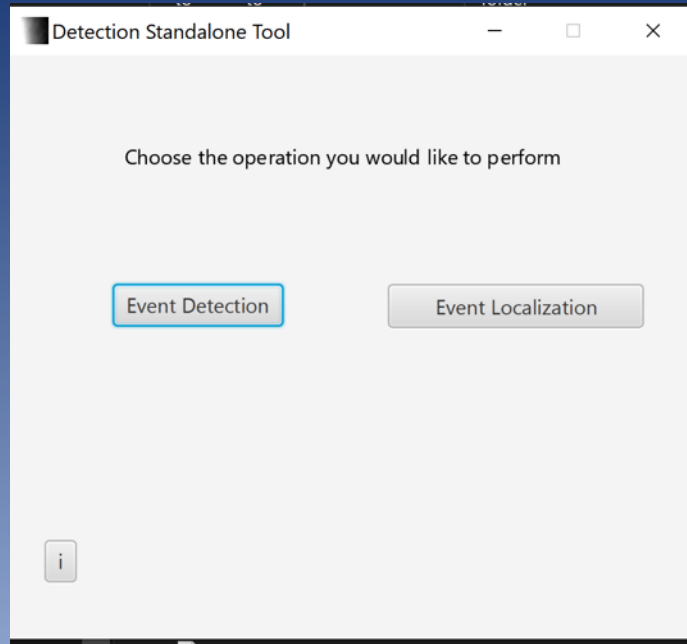
Move Close Alt+F

versus



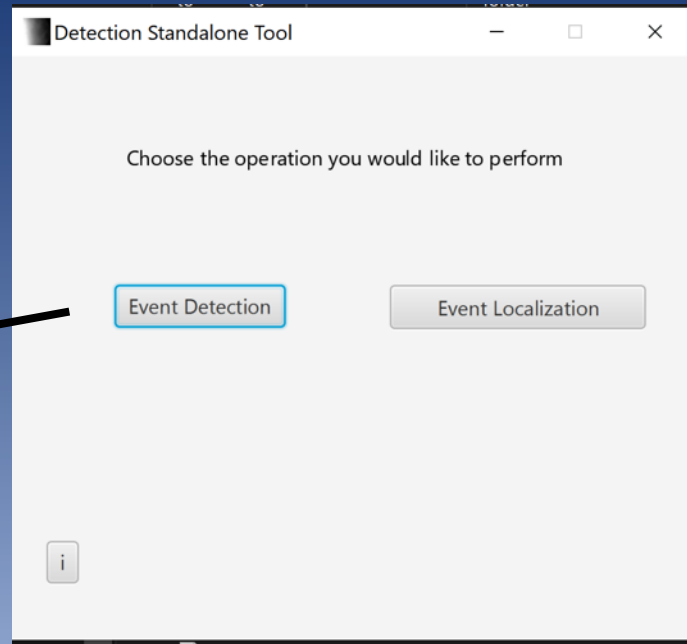
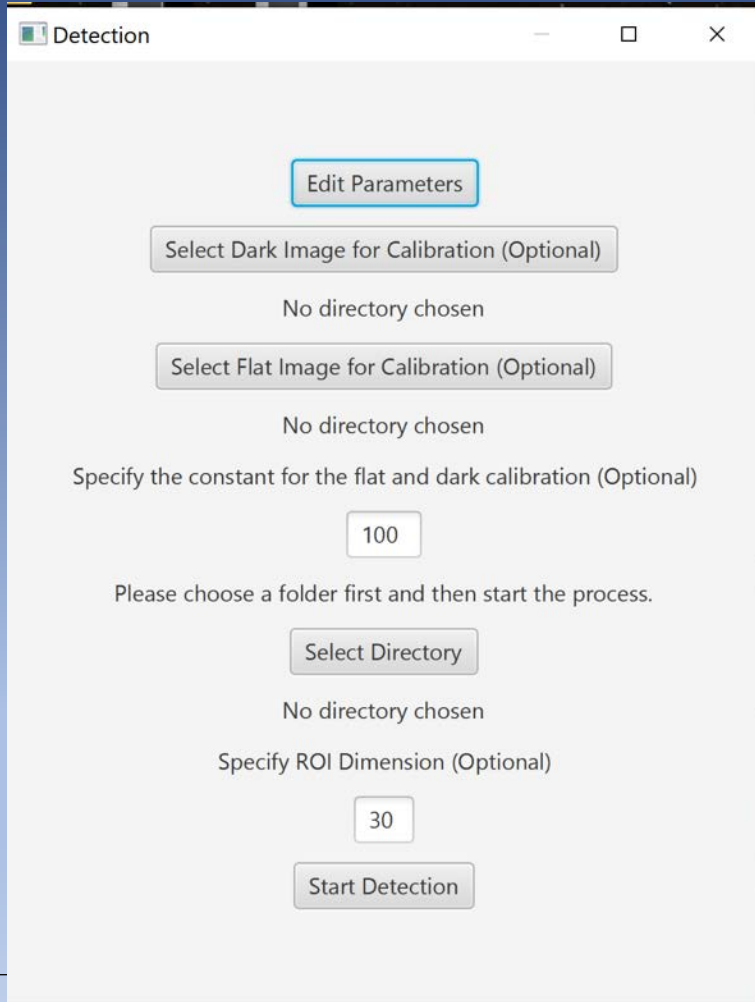
# Flash Detection Software (FDS)

