

Impact of asteroids and recovery of meteorites in Botswana



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PRISMA DAYS 2025 – TERAMO 7-8 NOVEMBRE 2025

Impact of asteroids and recovery
of meteorites in Botswana:

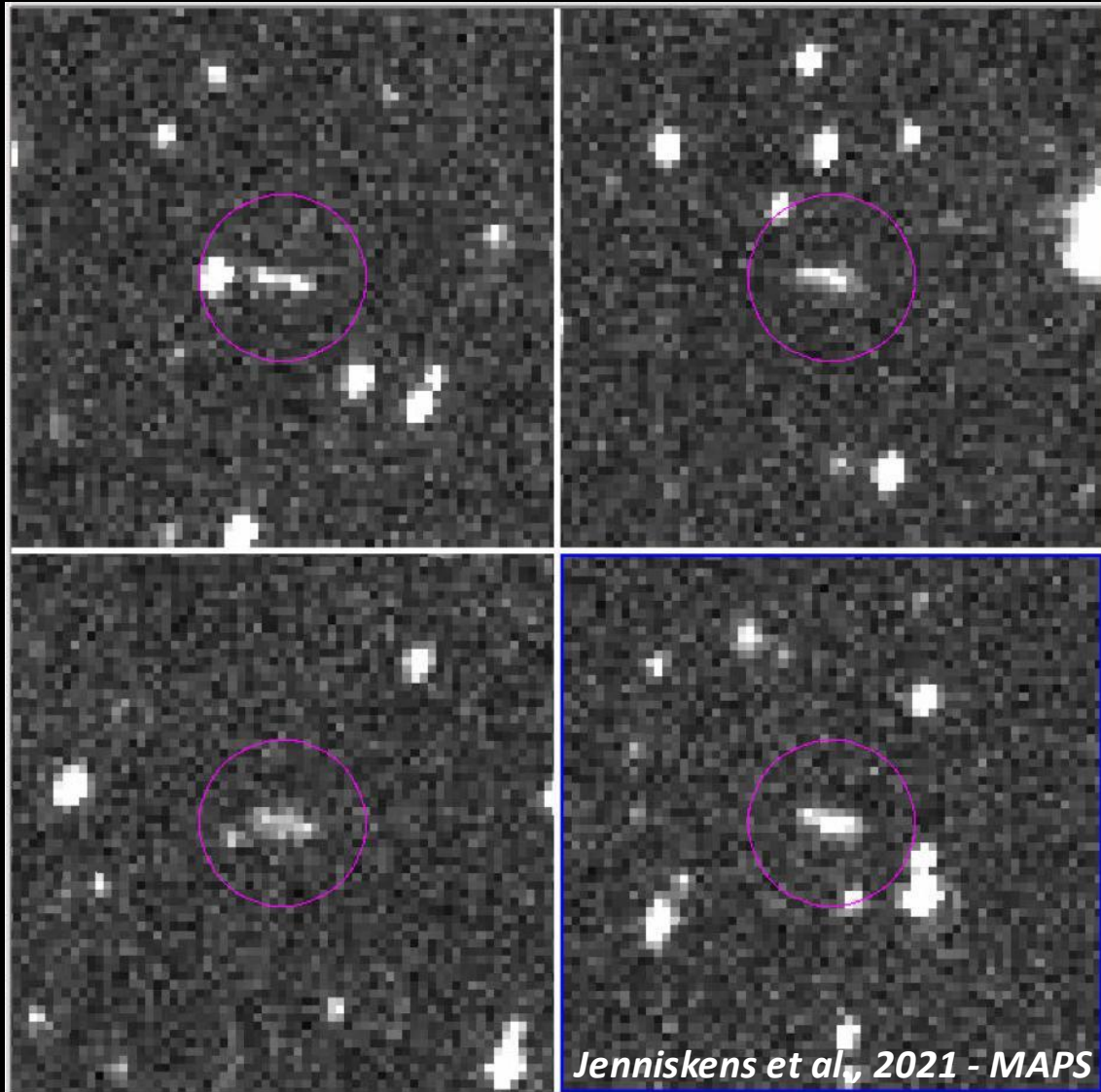
1. The asteroid 2018LA
2. The Motopi Pan meteorite
3. The 3rd August Bolide



1. THE ASTEROID 2018LA



On 2 June 2018, at ca. 08:14 UTC, Richard Kowalski of the Mount Lemmon Survey (part of the **Catalina Sky Survey**) picked up an 18th magnitude asteroid moving quickly against the background stars.



ZLAF9B2 → 2018 LA

The **Minor Planet Center** in Cambridge, Massachusetts, calculates a preliminary trajectory indicating possible impact.

Main issue at the time was to evaluate the impact threat!

Center for Near-Earth Object Studies (CNEOS) at the **NASA's Jet Propulsion Laboratory (JPL)** estimates a high probability for the impact: this is a security problem but fortunately the object is too small (first estimate at **1.6-5.2 m** in diameter) to pose a real threat.

Predictions from orbital data were done by the University of Hawaii's **Asteroid Terrestrial-Impact Last Alert System (ATLAS)** telescope took the final images of 2018 LA before it entered Earth's atmosphere and exploded.



