UFO Dynamics on the Moon

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ABSTRACT High-speed video recordings of the sky near the Moon have revealed numerous UFOs. We broadly classify them as 'atmospheric' and 'continental'. Atmospheric UFOs exhibit flashes lasting from 100 to 500 milliseconds with an amplitude of approximately one magnitude. Their brightness fluctuates with a fundamental frequency and several harmonics (overtones) in the range of a few hertz. Disc-shaped continental UFOs have a diameter of approximately 25 to 40 km. The discs exhibit brightness fluctuations of up to 1% within a range of several hertz. Toroidal continental UFOs are approximately 36 km in size, and their speed reaches 11 km/s. The rotation period of toroidal UFOs is approximately 180 seconds, and the centrifugal acceleration is 2200 cm/s^2, which is roughly twice as strong as the acceleration caused by gravity on Earth. UFOs are observed on Earth and in near-Earth space. We believe that the Moon serves as a base for UFOs. UFOs can reach Earth in 20 minutes. On Earth, they manifest as UAP phenomena. UFOs demonstrate intelligent behavior and can be regarded as a technologically advanced civilisation.

Key words: methods: observational; object: UAP; object: UFO; techniques: imaging

1 Introduction

The Main Astronomical Observatory of NAS of Ukraine conducts an independent study of Unidentified Flying Objects (UFO) - objects or phenomena observed in the sky but not yet identified or explained (Zhilyaev 2025).

There is sufficient background information, which includes previous work on UFO in Carlotto (1995, 2005), as well as anomalous space objects captured by a camera aboard the space shuttle Columbia in 1996. Carlotto (2020) published observations showing three very large unidentified objects flying around the Moon. These objects are estimated to be between 5 and 15 miles long and between 1 and 3 miles wide, and appear to be travelling at a speed of over 30 miles per second at an altitude of 5 to 10 kilometers.

Vallee in the CAIPAN Workshop, CNES, Paris (2014), giving a talk on UFO research methodology, history and future steps. In our work, we follow his methodology.

2 Analysis of objects on the Moon

The Moon was detected during sky monitoring on September 07, 2025, at 23:05:02 UT and at 23:27:49 UT. The Moon was monitored in video mode on the Intes-AlterM603 telescope in the Vinarivka village in the south of the Kyiv region.

The telescope was equipped with an ASI 294 Pro camera. The data were collected with a time resolution of 0.05 sec. Offset, dark frame, and flat field frame calibration was performed to eliminate dark current fluctuations, differences in the sensitivity of individual pixels, and illumination fluctuations across the entire chip area. The SharpCap 4.0 program was used for data recording. Data processing was performed in MATLAB.

High-speed video recording of the sky near the Moon was investigated and found to reveal UFOs. More than 20 objects were counted in frames. We conditionally divide them into 'atmospheric' and 'continental'. Atmospheric UFOs are stationary objects. Continental UFOs move across the surface of the Moon.

Figure 1 shows images of the Moon from a video depicting numerous 'atmospheric' UFOs. Figure 2 shows image of the object. Figure shows cropped image of UFO from the video. The size of the object, 2x2 pixels, corresponds to the point spread function.

UFOs have very low contrast, no more than 10%. We present images in pseudo colors to enhance contrast.

2.1 Analysis of 'atmospheric' objects on the Moon

Figure 3 shows the positions (top and middle panels) and brightness of the object (bottom panel) over a period of 100 frames. The position of the object remains constant with an accuracy of one pixel (0.75 arc seconds).

Figure 4 shows atmospheric UFOs moving in sync with the Moon. This means that they are anchored.

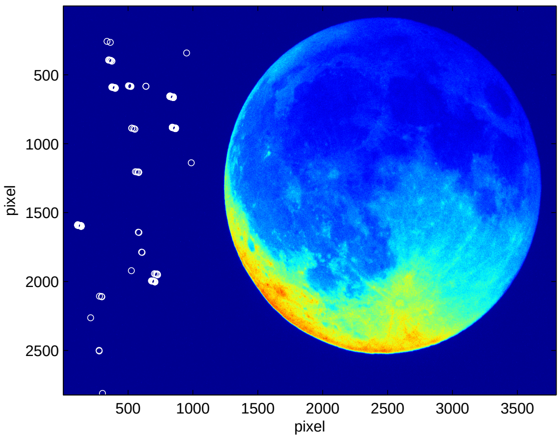

Fig. 1: A video clip showing 'atmospheric' UFOs.

