

An Historical Perspective: the Grazing Lunar Occultation of 139 Tauri

1972 March 21

Richard Miles

H.M. Nautical Almanac Office,
Royal Greenwich Observatory,
Herstmonceux Castle,
Hailsham, Sussex.

Ref: 72/1

3/2/72

Dear Mr S. Pine

Occultations of stars by the Moon

Predictions of limiting line (graze tracks) passing near to

Bristol

on Mar 21st 1972

I enclose herewith predictions of graze\$ which will occur ~~during the next~~
~~few months~~. If you would like to observe any of these events you should plot the
co-ordinates tabulated at 10 second intervals of time on a detailed map of your
region.

This Office and the U.S. Naval Observatory, Washington D.C. 20390, will be
very pleased to receive a report of the exact timings (to $\pm 2^s$ or better) of the
phenomena, together with the geodetic location of the observers (to a precision
of 1" arc in both co-ordinates) and the height above mean sea level (to the
nearest 30 metres). These observations will be very useful for determining
corrections to the latitude of the Moon and systematic corrections to the star
places.

Yours sincerely,

R. V. Morrison

R.P.

L. V. Morrison

MAGNITUDE 4.9

50% SUNLIT

ELONGATION 90 DEGREES

NORTHERN LIMIT

P.A. OF GRAZE 11

P.A. OF NORTHERN CUSP 359.8

TOPOCENTRIC LIBRATION:-

LONGITUDE 5.79

LATITUDE -3.07

DELTA SIGMA = 0.0

=====

DELTA SIGMA = -1.0

=====

U.T.			LONG.		LATITUDE		ALT. AZ. OF STAR		TANZ	ALT. SUN	P.A. FROM AXIS	P.A. FROM NORTHERN CUSP	U.T.			LONG.		LATITUDE	
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H	M	S	0	'	0	'	0	0		0	0	0	H	M	S	0	'	0	'
22	49	0	6	11.0	53	31.0	34.4	268.1	1.461	-31.9	12.73	11.3 D	22	49	0	6	13.4	53	30.5
22	49	10	6	2.8	53	26.6	34.3	268.3	1.467	-32.0	12.74	11.3 D	22	49	10	6	5.2	53	26.0
22	49	20	5	54.5	53	22.2	34.2	268.5	1.473	-32.1	12.75	11.3 D	22	49	20	5	57.0	53	21.6
22	49	30	5	46.3	53	17.7	34.1	268.7	1.479	-32.2	12.77	11.3 D	22	49	30	5	48.7	53	17.1
22	49	40	5	38.1	53	13.2	34.0	268.9	1.485	-32.3	12.78	11.3 D	22	49	40	5	40.5	53	12.7
22	49	50	5	29.8	53	8.7	33.9	269.1	1.491	-32.4	12.79	11.3 D	22	49	50	5	32.3	53	8.2
22	50	0	5	21.6	53	4.2	33.8	269.3	1.497	-32.6	12.81	11.3 D	22	50	0	5	24.0	53	3.7
22	50	10	5	13.3	52	59.7	33.6	269.5	1.503	-32.7	12.82	11.4 D	22	50	10	5	15.8	52	59.2
22	50	20	5	5.0	52	55.2	33.5	269.6	1.509	-32.8	12.83	11.4 D	22	50	20	5	7.5	52	54.6
22	50	30	4	56.8	52	50.6	33.4	269.8	1.515	-32.9	12.84	11.4 D	22	50	30	4	59.2	52	50.1
22	50	40	4	48.5	52	46.1	33.3	270.0	1.521	-33.0	12.86	11.4 D	22	50	40	4	51.0	52	45.5
22	50	50	4	40.2	52	41.5	33.2	270.2	1.528	-33.1	12.87	11.4 D	22	50	50	4	42.7	52	40.9

.1	270.4	1.534	-33.3	12.88	11.4 D	22	51	0	4	34.4	52	36.4
.0	270.6	1.540	-33.4	12.90	11.4 D	22	51	10	4	26.1	52	31.7
.9	270.8	1.547	-33.5	12.91	11.4 D	22	51	20	4	17.8	52	27.1
.8	271.0	1.554	-33.6	12.92	11.5 D	22	51	30	4	9.5	52	22.5
.7	271.1					22	51	40	4	1.2	52	17.8
.5	271.1											

.4 271.1

.3 271.1

.2 271.1

.1 272.1

.0 272.1

.9 272.1

.7 272.1

.6 272.1

.5 273.1

.4 273.1

.3 273.1

.2 273.6

.0 273.8

.9 274.0

.8 274.2

.7 274.4

22	54	40	1	27.0	50	51.5	30.5	274.6	1.694	-35.9	13.14	11.7 D	22	54	40	1	29.6	50	51.1
22	54	50	1	18.4	50	46.6	30.4	274.8	1.703	-36.0	13.16	11.7 D	22	54	50	1	21.0	50	46.1

22	55	0	1	9.9	50	41.5	30.3	275.0	1.711	-36.2	13.17	11.7 D	22	55	0	1	12.5	50	41.1
22	55	10	1	3.9	50	36.1	30.2	275.1	1.717	-36.3	13.18	11.7 D	22	55	10	1	3.9	50	36.1



Taylor G.E. - The visual observation of occultations: 1966 / 7 pages

Taylor G.E. - Predictions of grazing occultations: 1970 / 15 pages

Taylor G.E. - The visual observation of occultations (supersedes No. 5): 1974 / 7 pages

Taylor G.E. - Planetary occultations: A review of the methods of prediction, the results of astrometric analysis and the future prospects: 1974 / 23 pages