Offline tool / standalone tool

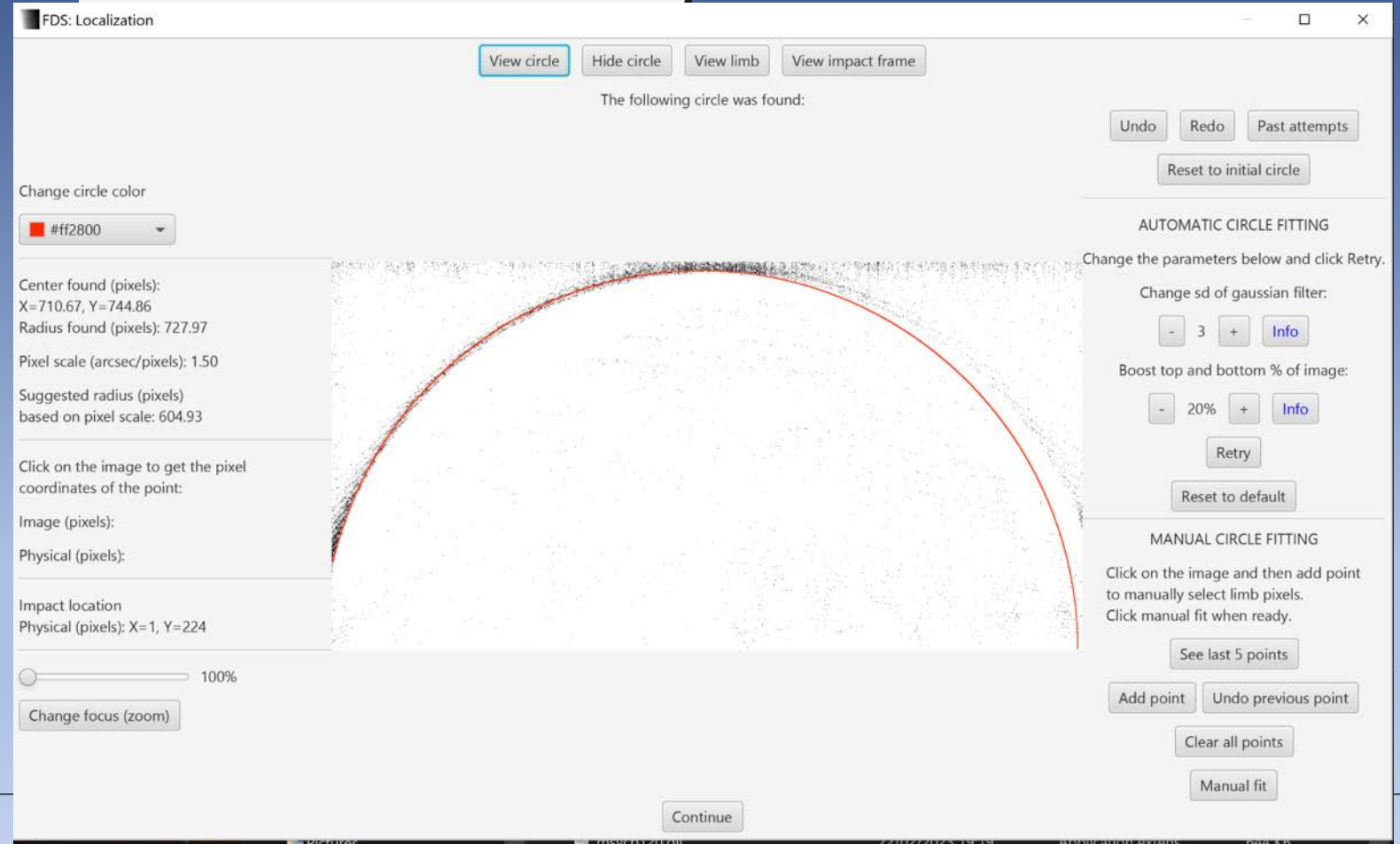
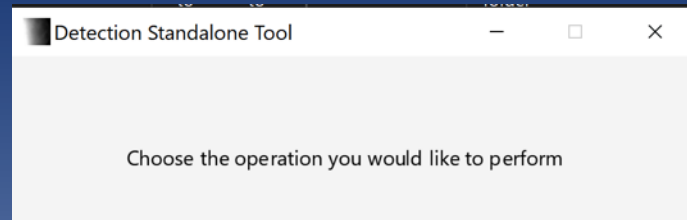
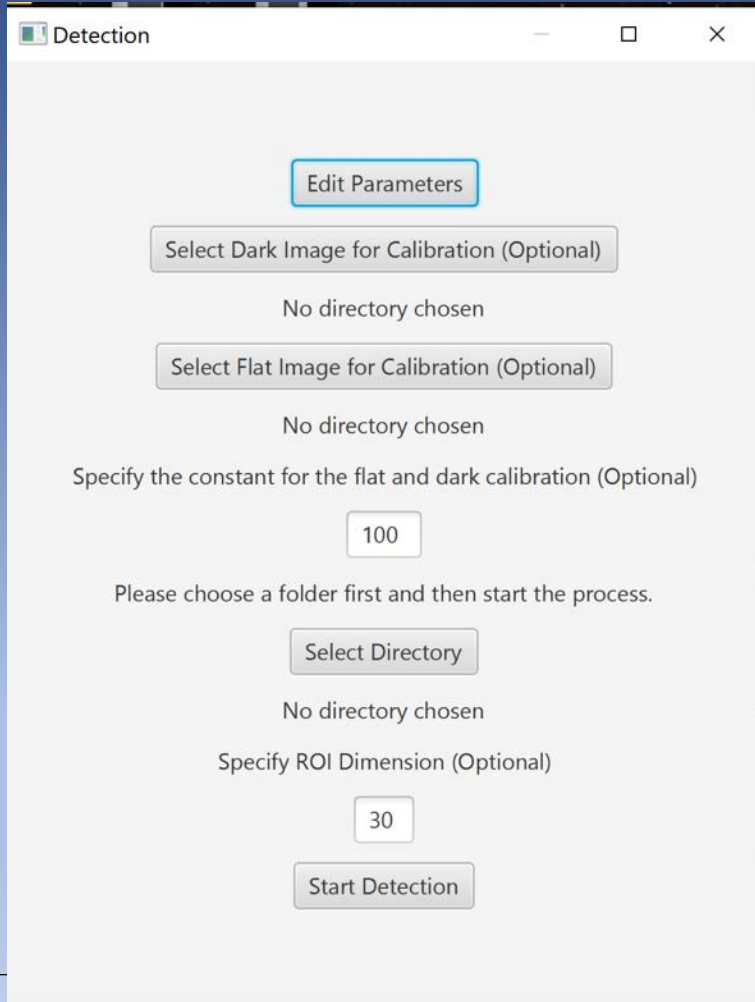




