

ASTRONOMY 2020

Supplementary Information

ADELAIDE

Quasar Publishing
Version 1.0

This year for our thirtieth edition we have made some changes. As part of this we have removed some data from the yearbook.

To decide what could be taken out we reviewed how the people, who value our book, participate in the hobby and how has this evolved over the years. For the true beginners with little more than a sense of wonder and a thirst to know, we believe they are well catered for in Astronomy 2020.

Telescope users have become polarised into two camps. There are those we call the pure observers who, with some knowledge, spend their money on the optics, taking a more low cost approach to their mounts. Then there are the people who ride the back of the technology revolution turning to computer controlled scopes, now much more affordable instruments, that can automatically slew to an object selected from its database.

Keeping this in mind, we had a hard look at the sea of numbers in Part II. Printed rise and set times for all the planets are not used by the beginner or pure observer and not needed by the techies. Besides, no one observes the planets (or anything) close to the horizon unless they have to. For this reason we

believe the approximate times given in the Rise–Set charts in Part I should suffice. Often the transit times for the outer planets are more valuable, when the planet is high in the northern sky with minimal atmospheric turbulence. Using the same reasoning, the position tables of the Sun, Moon and planets are either not used or not necessary.

When we started these books in 1990 there was no internet (believe it or not!), so some of the information we supplied wasn't easily obtainable elsewhere. Today a lot is available either online, from computer programmes or through cheap (or free) astronomy/planetarium apps on mobile devices. The lunar occultation tables are no longer included as the Occult software (written by Australian David Herald) is readily available for download and it can tailor event times for your location. Nevertheless, if you still need this information it is now available here.

The data on the following pages (available for download from our web site) is supplementary to the yearbook ASTRONOMY 2020 that we published in October 2019. Note there is a separate PDF for each capital city in Australia.

www.quasarastronomy.com.au/downloads---2020.html

In the event you are reading this and don't know what the yearbook we are referring to is, have a look here.

www.quasarastronomy.com.au/order.html

GEOCENTRIC POSITION of the SUN

(0 hr UT, Epoch 2000.0)

	JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE	
	RA hh mm.m	Dec. ° ' "	RA hh mm.m	Dec ° ' "	RA hh mm.m	Dec ° ' "	RA hh mm.m	Dec ° ' "	RA hh mm.m	Dec ° ' "	RA hh mm.m	Dec ° ' "
1	18 42.4	-23 04.8	20 55.0	-17 23.1	22 48.4	-07 35.6	00 42.1	+04 31.9	02 33.6	+15 04.1	04 36.4	+22 02.9
2	18 46.8	-23 00.1	20 59.1	-17 06.2	22 52.1	-07 12.8	00 45.8	+04 55.0	02 37.4	+15 22.1	04 40.5	+22 10.8
3	18 51.2	-22 54.9	21 03.2	-16 49.0	22 55.8	-06 49.8	00 49.4	+05 18.0	02 41.2	+15 39.9	04 44.6	+22 18.4
4	18 55.6	-22 49.3	21 07.2	-16 31.5	22 59.6	-06 26.8	00 53.1	+05 40.9	02 45.1	+15 57.4	04 48.7	+22 25.6
5	19 00.0	-22 43.2	21 11.3	-16 13.7	23 03.3	-06 03.7	00 56.7	+06 03.8	02 48.9	+16 14.6	04 52.8	+22 32.4
6	19 04.4	-22 36.7	21 15.3	-15 55.6	23 07.0	-05 40.4	01 00.4	+06 26.5	02 52.8	+16 31.6	04 57.0	+22 38.8
7	19 08.8	-22 29.7	21 19.3	-15 37.3	23 10.7	-05 17.2	01 04.0	+06 49.1	02 56.6	+16 48.3	05 01.1	+22 44.8
8	19 13.2	-22 22.3	21 23.3	-15 18.7	23 14.4	-04 53.8	01 07.7	+07 11.6	03 00.5	+17 04.7	05 05.2	+22 50.4
9	19 17.5	-22 14.4	21 27.3	-14 59.8	23 18.1	-04 30.4	01 11.4	+07 33.9	03 04.4	+17 20.9	05 09.4	+22 55.6
10	19 21.9	-22 06.1	21 31.3	-14 40.7	23 21.8	-04 06.9	01 15.0	+07 56.2	03 08.3	+17 36.7	05 13.5	+23 00.4
11	19 26.3	-21 57.4	21 35.3	-14 21.3	23 25.5	-03 43.4	01 18.7	+08 18.3	03 12.2	+17 52.3	05 17.6	+23 04.8
12	19 30.6	-21 48.3	21 39.2	-14 01.7	23 29.1	-03 19.8	01 22.4	+08 40.3	03 16.1	+18 07.5	05 21.8	+23 08.7
13	19 34.9	-21 38.7	21 43.2	-13 41.9	23 32.8	-02 56.2	01 26.1	+09 02.1	03 20.1	+18 22.5	05 25.9	+23 12.3
14	19 39.3	-21 28.7	21 47.1	-13 21.8	23 36.5	-02 32.5	01 29.8	+09 23.8	03 24.0	+18 37.1	05 30.1	+23 15.5
15	19 43.6	-21 18.3	21 51.0	-13 01.5	23 40.2	-02 08.9	01 33.5	+09 45.3	03 28.0	+18 51.4	05 34.2	+23 18.3
16	19 47.9	-21 07.5	21 54.9	-12 41.0	23 43.8	-01 45.2	01 37.2	+10 06.7	03 31.9	+19 05.4	05 38.4	+23 20.6
17	19 52.2	-20 56.3	21 58.8	-12 20.3	23 47.5	-01 21.5	01 40.9	+10 27.9	03 35.9	+19 19.1	05 42.5	+23 22.6
18	19 56.4	-20 44.6	22 02.7	-11 59.4	23 51.1	-00 57.7	01 44.6	+10 48.9	03 39.9	+19 32.5	05 46.7	+23 24.1
19	20 00.7	-20 32.6	22 06.5	-11 38.3	23 54.8	-00 34.0	01 48.3	+11 09.7	03 43.8	+19 45.5	05 50.9	+23 25.2
20	20 05.0	-20 20.2	22 10.4	-11 17.1	23 58.4	-00 10.3	01 52.0	+11 30.4	03 47.8	+19 58.2	05 55.0	+23 25.9
21	20 09.2	-20 07.4	22 14.2	-10 55.6	00 02.1	+00 13.4	01 55.8	+11 50.9	03 51.8	+20 10.6	05 59.2	+23 26.2
22	20 13.4	-19 54.2	22 18.1	-10 34.0	00 05.7	+00 37.1	01 59.5	+12 11.2	03 55.8	+20 22.6	06 03.4	+23 26.1
23	20 17.7	-19 40.7	22 21.9	-10 12.2	00 09.4	+01 00.8	02 03.3	+12 31.3	03 59.9	+20 34.3	06 07.5	+23 25.5
24	20 21.9	-19 26.8	22 25.7	-09 50.2	00 13.0	+01 24.4	02 07.0	+12 51.1	04 03.9	+20 45.6	06 11.7	+23 24.6
25	20 26.1	-19 12.5	22 29.5	-09 28.1	00 16.6	+01 48.1	02 10.8	+13 10.8	04 07.9	+20 56.5	06 15.8	+23 23.2
26	20 30.2	-18 57.9	22 33.3	-09 05.9	00 20.3	+02 11.6	02 14.6	+13 30.3	04 12.0	+21 07.1	06 20.0	+23 21.4
27	20 34.4	-18 42.9	22 37.1	-08 43.5	00 23.9	+02 35.2	02 18.4	+13 49.5	04 16.0	+21 17.3	06 24.1	+23 19.3
28	20 38.6	-18 27.6	22 40.8	-08 21.0	00 27.6	+02 58.6	02 22.1	+14 08.5	04 20.1	+21 27.2	06 28.3	+23 16.7
29	20 42.7	-18 12.0	22 44.6	-07 58.4	00 31.2	+03 22.0	02 25.9	+14 27.3	04 24.2	+21 36.7	06 32.4	+23 13.6
30	20 46.8	-17 56.0			00 34.8	+03 45.4	02 29.8	+14 45.8	04 28.3	+21 45.8	06 36.6	+23 10.2