GRAZING OCCULTATION OF ZC 500 1972 MARCH 21

Bristol

ANGULAR DISTANCE FROM MEAN LUNAR LIMB IN SECONDS OF ARC

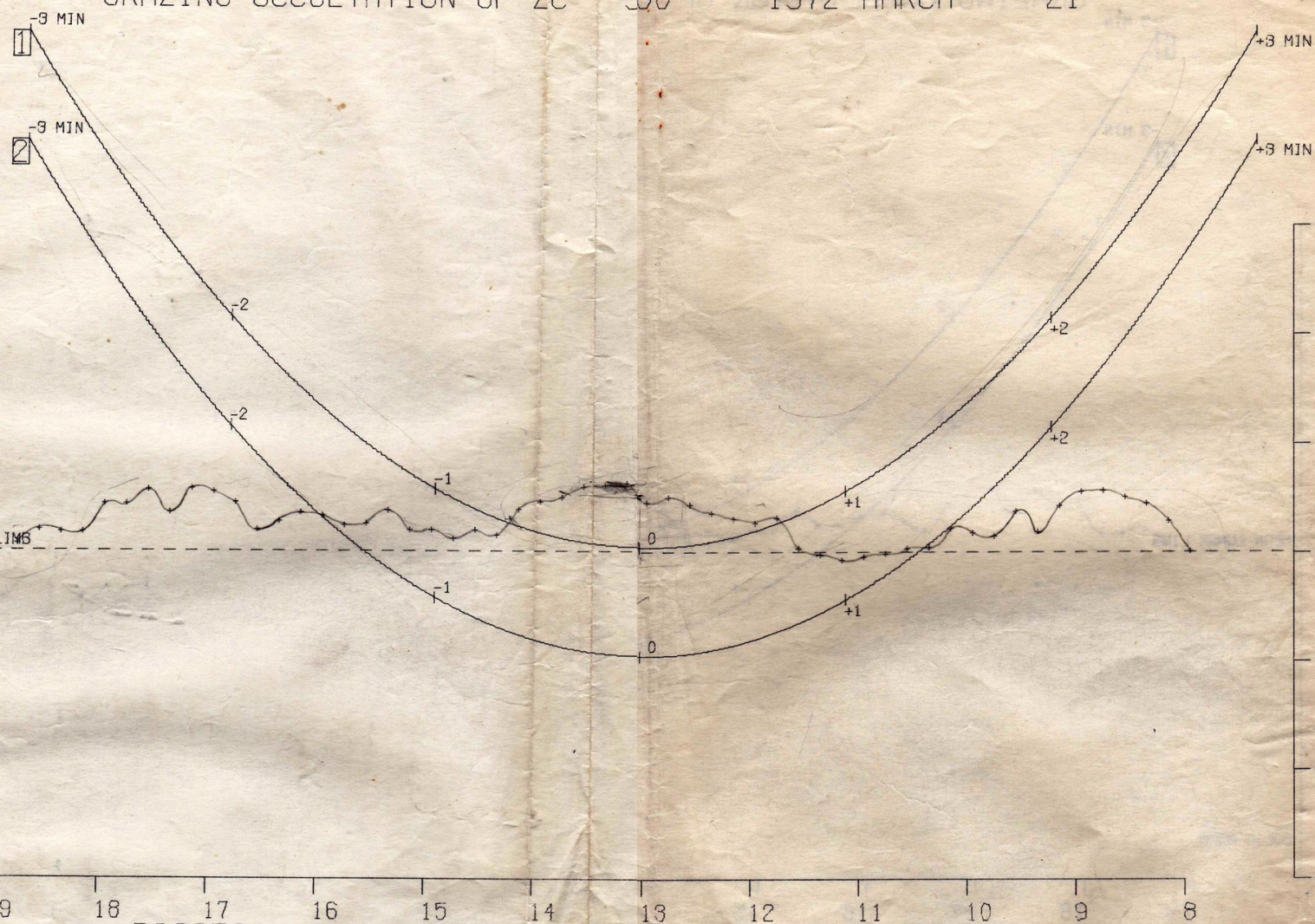
MEAN LUNAR LIMB

SOLID MOON

19 18 17 16 15 14 13 12 11 10 9 8

POSITION ANGLE FROM AXIS OF MOON IN DEGREES

ANGULAR DISTANCE FROM MEAN LUNAR LIMB IN SECONDS OF ARC



Bristol Astronomical Society
 Grazing Occultation ZC 900
 Lunation 609

MARCH 21 1972

No	NAME	TIME	A	TELE SCOPE	METRON OF TICKINGS	TIME SIG	HEIGHT	LAT	LONG
1	JOHN RUDLER	22.53.21	D	60mm	STOP	GPO	21.3m	51.32.07	2.36.17
1	DAVID GRIFFIN	22.53.16.5	R	REFR	WATCH				
3	KETH HENNELIN	22.53.1	D	6"	STOP	GPO	64m	51.31.46	2.36.28
3	MRS "	22.53.25	R	REFL	WATCH				
5	STONE PINE	22 52 52.5	D		TAPE RECORD	ATSF RUSBY 60KHZ	64m	51.31.43	2.36.32
5	MIKE REDFERN	22 52 53	R						
5		22 52 56	D						
5		22 53 23.5	R						
5		22 53 24.5	D						
5		22 53 25	R						
5		22 53 27.5	D						
5		22 53 33.5	R						
5A	T WATKINS	22 52 51	D	3"	STOP	GPO	62.5	51.31.37	2.36.40
	GEORGE WOODMAN	22 53 53	R	REFR	WATCH				
	STUDENT (KETH)	22 52 55	D						
		22 53 37	R						
6	BOB & PAUL GILBERT	22 52 51	D	3" REFR	STOP	GPO	62	51.31.34	2.36.43
6	M. BRAIN	22 53 43	R		WATCH				
7	ALLAN QUIRK	22 52 45.5	D	2 1/2"	STOP	GPO	61	51.31.28	2.36.48
7	MICHAEL GRIFFITH	22 53 48	R	REFR	WATCH				
8	TREVOR COLEMAN	22 52 32	D	6"	STOP	GPO	44	51.31.11	2.37.10
8	DAVID REYNOLDS	22 53 56	R	REFL	WATCH				
8		22 53 59	D						
8		22 54 00	R						
9	RODNEY HUNTER	22 52 26	D				42.5	51.31.04	2.37.16
9		22 54 07	R						
10	RICHARD MILES	22 52 25	D				42.5	51.31.00	2.37.21
10	JACKIE PATT	22 54 08	R						
11	JIM ASTON	22 50 58.7	D	6"	STOP	GPO	20	51.28.36	2.37.03
11		22 58 25.1	R	REFL					

