OBSERVATIONS OF LUNAR TRANSIENT PHENOMENA (LTP) IN 1972 AND 1973

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Abstract. A list of reports of Lunar Transient Phenomena (LTP) which have been observed in 1972 and 1973 by an international group of amateur astronomers is given. From 907 monitoring observations (1972: 526, 1973: 381) 92 LTP (74 reliable, 18 possible individual sightings) have been reported (1972: 52, 1973: 40) including parallel observations of the same event. The LTP were brightenings, shadings, flashes, colours, moving clouds and brightness diminutions of stars before occultations. 45 LTP events may be expected to be real in a catalogue of criteria for the reliability of observations. Sixteen events have been reported by several independent observers. A short examination of the temporal distributions of monitoring observations and recorded LTP is given.

1. Introduction

Cameron (1972) gave a catalogue of more than 270 Lunar Transient Phenomena (LTP) of Aristarchus obtained from her unpublished more extensive catalogue of LTP covering the years 1650 to 1968. Since then a catalogue of 1468 events has been published (Cameron, 1978). The great majority of the observations reported were made by chance. In 1971 the Volkssternwarte Gummersbach (Federal Republic of Germany) started to organize a working group of about 200 amateur astronomers from F.R.G., D.D.R., Switzerland, and Austria in order to perform a systematic monitoring of the moon. One of the main aims of this program was to get independent parallel observations of the same event. For more details and first results see Küveler (1972, 1973) and Klemm and Küveler (1972).

With this paper we list all positive reports of the years 1972/73.

2. Observations

During the years 1972 and 1973 907 monitoring observatins have been sampled (1972: 526, 1973: 381) with 92 positive individual reports (1972. 52, 1973: 40) including parallel observations of the same event. From these observations 45 LTP events were regarded as reliable including 16 LTP which have been reported by several independent persons.

The reliability of the reports has been estimated by four criteria.

(1) Number of independent observations of the same event.

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TABLE Ia

Positive LTP-Reports 1972 and 1973

month (m), day (d), time in Universal Time (U.T.), anomalistic phase (ϕ_d, Cameron (1972)), seeing conditions (T for Transmission, S for Scintillation, 1 = best, 5 = very poor seeing), reliability (r = reliable observations are marked by a cross (+)), instrument used for observation (aperture/focal length, both in millimeters, refr. = refractor, refl. = reflector, $N \times M$ = binocular, N = magnification, M = aperture, name of the observer, geograph. location (lat., long.), description of the event (Rem.).

