

# OCCULTATIONS OF PLANETS AND BRIGHT STARS BY THE MOON

June 22, 2017

The moon, as our nearest neighbor, sometimes blocks the light coming from a planet, a star, or the sun. Occultations are listed below for the years 2017-2020. The name of the planet or star, along with its visual magnitude, is listed along with the percentage of the moon's disk that is illuminated at the time. The date and time (UTC) when the angle between the center of the moon and the center of the planet or star is minimal (mid-point of the occultation), and the angle of separation are the next items listed.

For local times, subtract 7 hours from UTC to obtain MST, or 6 hours for MDT.

Then, the date and times when the occultation first commences, and last ends, for observers on earth are listed, followed by the latitude and longitude of the location where the line from the object's center through the moon's center strikes the surface of the earth at mid-occultation.

If the occultation is visible, in whole or in part, from the **Hidden Valley Observatory**, the times (UTC) of the various stages are listed along with the altitude above the horizon of the moon and the sun respectively. For occultations, when the moon is above the horizon, but not the sun, this is noted with three asterisks (\*\*\*) . If, on the other hand, the Moon is visible at HVO when the object in question is closest to the Moon, but the planet or star is not occulted because of perspective, then the angle between the edge of the Moon and the object is listed.

Note: the data listed below depend on estimates of DUT1 and DUTC. Also, a number of other factors are involved in the computation of an occultation, and the results given here can easily be off by a few seconds. In addition, direct visual observation can be uncertain in terms of reaction time, and in establishing the accuracy of the clock you use.

N.B. This edition of June 22, 2017 replaces all previous editions.

Occultation of Neptune 7.9 by moon 23% illuminated at phase= 57 degrees  
01/03/2017 03:59:54.2 Geocentric minimum 0.4 degrees  
Global start/end: 01/03/2017 01:53:54.4 and 01/03/2017 06:05:52.2  
Mid-occultation observing point (lat., long.) 13.7 171.9

Occultation of Mars 0.9 by moon 24% illuminated at phase= 58 degrees  
01/03/2017 06:38:16.8 Geocentric minimum 0.2 degrees  
Global start/end: 01/03/2017 04:20:49.1 and 01/03/2017 08:55:42.7  
Mid-occultation observing point (lat., long.) 5.5 136.3

Occultation of Aldebaran 0.85 by moon 89% illuminated at phase= 141 degrees  
01/09/2017 14:25:41.6 Geocentric minimum 0.4 degrees  
Global start/end: 01/09/2017 12:25:27.6 and 01/09/2017 16:25:53.9  
Mid-occultation observing point (lat., long.) 37.1 99.7

Occultation of Regulus 1.35 by moon 91% illuminated at phase= 215 degrees  
01/15/2017 04:07:13.1 Geocentric minimum 0.8 degrees  
Global start/end: 01/15/2017 02:28:47.5 and 01/15/2017 05:45:44.1  
Mid-occultation observing point (lat., long.) -42.8 -42.0

Occultation of Neptune 8.0 by moon 7% illuminated at phase= 30 degrees  
01/30/2017 11:19:05.3 Geocentric minimum 0.2 degrees  
Global start/end: 01/30/2017 09:09:28.5 and 01/30/2017 13:28:41.9  
Mid-occultation observing point (lat., long.) 2.6 39.4

Occultation of Aldebaran 0.85 by moon 69% illuminated at phase= 113 degrees  
02/05/2017 21:34:34.9 Geocentric minimum 0.2 degrees  
Global start/end: 02/05/2017 19:29:31.5 and 02/05/2017 23:39:37.2  
Mid-occultation observing point (lat., long.) 30.5 -33.1  
At HVO the miss angle is 868.0 arc-sec at 02/05/2017 20:38:01.5

Occultation of Regulus 1.35 by moon 100% illuminated at phase= 187 degrees  
02/11/2017 14:06:34.6 Geocentric minimum 0.8 degrees  
Global start/end: 02/11/2017 12:24:50.3 and 02/11/2017 15:48:22.9  
Mid-occultation observing point (lat., long.) -38.8 143.2