# Flash Detection Software (FDS)



# Flash Detection Software (FDS)





# Test setup – 13 cm Refraktor



And the camera:  
QHY 174  
1920 x 1200 px, 5.86  $\mu$ m  
11.3 mm \* 7.0 mm





# Test setup – 6" Refraktor





# Test setup – 10" Newton

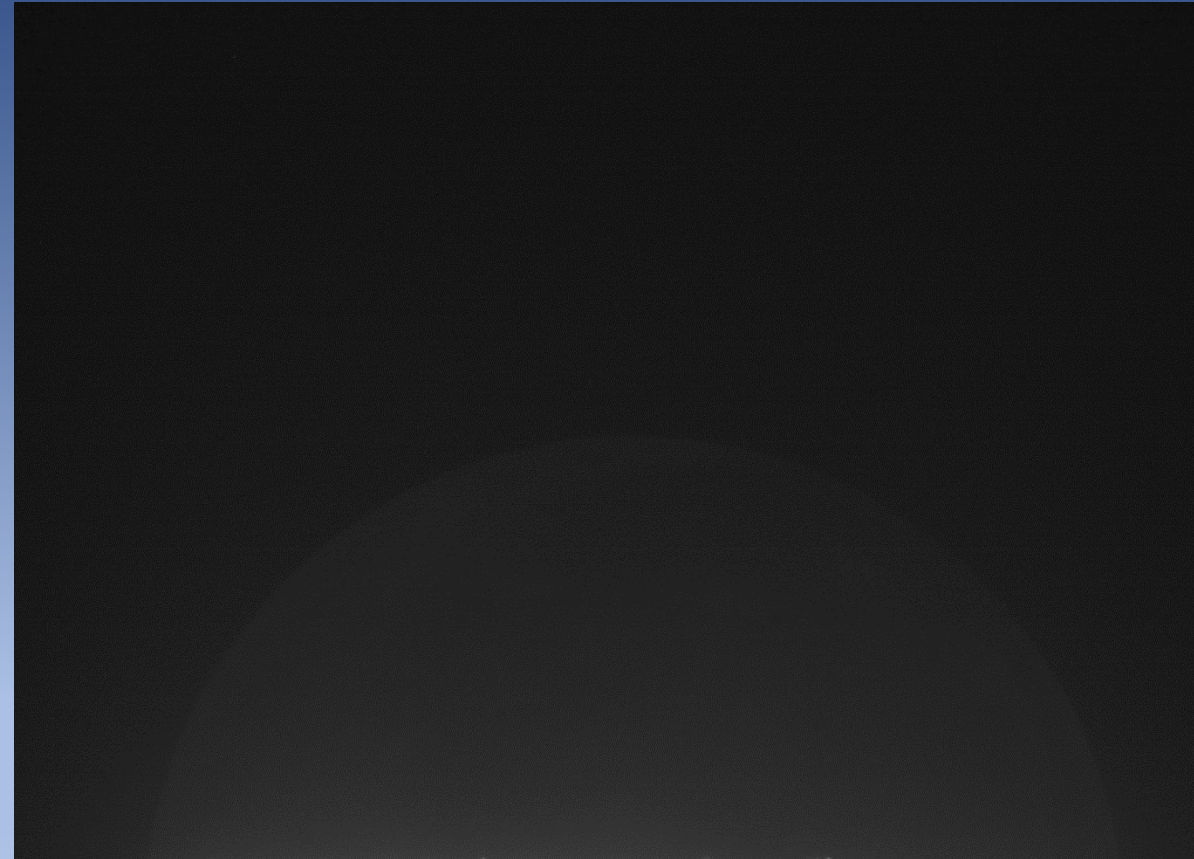


TKO-HO-008/1.2 – FDS testing

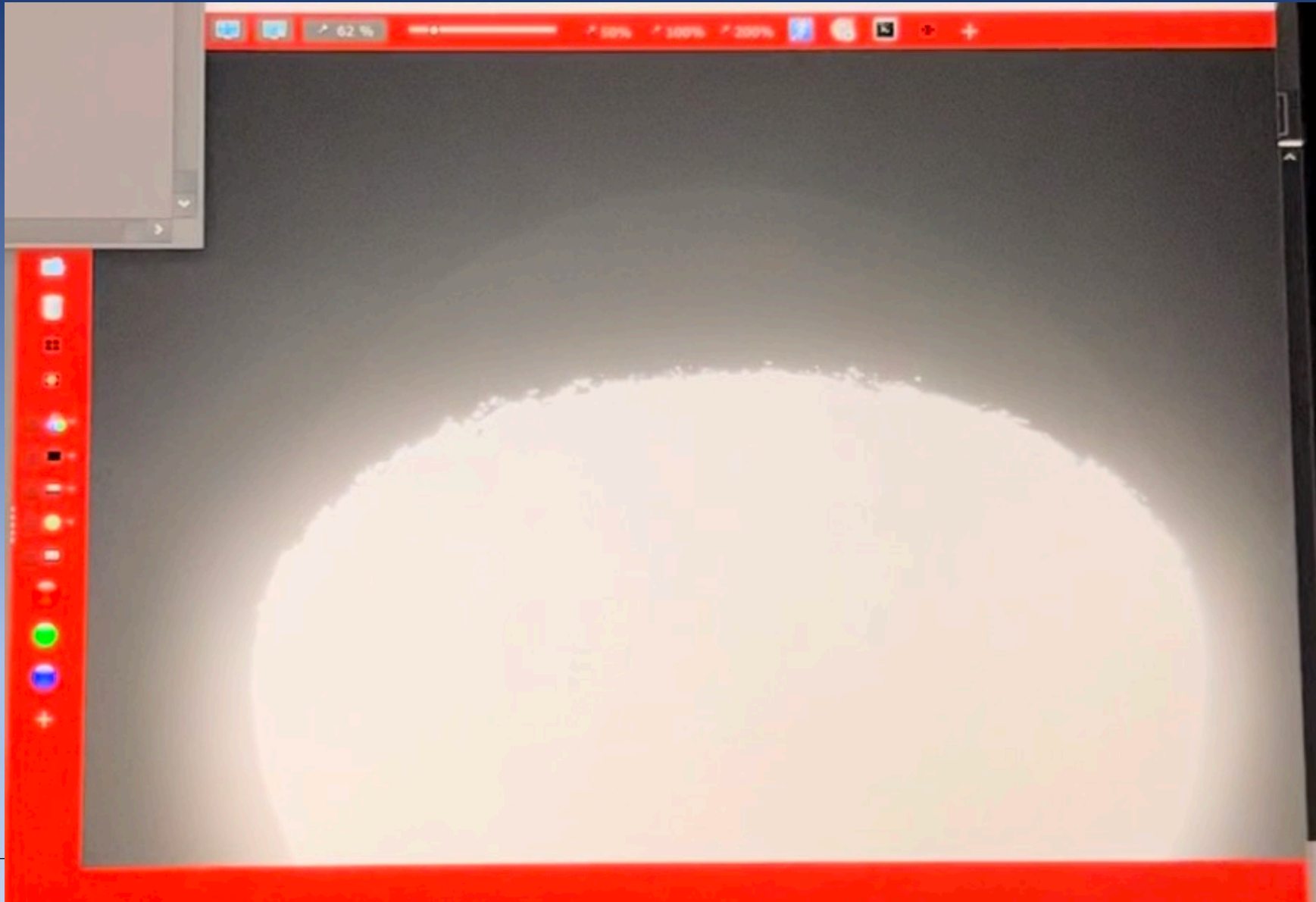




# Newton vs. Refraktor



# Streulicht ist weniger im Refraktor



# First experiences



- ❑ Einige guten Nächte in Feb, Mär und Mai 2023
- ❑ Insgesamt ca. 35 Stunden
- ❑ Fokus war auf 'real-time' Detektion, nicht das Offline Tool



# First experiences with FDS

- ❑ The illuminated part of the Moon must not be in the image
  - => proper lunar tracking is important (achieved manually)
  - currently testing Moon tracking with different s/w
- ❑ Several (false) detections => frame rate drops => difference to previous images larger => more false detections
  - -> not so bad when using a smaller 'region of interest'
- ❑ Stars in the field of view tend to trigger detections
- ❑ Directory numbering without preceding zeros – fixed with script; when restarting detection, event numbers start with 1 again
- ❑ Metadata file uses units inconsistently – crashes the offline detection – fixed with script