No.	m	d	U.T.	ϕ_d	T/S	Feature	r	Instrument	Observer	Lat. /Long.
1 72	01	20	16.25–16.50	0.900	–/–	Aristarchus	+	160/– refl.	Loibl	50°40′/12°30′
2		20	16.30	0.900	4/3	Aristarchus	+	75/– refr.	Kufferath	52°25′/ 9°45′
3	01	23	15.20–16.50	0.056	2/2	Proclus		50/– refr.	Stolzen	51°10′/ 9°15′
4	03	05/6	23.29–00.10	0.614	4/4	Aristarchus		8 × 30	Hopp	52°30′/13°15′
5	03	17	18.07–18.40	0.035	2/3	Aristarchus	+	75/1200 refr.	Hopp	52°30′/13°15′
6		17	18.45–19.00	0.035	3/3	Aristarchus	+	60/910 refr.	Borchers	51°50′/10°00′
7		17	17.15–20.00	0.035	2/2	Aristarchus	+	12/1900 refr.	Beneke	48°45′/ 9°15′
8		17	18.52–19.10	0.035	3/3	Aristarchus	+	110/– refl.	Kowalec	52°30′/13°15′
9		17	18.55–19.30	0.035	3/3	Aristarchus	+	30/5000 refr.	Böhlendorf	52°30′/13°15′
10	03	18	18.45–18.47	0.067	2/2	Aristarchus	+	60/700 refr.	Schellhammer	51°00′/ 9°50′
11		18	19.25	0.067	2/2	Aristarchus	+	30/5000 refr.	Witzigmann	52°30′/13°15′
12		18	18.51–18.57	0.067	1/2	Aristarchus	+	60/700 refr.	Schellhammer	51°00′/ 9°50′
13	03	19	19.52–19.57	0.105	–/–	Pos. ang. 30°	+	150/– refr.	Germann	47°17′/ 8°55′
14	03	19	21.07–21.29	0.105	3/4	W Hipparch	+	60/– refr.	Schnuchel	52°30′/13°50′
15	03	23	19.24	0.246	2/–	Proclus	+	60/700 refr.	Rudolphi	48°35′/10°00′
16		23	20.56	0.246	3/4	Proclus	+	75/1200 refr.	Hopp	52°30′/13°15′
17		23	20.30–20.55	0.246	2/2	Proclus	+	60/750 refr.	Gloy	53°55′/ 9°30′
18		23	20.30–20.55	0.246	2/2	Proclus	+	200/– refr.	obs. Munich	48°15′/11°30′
19		23	20.30–20.55	0.246	–/–	Proclus	+	8 × 30	Kowalec	52°30′/13°15′
20		23	22.30	0.246	–/–	Proclus	+	10 × 50	Sandner	48°05′/12°00′
21	03	24	16.29–19.22	0.277	3/3	Proclus	+	75/1200 refr.	Hopp	52°30′/13°15′
22	03	30	23.03–23.05	0.498	1/2	Aristarchus		110/900 refl.	Kufer	48°15′/11°30′
23	04	17	20.04–20.05	0.123	2/2	Aristarchus	+	60/700 refr.	Schellhammer	51°00′/ 9°50′
24	04	22	17.30–18.15	0.299	3/3	Censorinus	+	60/1000 refr.	Iwanoff	53°05′/ 8°45′
25		22	18.58–00.28	0.299	4/4	Censorinus	+	75/1200 refr.	Hopp	52°30′/13°50′
26	04	25	19.15–19.20	0.405	2/4	Aristarchus	+	60/910 refr.	Ventzke	48°40′/12°00′
27		25	19.15–20.30	0.405	1/5	Aristarchus	+	50/620 refr.	Raschke	52°15′/10°30′
28		25	22.15–22.19	0.405	–/–	Aristarchus	+	120/– refr.	Klemm	48°30′/13°25′

Table Ia (continued)

