Observations of Comet C/2012 F6 (Lemmon)

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Summary

Comet C/2012 F6 Lemmon (hereinafter referred to simply as Comet Lemmon) peaked at around 4th magnitude in March 2013, and became an easy binocular object. This article summarises the observations and images made by several observers and sent to the author. Comet Lemmon was discovered on 2012 March 23. The first reported observation by ASSA members was by the author, who observed the comet visually on 2013 January 24, estimating the total cometary magnitude (m1) as 7.5. From then on the comet was reasonably well observed visually and photographically, though by only a few observers, until it became too close to the sun in mid March 2013. The comet was at perihelion on 2013 March 24, and was recovered in the morning sky on 2013 April 9, again by the author, and observed until May 7 when poor weather conditions prevented any further observations. The comet was placed too far north for observation thereafter. Note all dates in this article are in UT.

Visual Observations

Comet Lemmon was observed visually by Magda Streicher (ICQ Code STR03), Richard Ford (FORxx) and Tim Cooper (COO02). These observations included total cometary magnitude (m1) as well as coma size and degree of condensation (DC). Few visual observations were reported of the tail, which shows well in the images of this comet (see Plates 2 and 3). An examination of the images however indicates the presence of a bright ion tail, but the absence of a bright dust tail. While the tenuous ion tail shows up well in photographs, it is difficult to see visually and is generally rendered invisible by the light pollution suffered by all three visual observers, who reside nearby to large cities. Estimates of m1 are shown in Figure 1 based on 5-day bins. A curve has been added by the author that best fits the magnitude observations. These are generally in good agreement with the curve, except for the period around late February to early March 2013, when the comet was low above the evening horizon making brightness estimation difficult for the aforementioned reasons of light pollution. The curve indicates a general increase from about magnitude 8 in late January 2013, peaking at slightly fainter than magnitude 4 in late March, and then fading to magnitude 8 again by late May. Hence the comet was brighter than magnitude 8 for about four months, during which time it was a fine object in binoculars. More the pity that only three observers contributed any visual

observations of this comet. There are also unfortunately too few visual observations to define the brightness parameters according to the standard formula with any accuracy. However, using the combined pre- and post-perihelion observations, I derive the general equation for the brightness behaviour as:

$$m1 = 5.6 + 5 \log \Delta + 15 \log R$$

and from which the absolute magnitude of the comet $H_0 = 5.6$ ($\Delta = R = 1$au), and the slope factor n = 15/2.5 = 6. This value of the slope factor is rather atypical of long period comets, which typically have n<4 (Green 1997), but the value has been determined from a rather small arc of the comets orbit. Note Δ is the geocentric distance of comet, and R is the heliocentric distance of the comet.

The visual descriptions reported in addition to the aforementioned observations are as follows:

2013 Jan 24.08, in 30cmT, f/10 x117, prominent, stands out from the star background, quite condensed, central coma punctuated by faint star-like point and surrounded by considerable wispy outer coma. Slightly hazy sky and optics dewed by 02h10UT [COO02].
2013 Feb 2.82, in 30cmT, f/10 x95, bright and easy shining with an overwhelming appearance, outer coma is very hazy with a misty and washed-out effect, small very bright core, but not quite star-like, size of the core estimated as 0.8' perhaps slightly uneven in shape. Coma appears to be slightly greenish [STR03].
2013 Feb. 6.81, In 30cmL f/8 x75 coma moderately condensed, looks like an out of focus halo of soft light, measures 11x8'. Blesfontein Guest Farm, Sutherland, crystal clear sky, stars magnitude 6 and fainter visible to NE [FORxx].
2013 Feb 7.79, in 30cmL x75, hint of tail visible. Coma moderately condensed, DC=5. Blesfontein, Sutherland [FORxx].
2013 Feb 9.80, in 5.0B x10, coma more condensed, DC=7, fine details discernible in outer coma. In 30cmL x75, spurious outer coma, suddenly bright towards the centre, elongated, size 11x8'. Blesfontein, Sutherland [FORxx].
2013 Feb 15.78, outer coma considerably brighter and coma more condensed, DC=7, with bright stellar point in centre, tail visible but very difficult to discern. Perdeberg, Cape, fainter parts of the Milky Way barely visible, slight haze limited to the horizon did not interfere [FORxx].
2013 Feb 16.81, coma appears more condensed in 5.0B x10, DC=7. In 30cmL x75 outer coma very much brighter, oval shaped, 12x9', DC=5 with central point almost stellar, tail visible but difficult to discern [FORxx].