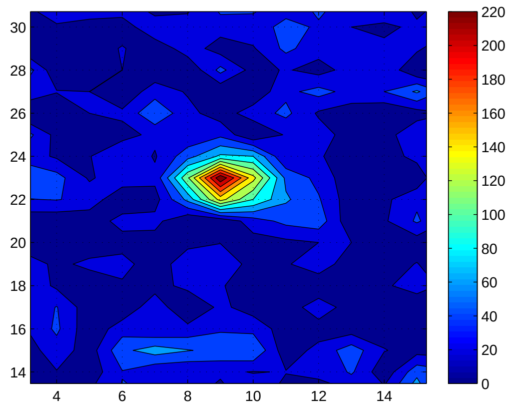

Fig. 2: Image of the object.

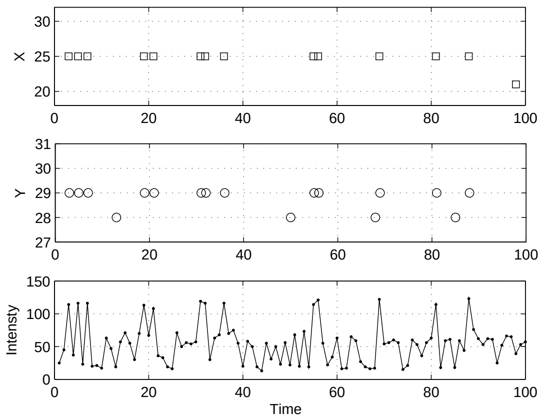

Fig. 3: Positions (top and middle panels) and object intensity (bottom panel) over 100 frames.

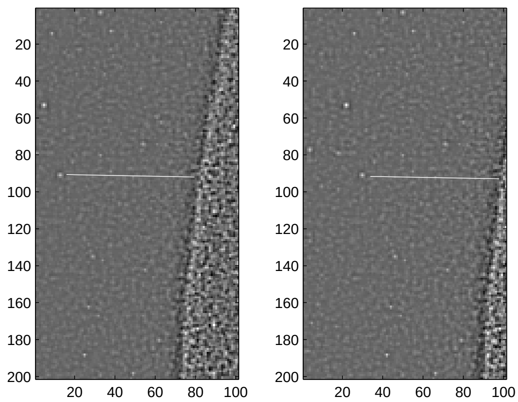

Fig. 4: A video showing 'atmospheric' UFOs moving in sync with the Moon.

All objects exhibit brightness variations. The brightness curves of the objects, recorded at a sampling rate of 20 Hz, show flashes lasting between 100 and 500 milliseconds with an amplitude of approximately one magnitude (Figs. 5 - 9).

Figures 7, 8 and 9 show the brightness curves and power spectra of the UFO in the 'signal-to-noise ratio' (SNR) versus frequency (Hz) coordinate system. Several harmonics are observed in the 5-second series. The Fourier spectra of the brightness curves show fluctuations in the intensity of the UFO at the fundamental frequency and some harmonics (overtones). It should be noted that such spectra are characteristic of pulsed processes.

The light curves in Figure 9 show a significant correlation of two objects with a confidence level of 95%. This means that two UFOs hundreds km apart change their brightness synchronously.

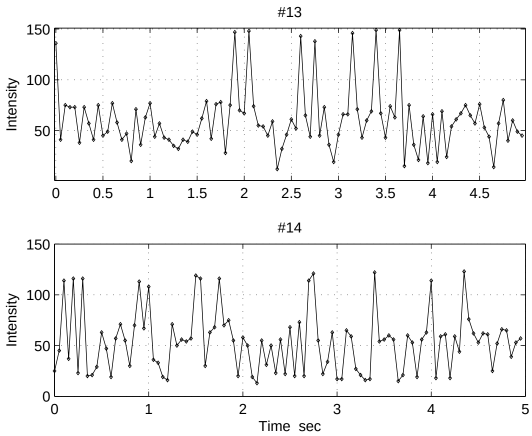

Fig. 5: The light curves for UFOs No. 13 and No. 14.

