

UFOs on the Moon

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ABSTRACT High-speed video recordings of the sky near the Moon were studied, which allowed us to detect numerous UFOs: more than 20 objects were counted in the frames. We conditionally divide them into "atmospheric" and "continental". Atmospheric UFOs that are anchored. Continental UFOs move across the surface of the Moon. The size of atmospheric UFOs, depending on albedo, is estimated to range from hundreds of metres to several kilometres. The dimensions of continental UFOs are estimated at 40 kilometres, and their speed at approximately 20 kilometres per second. UFOs are camouflaged. In terms of colour and brightness, they are virtually indistinguishable from the Moon. They are difficult to detect. UFOs demonstrate variable brightness in the range of several hertz. They change their brightness synchronously. The objects discussed in this article are unprecedented in size and speed.

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

1 Introduction

The Main Astronomical Observatory of NAS of Ukraine conducts an independent study of unidentified flying objects (UFOs) - objects or phenomena observed in the sky but not yet identified or explained.

UFOs as pop culture objects have become objects of scientific research. 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 object near the Moon

The Moon (Figure 1) was detected during sky monitoring on September 07, 2025, at 19:09:28 UT and at 20:05:03 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 CCD 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.

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 (Figure 1). We conditionally divide them into "atmospheric" and "continental". Atmospheric UFOs are stationary objects. Continental UFOs move across the surface of the Moon.

Figure 2 shows atmospheric UFOs moving in sync with the Moon. This means that they are anchored.

Figures 3 and 4 demonstrate variable brightness of UFOs. The Fourier spectra of the light curves show variability in the range of several hertz. The power spectra in frequency - signal-to-noise ratio (SNR) coordinates of two stationary objects in Fig. 2 show variability at frequencies of 2, 4, 6, and 8 hertz.

The light curves in Figures 3 and 4 show a significant correlation with a confidence level of 95%. This means that two UFOs about 40 km apart change their brightness synchronously.

Figure 5 shows an unprocessed image of a continental UFO. The contrast relative to the background is about 3%. The albedo of the UFO, given below, is 0.029, which is half that of the Moon. The UFO appears as a dark spot against the background of the Moon.

Figure 6 shows a reconstructed image of the continental UFO. The UFO has a toroidal shape. Its size is 28 pixels, or about 39 kilometers.

To determine the speed of the UFO, we used frame alignment to remove the motion of the moon and telescope tracking errors. To align the frames, the optical center of gravity of the lunar disc is determined. The accuracy of the estimate is approximately one pixel.

Figure 7 shows a composite image of two frames taken at an interval of 2.5 seconds. This gives an estimate of the UFO's speed at 19.5 km/s.

Figure 8 shows the brightness curves for three continental UFOs (top panel) and the background (bottom panel). Variations in UFO brightness are around 5%. It is noteworthy that three objects hundreds of kilometers apart change their brightness synchronously. Two UFOs demonstrate a fluctuation period of about one and a half seconds.

The consistency of the background brightness in the lower image indicates that the variations in UFO brightness are real.

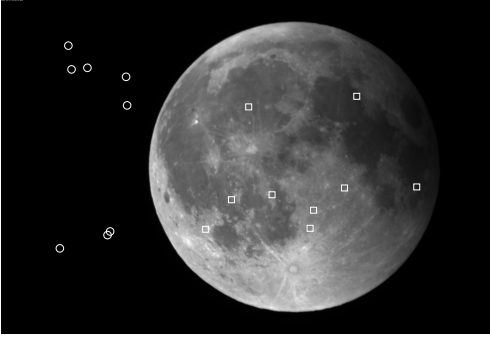


Fig. 1: A cropped image from a video showing numerous UFOs.

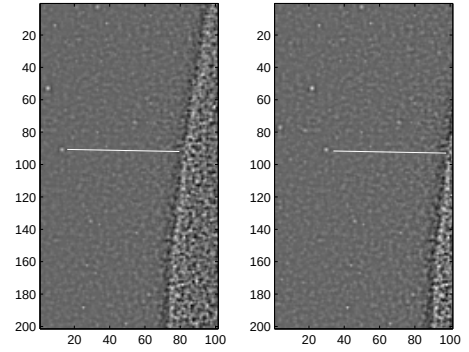


Fig. 2: A video showing "atmospheric" UFOs moving in sync with the Moon.