Eclipse of the sun by moon 0% illuminated at phase= 360 degrees  
02/26/2017 14:53:24.6 Geocentric minimum 0.4 degrees  
Global start/end: 02/26/2017 12:10:40.1 and 02/26/2017 17:35:58.9  
Mid-occultation observing point (lat., long.) -34.7 -31.2

Occultation of Aldebaran 0.85 by moon 46% illuminated at phase= 85 degrees  
03/05/2017 02:59:06.9 Geocentric minimum 0.2 degrees  
Global start/end: 03/05/2017 00:53:20.9 and 03/05/2017 05:04:53.6  
Mid-occultation observing point (lat., long.) 29.8 -140.9

---For observations at HVO:

03/05/2017 04:01:49.2 OCCULTATION MID-POINT 39.1 -34.9 \*\*\*  
03/05/2017 03:40:21.5 Start Total 42.8 -31.5 \*\*\*  
03/05/2017 04:22:39.0 End Total 35.5 -38.0 \*\*\*

Occultation of Regulus 1.35 by moon 97% illuminated at phase= 160 degrees  
03/10/2017 22:22:24.6 Geocentric minimum 0.8 degrees  
Global start/end: 03/10/2017 20:40:44.8 and 03/11/2017 00:04:06.9  
Mid-occultation observing point (lat., long.) -39.9 -8.2

Occultation of Neptune 8.0 by moon 4% illuminated at phase= 337 degrees  
03/26/2017 08:22:58.5 Geocentric minimum 0.0 degrees  
Global start/end: 03/26/2017 06:13:36.3 and 03/26/2017 10:32:19.5  
Mid-occultation observing point (lat., long.) -7.9 34.7

Occultation of Aldebaran 0.85 by moon 24% illuminated at phase= 58 degrees  
04/01/2017 09:07:41.3 Geocentric minimum 0.3 degrees  
Global start/end: 04/01/2017 07:05:59.1 and 04/01/2017 11:09:25.9  
Mid-occultation observing point (lat., long.) 36.2 98.7

Occultation of Regulus 1.35 by moon 84% illuminated at phase= 133 degrees  
04/07/2017 04:34:13.0 Geocentric minimum 0.7 degrees  
Global start/end: 04/07/2017 02:45:51.3 and 04/07/2017 06:22:37.1  
Mid-occultation observing point (lat., long.) -33.8 -125.5  
At HVO the miss angle is 3414.2 arc-sec at 04/07/2017 04:04:02.9

Occultation of Neptune 7.9 by moon 17% illuminated at phase= 311 degrees  
04/22/2017 19:55:23.8 Geocentric minimum 0.2 degrees  
Global start/end: 04/22/2017 17:46:25.8 and 04/22/2017 22:04:17.5  
Mid-occultation observing point (lat., long.) -18.1 -161.2

Occultation of Aldebaran 0.85 by moon 7% illuminated at phase= 31 degrees  
04/28/2017 17:34:31.1 Geocentric minimum 0.5 degrees  
Global start/end: 04/28/2017 15:39:41.7 and 04/28/2017 19:29:22.9  
Mid-occultation observing point (lat., long.) 45.0 -57.4

Occultation of Regulus 1.35 by moon 64% illuminated at phase= 106 degrees  
05/04/2017 09:58:54.7 Geocentric minimum 0.5 degrees  
Global start/end: 05/04/2017 07:57:59.7 and 05/04/2017 11:59:53.5  
Mid-occultation observing point (lat., long.) -19.0 131.5

Occultation of Neptune 7.9 by moon 38% illuminated at phase= 285 degrees  
05/20/2017 05:46:27.1 Geocentric minimum 0.5 degrees  
Global start/end: 05/20/2017 03:43:25.5 and 05/20/2017 07:49:22.6  
Mid-occultation observing point (lat., long.) -33.8 31.0