31	20 50.9	-17 39.7			00 38.5	+04 08.7			04 32.3	+21 54.5		
	JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
1	06 40.7	+23 06.4	08 45.5	+18 01.3	10 41.4	+08 17.5	12 29.4	-03 10.3	14 25.4	-14 24.8	16 29.0	-21 47.5
2	06 44.8	+23 02.2	08 49.3	+17 46.1	10 45.0	+07 55.7	12 33.0	-03 33.5	14 29.4	-14 43.9	16 33.4	-21 56.6
3	06 49.0	+22 57.6	08 53.2	+17 30.6	10 48.7	+07 33.7	12 36.6	-03 56.7	14 33.3	-15 02.7	16 37.7	-22 05.3
4	06 53.1	+22 52.5	08 57.1	+17 14.8	10 52.3	+07 11.7	12 40.2	-04 19.9	14 37.2	-15 21.3	16 42.0	-22 13.6
5	06 57.2	+22 47.1	09 00.9	+16 58.7	10 55.9	+06 49.5	12 43.9	-04 43.0	14 41.2	-15 39.7	16 46.4	-22 21.5
6	07 01.3	+22 41.3	09 04.7	+16 42.3	10 59.5	+06 27.2	12 47.5	-05 06.0	14 45.2	-15 57.8	16 50.7	-22 28.9
7	07 05.4	+22 35.1	09 08.6	+16 25.7	11 03.1	+06 04.8	12 51.2	-05 29.0	14 49.2	-16 15.7	16 55.1	-22 35.9
8	07 09.5	+22 28.5	09 12.4	+16 08.8	11 06.7	+05 42.3	12 54.8	-05 51.9	14 53.2	-16 33.2	16 59.5	-22 42.4
9	07 13.6	+22 21.5	09 16.2	+15 51.7	11 10.3	+05 19.8	12 58.5	-06 14.8	14 57.2	-16 50.5	17 03.9	-22 48.6
10	07 17.7	+22 14.1	09 20.0	+15 34.3	11 13.9	+04 57.1	13 02.2	-06 37.5	15 01.2	-17 07.6	17 08.2	-22 54.2
11	07 21.8	+22 06.4	09 23.8	+15 16.6	11 17.5	+04 34.3	13 05.8	-07 00.2	15 05.3	-17 24.3	17 12.6	-22 59.4
12	07 25.9	+21 58.2	09 27.6	+14 58.7	11 21.1	+04 11.5	13 09.5	-07 22.8	15 09.3	-17 40.7	17 17.1	-23 04.2
13	07 29.9	+21 49.7	09 31.3	+14 40.6	11 24.7	+03 48.5	13 13.2	-07 45.3	15 13.4	-17 56.8	17 21.5	-23 08.5
14	07 34.0	+21 40.8	09 35.1	+14 22.2	11 28.3	+03 25.6	13 16.9	-08 07.6	15 17.5	-18 12.6	17 25.9	-23 12.3
15	07 38.0	+21 31.6	09 38.8	+14 03.6	11 31.8	+03 02.5	13 20.7	-08 29.9	15 21.6	-18 28.1	17 30.3	-23 15.7
16	07 42.1	+21 22.0	09 42.6	+13 44.8	11 35.4	+02 39.4	13 24.4	-08 52.1	15 25.7	-18 43.3	17 34.7	-23 18.6
17	07 46.1	+21 12.0	09 46.3	+13 25.7	11 39.0	+02 16.2	13 28.1	-09 14.1	15 29.8	-18 58.1	17 39.2	-23 21.0
18	07 50.1	+21 01.6	09 50.0	+13 06.5	11 42.6	+01 53.0	13 31.9	-09 36.0	15 34.0	-19 12.6	17 43.6	-23 23.0
19	07 54.1	+20 50.9	09 53.8	+12 47.0	11 46.2	+01 29.8	13 35.6	-09 57.7	15 38.1	-19 26.8	17 48.0	-23 24.5
20	07 58.2	+20 39.9	09 57.5	+12 27.3	11 49.8	+01 06.5	13 39.4	-10 19.3	15 42.3	-19 40.6	17 52.5	-23 25.5
21	08 02.2	+20 28.5	10 01.2	+12 07.4	11 53.4	+00 43.2	13 43.2	-10 40.8	15 46.5	-19 54.0	17 56.9	-23 26.1
22	08 06.1	+20 16.7	10 04.9	+11 47.4	11 57.0	+00 19.8	13 46.9	-11 02.1	15 50.7	-20 07.1	18 01.4	-23 26.2
23	08 10.1	+20 04.6	10 08.6	+11 27.1	12 00.5	-00 03.5	13 50.7	-11 23.2	15 54.9	-20 19.8	18 05.8	-23 25.8
24	08 14.1	+19 52.2	10 12.2	+11 06.7	12 04.1	-00 26.9	13 54.5	-11 44.2	15 59.1	-20 32.1	18 10.2	-23 25.0
25	08 18.0	+19 39.4	10 15.9	+10 46.1	12 07.7	-00 50.3	13 58.4	-12 04.9	16 03.4	-20 44.1	18 14.7	-23 23.6
26	08 22.0	+19 26.4	10 19.6	+10 25.3	12 11.3	-01 13.6	14 02.2	-12 25.5	16 07.6	-20 55.7	18 19.1	-23 21.8
27	08 25.9	+19 13.0	10 23.2	+10 04.4	12 14.9	-01 37.0	14 06.0	-12 45.9	16 11.9	-21 06.8	18 23.5	-23 19.6
28	08 29.9	+18 59.2	10 26.9	+09 43.3	12 18.5	-02 00.3	14 09.9	-13 06.1	16 16.1	-21 17.6	18 28.0	-23 16.9
29	08 33.8	+18 45.2	10 30.5	+09 22.1	12 22.1	-02 23.7	14 13.8	-13 26.1	16 20.4	-21 28.0	18 32.4	-23 13.7
30	08 37.7	+18 30.9	10 34.2	+09 00.7	12 25.8	-02 47.0	14 17.6	-13 45.9	16 24.7	-21 37.9	18 36.8	-23 10.0
31	08 41.6	+18 16.2	10 37.8	+08 39.1			14 21.5	-14 05.4			18 41.3	-23 05.9