No.	m	d	U.T.	ϕ_d	T/S	Feature	r	Instrument	Observer	Lat. /Long.
29		05	06	03.20–03.55	0.768	1/1	Aristarchus		110/900 refl.	Wolf	
30		05	19	18.24	0.247	2/–	M. Crisium		10 × 50	Engels	52°40′/ 9°05′
31		05	19	23.48	0.258	4/2	Theophilus	+	60/750 refr.	Ruchatz	51°00′/10°00′
32		05	20	19.10–19.59	0.286	2/3	Theophilus	+	75/1200 refr.	Haiduk	52°30′/13°15′
33		05	22	20.10–20.40	0.357	2/4	Manilius		60/910 refr.	Kern	48°45′/ 8°45′
34		05	25	19.32–19.38	0.463	2/2	Aristarchus	+	60/910 refr.	Leitzinger	48°45′/ 8°45′
35		06	04	00.25–01.46	0.859	1/3	Aristarchus	+	110/900 refl.	Wolf	
36		06	18	15.48	0.311	3/2	Proclus	+	75/1200 refr.	Hopp	52°30′/13°15′
37			18	20.50–21.15	0.319	4/3	Proclus	+	60/910 refr.	Kern	48°45′/ 8°45′
38			18	21.00–21.30	0.314	2/4	Proclus	+	150/–	Brändli	45°15′/ 8°55′
39		06	18	19.20–19.25	0.314	4/4	Albategnius		20 × 60	Schnuchel	52°30′/13°15′
40		06	25/26	23.10–00.15	0.571	5/3	Aristarchus	+	75/1200 refr.	Müller	51°25′/ 8°45′
41			25/26	22.42–22.51	0.571	2/3	Aristarchus	+	60/910 refr.	Quindeau	51°25′/ 8°35′
42		07	18	20.02	0.406	2/3	Reichenbach		60/910 refr.	Kolrep	
43		08	17	19.08–19.23	0.563	4/4	Birt	+	75/1200 refr.	Hopp	52°30′/13°15′
44		08	17	19.20–19.33	0.563	4/3	Aristarchus		110/900 refl.	Vay	50°15′/ 9°15′
45		08	17	20.05–21.10	0.563	1/3	Proclus		60/700 refr.	Haiduk	52°30′/13°15′
46		09	15	18.48–18.56	0.651	4/4	Alphonsus		75/1200 refr.	Hopp	52°30′/13°15′
47		10	15	20.48	0.727	3/5	Proclus	+	75/1200 refr.	Hopp	52°30′/13°15′
48		10	21	22.10–22.45	0.943	1/3	Aristarchus	+	60/700 refr.	Schnuchel	52°30′/13°15′
49		12	12	16.15–16.30	0.761	2/2	dark limb		200/– refl.	Germann	47°15′/ 8°55′
50		12	16	21.35	0.905	–/–	SAO 092 801	+	150/– refr.	Germann	47°15′/ 8°55′
51		12	17	21.50–22.20	0.940	2/3	Aristillus	+	60/910 refr.	Berger	51°30′/ 9°00′
52			17	22.02–22.25	0.940	2/3	Aristillus	+	60/910 refr.	Klinker	
53	73	01	13	19.06–19.40	0.894	3/2	Archimedes	+	75/1200 refr.	Theiss	51°00′/ 9°40′
54		01	13	20.02–20.14	0.894	–/–	Censorinus	+	60/910 refr.	Leitzinger	48°15′/11°30′
55		01	13	19.30–19.35	0.894	3/2	Proclus	+	60/910 refr.	Krojer	48°15′/11°30′
56			13	20.50	0.894	1/3	Proclus	+	7 × 50	Schnuchel	52°30′/13°15′
57		01	21	23.57–00.25	0.188	3/4	Proclus		50/– refr.	Müller	51°25′/ 8°45′
58		02	05	16.50–17.15	0.718	–/–	Aristarchus		63/840 refr.	Voigt	51°05′/13°35′
59		02	14	18.31–18.34	0.044	1/2	Aristarchus		75/1200 refr.	Füger	49°00′/ 8°25′
60		02	15	17.07–19.31	0.089	3/2	Aristarchus	+	75/1200 refr.	Theiss	51°00′/ 9°40′

Table Ia (continued)