Grazing Occultation of ZC 900 (139 Tauri)

1972 March 21

Star: V = 4.82, Sp. = B0.5II, Distance = 1540 l-y

	D			R			s	cal	ht.	Lat.			Lon	delta		
													.		N	
John Pedler / David Griffin	22	53	2.1	22	53	17	14.4	27	21	51	32	7	2	36	17	67
Keith Llewelin / Mrs Llewelin	22	53	1	22	53	25	24	44	64	51	31	46	2	36	28	46
Steve Pine / Mike Redfern	22	52	52	22	52	53	1.5	3	64	51	31	43	2	36	32	43
	22	52	56	22	53	24	27.5	51								
	22	53	25	22	53	25	0.5	1								
	22	53	28	22	53	34	6	11								
T. Watkins / George Woodman	22	52	51	22	53	53	62		63	51	31	37	2	36	40	37
Keith (student)	22	52	55	22	53	37	42	78	63	51	31	37	2	36	40	37
Bob Gilbert / Pat Gilbert	22	52	51	22	53	43	52	96	62	51	31	34	2	36	43	34
Allan Quirk / Michael Griffith	22	52	46	22	53	48	62.5	116	61	51	31	28	2	36	48	28
Trevor Coleman / David Reynolds	22	52	32	22	53	56	84	155	44	51	31	11	2	37	10	11
	22	53	59	22	54	0	1									
Rodney Hillier	22	52	26	22	54	7	101	187	43	51	31	4	2	37	16	4
Richard Miles / Jackie Pett	22	52	25	22	54	8	103	190	43	51	31	0	2	37	21	0
Jim Aston	22	50	59	22	58	25	446		20	51	28	36	2	39	3	

H.M. Nautical Almanac Office
Royal Greenwich Observatory, Herstmonceux Castle, Hailsham, Sussex
Telephone : Herstmonceux 3171 Telex : 87451 Telegrams : Observer Hailsham Telex

Your reference :

Our reference : 72/2

14 April 1972

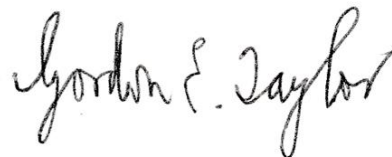
Mr. M. Brain,
15 Overhill,
Pill,
BRISTOL.

Dear Mr. Brain,

Thank you for sending in the observations of the grazing occultation of Z.C. 900 on 21 ^{March} ~~September~~ 1972. I am very pleased that the observations were so successful, and have passed them on to our Occultation Section for analysis. So many observations of the occultations of the Pleiades have come in recently that it may well be another month or more before you receive the preliminary analysis.

I look forward to meeting you again on 30 September.

Yours sincerely,



Gordon E. Taylor

Bristol Astronomical Society
(Observing site near Filton, Glos.)

John Pedler	60 mm R	2
David Griffin		
Keith Llewelin	150 mm L	2
Mrs Llewelin		
Steve Pine		8
Mike Redfern		
T. Watkins	75 mm R	2
George Woodman		
Student		2
Bob Gilbert	75 mm R	2
Pat Gilbert		
M. Brain		
Allan Quirk		
Michael Griffith	65 mm R	2
Trevor Coleman		
David Reynolds	150 mm L	4
Rodney Hillier		
Student		2
Richard Miles		2
Jackie Pett		

Southampton Astronomical Society
(Beaulieu Heath, New Forest)

John Lucey, Jun.	150 mm L	5
R. W. Arbour	150 mm L	2
William Legros	100 mm R	2
M. R. Turner	165 mm L	1
Maureen Allen	75 mm R	2
J. G. Thompson	90 mm R	Miss
Kenneth Medway	60 mm L	Miss

Southampton University
(Downton, near Southampton)

Storm Dunlop	60 mm R	4
Rob Bentley	100 mm R	5
Dave Guntrip	60 mm R	4

Wessex Astronomical Society
(Landford, near Southampton)

A. Owen	75 mm R	1
G. Nash	75 mm R	2
B. J. McInnerny	75 mm R	1
R. Hunt	60 mm R	2
D. J. Miles	60 mm R	1

Royal Greenwich Observatory
(Landford, near Southampton)

Jane Biggin	75 mm R	3
Ann Parkin		
Richard Wordsworth	80 mm R	3
Peter Ellis	75 mm R	2
Lynda Swift	50 mm R	-
Richard Martin	90 mm R	2
Andrew Sinclair	50 mm R	3
Ken Blackwell	100 mm R	2
Gordon Taylor	200 mm L	4
Graham Appleby	75 mm R	Miss
Leslie Morrison	100 mm R	Miss