Credit: Aren Heinze (IfA/ATLAS), Brooks Bays (SOEST), Bill Gray (Project Pluto)

The news of a bold explosion (brief red flare) in the sky of Botswana
reached the residents and on

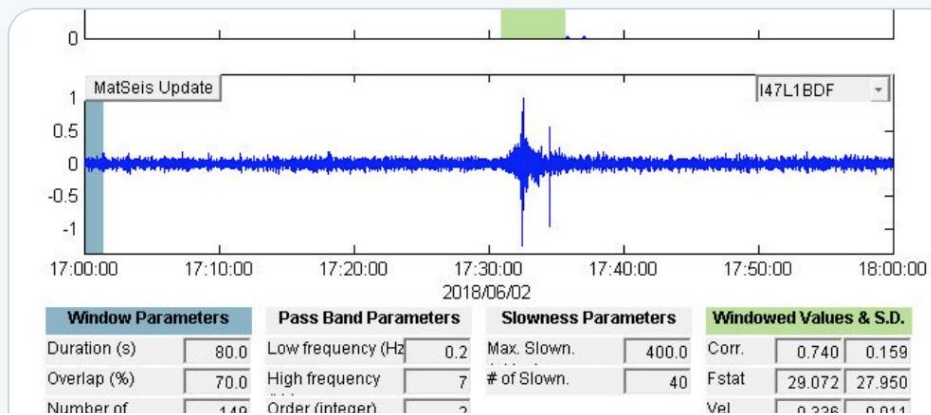


Eyewitness reports were crucial for the identification of the fall area:



Peter Brown @pgbrown · Jun 3, 2018

Strong infrasound detection of a bolide at station I47 in South Africa today at 1730 UT. Origin time between 1645-17 UT over Botswana. Yield 0.3-0.5 kT, corresponding to 2m diameter asteroid. #fireball #neoimpacts



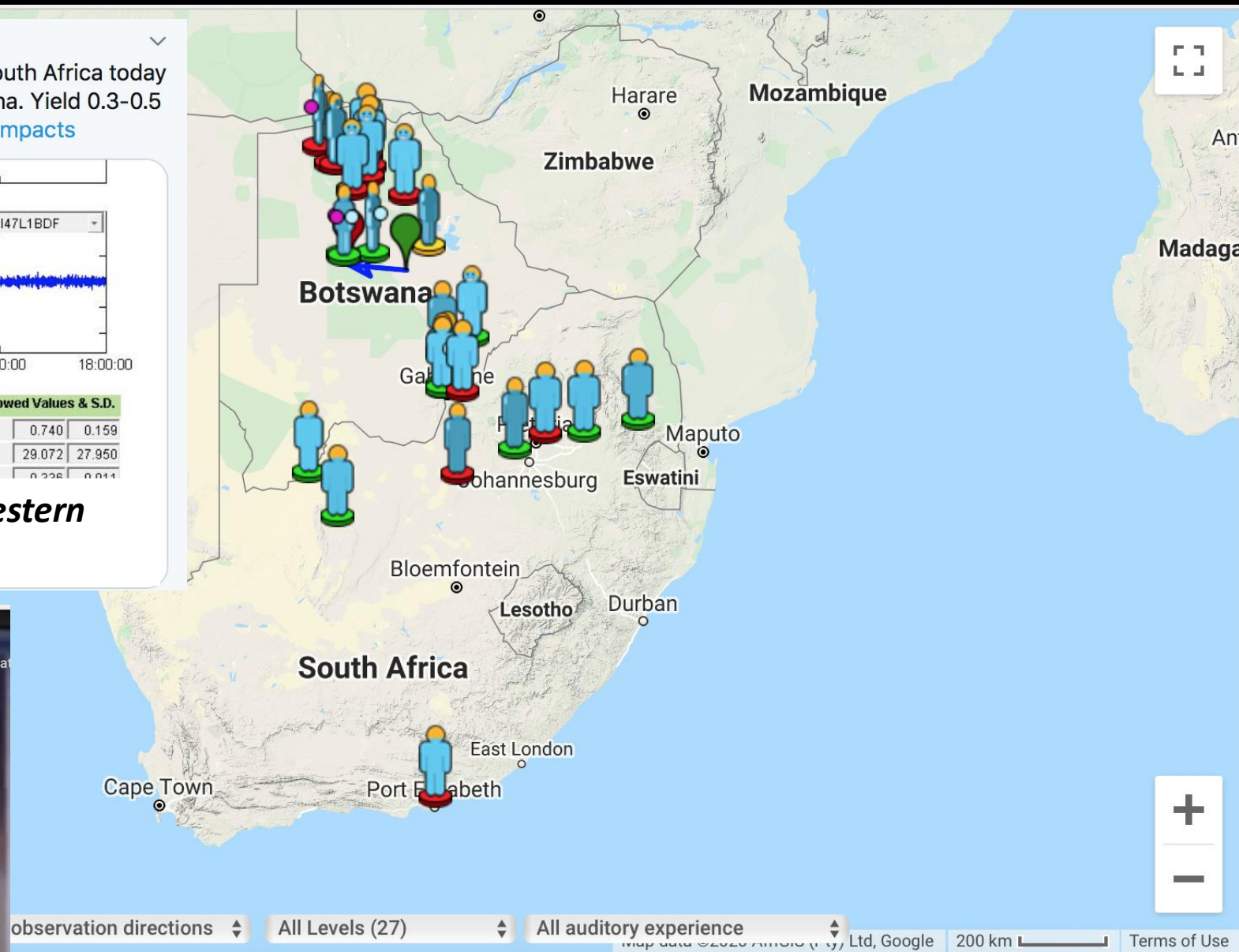
Credits: Twitter account Dr Peter Brown, Western University's Faculty of Science