F

FDS Event Browser

FDS Event Browser

<< < > >>

Set Lower Threshold

Set Upper Threshold

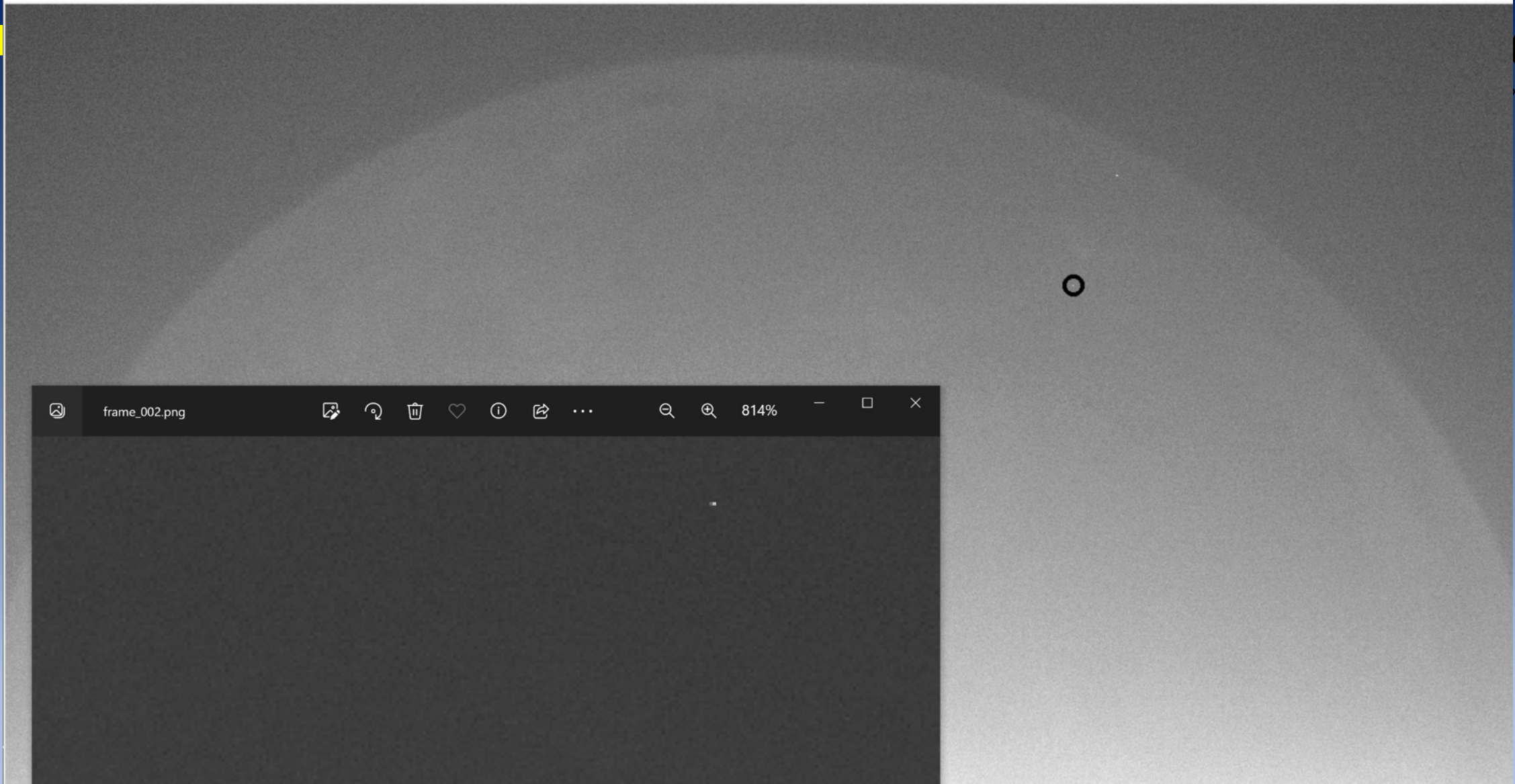
Image no.: 2

Event no.: 1



19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53

```
54         and "event" in dir_name]  
55     self.n_events = len(self.event_dirs)  
56     print(f"There are {self.n_events} directories that look good.")  
57
```