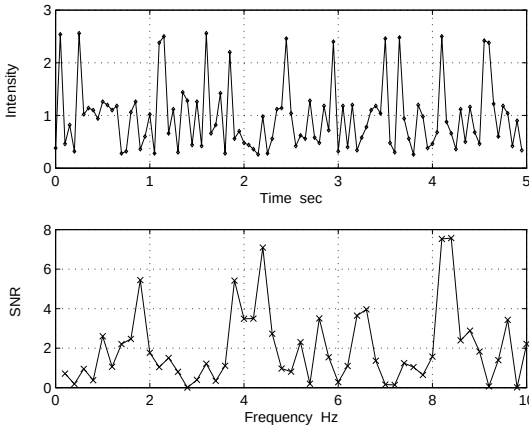


Fig. 3: The light curve and Fourier spectrum of the upper stationary UFO in Fig. 2.

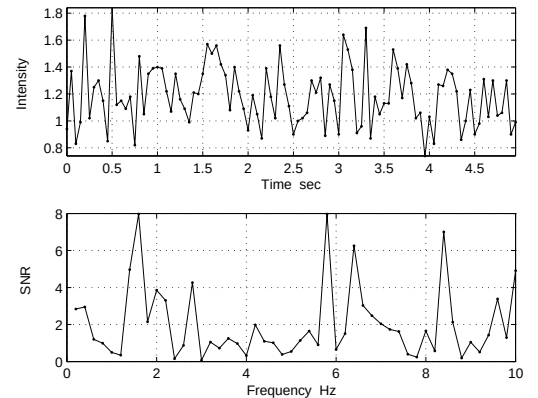


Fig. 4: The light curve and Fourier spectrum of the lower stationary UFO in Fig. 2

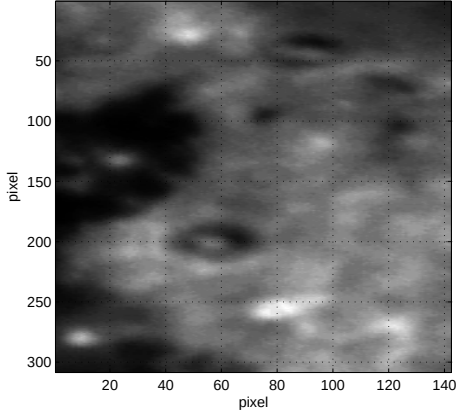


Fig. 5: Unprocessed image of a continental UFO.

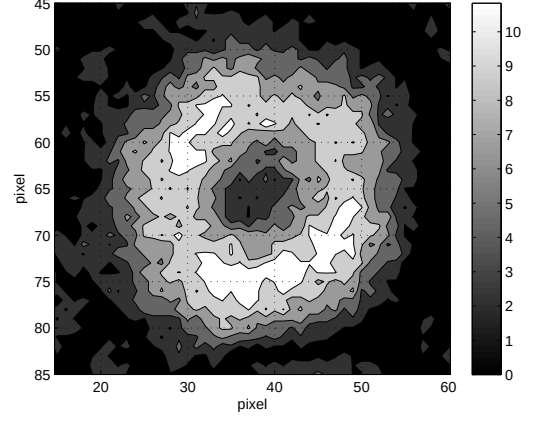


Fig. 6: Restored image of the continental UFO.