No.	m	d	U.T.	$\emptyset_d$	T/S	Feature	r	Instrument	Observer	Lat. /Long.
61	03	07	18.35–19.05	0.895	2/3	Archimedes		10 × 50	Schmidt	53°15′/ 7°50′
62	03	09	17.40–17.45	0.972	2/3	Aristarchus	+	175/2400 refr.	Hopp	52°30′/13°15′
63		09	20.21	0.976	1/4	Aristarchus	+	60/900 refr.	Schnuchel	52°30′/13°15′
64	03	09	19.28	0.976	3/3	Pos. ang. 90°	+	150/1250 refl.	Siebenhorn	49°25′/10°55′
65	03	15	18.15–18.55	0.201	–/–	M. Humorum		110/900 refl.	Foller	
66	04	07	21.00–22.00	0.05	2/2	Aristarchus	+	175/– refr.	Karkoschka	52°30′/13°15′
67		07	21.15	0.05	1/3	Aristarchus	+	75/1200 refr.	Füger	49°00′/ 8°25′
68	04	08	21.10	0.093	1/1	Aristarchus	+	20 × 60	Schnuchel	52°30′/13°15′
69		08	20.10	0.093	2/2	Aristarchus	+	110/900 refl.	Brodzinski	52°30′/13°15′
70		08	20.00–21.00	0.093	2/2	Aristarchus	+	150/3000 refr.	Düsberg/Küveler	51°05′/ 9°35′
71		08	19.15	0.093	3/2	Aristarchus	+	75/700 refl.	Pasternak	53°20′/ 7°30′
72	04	10	18.37–19.49	0.160	2/3	Atlas	+	75/1200 refr.	Theiss	51°00′/ 9°40′
73	04	10	20.18–20.24	0.164	3/3	Aristillus	+	75/700 refl.	Pasternak	53°20′/ 7°30′
74	04	15	19.03–20.13	0.392	3/3	Aristarchus	+	75/– refl.	Pasternak	53°20′/ 7°30′
75	04	16	23.45	0.384	–/–	Aristarchus	+	60/1000 refr.	Schlegel	52°30′/13°15′
76	05	04	18.30–18.49	0.014	3/2	Maurolycus		60/910 refr.	Berger	51°30′/ 9°00′
77	05	04	19.50–19.57	0.018	1/4	Aristarchus	+	110/900 refl.	Wolf	
78	05	05	20.06–20.12	0.053	2/3	Aristarchus	+	60/910 refr.	Gröll	51°25′/ 8°25′
79		05	20.10–20.43	0.053	2/2	Aristarchus	+	60/1000 refr.	Schlegel	52°30′/13°15′
80		05	20.20–20.26	0.053	1/2	Aristarchus	+	110/– refl.	Quindeau	51°25′/ 8°35′
81	05	27	01.09–01.56	0.802	2/2	Aristarchus	+	75/1200 refr.	Theiss	51°00′/ 9°40′
82	06	11	21.05–21.15	0.359	1/2	Archimedes	+	75/700 refl.	Pasternak	53°20′/ 7°30′
83	06	12	20.50–21.15	0.394	2/3	Gassendi	+	240/2820 refl.	Baumeister	48°50′/ 9°15′
84	08	10	20.14	0.450	2/2	Aristarchus	+	110/900 refl.	Baumeister	48°50′/ 9°15′
85		10	22.09–22.20	0.451	1/3	Aristarchus	+	150/1200 refl.	Hollenbach	
86	08	13	20.16–20.19	0.554	2/2	Aristarchus	+	75/– refl.	Pasternak	53°20′/ 7°30′
87	08	22	00.22–00.23	0.882	2/2	Aristarchus	+	200/– refl.	Germann	47°15′/ 8°55′
88	09	11	20.48–21.06	0.658	1/3	Aristarchus	+	75/– refl.	Pasternak	53°20′/ 7°30′
89	10	12	18.13–18.45	0.869	1/4	Aristarchus	+	–/–		
90		12	18.28–18.55	0.869	2/4	Aristarchus	+	75/700 refl.	Pasternak	53°20′/ 7°30′
91	12	18	06.35–06.38	0.259	1/2	Aristarchus	+	75/700 refl.	Pasternak	53°20′/ 7°30′
92	12	31	19.10	0.731	1/2	19 Piscium	+	75/700 refl.	Pasternak	53°20′/ 7°30′

TABLE Ib

LTP-reports 1972

All directions are given in the IAU convention, where Mare Crisium is in the east

No.	Description of the event
01	pure white bright point (like a star) within the crater
02	very bright white point in the NE wall
03	pure white bright point within the crater
04	diminution of brightness relative to Kepler and Copernicus
05	diffuse bright area with very bright 'blinks' (flashes) white within the crater (Küveler, 1972)
06	variations in brightness of the crater but not certainly recognizable (Küveler, 1972)
07	several white flashes (Küveler, 1972)
08	diffuse bright area within the crater (Küveler, 1972)
09	oval orange pattern disappeared about 19.30 U.T. (Küveler, 1972)
10	2 sudden brightenings of the crater with white to grey colour
11	white bright points within the crater
12	3 white brightenings within the crater, observations interrupted by clouds
13	star became red shortly before the occultation, diminution of brightness and colour change 0.5 to 1.0 sec. before occultation. Parallel observations by Brändli with the same result
14	2 sudden white brightenings in the W-wall approx. 7^m, first: 21.07 U.T., second: 21.29 U.T., both for approx. 1 sec.
15	pure white very bright event
16	white brightening in the NW wall
17	the whole crater appeared extraordinarily bright
18	the crater was extraordinarily bright
19	Proclus was brighter than Langrenus
20	Proclus appeared very bright but not certain if not normal
21	enormous brightening vanished until 19.22 U.T., pattern changed from oval to circular several times
22	a sudden brightening but observations limited by clouds
23	2 sudden brightenings of a starlike bright point in SE of the crater, pure yellow, approx. 4^m
24	diffuse bright area greater than the crater itself, yellow to white
25	Censorinus brighter than normal relative to Proclus, pure white
26	diffuse brightening in the inner N wall, reddish
27	very bright white point becomes bigger around 19.25 U.T., diminution of brightness from 19.35 U.T. on
28	'light fountain' series of photographs of a bright region moving from the Aristarchus hills (— 53° Long./+ 26° 30′ Lat.) approx. 60 km to SE, not quite sure if not a photographical effect. Photogr. publ. by Klemm and Küveler (1972)