R = Refractor

L = Reflector

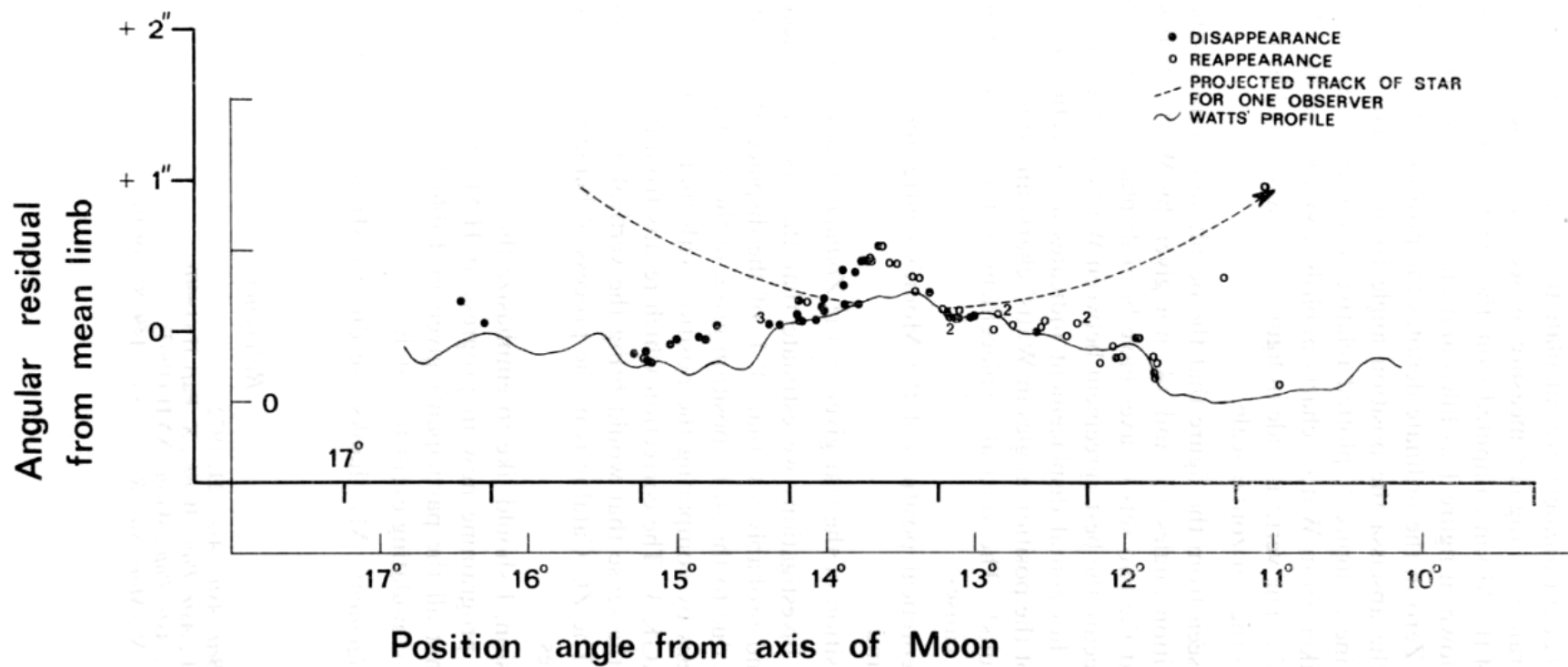
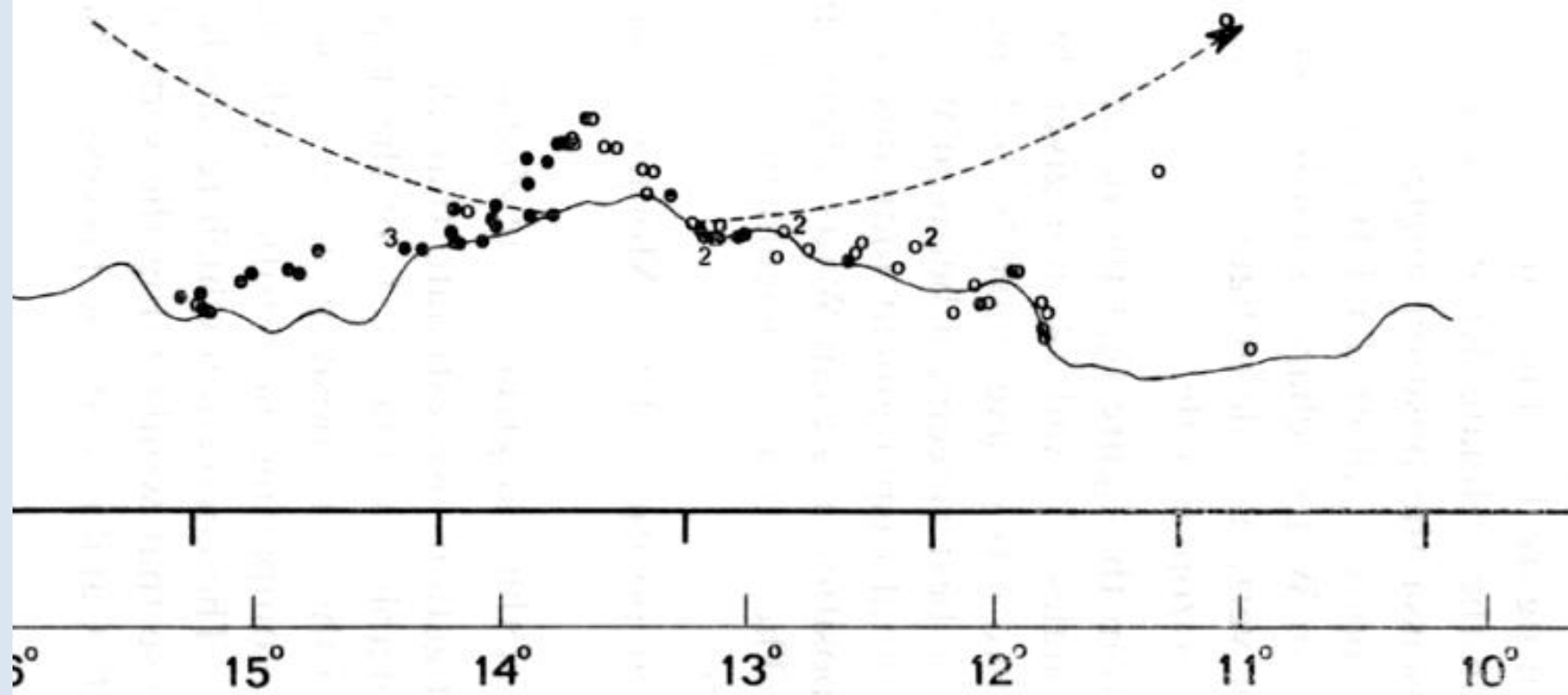


FIGURE 1. Lunar profile deduced from observations of the graze of 139 Tau on 1972 March 21. The four numbered points represent coincident observations.