LUNAR OCCULTATIONS for ADELAIDE (34° 54' S, 138° 36' E)

INTRODUCTION From month to month the Moon does not occult the same stars. In fact over a number of years it drifts in declination between plus and minus 28°. The brighter stars that the Moon occults are listed in the Zodiacal Catalogue (ZC). There are about 3500 stars in the ZC.

The Moon moves from west to east, so it rises and sets later each day. From just after New Moon to just before Full Moon, stars being occulted disappear behind part of the dark limb and reappear from the bright limb. The limb is another term for the edge of the Moon. After Full Moon a star disappears on the bright limb and reappears on the dark limb. There is no dark limb at Full Moon.

Dark limb events, in particular disappearances, are the easiest to observe. Following a star until it *winks out* is much easier than scanning the lunar limb, waiting for it to suddenly reappear. The brighter the star, the more spectacular the event. The table here present the easier to observe occultations for this year as predicted. Both events, the disappearance and reappearance, are not necessarily included. An event may not be present because:

1. The Moon is in daylight.
2. The Moon is too close to or below the horizon.
3. For faint stars, events on a bright limb (in particular reappearances) are difficult to observe and have been omitted.

TELESCOPE REQUIREMENTS. These vary greatly with the brightness of the star being observed, the brightness of the Moon (how close to Full Moon) and whether the event is on a bright or dark limb. Disappearances of first magnitude stars on the dark limb can be observed with the naked eye.

www.lunar-occultations.com/iota/iotandx.htm
www.occultations.org.nz

The faintest stars, which have occultation predictions, are about 6.5 magnitude. The criteria for selection are complex involving the Sun and Moon altitude, star magnitude and whether it is a bright or dark limb event.

CST the date and time of the occultation, hr and min are in CST
OBJECT n, nn, nnn, nnnn ZC catalogue number
 ggg ccc Greek letter and constellation abbreviation
 n ccc Flamsteed number and constellation
 name of planet, satellite or deep sky object.

PD event, consisting of two letters.
 The first letter is the Event type: D = Disappearance and R = Reappearance. The 2nd letter represents: D = Dark limb, B = a bright limb event. G indicates a graze at or near the location. M means a miss with a graze nearby.

Mag magnitude of the star.
Elg elongation or separation of the Moon from the Sun as measured in degrees.

Alt altitude of the Moon during the occultation.

PA position angle is the position the event occurs on the limb of the Moon (measured as degrees east of north).

A coefficient of longitude (see below)

B coefficient of latitude (see below)

NB. For some stars, close to grazing, A and B values would be useless, and no values are shown.

CALCULATING EVENT TIME FOR OTHER LOCATIONS

Unless the event is close to a graze (PA is close to 0° or 180°) this method will give a good approximation for any location within about 500 km of this city. The predicted time at your location is given by:

$$\text{Predicted Time} = \text{Time from Table} + (A \times n) + (B \times p)$$

where *A* and *B* are taken from the table below and *n* and *p* are given by (convert to decimal degrees)

$$n = \text{your longitude} - \text{reference longitude}$$

$$p = \text{reference latitude} - \text{your latitude}$$

you need to preserve the signs of *n* and *p*, that is, whether they are positive or negative and it is best to use your closest city.