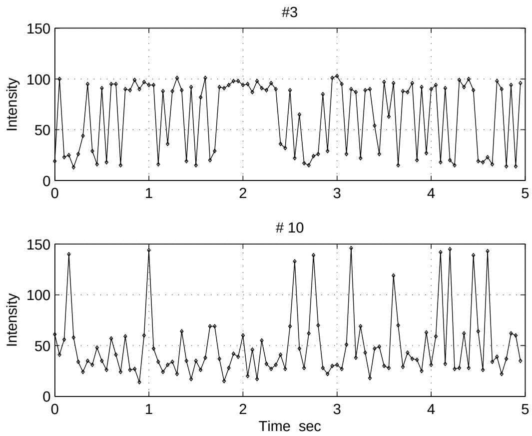

Fig. 6: The light curves for UFOs No. 3 and No. 10.

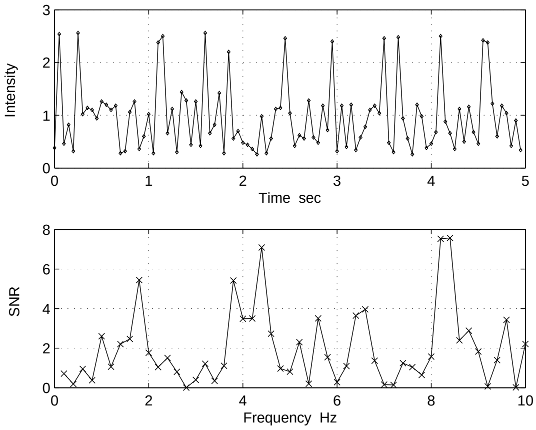

Fig. 7: The light curve and Fourier spectrum of the stationary UFO in Fig. 1.

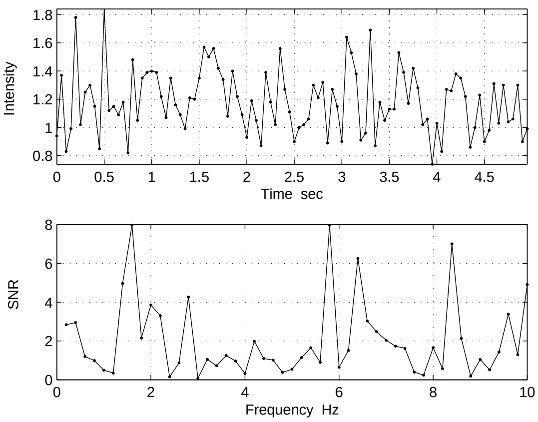

Fig. 8: The light curve and Fourier spectrum of the stationary UFO in Fig. 2.

2.2 Evaluation of objects' properties

Observing UFOs, it becomes necessary to evaluate their characteristics. In particular, the sizes of bright objects can be determined if they shine with reflected sunlight.

For calculations, we need to know the brightness of the sky near the object and the distribution of energy in the spectrum of the Sun. The generic analytical expression of the spectrum of a clear daylight sky is given in [6]. The brightness of a clear blue sky for a zenith distance of 45 deg depending on the wavelength λ and the distribution of energy in the spectrum of the Sun are given in [1]. In particular, a clear daylight sky brightness for $\lambda = 0.5$ μm $F_{sky} = 4.5$ $erg/(cm^2 \cdot s \cdot \text{Å} \cdot sr)$. The solar radiation flux $F_{sun} = 193$ $erg/(cm^2 \cdot s \cdot \text{Å})$.

If observations are conducted at night for calculations, we can use the brightness of the Moon.

We represent the light fluxes of the object and the sky background as:

$$I_{obj} = F_{sun} \cdot r^2/R^2 \cdot \alpha \tag{1}$$

$$I_{sky} = F_{sky} \cdot \Omega \tag{2}$$

$$I_{obj} = \beta \cdot I_{sky} \tag{3}$$

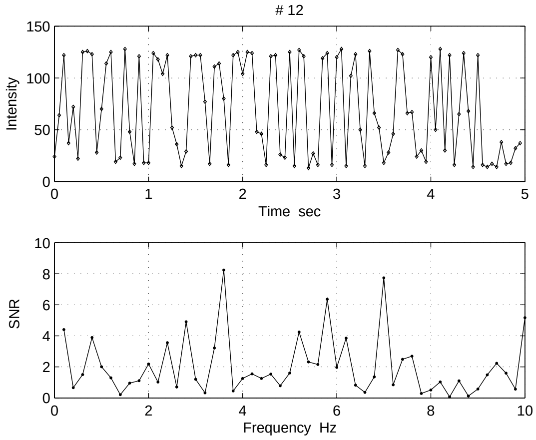

Fig. 9: The light curve and Fourier spectrum of the stationary UFO.