- DISAPPEARANCE
- REAPPEARANCE
- - - PROJECTED TRACK OF STAR FOR ONE OBSERVER
- ~ WATTS' PROFILE



Updated Lunar Profile from *Kaguya* Data



Impact of Kaguya on the Moon on 2009 June 10
(J. Bailey / Steve Lee - 3.9-m Anglo-Australian Telescope)



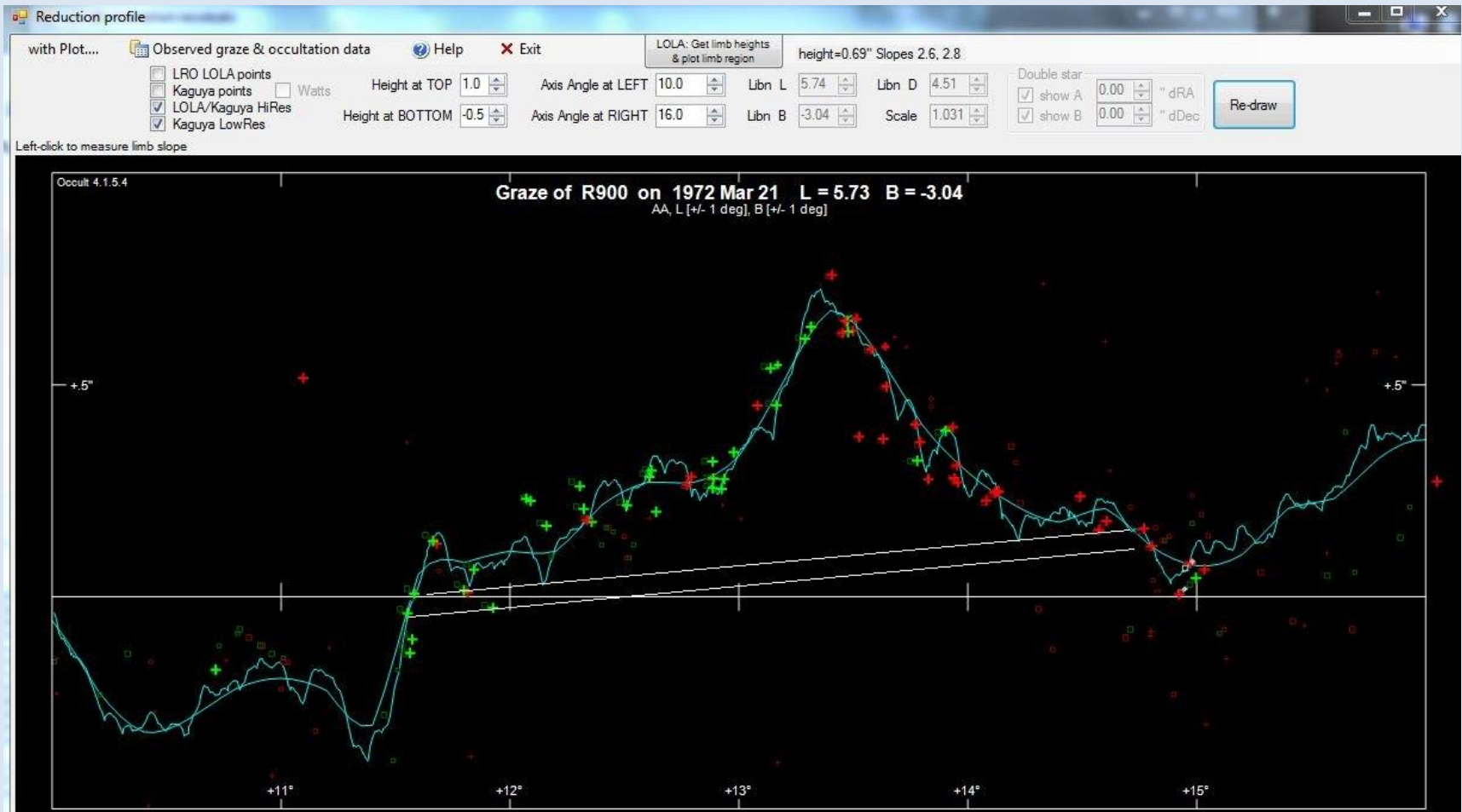
Just moments before impact, Kaguya's HD camera took this picture. Lunar hills loom in a seemingly distant background.