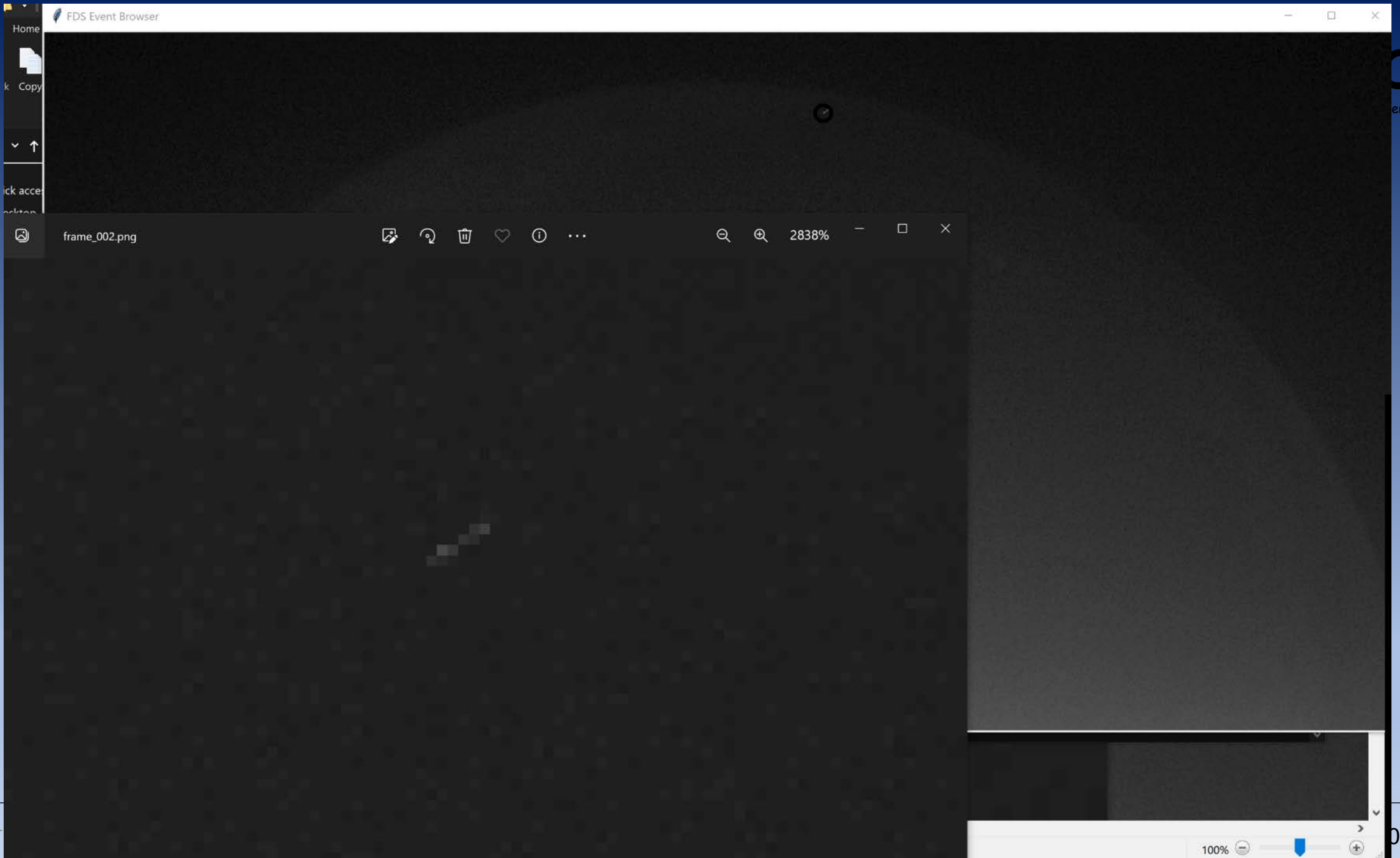


frame\_002.png



814%

Fi



ervatory

TKO-

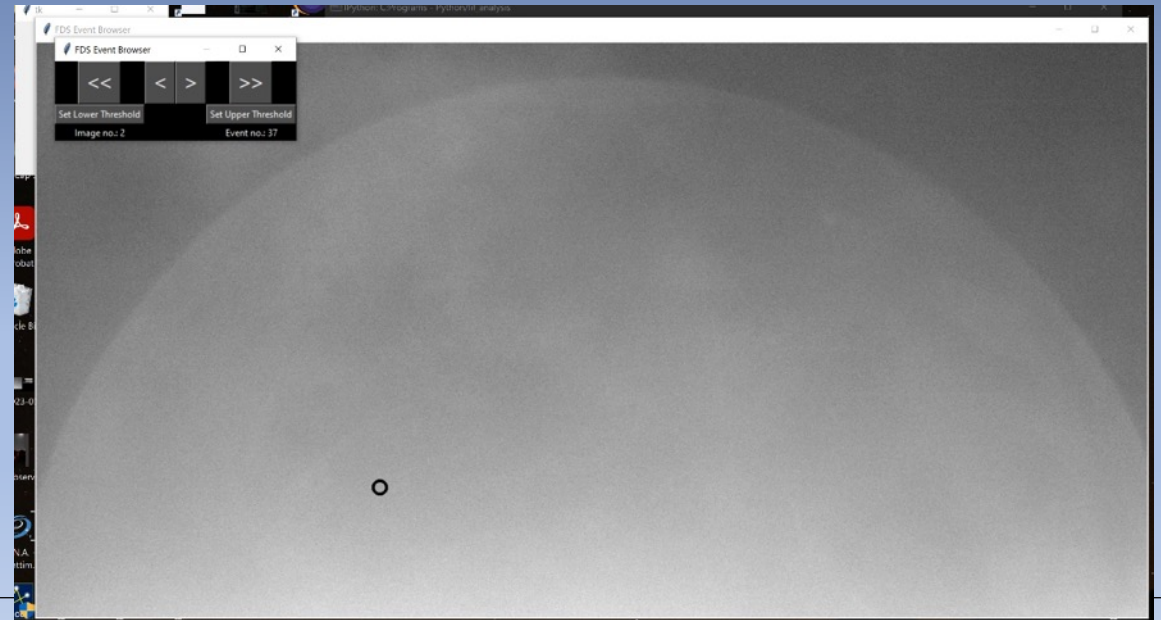
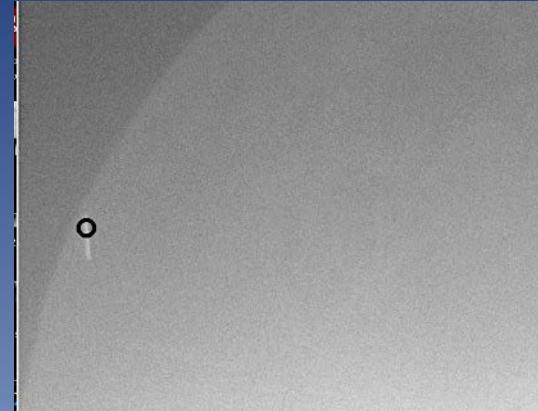
0-





# Zusammenfassung 2023-03-27

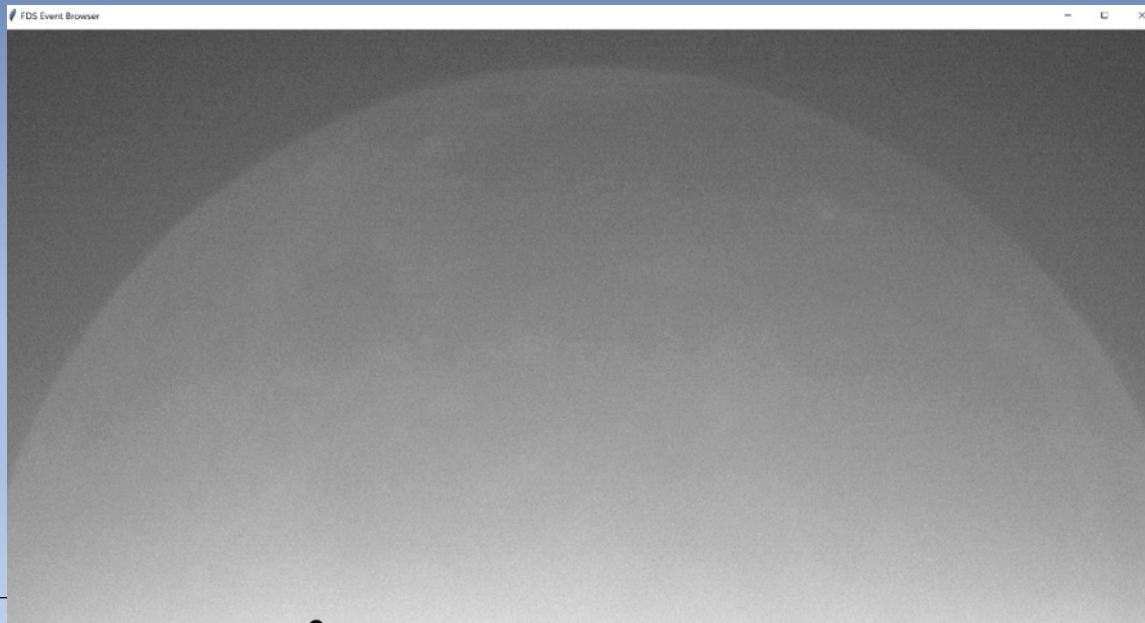
- ❑ Total 1164 Ereignisse
- ❑ Satelliten: 2
- ❑ Cosmic rays: 48
- ❑ Andres: Wolken, Fehldetektionen am unteren Bildrand, *beleuchteter Teil vom Mond im Gesichtsfeld*
- ❑ Jetzt: Typischerweise 50-60 Detektionen in eine Session