2013 Feb 22.75, 5.0B x16, very prominent, stands out from the star background but clearly fainter than NGC 104 (47 Tuc), quite condensed, suddenly bright towards the centre, DC=6, hint of tail visible but difficult in light of bright gibbous moon [COO02].
2013 Mar 4.73, bright aspect and readily discernible despite low altitude of 16° though much less conspicuous than 47 Tuc. DC=6/. In 30cmT x117, very bright central coma punctuated by bright central point almost stellar in appearance, surrounded by considerable diffuse glow which fills the field. Poor conditions with a lot of low hazy cloud, especially towards west in the direction of the comet [COO02].
2013 Mar 8.73, becoming difficult in low haze, smaller than previous but appears slightly more condensed, DC=7, no extinction co-efficient applied as comparison stars selected at same altitude as comet [COO02].
2013 Apr 9.14, first observation in early morning after perihelion, comet remains bright and easy despite low altitude, and followed well into bright twilight, remains quite condensed, DC=7 [COO02].
2013 Apr 16.12, still easy in 5.0B x16 despite haze and some cloud after frontal system and heavy dew, and altitude only 25°. Quite condensed, DC=7.
2013 Apr 22.16, slightly less condensed than prev., DC=6, and smaller, 3.3' versus 4'. In 30cmT x117 very bright central condensation surrounded by conspicuous outer coma and slight hint of bright point in the centre [COO02].
2013 May 3.15, noticeably smaller (2.5') and fainter but still very evident, DC=6 [COO02].
2013 May 5.15, readily visible as a well-defined circular smudge, DC=6, appears larger than prev., ~6', but conditions also excellent with clear sky after passage of cold front, and no lights due to general power failure(!), and despite nearby 23% moon. A very satisfying observation [COO02].
2013 May 7.15, appears slightly brighter than prev., coma diameter 5.5', DC=6/, slight hint of tail visible in position angle (p.a.) 280°. Crescent moon nearby. Last observation [COO02].

Images

Photographic images were submitted by Kos Coronaios, Auke Slotegraaf and Mauritz Geyser. A selection of the images and cometary data derived from them by the author is given as follows:

Plate 1 is the first image received from Kos Coronaios, taken on 2013 Jan 30.77, when the comet was around visual magnitude 7, and circumpolar located in Chameleon. He used a 300mm lens on a Canon 60D camera set at ISO1600, 30 second exposures, stacking nineteen exposures to arrive at the final image. The three bright stars,

starting just below the comet and moving clockwise are SAO257025 (mag 7.1), SAO257019 (mag 5.8) and SAO257011 (mag 6.4). Closer examination of the original image shows a faint extension in position angle (p.a.) 308°, probably the early development of the tail. This p.a. is consistent with the anti-solar vector of 300° on this date. The original image shows clearly the green colour characteristic of fluorescence of diatomic carbon (C_2) at a wavelength of 516.5nm, the so-called Swan Band.

Plate 2 is another image from Kos Coronaios, taken on 2013 Feb 17.75, ten 30 second exposures with the same camera set-up as Plate 1, but at prime focus of a 20cmT f/10 telescope. The image is oriented north towards the right, with east at the top. The comet was then about visual magnitude 6, having brightened one full magnitude in the eighteen days since Plate 1 was taken. More evident is the development of the ion tail, which I measure as 1.1° in length in p.a. 151°. Close inspection shows the ion tail to be split into two separate streams outward of 24' from the centre of the coma. The brightest star to the lower left of the comet is magnitude 6.9 SAO255567. The bright globular cluster 47 Tucanae is located just outside the frame at upper left, only 5° from the comet.

Plate 3 was taken by Mauritz Geyser on 2013 Mar 1.81, using a Canon EOS Rebel T1i (500D) camera set at ISO400, Sigma 70-300mm APO DG f/5.6 lens set at 300mm focal length. The final image is the combination of 3 one minute exposures, with the comet now about magnitude 5. North is to the right and east is at the top. From his image I measure the tail length as 1.3° in p.a. 156°. The tail is quite sharp for the first 10' where it appears twisted and broadens from here outwards. The green colour is again very evident.