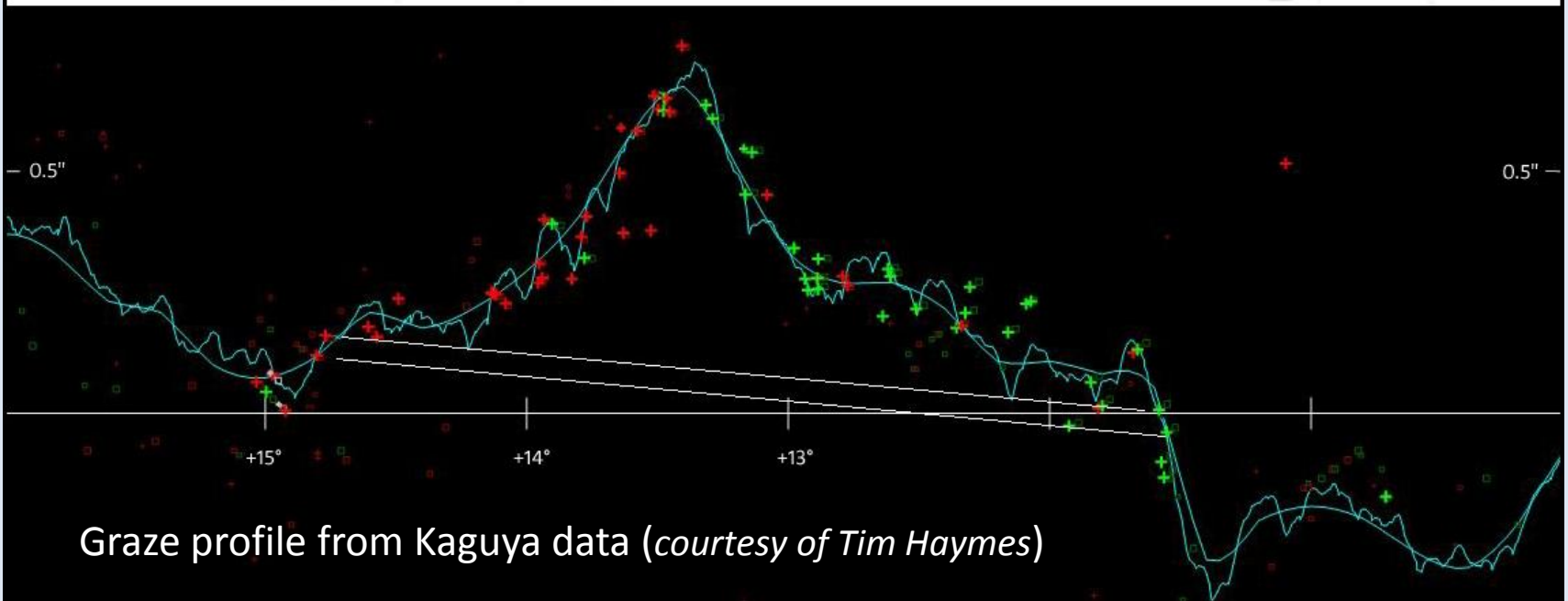
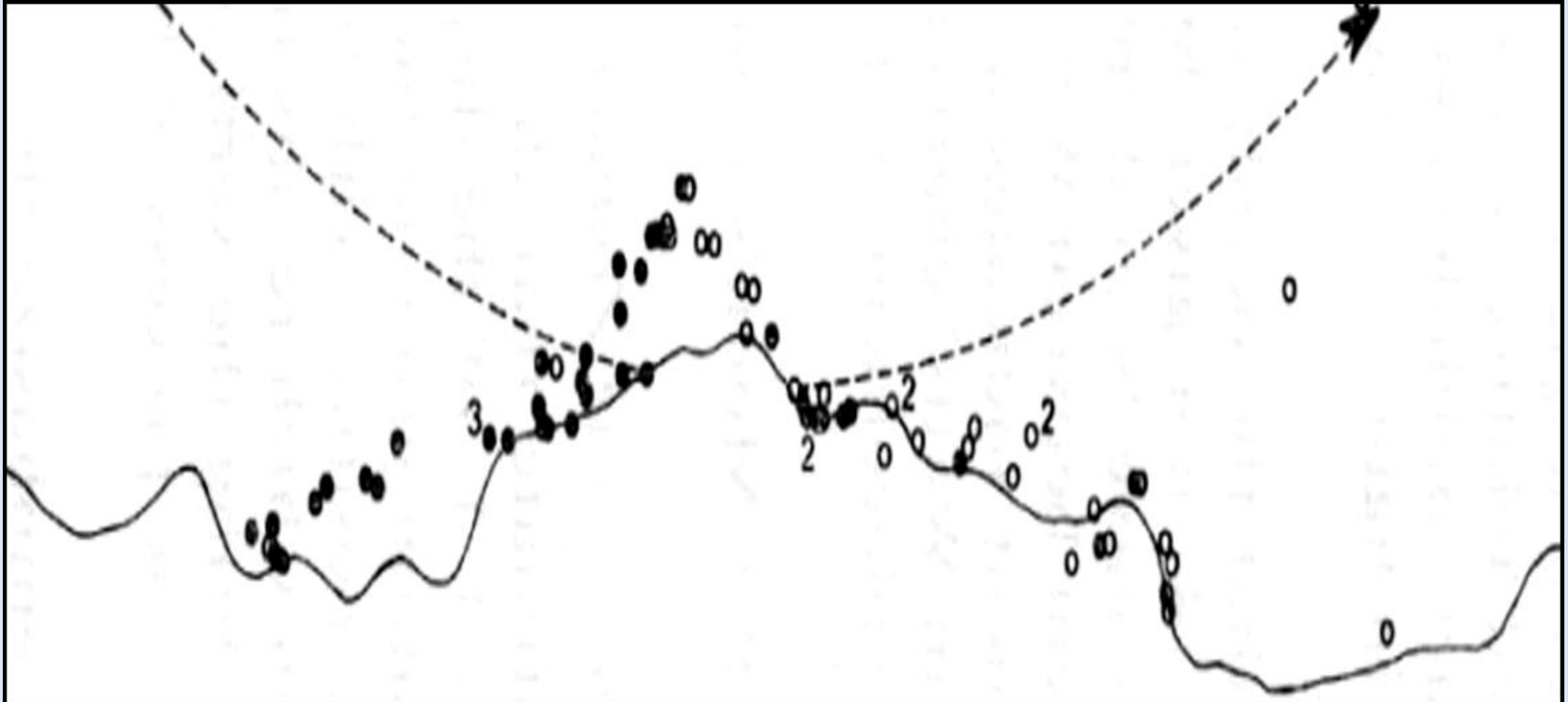
Credit: JAXA/Kaguya