Table Ib (continued)

No.	Description of the event
29	well visible yellow to white bright point at the SE wall
30	orange to yellow bright flash for some tenth of a sec. at the S rim of M. Crisium
31	diminution of brightenss of the S wall for a short time
32	well visible brightening of the SW wall
33	the SW inner wall became brighter for some times
34	bright point at the SE wall well visible, colour changed to orange shortly before it disappeared
35	well visible 'pulsating' bright feature at the SE wall
36	bright white point at the W wall of the crater
37	yellow to white bright pattern at the NW wall, visible only occasionally
38	N wall of the crater appeared extraordinarily bright
39	bright area at the inner N wall, diminution of brightness well observable
40	the whole crater appeared very bright but poor seeing conditions
41	bright point at the NE wall of the crater
42	pure white very bright flash for approx. 2 sec. at the wall of the crater
43	pure white bright point at the inner W wall of the crater, diminution of brightness well observable
44	white bright point but observations disturbed by haze
45	well visible bright area at the NE wall, end of event uncertain for seeing became poor
46	diffuse white to blue area within the crater but not sure
47	bright flash at the NW wall but poor seeing
48	bright spot with maximum intensity at 22.10 U.T., diminution of brightness well observable
49	brightening of the dark limb, dimension of feature $\approx 1'$
50	star became darker approx. 3.3 sec, before the occulation
51	diffuse bright cloud in the NE corner of the crater
52	same as No. 51
53	yellow to green colours at the wall of Archimedes, became stronger until 19.09 U.T., constant brightness until 19.10 U.T. and disappeared at 19.16 U.T.
54	Censorinus extraordinarily bright, pure white
55	NE wall of Proclus extraordinarily bright, observations interrupted by fog
56	Proclus brighter than Langrenus
57	Proclus much brighter than Censorinus
58	Aristarchus appeared as a silver to grey spot with faint starlike flashes for moments
59	violet colours at the S of the crater
60	area 4–5 diameters of Aristarchus were coloured clearly yellow to red

Table Ib (continued)