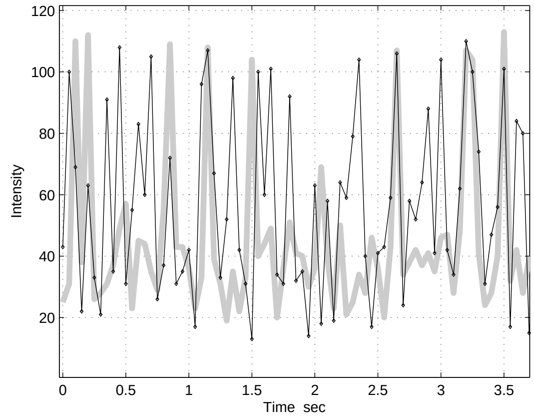

Fig. 10: The light curves of two UFOs changing their brightness in unison.

Here r is the size of the object, R is the distance to the object, α is the albedo, β is the ratio of the brightness of the object to the brightness of the sky background, and Ω is the solid angle of the pixel. This implies

$$r = R \cdot \sqrt{\beta \cdot F_{sky} \cdot \Omega / (F_{sun} \cdot \alpha)} \tag{4}$$

The brightness of the Moon F_{moon} is equal to $F_{sun} \cdot \alpha_{moon}$. This implies

$$r = R \cdot \sqrt{\beta \cdot \Omega \cdot (\alpha_{moon}/\alpha)} \tag{5}$$

Using of I_{obj} and I_{moon} in Figures 1 and 2, using the distance R, the albedo of the Moon $\alpha_{moon} = 0.064$ [1], and $\beta = 2$, we can estimate the value of the size as:

$$\frac{0.44}{\sqrt{\alpha}} \quad km$$

If we set the albedo α to 1 (the object reflects 100% of solar radiation), the size of the object will be 440 metres. Assuming an albedo of 0.064 (as for the Moon), we obtain a value for the size of the object of approximately 1,800 metres. In any case, we can say that UFOs are very impressive in size.

2.3 Analysis of 'continental' objects on the Moon

Figure 11 shows UFOs on the surface of the Moon. Figure 12 shows a UFO in flight. The object travels a distance of 22 km at a speed of 6.6 km per second.

Figure 13 shows the original image. Figure 14 shows the reconstructed image. Figures 15 and 16 show two disc-shaped continental UFOs measuring approximately 25 and 40 km in diameter. The discs exhibit a variation in brightness of up to 1% at frequencies of 3.0, 4.5 and 6.0 Hz (Figures 17 and 18).

To construct the UFO brightness curves, we use the 'Phase discrimination method' [7]. Phase discrimination is carried out by comparing the Fourier spectra of the useful signal and the interference signal.

The interference signal is the Moon's 'white light curve', obtained by integrating an array of Moon images. The global light curve of the Moon (Fig. 23) reflects variations in atmospheric transparency and tracking errors.

Harmonics falling within a phase difference range of ± 1 radian, are considered common and are subject to discrimination. After cleaning the brightness curve of spurious harmonics, we select the harmonics in the Fourier transform for which the signal-to-noise ratio exceeds a critical level. Knowing the amplitudes and phases of the selected harmonics, it is possible to reconstruct the brightness curve, free from noise.

The original and reconstructed brightness curves of the UFO and their spectra are shown in Figures 23 and 24.

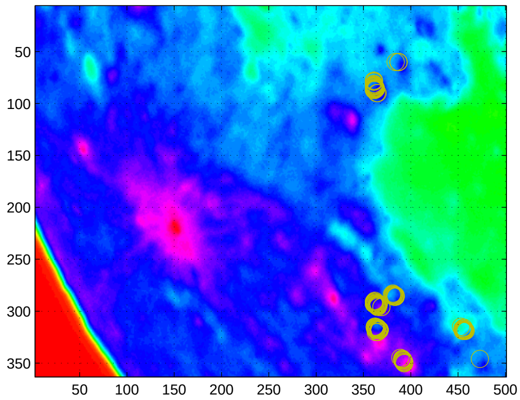

Fig. 11: Continental UFOs on the surface of the Moon (marked with circles).