Occultation of Regulus 1.35 by moon 41% illuminated at phase= 80 degrees  
05/31/2017 16:25:20.8 Geocentric minimum 0.2 degrees  
Global start/end: 05/31/2017 14:16:29.7 and 05/31/2017 18:34:16.0  
Mid-occultation observing point (lat., long.) -2.4 12.7

Occultation of Neptune 7.9 by moon 60% illuminated at phase= 259 degrees  
06/16/2017 13:03:56.2 Geocentric minimum 0.7 degrees  
Global start/end: 06/16/2017 11:14:48.7 and 06/16/2017 14:52:59.3  
Mid-occultation observing point (lat., long.) -51.4 -93.9  
At HVO the miss angle is 3717.2 arc-sec at 06/16/2017 14:28:12.4

Occultation of Aldebaran 0.85 by moon 3% illuminated at phase= 339 degrees  
06/22/2017 14:36:52.0 Geocentric minimum 0.5 degrees  
Global start/end: 06/22/2017 12:44:15.5 and 06/22/2017 16:29:26.6  
Mid-occultation observing point (lat., long.) 47.5 -68.2

Occultation of Regulus 1.35 by moon 20% illuminated at phase= 54 degrees  
06/28/2017 00:48:25.8 Geocentric minimum 0.0 degrees  
Global start/end: 06/27/2017 22:39:03.8 and 06/28/2017 02:57:49.5  
Mid-occultation observing point (lat., long.) 10.1 -136.6  
At HVO the miss angle is 1504.7 arc-sec at 06/28/2017 01:06:28.9

Occultation of Neptune 7.8 by moon 80% illuminated at phase= 232 degrees  
07/13/2017 18:19:04.0 Geocentric minimum 0.8 degrees  
Global start/end: 07/13/2017 16:42:33.7 and 07/13/2017 19:55:31.7  
Mid-occultation observing point (lat., long.) -63.4 176.1

Occultation of Aldebaran 0.85 by moon 16% illuminated at phase= 313 degrees  
07/19/2017 23:53:46.5 Geocentric minimum 0.4 degrees  
Global start/end: 07/19/2017 21:55:52.9 and 07/20/2017 01:51:37.1  
Mid-occultation observing point (lat., long.) 41.9 127.3

Occultation of Mercury 0.2 by moon 5% illuminated at phase= 27 degrees  
07/25/2017 09:11:14.4 Geocentric minimum 0.8 degrees  
Global start/end: 07/25/2017 07:28:16.7 and 07/25/2017 10:54:17.4  
Mid-occultation observing point (lat., long.) 66.6 101.2

Occultation of Regulus 1.35 by moon 6% illuminated at phase= 27 degrees  
07/25/2017 10:38:26.4 Geocentric minimum 0.1 degrees  
Global start/end: 07/25/2017 08:30:45.1 and 07/25/2017 12:46:09.7  
Mid-occultation observing point (lat., long.) 15.7 50.4

Occultation of Neptune 7.8 by moon 95% illuminated at phase= 206 degrees  
08/09/2017 23:05:58.6 Geocentric minimum 0.8 degrees  
Global start/end: 08/09/2017 21:28:59.5 and 08/10/2017 00:42:55.4  
Mid-occultation observing point (lat., long.) -62.5 74.9

Occultation of Aldebaran 0.85 by moon 36% illuminated at phase= 286 degrees  
08/16/2017 06:57:11.2 Geocentric minimum 0.4 degrees  
Global start/end: 08/16/2017 04:55:45.2 and 08/16/2017 08:58:35.1  
Mid-occultation observing point (lat., long.) 38.8 -4.6

Eclipse of the sun by moon 0% illuminated at phase= 360 degrees  
08/21/2017 18:25:28.5 Geocentric minimum 0.4 degrees  
Global start/end: 08/21/2017 15:46:44.7 and 08/21/2017 21:04:21.2  
Mid-occultation observing point (lat., long.) 37.0 -87.7

---For observations at HVO:

08/21/2017 17:49:02.2 OCCULTATION MID-POINT 54.7 54.7 \*\*\*  
08/21/2017 16:27:14.4 Start Partial 44.7 44.7 \*\*\*  
08/21/2017 19:13:44.0 End Partial 57.5 57.5 \*\*\*

Occultation of Neptune 7.8 by moon 100% illuminated at phase= 179 degrees  
09/06/2017 04:59:58.0 Geocentric minimum 0.7 degrees  
Global start/end: 09/06/2017 03:15:35.7 and 09/06/2017 06:44:16.8  
Mid-occultation observing point (lat., long.) -55.0 -51.8  
At HVO the miss angle is 4618.2 arc-sec at 09/06/2017 05:09:56.8

Occultation of Aldebaran 0.85 by moon 59% illuminated at phase= 260 degrees  
09/12/2017 12:26:37.8 Geocentric minimum 0.4 degrees  
Global start/end: 09/12/2017 10:26:45.3 and 09/12/2017 14:26:30.2  
Mid-occultation observing point (lat., long.) 42.6 -114.9

---For observations at HVO:

09/12/2017 12:48:13.2 OCCULTATION MID-POINT 60.9 2.8  
09/12/2017 12:08:33.4 Start Total 62.4 -4.4 \*\*\*  
09/12/2017 13:27:29.1 End Total 57.2 9.7

Occultation of Venus -3.9 by moon 6% illuminated at phase= 332 degrees  
09/18/2017 00:39:23.2 Geocentric minimum 0.5 degrees  
Global start/end: 09/17/2017 22:31:44.3 and 09/18/2017 02:47:04.9  
Mid-occultation observing point (lat., long.) -19.0 134.6

Occultation of Regulus 1.35 by moon 5% illuminated at phase= 335 degrees  
09/18/2017 04:58:29.7 Geocentric minimum 0.1 degrees  
Global start/end: 09/18/2017 02:49:46.8 and 09/18/2017 07:07:12.3  
Mid-occultation observing point (lat., long.) 16.8 81.8

Occultation of Mars 1.8 by moon 2% illuminated at phase= 342 degrees  
09/18/2017 19:46:41.4 Geocentric minimum 0.1 degrees  
Global start/end: 09/18/2017 17:31:43.5 and 09/18/2017 22:01:40.4  
Mid-occultation observing point (lat., long.) 17.1 -131.6  
At HVO the miss angle is 963.0 arc-sec at 09/18/2017 20:01:59.7

Occultation of Mercury -1.0 by moon 2% illuminated at phase= 344 degrees  
09/18/2017 23:20:08.5 Geocentric minimum 0.0 degrees  
Global start/end: 09/18/2017 20:53:38.2 and 09/19/2017 01:46:44.5  
Mid-occultation observing point (lat., long.) 7.4 174.0

Occultation of Neptune 7.8 by moon 94% illuminated at phase= 152 degrees  
10/03/2017 12:38:41.0 Geocentric minimum 0.7 degrees  
Global start/end: 10/03/2017 10:51:57.4 and 10/03/2017 14:25:19.2  
Mid-occultation observing point (lat., long.) -53.0 163.8

Occultation of Aldebaran 0.85 by moon 80% illuminated at phase= 233 degrees  
10/09/2017 18:19:59.3 Geocentric minimum 0.6 degrees  
Global start/end: 10/09/2017 16:28:16.6 and 10/09/2017 20:11:43.4  
Mid-occultation observing point (lat., long.) 52.7 126.2

Occultation of Regulus 1.35 by moon 19% illuminated at phase= 308 degrees  
10/15/2017 11:24:21.4 Geocentric minimum 0.2 degrees  
Global start/end: 10/15/2017 09:15:27.7 and 10/15/2017 13:33:15.3  
Mid-occultation observing point (lat., long.) 23.4 -39.5