Plate 4 was taken by Mauritz Geyser on 2013 Mar 9.77 to 9.79, using a Canon EOS 500D camera at prime focus of a 20cm f4.9 Newtonian (focal length 1000mm), and is a composite of 35 thirty second images at ISO1600. The resulting image was processed by applying an unsharp mask to bring out fine details in the tail. I measure the overall tail length as 0.6° in p.a. 162°, but several other sharp features are visible apart from this main tail.

Kos Coronaios was also able to secure a final image of the comet in the early morning sky after perihelion, on 2013 Apr 16. From his image I was able to determine a tail length of 0.5° in p.a. 222°.

Auke Slotegraaf used his image taken on 2013 Jan 26.09 to determine the brightness by aperture photometry. He used the 2-circle aperture photometry routine in IRIS to compare the brightness of the comet with globular clusters NGC 4833 and 4372. Using the V magnitudes for the clusters from Harris's list (7.8 and 9.8 respectively) he arrived at a magnitude of 7.5 for the comet, almost in exact agreement with the total magnitude at that date in Figure 1.

References

Green 1997, D.W, in Guide to Observing Comets, published as a Special Edition of the ICQ, p3

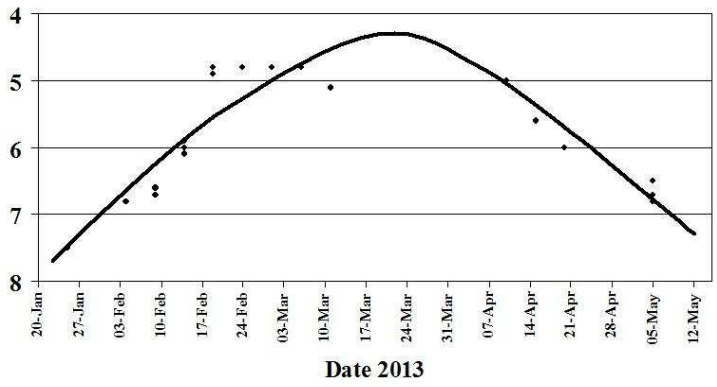

Fig. 1. Light curve of Comet Lemmon from visual Observations.

Plate 1. Image by Kos Coronaios taken on January 30.

Plate 2. Image by Kos Coronaios taken on February 17.

Plate 3. Image by Mauritz Geyser taken on March 1.

Plate 4. Image by Mauritz Geyser on March 9

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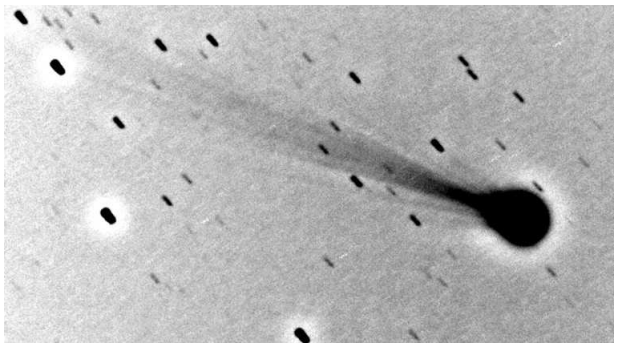

Amateur Optical Tracking in South Africa

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Abstract: This is the first of what is planned to be several articles covering the history of amateur satellite tracking in South Africa during the period 1957 to the present. It will concentrate almost exclusively on optical tracking rather than being a complete record of optical and radio tracking. Whilst it will mainly cover amateur activity some professional astronomers played leading roles for the first year or so.

Besides the **Moonwatch** organisation several other organisations were interested in satellite optical observations and they will also be discussed. Each of the various **Moonwatch** stations will be described, and illustrated where possible, in numerical order of their station identification by COSPAR which was established by the International Council of Scientific Unions in October 1958 to continue the cooperative programmes of rocket and satellite research undertaken during the International Geophysical Year (IGY) of 1957-58.

Introduction

Several books and articles have been written about the **Moonwatch** project, rated by many as one of the most successful collaborations between amateurs and professionals in the field of scientific research, but coverage of the South African