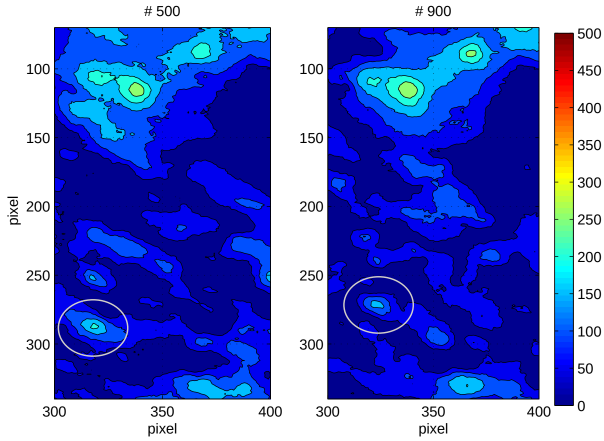

Fig. 12: Photographs showing a UFO in flight over land.

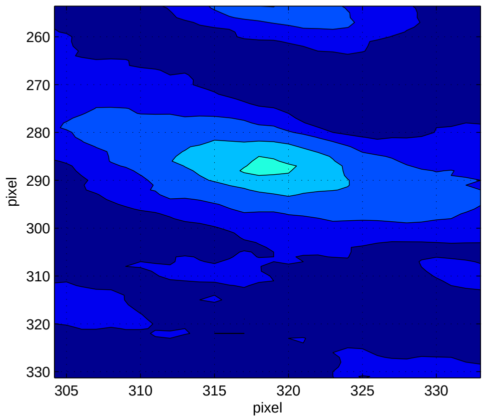

Fig. 13: A still from a video showing a UFO over land.

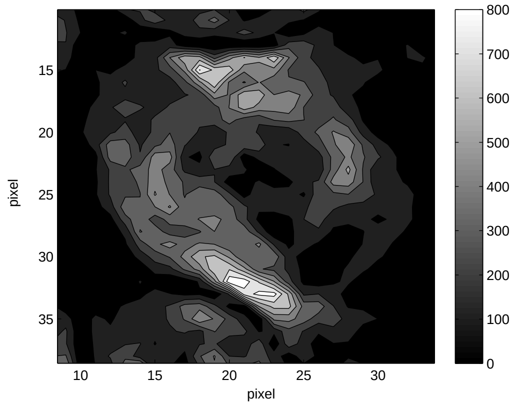

Fig. 14: A photograph showing a UFO over land.

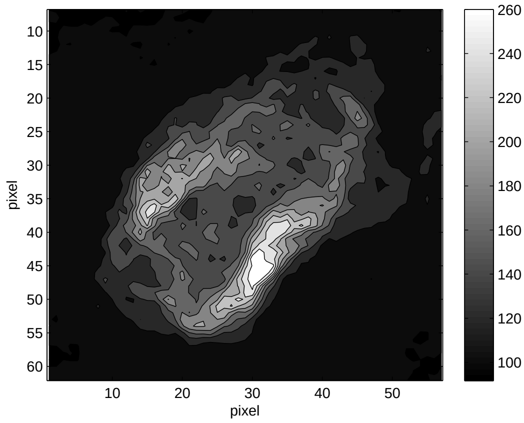

Fig. 15: A disc-shaped 'continental' UFO.

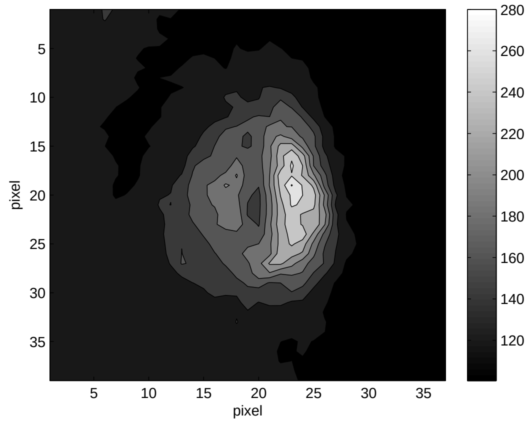

Fig. 16: A disc-shaped 'continental' UFO.