No.	Description of the event
61	Archimedes was very bright, brightness variations not very sure
62	Aristarchus appeared as a diffuse bright area within the Ashen Light
63	Aristarchus somewhat bluish, bright area between Aristarchus and Sinus Roris
64	diminution of brightness approx. 1 sec. before occultation
65	dark cloud within the M. Humorum, no further description and location given
66	Aristarchus was extraordinary bright
67	Aristarchus extraordinary well visible
68	bright feature within the crater appeared like a star
69	Aristarchus was not visible
70	Aristarchus could be observed as a very bright diffuse area
71	Aristarchus was well visible
72	N wall of Atlas was yellow-green, several magnifications tested with the same results
73	faint reddish area at the SE wall of Aristillus
74	N wall was blue to violet, beginning disappearance at 20.08 U.T., end at 20.13 U.T.
75	Aristarchus was extraordinarily bright
76	brightening, no further description
77	pulsating point of light like a star within the wall, disappeared at 19.50 U.T.
78	At 20.06 U.T. Aristarchus was very faint, at 20.12 U.T. somewhat brighter but diffuse, observations interrupted at 20.30 U.T.
79	several bright flashes ('like a thunderstorm') for very short times
80	very bright point within Aristarchus for only some minutes
81	3 diameters of Aristarchus around its center: orange bright area from 1.09–1.56 U.T.
82	faint red area at the E of Archimedes, diminution from 21.10–21.15 U.T.
83	bright point at the NNE slope of the central peak
84	orange to red colours at the crater floor disappeared until 21.04 U.T.
85	reddish bright point at the W wall at 22.09 U.T., observations interrupted by clouds at 22.20 U.T.
86	NW wall blue to white and very bright, became brighter from 20.16–20.17 U.T., diminution till 20.19 U.T.
87	well observable bright point disappeared within a minute
88	reddish coloures at the S of Aristarchus from 20.48–21.00 U.T., area spread to the region E of the crater at 20.57 U.T., disappeared there at 21.04 U.T., no colours after 21.06 U.T.
89	bright region of the S of the crater, colour was red
90	bright area S of the crater somewhat reddish, became faint from 18.28–18.33 U.T., very faint until 18.37 U.T., not recognisable after 18.45 U.T.
91	faint brightening in S wall of Aristarchus
92	very short diminution of brightness of the star approx. 0.5 sec. before the occulation

(2) Accuracy of descriptions, especially reported brightness and colour variations or motions.

(3) Experience of the reporting observer, i.e. amount of monitoring observations, experience with brightness estimations (e.g. variable star observers or specialisation on distinct features on the Moon).

(4) Aperture, power, kind of telescope and tests for chromatic aberrations and seeing conditions during the reported event.

In Table I a list of all individual reports is given. Reliable observations are marked by a cross (+).

The spatial distribution of reliable LTP events is given in Table II.

From 45 events (1972: 21, 1973. 24) 24 have been reported from Aristarchus.

TABLE II

Feature	1972	1973
Archimedes	–	2
Aristarchus	9	15
Aristillus	1	1
Atlas	–	1
Birt	1	–
Censorinus	1	1
Gassendi	–	1
Hipparchus	1	–
Proclus	4	1
Theophilus	2	–
occ. Stars	2	2

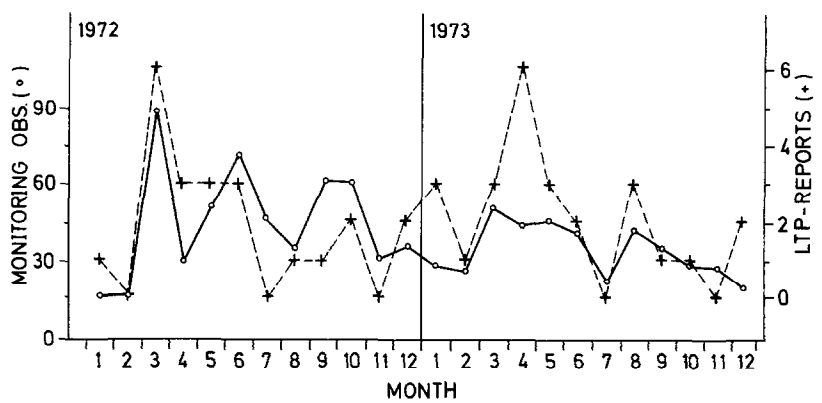

Fig. 1. Amount of monitoring observations (°) and positive LTP-reports (+) regarded as reliable in Table I.

The term 'occ. stars' means diminutions of brightnesses of stars shortly before an occultation by the Moon.

As shown in Figure 1 the reports are not distributed homogeneously over the referenced period. In winter the amount of observations is often restricted by weather. The minima from July to September may be regarded as a 'holiday effect', but more likely as a manifestation of the small elevation of the Moon in middle Europe in summer. A negative trend in the amount of monitoring observations is a result of a diminished number of observers. This did not correspond to a remarkable decrease of reported observing time because practiced observers contributed their long-time observations further on.

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