AMS event #1924-2018

2018-06-02 18:49:02

Wat

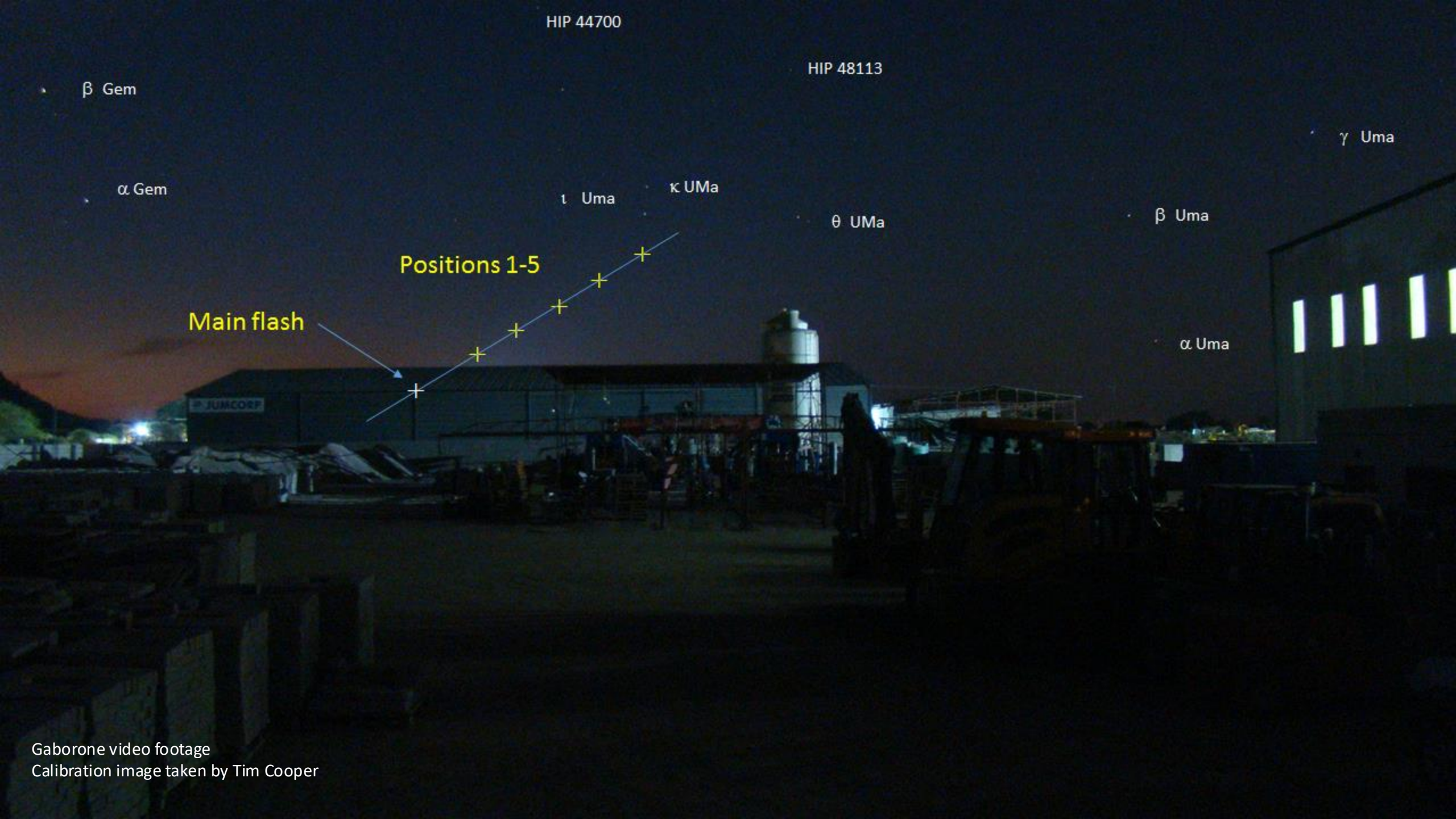


Credits: https://fireballs.imo.net/imo_view/event/2018/1924

6/02 18:42:20 SAT



Gaborone video footage
Calibration image taken by Tim Cooper



HIP 44700

HIP 48113

β Gem

γ Uma

α Gem

ι Uma

κ UMa

θ UMa

β Uma

Positions 1-5

Main flash

α Uma

• β Gem

• α Gem

31 Lyn

κ UMa

ι UMa

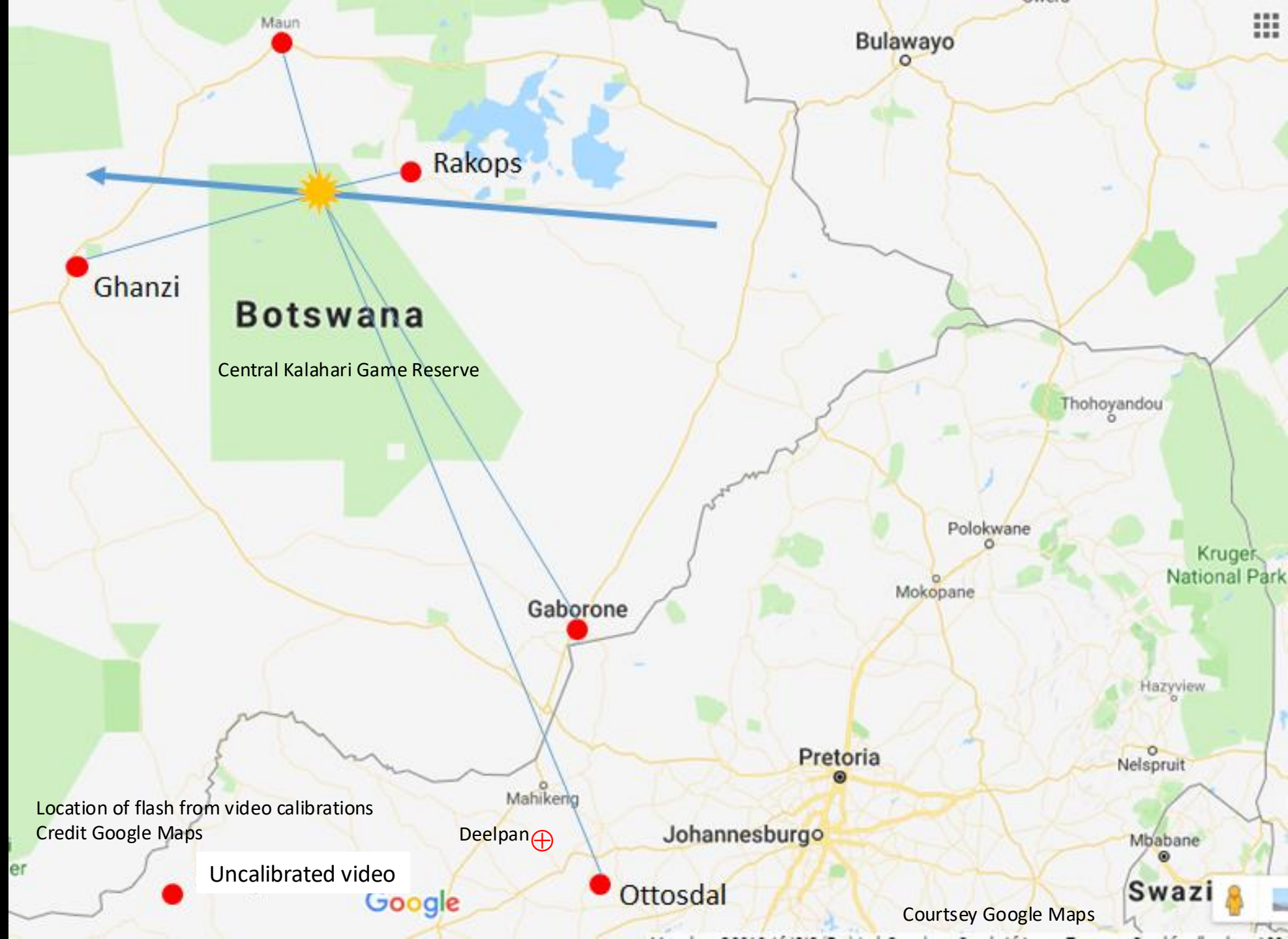