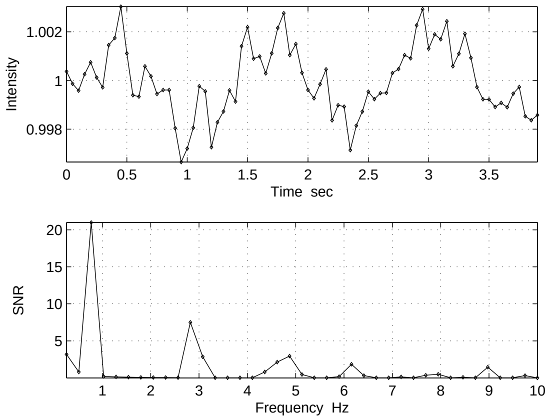

Fig. 17: The light curve and Fourier spectrum of the continental UFO.

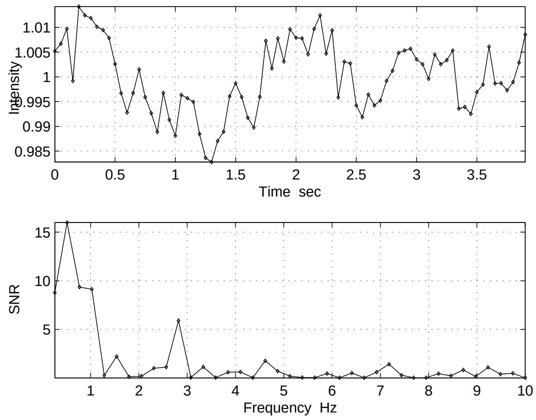

Fig. 18: The light curve and Fourier spectrum of the continental UFO.

2.4 Toroidal UFOs

The UFO on the Moon (Fig. 19) was detected during a sky observation on 16 August 2025 at 06:52:00 UT. The Moon was observed in video mode using the Intes-AlterM603 telescope. The Moon and the objects were captured against the backdrop of a bright daytime sky. The contrast of the objects is approximately 5%. Special image processing techniques are required to detect them. The data in the figures are presented in false colors to enhance the image contrast.

As shown in Figure 20 residual intensity for RGB rays has the same values. Such a feature is characteristic of a black body. This means that the object does not emit and absorbs all the radiation falling on it.

The Moon's albedo is 0.064 [1], and the residual intensity of the RGB rays is 0.95; therefore, the albedo of the torus is $0.064 \cdot 0.95 = 0.061$.

It should be noted that the contrast of the object for RGB rays is low and consistent across all colors. This means that the torus is highly obscured and difficult to detect.

Figure 21 is a composite of the first and last frames. It shows several toroidal UFOs and demonstrates their movement.

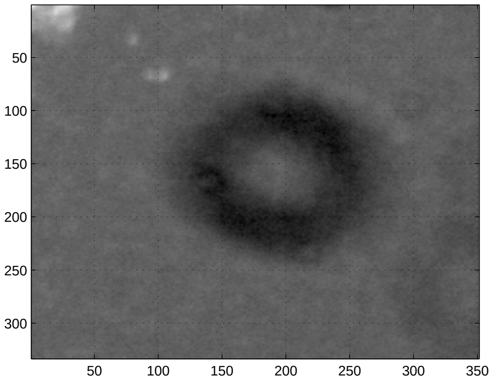

Fig. 19: Cropped image from the video showing a toroidal UFO.

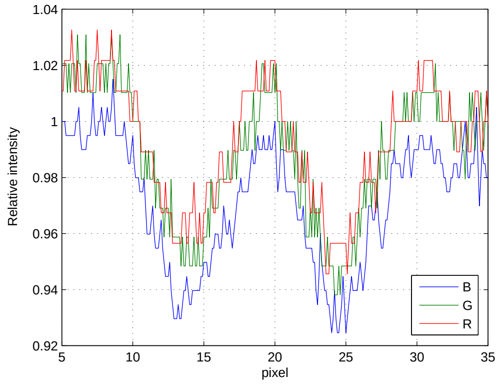

Fig. 20: The UFO RGB color map in Figure 19.