# Zusammenfassung 2023-03-27

- Noch kein Einschlagsblitz – aber noch Daten anzugucken

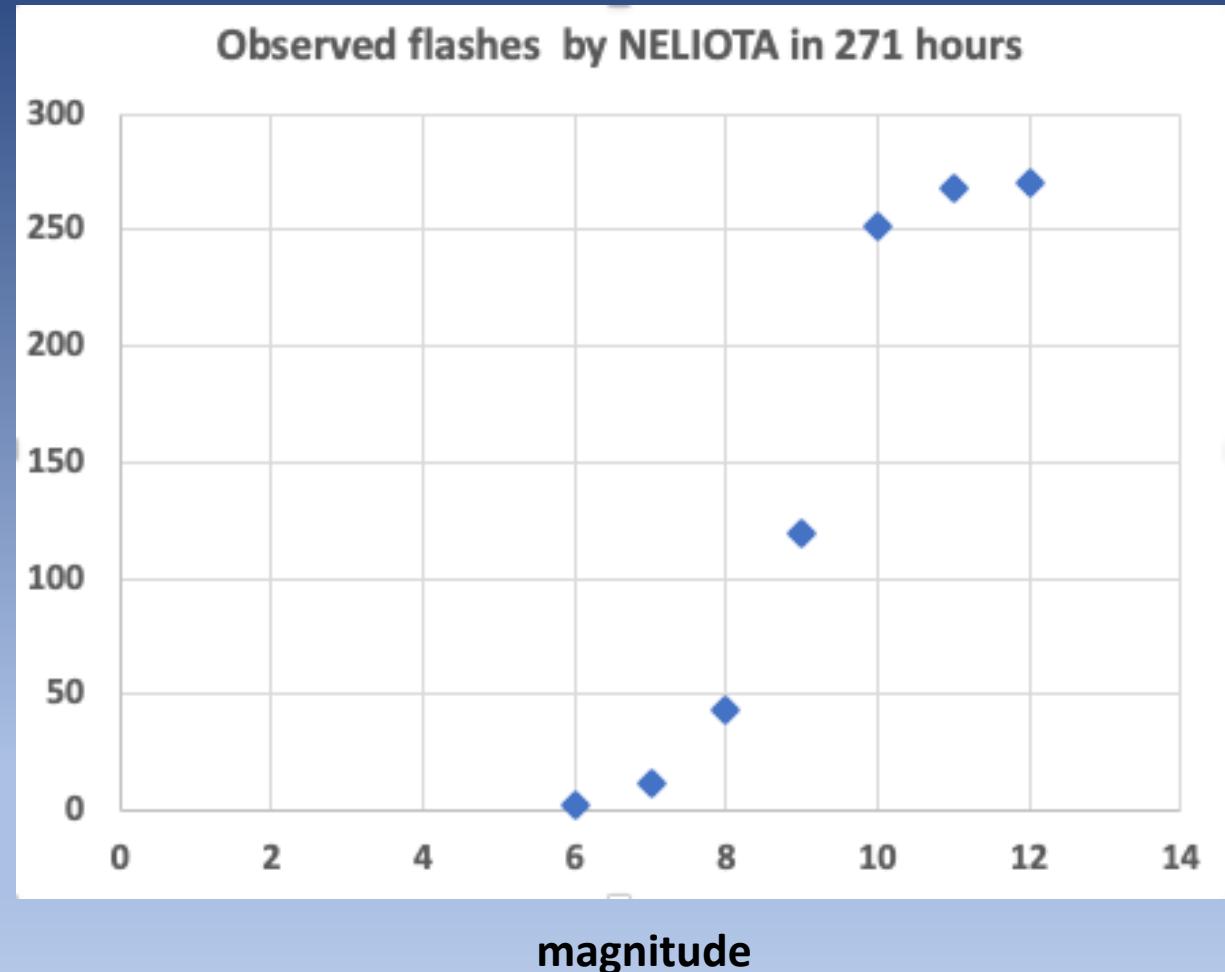


# Wieviel Ereignisse erwarten wir?

- Heller als 8 mag: 48  
in 271 Stunden =>  
Alle 5.6 Stunden
- Heller als 9 mag: 119  
in 271 Stunden =>  
Alle 2.3 Stunden (10" bis 12" Öffnung?)