θ UMa

2018-06-02 18:49:22

2018 June 8
Image @ 16:41:00 UT
10 seconds

CAM02

Ottosdal video footage
Calibration image taken by Tim Cooper

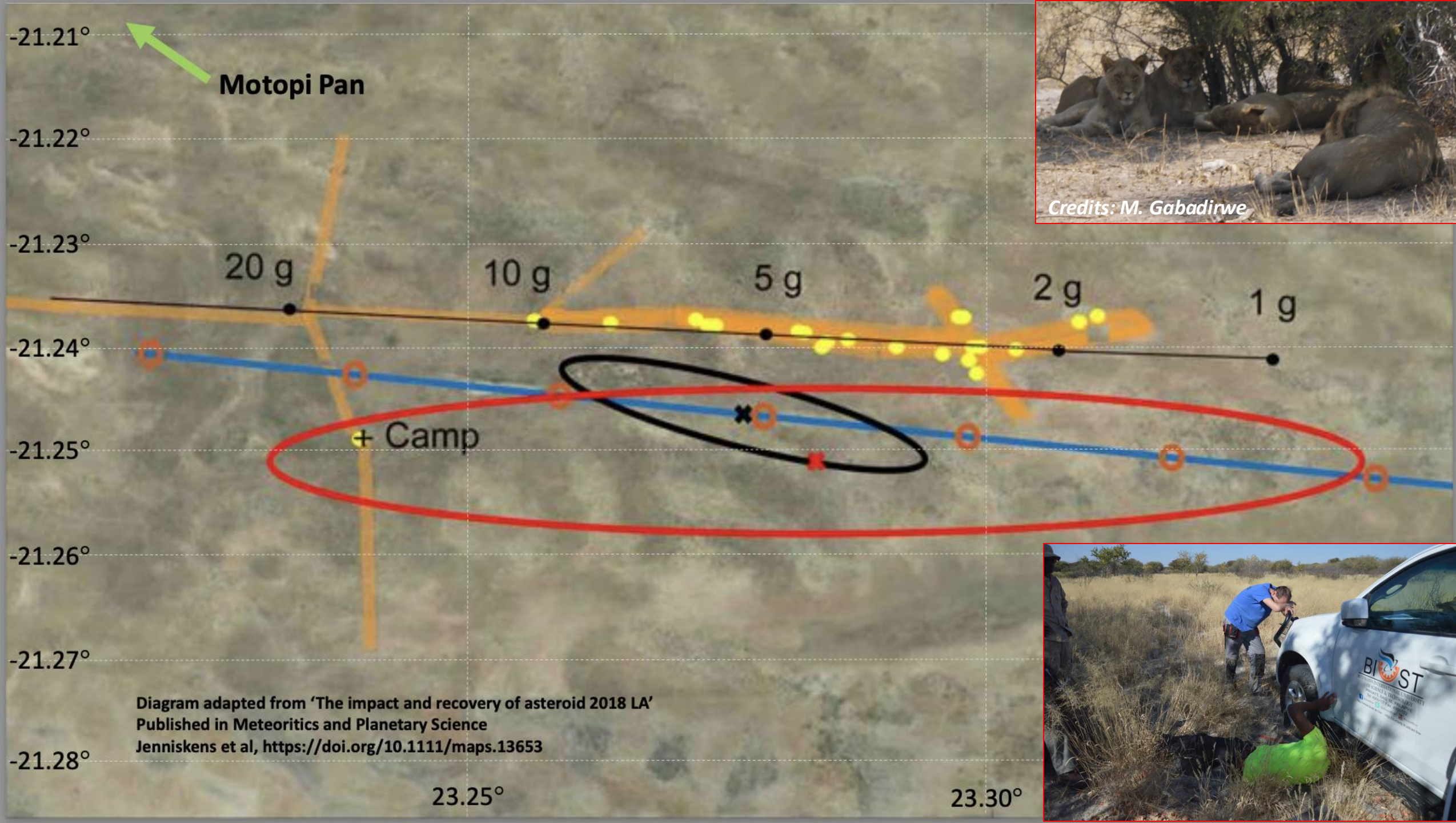


Meteorite strewn field location (*P. Jenniskens, J., Assink, L. Evers, E. Lyytinen, J. Moilanen, P. Lahtinen*)



Size ca. $45 \times 2 \text{ km} = 90 \text{ km}^2$

About 6 months to search the entire strewn field cm by cm!!!