Figures 22 and 25 show image frames illustrating the movement and rotation of toroidal UFOs. The rotation angles in the first and last frames have been determined based on prominent features in the images. The toroids rotate at a rate of approximately 2.0 degrees per second. The calculated rotation

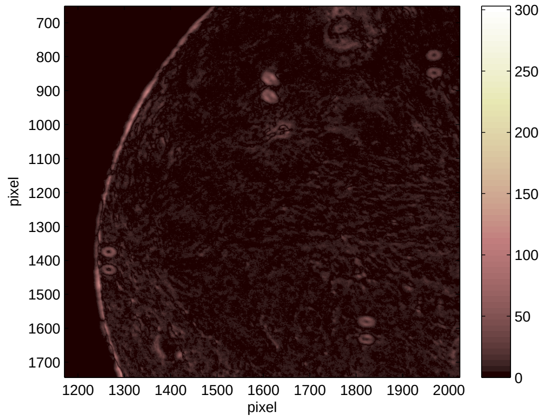

Fig. 21: A video clip showing 'toroidal' UFOs.

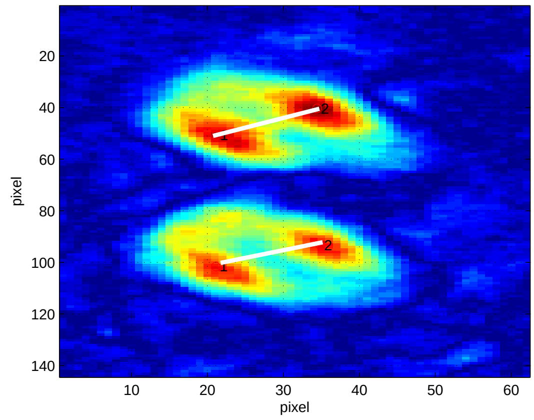

Fig. 22: The UFO in the top right-hand corner of Fig. 19.

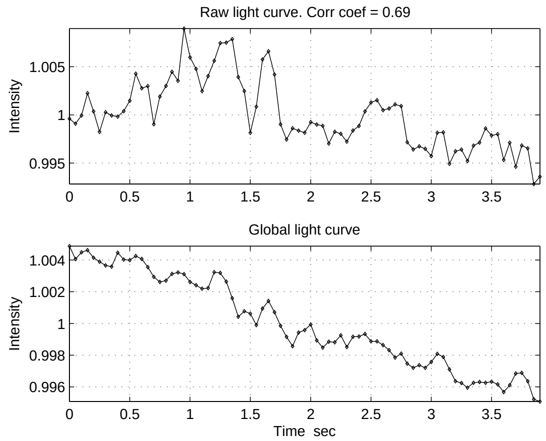

Fig. 23: The curve showing the initial brightness of the UFO (top graph) and the curve showing the overall brightness of the Moon (bottom graph).

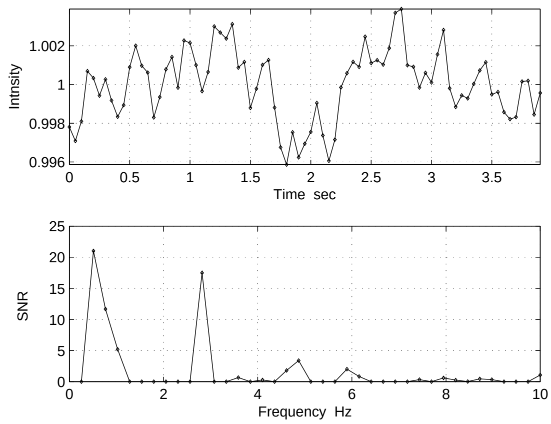

Fig. 24: The brightness curve and Fourier spectrum of the reconstructed UFO are shown in Fig. 23.

period is 180 seconds, and the rotation frequency is 0.0056 Hz. The radius of the torus is about 18 km, the linear velocity is 0.630 km/s, and the centrifugal acceleration can be estimated as equal to 2200 cm/s^2. Note that the acceleration caused by gravity on Earth is 968 cm/s^2. Thus, artificial gravity on the torus is roughly twice as strong as on Earth.

Figures 22 and 25 show reconstructed images of UFOs observed on the continents. The UFOs have a toroidal shape. The objects have a size of 26 $\pm$ 3 pixels, i.e. 36 $\pm$ 3 km, and their speed range to 11 kilometres per second.