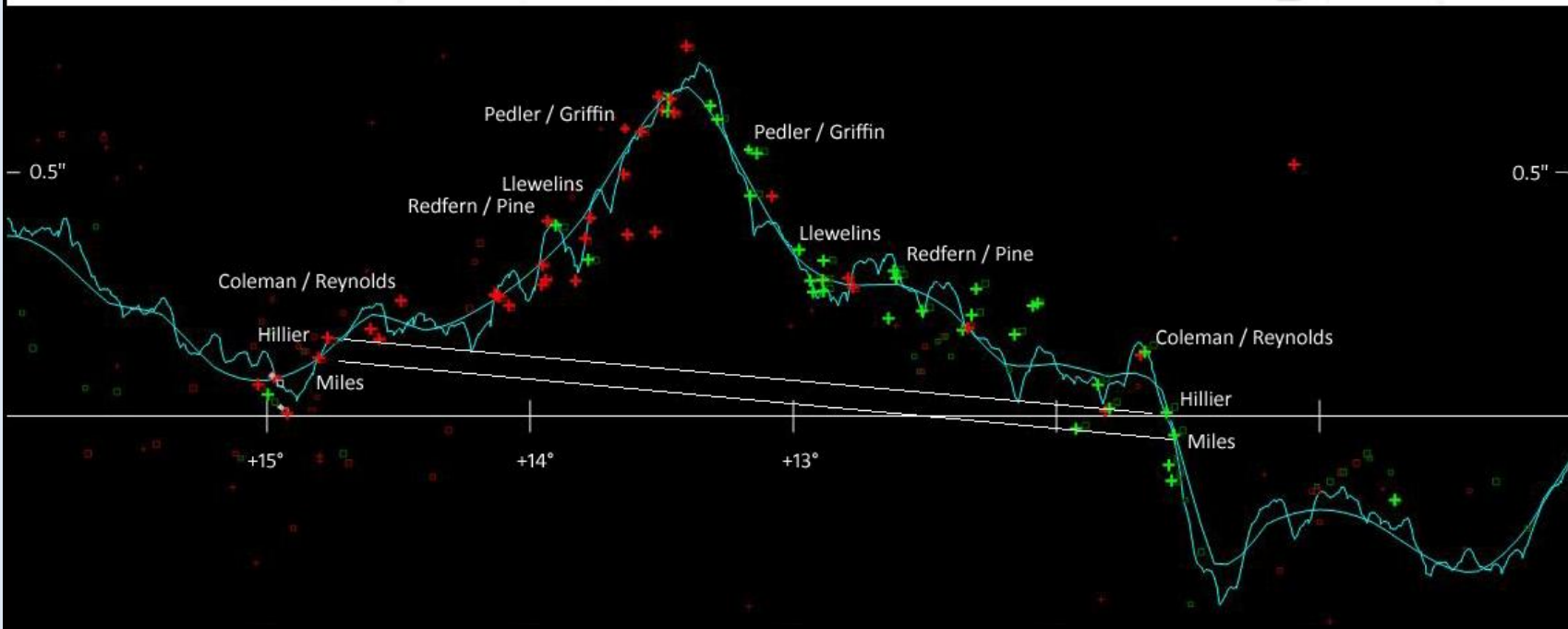
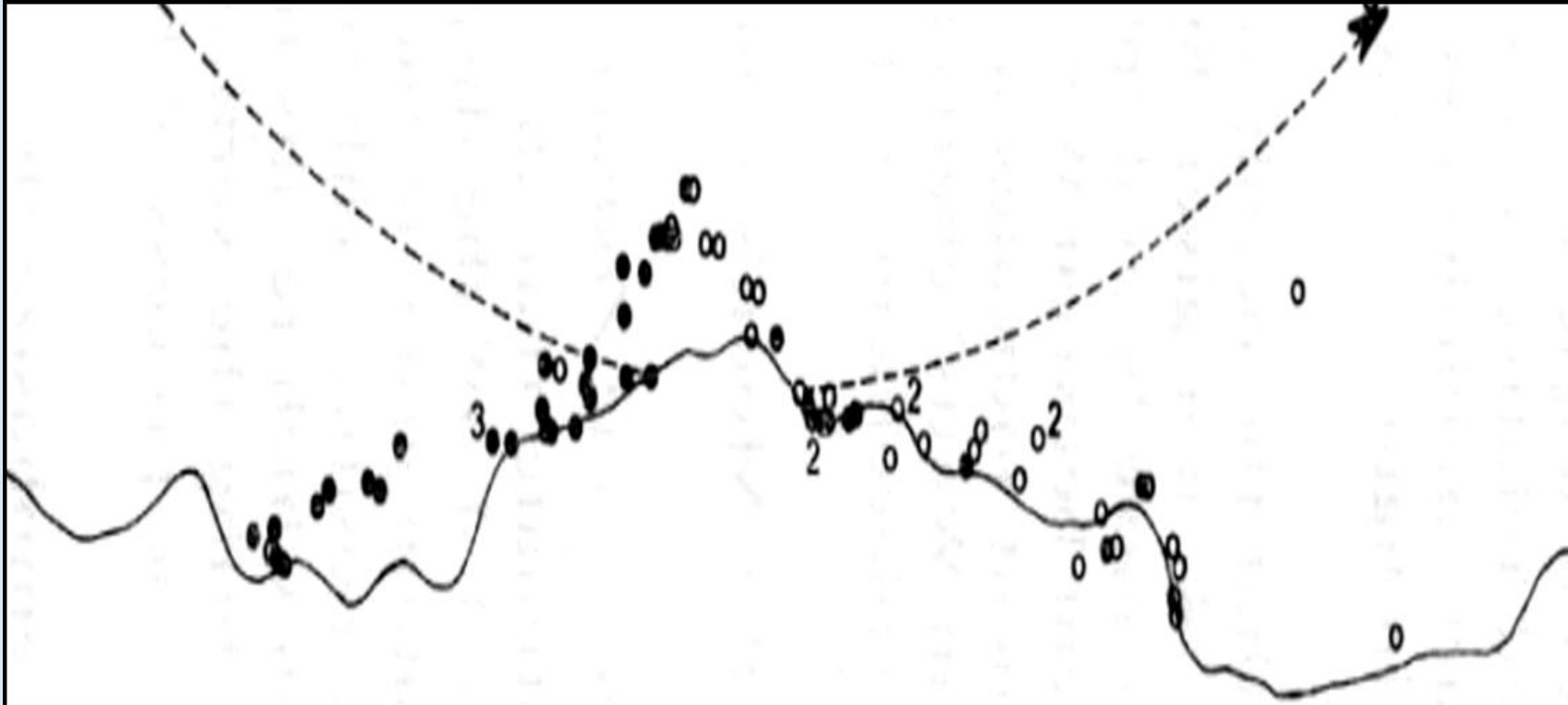
Japan's Kaguya satellite in lunar orbit after jettisoning one of its