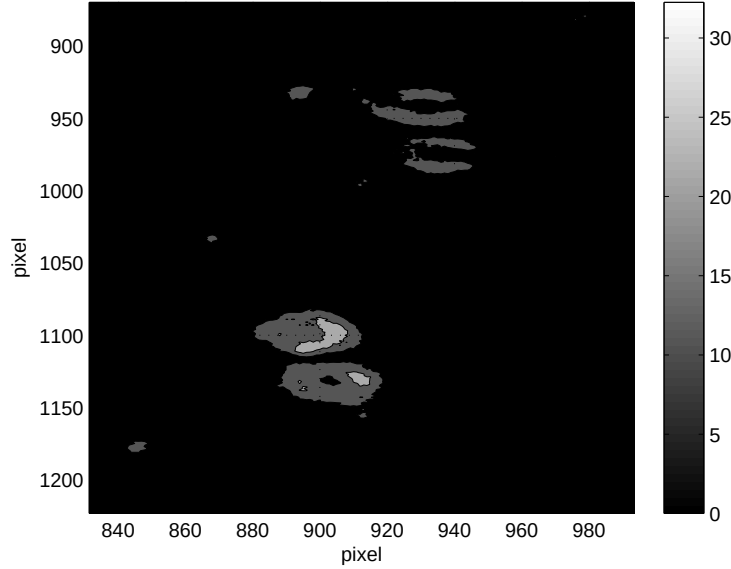


Fig. 7: A cropped image from a video showing moving UFOs.

2.1 Evaluation of objects' properties

Observing APs, 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 $\lambda = 0.5 \mu\text{m}$ $F_{sky} = 4.5 \text{ erg}/(\text{cm}^2 \cdot \text{s} \cdot \text{\AA} \cdot \text{sr})$. The solar radiation flux $F_{sun} = 193 \text{ erg}/(\text{cm}^2 \cdot \text{s} \cdot \text{\AA})$.

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:

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

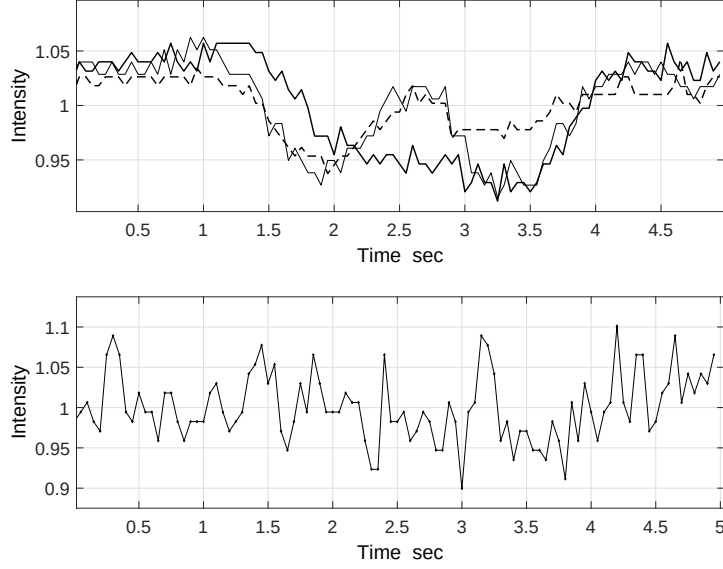


Fig. 8: Light curves for three continental UFOs (top panel) and background (bottom panel).

$$I_{sky} = F_{sky} \cdot \Omega \quad (2)$$

$$I_{obj} = \beta \cdot I_{sky} \quad (3)$$

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

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

If the distance and the size of the object are known from measurements, then one can easily determine the albedo value:

$$\alpha = \beta \cdot F_{moon} \cdot \Omega / F_{sun} \cdot (R/r)^2 \quad (5)$$

Using the distance and size according to Fig. 6 and β equal to 1, one can estimate the albedo of the object to be 0.029.

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

$$r = R \cdot \sqrt{\beta \cdot \Omega \cdot (\alpha_{moon} / \alpha)} \quad (6)$$

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

$$\frac{0.31}{\sqrt{\alpha}} \text{ km}$$

If we set the albedo α to 1 (the object reflects 100% of solar radiation), the size of the object will be 310 metres. Assuming an albedo of 0.029 (as for the continental UFOs), we obtain a value for the size of the object of approximately 1,800 meters. In any case, we can say that "atmospheric" UFOs are very impressive in size.

3 Discussion

High-speed video monitoring of the Moon has allowed us to detect numerous UFOs: more than 20 objects were counted in the footage. We conditionally divide them into "atmospheric" and "continental". Atmospheric UFOs are stationary. Continental UFOs move across the surface of the Moon.

The size of UFOs is estimated to be from hundreds of metres to several kilometres, and their speed is approximately 20 kilometres per second. UFOs are camouflaged. In terms of colour and brightness, they are virtually indistinguishable from the Moon. They are difficult to detect. UFOs demonstrate variable brightness in the range of several hertz. They change their brightness synchronously. The objects discussed in this article are unprecedented in terms of size and speed.

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