Daten von 35 Stunden vorhanden – aber:  
Keine grossen Ströme

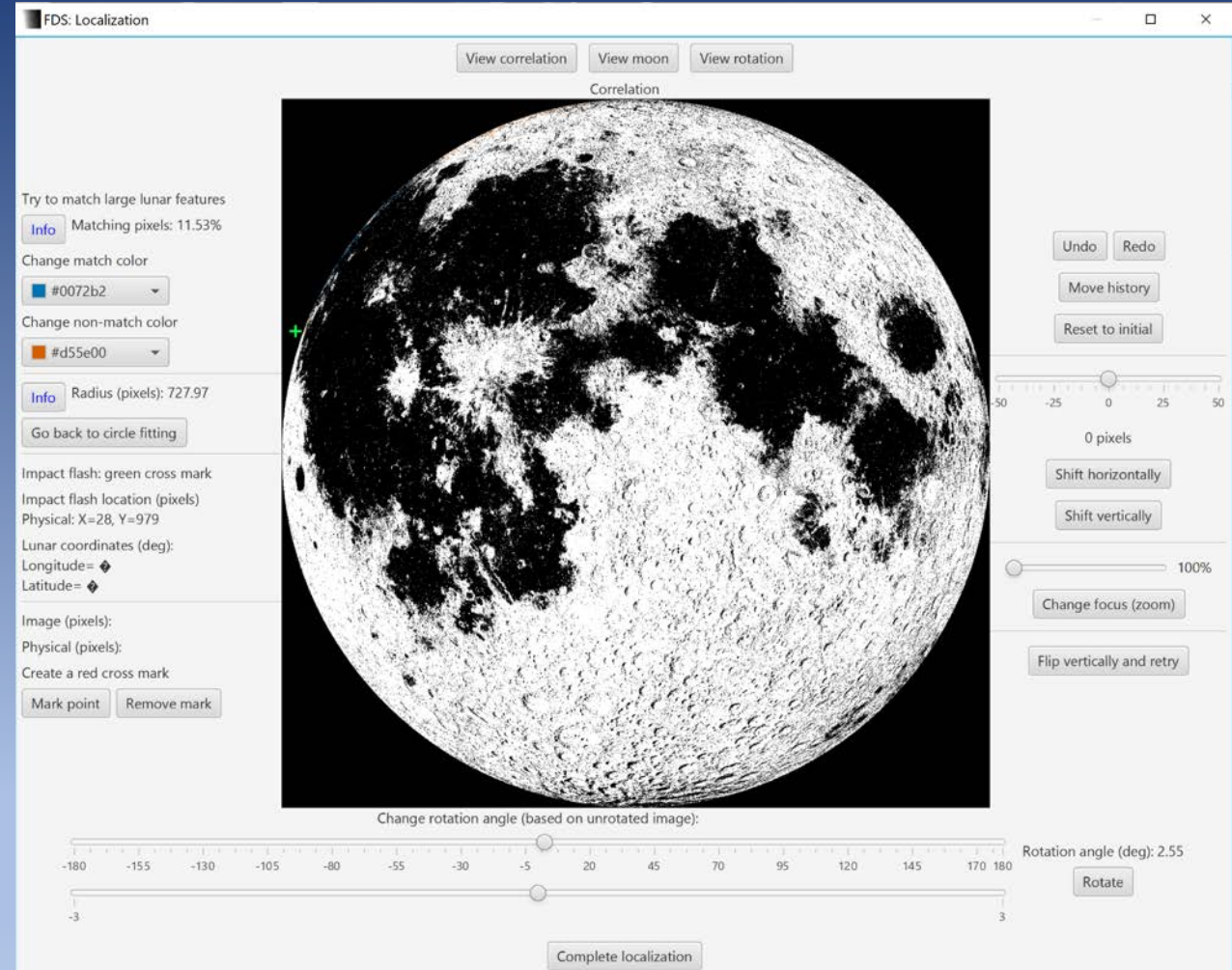
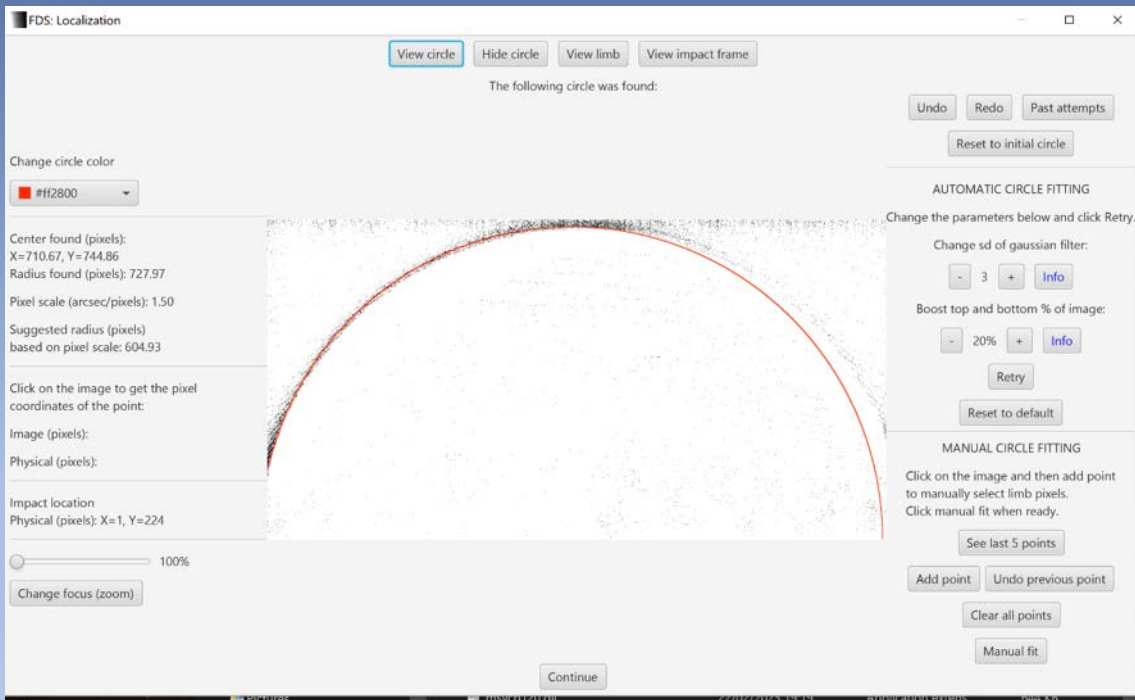
Kumulative Anzahl von Ereignissen heller  
als die Magnitude, in 271 Stunden





# Location tool

☐ Bilder müssen noch rotiert werden



**Lunar Impact Flash observing log**

**Date:**

**Name:**

**Before starting, check the following:**

- Mount is aligned
- Mount set such that no pier flip will be needed during the observing run
- Mount has enough battery power, or is connected to power
- Cables routed such that over the full expected recording time they don't block the tracking
- Dew protection in place
- Recording computer has enough free disk space
- Recording computer has enough battery power (or is connected to power)
- No unnecessary processes are running in the background
- Computer clock is synchronized to some time server. Time zone (UTC preferred): \_\_\_\_\_
- Telescope is aligned
- Telescope is in focus
- A recent magnitude calibration is existing

**Configuration of this night**

Camera	Make/type	Pixel size			
Telescope	Make/type	R = Refractor, N = Newton, SC = Schmidt-Cassegrain, O = other (specify)	Aperture in mm	Focal length in mm	Correctors, barlow?
Mount	Make/type		Azimuthal / equatorial	Guiding	
Software	Make/type		Version		
Recording	Frames/s	Exp. time in ms	Gain		
Begin time (UTC)					
End time (UTC)					
Transparency		(Scale: tbd)			
Seeing		(Scale: tbd)			

**Lunar Impact Flash observing log**

**Date:**

**Name:**

Sketch Moon with illuminated part, N-S and E-W orientation, and the field of the camera as seen on the monitor.	
---	--

**Record of events**

Slews (note times, or say roughly how often)	
Clouds in front of Moon (note time slots, from – to)	
Other events (note times)	

**Derived values**

Total recorded time (end – begin – interruptions due to clouds or other)				
Comments:				



# Zusammenfassung

- ❑ Software ist aktuell benutzbar, wenn...
  - Man drauf achtet dass der beleuchtete Mond nicht zu sehen ist
  - Man mein Skript 'lif\_fds\_fix\_data.py' laufen lässt
  - => einige 10 Events pro Abend
- ❑ Pythontool zum Daten anschauen ist vorhanden
- ❑ Europlanet Workshop zum Thema: Dort wurde vorgeschlagen, zu den Perseiden eine Campagne zu machen – wer macht mit?





# Ganz neu

□ Seit ein paar Tagen gibt es

<https://www.groups.io/g/lunar-impacts>