Graze profile from Kaguya data (*courtesy of Tim Haymes*)

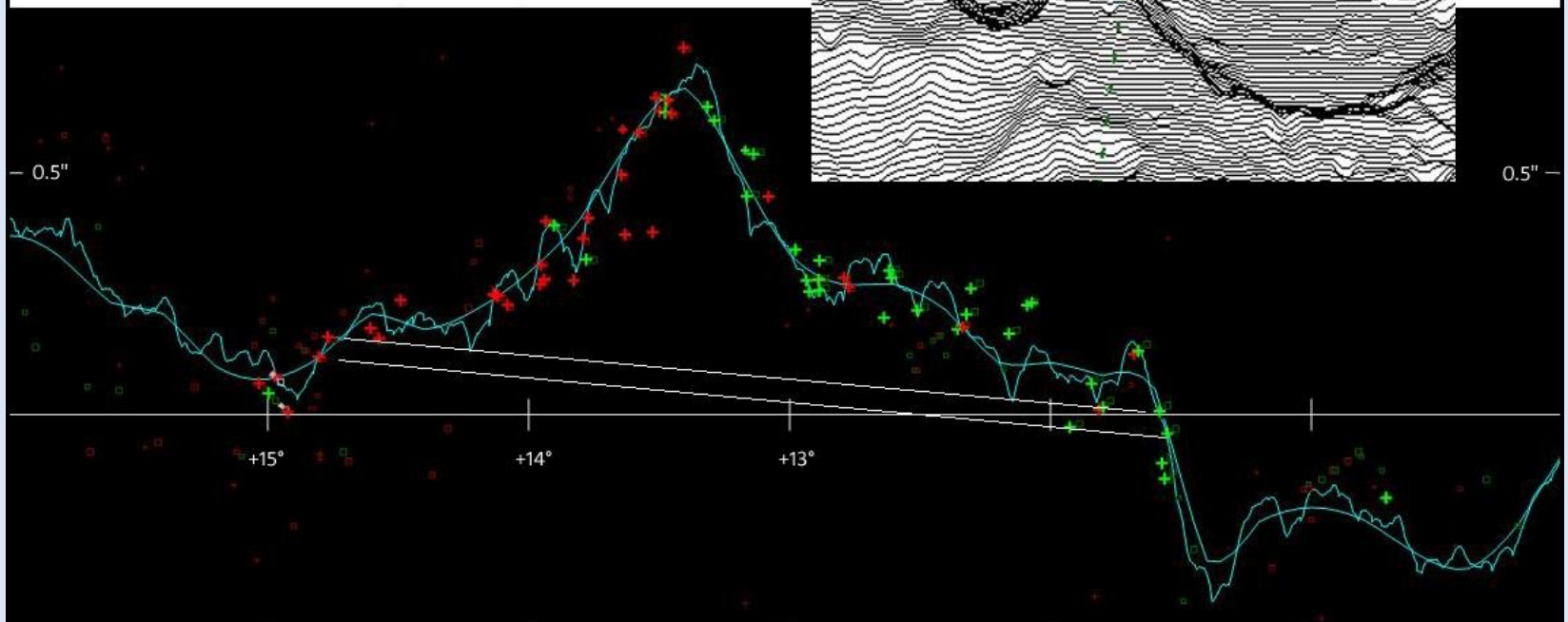
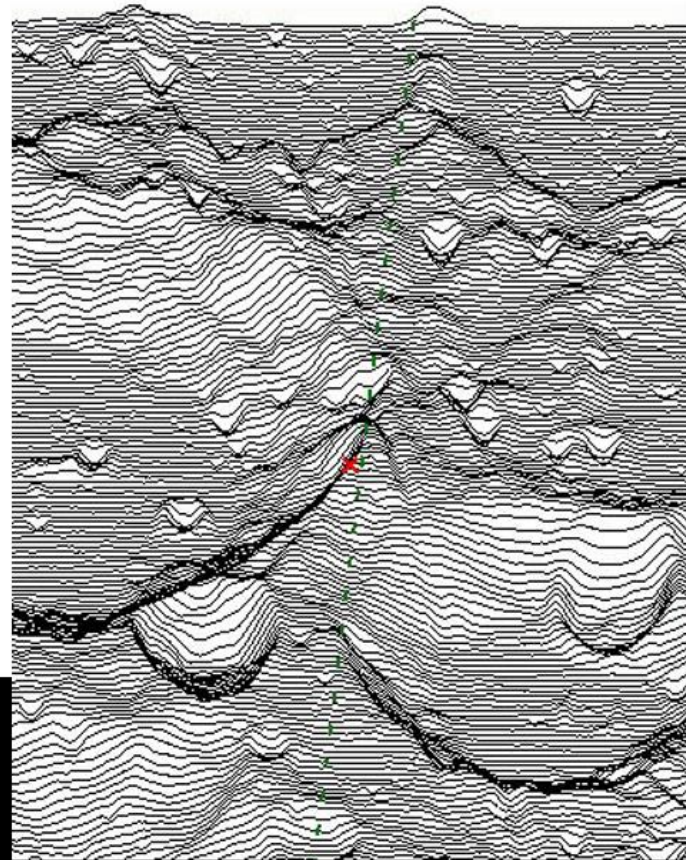




Graze profile from Kaguya data (*courtesy of Tim Haymes*)



**Relief Map of Moon
close to the Track of the Lunar Graze**
(courtesy of Tim Haymes)



The End
el Fin
Das Ende
La Fin
Het einde
Konec
Fine
Koniec
Y diwedd

10:00:20

50%

488

22549