Figures 24 and 26 show the light curves and Fourier spectra of the toroidal UFOs. The brightness curves show variability with an amplitude of only two tenths of a percent. The graphs show variability at frequencies [1.0 3.0 4.5 6.0] Hz, multiples of the fundamental frequency 1.5 Hz.

3 Discussion

High-speed video recording of the sky near the Moon was investigated and found to reveal UFOs: more than 20 objects were counted in frames. We conditionally divide them into 'atmospheric' and 'continental'. Atmospheric UFOs are stationary objects. Continental UFOs move across the surface

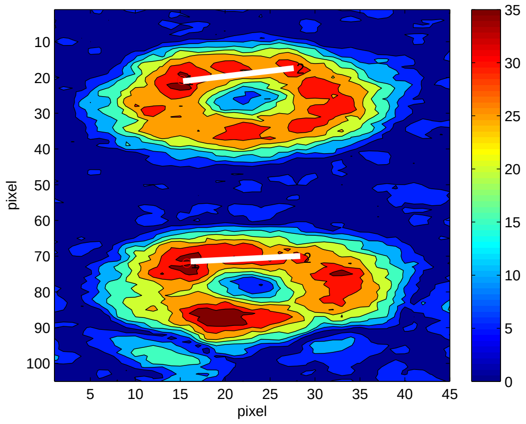

Fig. 25: A video clip showing toroidal UFO.

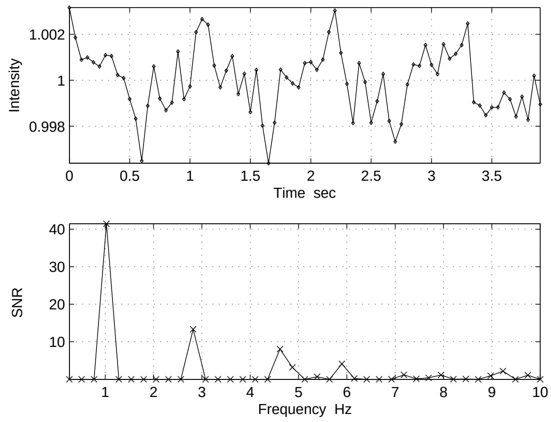

Fig. 26: The light curve and Fourier spectrum of a toroidal UFO.

of the Moon.

All objects exhibit brightness variations. The brightness curves of the objects, recorded at a sampling rate of 20 Hz, show flashes lasting between 100 and 500 milliseconds with an amplitude of approximately one magnitude.

The Fourier spectra of the brightness curves show fluctuations in the intensity of the UFO at the fundamental frequency and some harmonics (overtones). It should be noted that such spectra are characteristic of pulsed processes.

If we set their albedo to 1 (the object reflects 100% of solar radiation), the size of the objects will be 440 metres. Assuming an albedo of 0.064 (as for the Moon), we obtain a value for the size of the object of approximately 1,800 metres. In any case, we can say that atmospheric UFOs are very impressive in size.

The disc-shaped continental UFOs measuring approximately 25 and 40 km in diameter. The discs exhibit a variation in brightness of up to 1% at frequencies of 3.0, 4.5 and 6.0 Hz.

Toroidal UFOs have been detected on the Moon. The contrast of the objects is approximately 5%. The torus's albedo is 0.061. The torus is heavily obscured and difficult to detect.

The objects measure approximately 36 km, and their speed reaches 11 km/s. The light curves show variability with an amplitude of just two-tenths of a per cent. They reveal variability at frequencies that are multiples of the fundamental frequency of 1.5 Hz.

The toroidal UFOs have a rotation period of about 180 seconds and a centrifugal acceleration of 2200 cm$/s^2$ which is roughly twice as strong as on Earth.

Objects have unprecedentedly large sizes, and unprecedentedly high velocities. Ian Clague, CEO of Dirac Drives from Cambridge, tells us: "I have studied UFOs and I see that no country on Earth has developed such a propulsion system. The physics of such a propulsion system are beyond the accepted physics here on Earth".

UFOs are observed on Earth and in near-Earth space. We believe that the Moon serves as a base for UFOs. UFOs can reach Earth in 20 minutes. On Earth, they manifest as UAP phenomena. UFOs exhibit intelligent behaviour and can be regarded as a technologically advanced civilisation.

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