CST	Object	PD	Mag	Elg°	Alt°	PA°	A	B	CST	Object	PD	Mag	Elg°	Alt°	PA°	A	B	CST	Object	PD	Mag	Elg°	Alt°	PA°	A	B
Jan 01 21:02	3478	DD	6.4	71	30	74	0.9	1.7	Apr 12 01:50	2401	RD	5.6	130	62	336	0.6	-3.3	Aug 04 04:22	Eta Cap	DD	4.9	177	37	51	0.4	2.1
Jan 09 00:41	108 Tau	DD	6.3	152	24	57	1.9	1.7	Apr 12 23:02	52 Oph	RD	6.5	118	19	295	0.0	-1.6	Aug 11 01:20	Xi Ari	RD	5.5	101	17	271	1.1	-1.3
Jan 09 02:44	109 Tau	DD	5.0	153	6	115	0.5	0.4	Apr 14 01:09	2706	RD	5.8	105	34	253	1.0	-0.6	Aug 26 19:07	2394 RB	6.3	98	74	338	1.4	-3.7	
Jan 10 01:55	8 Gem	DD	6.1	165	21	36	2.5	3.1	Apr 20 05:17	3506	RD	6.1	35	17	282	0.6	-1.9	Aug 28 20:43	26 Sgr	DD	6.2	124	79	32	2.3	4.6
Jan 10 02:01	9 Gem	DD	6.2	165	20	92	1.5	0.8	May 07 01:14	2043	DD	6.5	168	55	100	1.9	0.2	Aug 29 20:22	53 Sgr	DD	6.4	136	72	56	2.3	1.4
Jan 20 03:17	Eta Lib	RD	5.4	61	23	264	0.6	-1.0	May 07 01:38	2047	DD	6.6	168	52	110	1.6	-0.1	Aug 29 20:33	2875	DD	6.0	136	74	58	2.3	1.3
Jan 23 12:17	Jupiter	DB	-1.7	21	69	54	1.9	2.4	May 08 23:41	2316	RD	6.4	164	63	293	1.6	-1.4	Sep 03 04:30	Psi 2 Aqr	DB	4.4	173	33	65	0.8	1.8
Jan 23 13:25	Ganymed	RD	5.4	21	56	292	2.1	-0.2	May 14 01:35	3081	RD	6.5	100	31	237	1.1	0.1	Sep 03 05:37	Psi 2 Aqr	RD	4.4	172	19	236	0.3	1.9
Jan 23 13:32	Jupiter	RD	-1.7	21	55	292	2.1	-0.2	May 19 05:00	26 Cet	RD	6.1	43	17	184	0.0	3.2	Sep 12 04:39	977	RD	6.4	73	19	284	1.9	-1.4
Jan 28 20:30	Psi 2 Aqr	RB	4.4	39	12	211	-0.1	2.3	May 26 18:07	52 Gem	RB	5.8	42	18	325	0.5	-0.8	Sep 13 05:08	57 Gem	RD	5.0	61	16	311	2.0	-2.3
Feb 05 22:05	865	DD	6.2	130	30	77	2.2	0.8	May 29 18:53	Eta Leo	MB	3.5	80	37	209	9.9	9.9	Sep 22 19:48	Psi Oph	RB	4.5	68	45	276	1.3	0.8
Feb 08 20:06	Gam Cnc	DD	4.7	168	13	150	1.7	-3.0	May 31 23:19	1739	DD	6.4	108	25	130	0.7	-0.3	Sep 25 00:02	24 Sgr	DD	5.5	96	20	97	0.3	0.9
Feb 11 22:17	Xi Vir	RD	4.8	148	15	9	0.4	-5.6	Jun 07 20:02	2706	RD	5.8	158	15	281	0.0	-1.3	Sep 25 20:25	49 Sgr	DD	5.5	107	73	78	2.1	1.0
Feb 17 02:48	Chi Oph	DB	4.2	79	32	64	1.4	-0.2	Jun 07 21:24	26 Sgr	RD	6.2	157	31	236	1.2	0.1	Sep 25 21:49	49 Sgr	RB	5.5	107	57	259	1.6	1.3
Feb 17 03:31	Chi Oph	RD	4.2	79	41	343	-0.2	-3.3	Jun 08 20:32	2875	RD	6.0	145	10	189	9.9	9.9	Oct 01 20:40	49	DD	6.1	174	34	6	0.3	3.2
Feb 18 01:57	Xi Oph	DB	4.4	68	13	103	-0.1	-1.3	Jun 10 01:11	17 Cap	RD	5.9	131	53	190	2.4	7.0	Oct 07 00:41	Ome 2 Tau	DB	4.9	128	21	48	0.8	0.3