SEARCHING THE METEORITE IN THE THICK GRASS...



2. MOTOPI PAN METEORITE



**23 June 2018, 08:15 am: finds the FIRST meteorite from asteroid
LA2018!**

4 more expeditions were undertaken between June and August 2018, but no meteorite found!

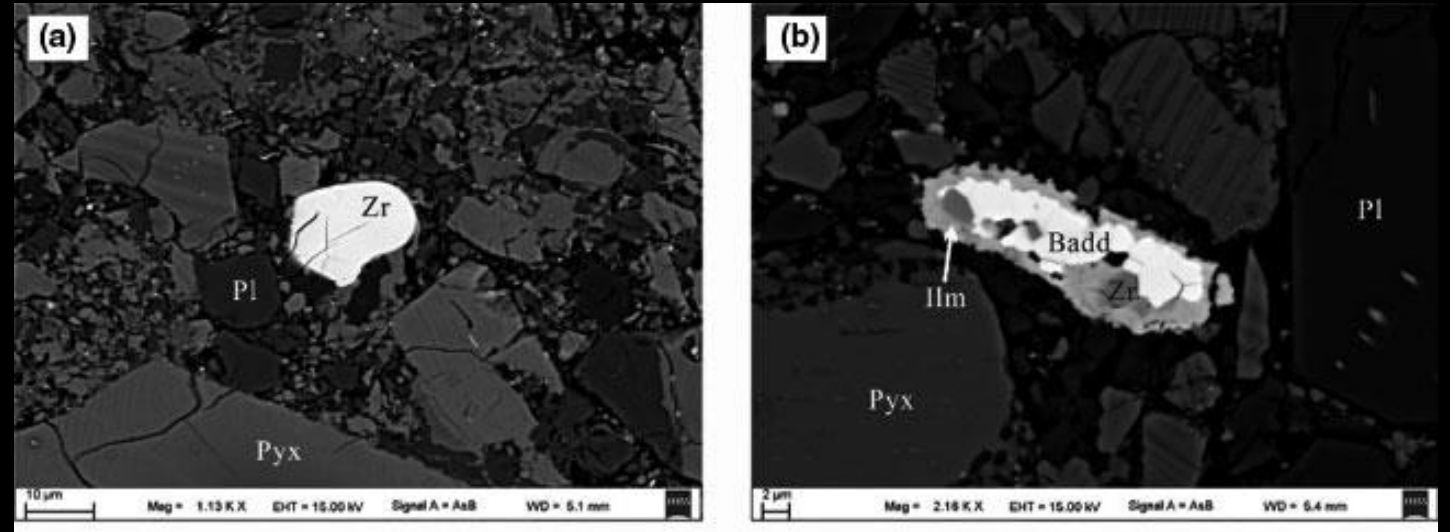
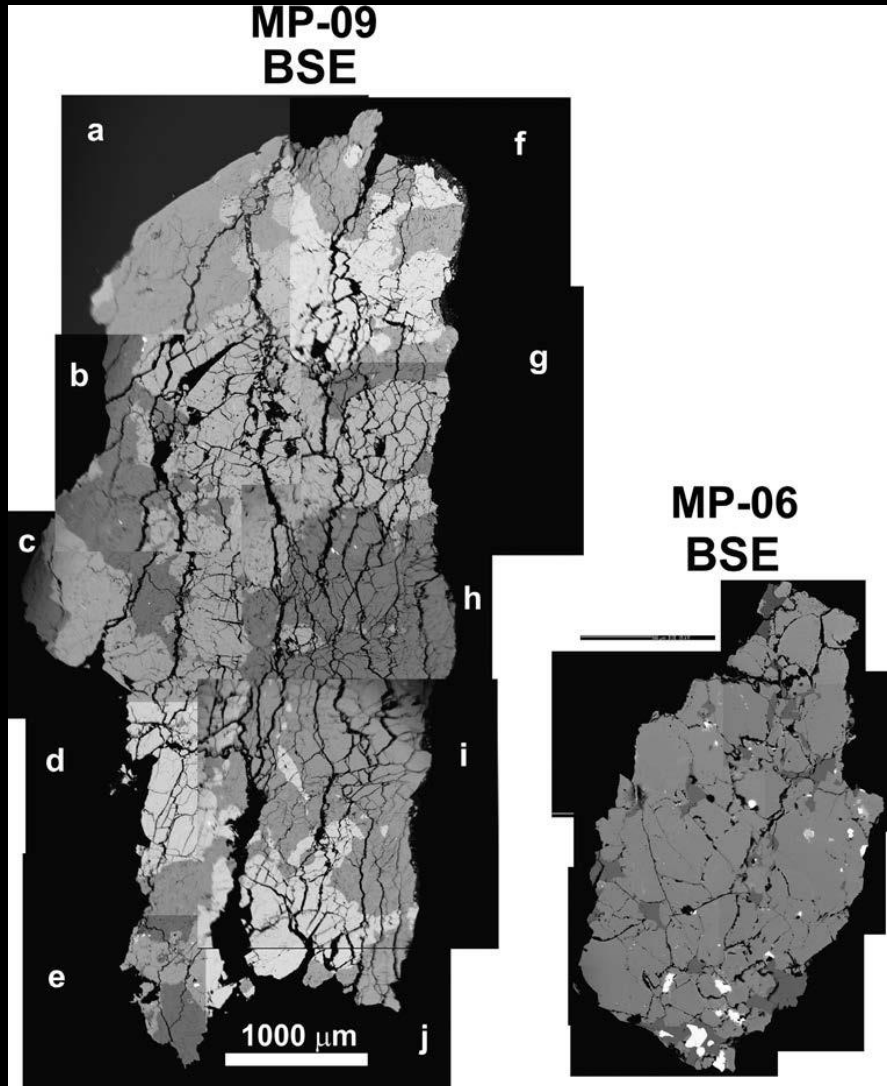
Finally during the 6th and last expedition in October 22 more meteorites found. One large fragment in November 2022