Feb 18 02:55	Xi Oph	RD	4.4	67	25	291	0.2	-1.6	Jun 12 02:03	56 Aqr	RD	6.4	107	40	192	1.3	3.7	Oct 07 02:01	Ome 2 Tau	RD	4.9	127	31	258	2.1	-0.2
Feb 18 03:44	2509	DB	5.8	67	34	114	0.5	-1.7	Jun 13 03:00	Psi 3 Aqr	DB	5.0	95	40	17	1.0	2.7	Oct 21 19:05	2602 RB	5.4	63	53	224	0.9	3.1	
Feb 18 04:54	2509	RD	5.8	66	49	282	1.3	-1.4	Jun 13 03:59	Psi 3 Aqr	RD	5.0	95	51	287	2.6	-2.2	Oct 21 22:42	1 Sgr	DD	5.0	64	10	2	9.9	9.9
Feb 27 20:29	89 Psc	DD	5.1	41	6	94	0.3	1.2	Jun 28 20:29	1813	DD	5.7	91	44	128	1.3	-0.7	Oct 24 23:32	3081	DD	6.5	102	31	65	0.4	1.7
Feb 29 20:19	38 Ara	RB	5.2	63	18	232	1.1	2.1	Jun 28 21:41	1813	RB	5.7	91	32	298	1.0	0.0	Oct 28 02:05	3478	DD	6.4	137	21	70	0.5	1.7
Mar 04 21:27	8 Gem	DD	6.1	109	26	100	1.9	0.4	Jul 01 22:31	30 Lib	DD	6.5	132	62	121	1.8	-0.8	Nov 11 04:25	Iot Leo	DB	3.9	61	19	104	1.0	-1.4
Mar 04 22:27	9 Gem	DD	6.2	110	20	175	9.9	9.9	Jul 02 18:38	2331	DD	6.3	144	45	100	1.2	-1.3	Nov 20 21:52	17 Cap	DD	5.9	70	26	87	0.5	1.2
Mar 05 19:22	48 Gem	DD	5.9	121	29	107	2.2	-0.9	Jul 11 03:51	3506	DB	6.1	114	59	16	0.9	2.9	Nov 23 23:25	Psi 3 Aqr	DD	5.0	105	30	119	1.9	0.0
Mar 13 04:31	2043	RD	6.5	137	58	270	2.2	0.6	Jul 11 05:03	3506	RD	6.1	114	61	271	3.0	0.1	Nov 24 00:00	Psi 3 Aqr	RB	5.0	105	23	179	-0.6	3.6
Mar 15 03:34	2316	DD	6.4	110	66	192	-2.7	-9.7	Jul 13 05:02	89 Psc	DB	5.1	91	48	2	0.0	3.5	Dec 05 02:49	Lam Cnc	RD	5.9	131	30	282	2.3	-0.7
Mar 15 03:52	2316	RD	6.4	110	69	219	6.1	7.2	Jul 13 05:59	89 Psc	RD	5.1	91	51	283	3.7	-0.9	Dec 06 01:18	1373	RD	6.5	119	18	249	1.3	-0.5
Mar 17 01:32	2595	DB	5.7	86	23	140	-0.3	-2.3	Jul 15 04:02	38 Ara	RD	5.2	70	22	268	1.3	-1.1	Dec 21 23:01	3506	DD	6.1	85	16	119	0.9	0.3
Mar 17 02:23	2595	RD	5.7	86	33	248	1.2	-0.4	Jul 30 01:30	2316	DD	6.4	117	16	48	-0.3	2.9	Dec 27 01:04	517	DD	6.1	140	17	65	1.3	1.8
Mar 18 01:19	2754	RD	5.9	74	11	243	0.2	-0.4	Jul 31 00:41	2457	DD	6.3	130	38	83	0.9	1.4	Dec 27 20:20	Ome 2 Tau	DD	4.9	150	29	102	2.6	-1.3
Apr 09 00:40	1965	RD	6.5	171	61	261	2.7	0.4	Aug 02 23:48	2921	DD	6.0	167	77	45	1.9	2.4	Dec 27 21:29	Ome 2 Tau	RB	4.9	150	34	204	1.1	1.8
Apr 12 00:56	2401	DB	5.6	130	51	69	2.1	-0.1	Aug 03 01:20	2928	DD	6.4	167	64	44	1.3	2.6	Dec 27 22:24	53 Tau	DD	5.5	151	34	33	1.7	1.8