*Credits: A. Proyer,
M. Gabadirwe*

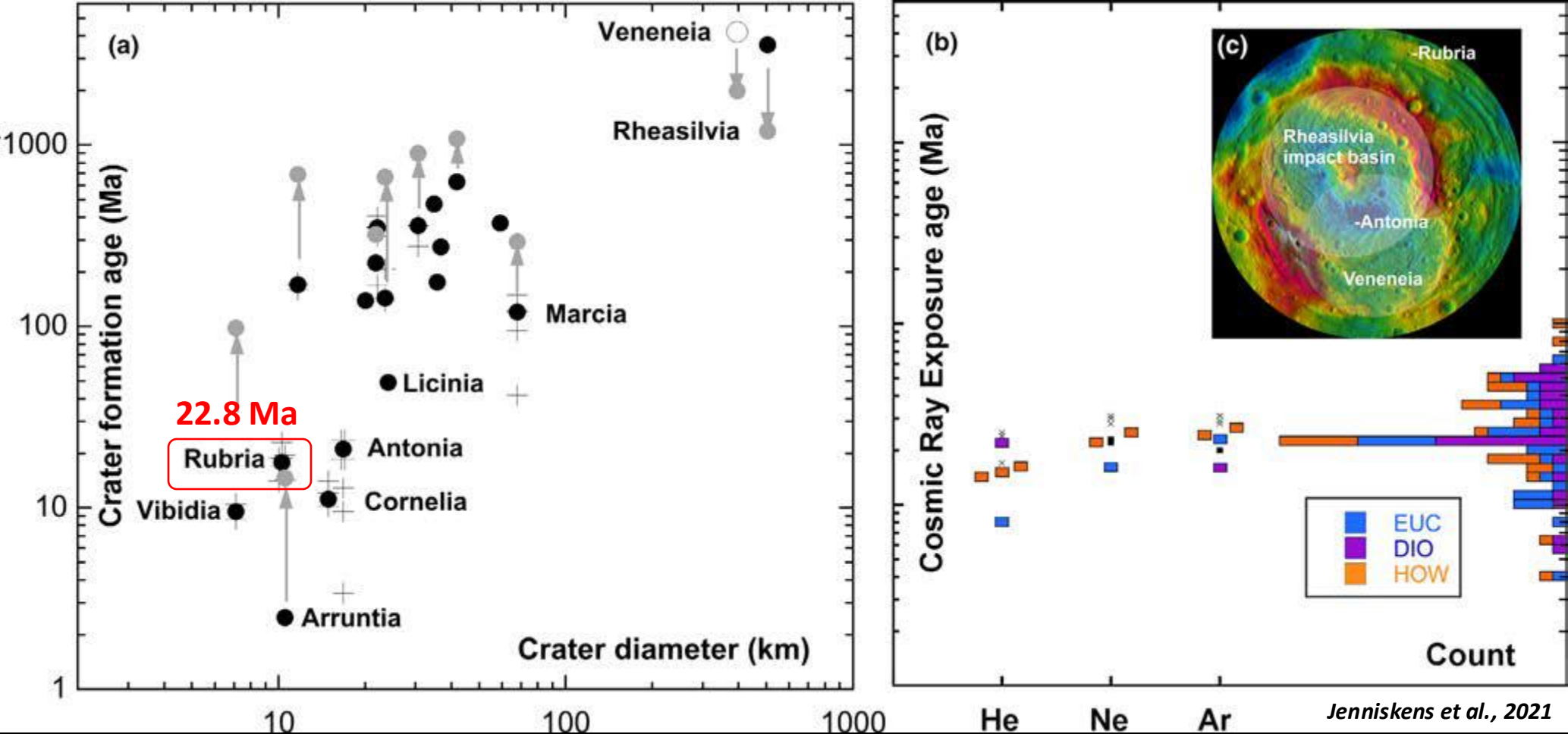
THE MOTOPI PAN METEORITE

The petrography and mineralogy of five meteorites show them to be pieces of an HED polymict breccia derived from howardite, cumulate and basaltic eucrite, and diogenite lithologies.



Motopi Pan Meteorite:
Howardite– eucrite– diogenite (HED) meteorites are
basaltic achondrites
4.56 Ga old!

The constraints set by the absolute magnitude, the asteroid's impact kinetic energy, and the noble gas and cosmogenic nuclide data imply that the asteroid was about 156 cm in diameter, with a mass of about 5700 kg.



THE IMPACT CRATER RUBRIA ON VESTA IS A LIKELY SOURCE
CRATER OF MOTOPI PAN

3. THE 3rd AUGUST BOLIDE

Locations of all videos





2



3



6



7



9



10



14



25



28a



28b



29



30



31



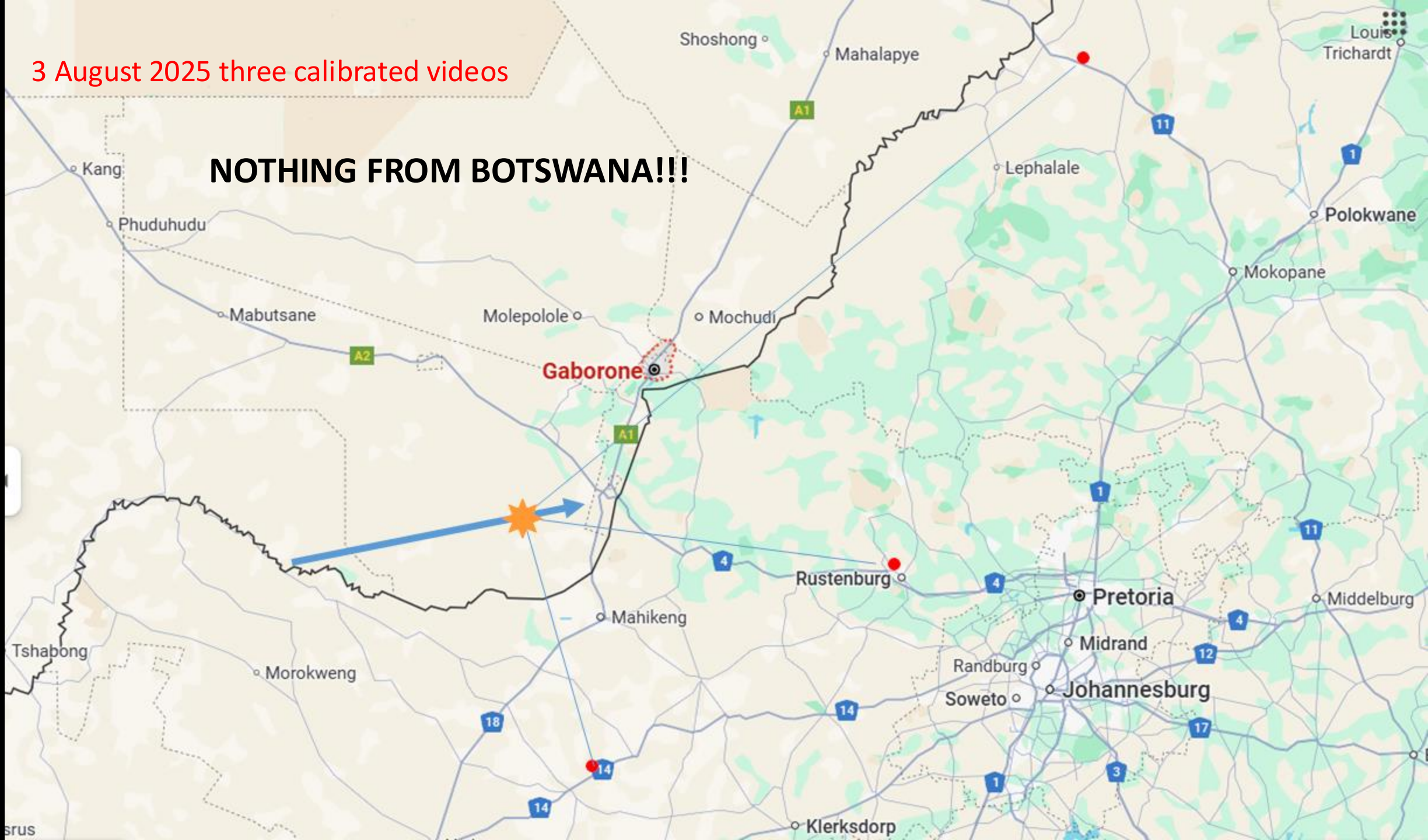
33



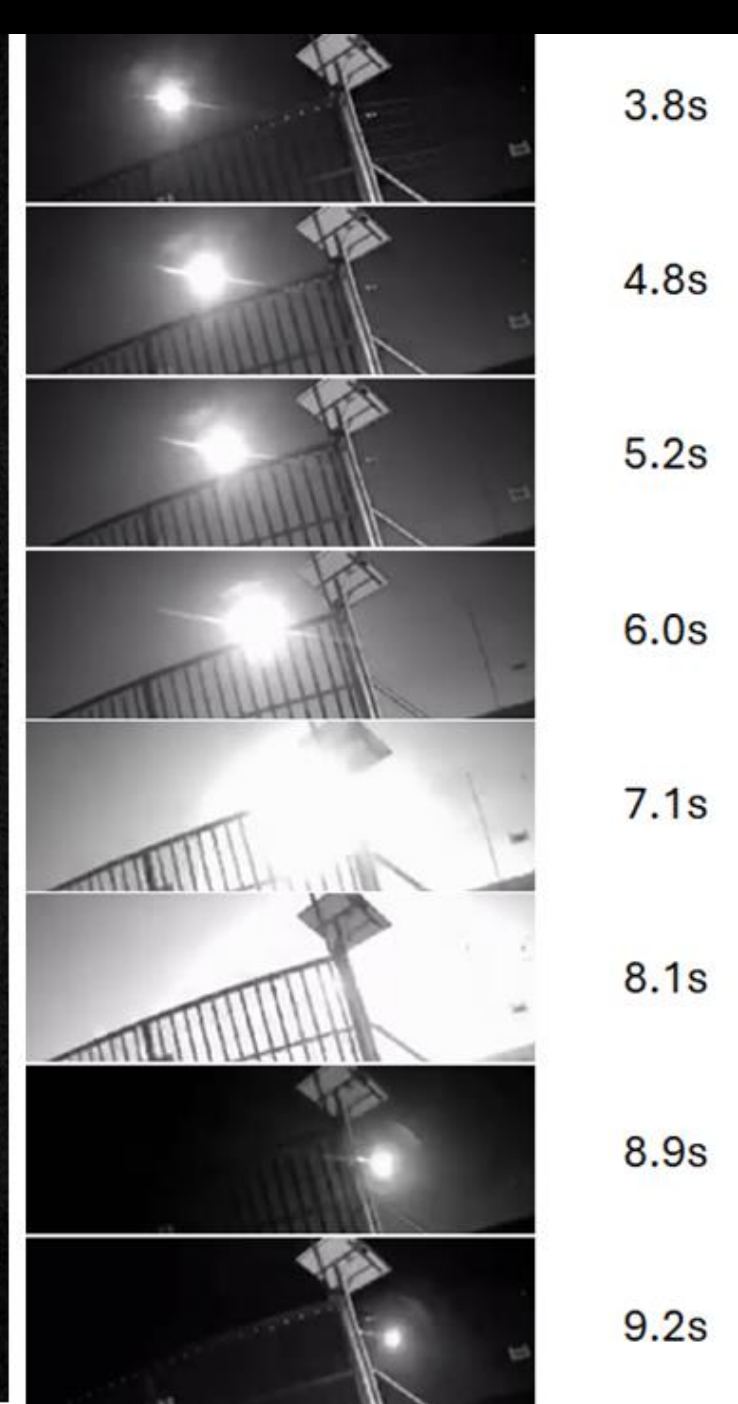
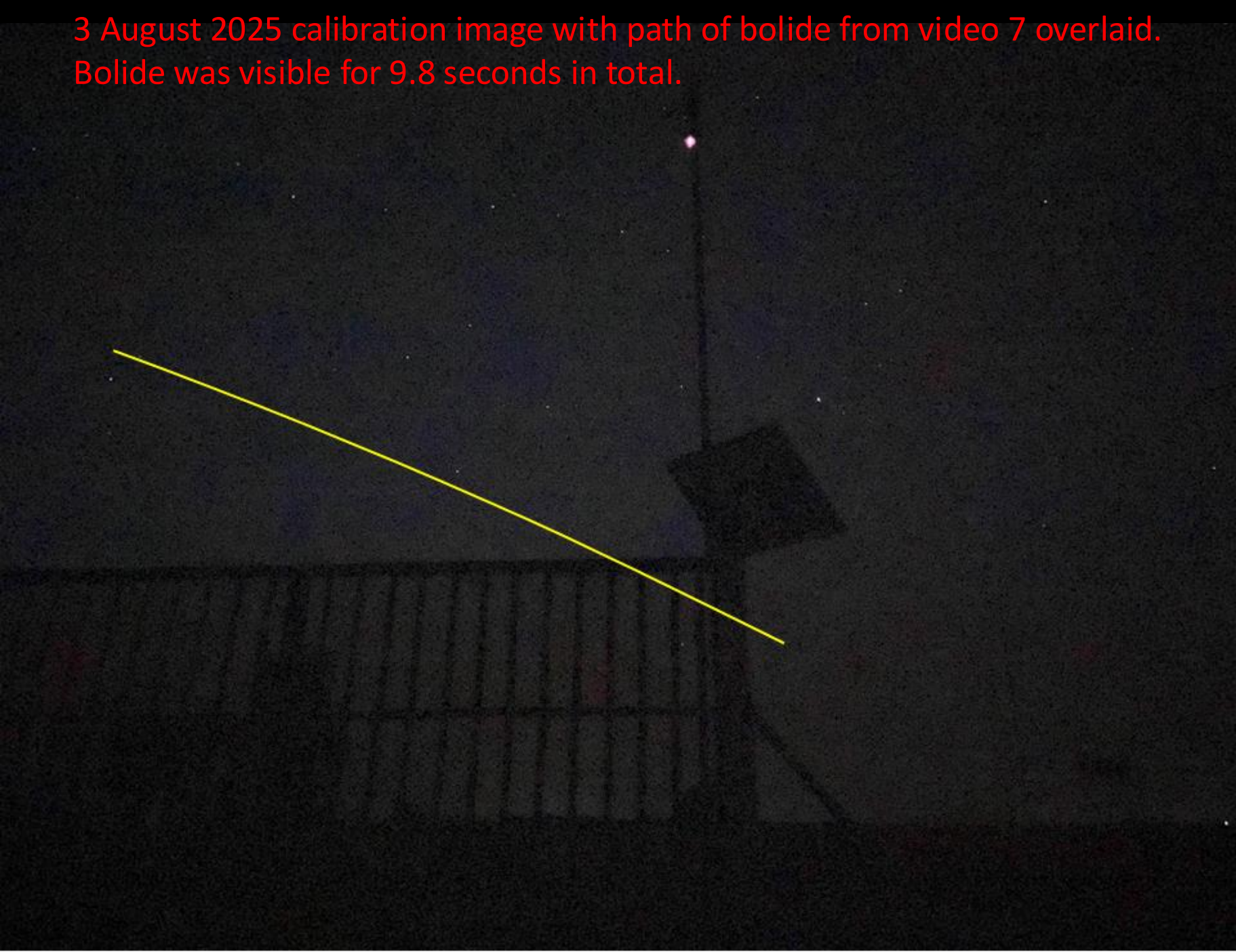
39

3 August 2025 three calibrated videos

NOTHING FROM BOTSWANA!!!



3 August 2025 calibration image with path of bolide from video 7 overlaid.
Bolide was visible for 9.8 seconds in total.



3 August 2025 shadow from bright flash from video 1, which was calibrated against star positions. The shadow is in the anti-direction of the flash, so a line was drawn along the shadow using the STOP road markings as guide, camera placed exactly centred on the line, and images of the stars taken with the pole of the sign in the centre of view.





We need
more
videos!!

**THANK YOU
GRAZIE
KE A LEBOGA**