---For observations at HVO:  
10/15/2017 09:57:05.8 OCCULTATION MID-POINT 13.9 -34.5 \*\*\*  
10/15/2017 09:42:44.8 Start Total 11.3 -36.8 \*\*\*  
10/15/2017 10:11:48.2 End Total 16.5 -32.0 \*\*\*

Occultation of Neptune 7.9 by moon 78% illuminated at phase= 124 degrees  
10/30/2017 21:24:32.9 Geocentric minimum 0.8 degrees  
Global start/end: 10/30/2017 19:48:41.1 and 10/30/2017 23:00:19.3  
Mid-occultation observing point (lat., long.) -64.4 21.4

Occultation of Aldebaran 0.85 by moon 95% illuminated at phase= 206 degrees  
11/06/2017 02:30:17.1 Geocentric minimum 0.8 degrees  
Global start/end: 11/06/2017 00:49:30.7 and 11/06/2017 04:11:04.3  
Mid-occultation observing point (lat., long.) 63.6 -30.4

---For observations at HVO:  
11/06/2017 01:35:16.9 OCCULTATION MID-POINT 2.6 -21.5 \*\*\*  
11/06/2017 01:12:02.3 Start Total -1.0 -17.4  
11/06/2017 01:59:10.3 End Total 6.5 -25.8 \*\*\*

Occultation of Regulus 1.35 by moon 41% illuminated at phase= 281 degrees  
11/11/2017 16:45:02.0 Geocentric minimum 0.4 degrees  
Global start/end: 11/11/2017 14:42:27.5 and 11/11/2017 18:47:39.8  
Mid-occultation observing point (lat., long.) 37.5 -141.2  
At HVO the miss angle is 62.0 arc-sec at 11/11/2017 17:24:27.7

Occultation of Neptune 7.9 by moon 56% illuminated at phase= 96 degrees  
11/27/2017 05:58:22.6 Geocentric minimum 1.1 degrees  
Global start/end: 11/27/2017 05:05:33.7 and 11/27/2017 06:51:09.8  
Mid-occultation observing point (lat., long.) -70.1 -55.8

Occultation of Aldebaran 0.85 by moon 100% illuminated at phase= 178 degrees  
12/03/2017 13:10:31.0 Geocentric minimum 0.8 degrees  
Global start/end: 12/03/2017 11:34:06.2 and 12/03/2017 14:46:54.4  
Mid-occultation observing point (lat., long.) 67.4 138.1

Occultation of Regulus 1.35 by moon 65% illuminated at phase= 253 degrees  
12/08/2017 23:10:05.7 Geocentric minimum 0.7 degrees  
Global start/end: 12/08/2017 21:23:11.7 and 12/09/2017 00:57:05.3  
Mid-occultation observing point (lat., long.) 55.2 106.5

Occultation of Aldebaran 0.85 by moon 94% illuminated at phase= 151 degrees  
12/31/2017 00:36:14.9 Geocentric minimum 0.7 degrees  
Global start/end: 12/30/2017 22:54:55.9 and 12/31/2017 02:17:30.2  
Mid-occultation observing point (lat., long.) 62.6 -55.9

---For observations at HVO:  
12/30/2017 23:58:50.8 OCCULTATION MID-POINT 23.4 -6.4 \*\*\*  
12/30/2017 23:12:22.9 Start Total 15.1 1.3  
12/31/2017 00:07:51.5 End Total 25.0 -7.9 \*\*\*

Occultation of Regulus 1.35 by moon 85% illuminated at phase= 225 degrees  
01/05/2018 08:12:09.9 Geocentric minimum 0.9 degrees  
Global start/end: 01/05/2018 06:40:45.9 and 01/05/2018 09:43:39.0  
Mid-occultation observing point (lat., long.) 68.5 -35.8  
At HVO the miss angle is 693.0 arc-sec at 01/05/2018 07:10:58.0

Occultation of Aldebaran 0.85 by moon 77% illuminated at phase= 123 degrees  
01/27/2018 10:22:04.6 Geocentric minimum 0.7 degrees  
Global start/end: 01/27/2018 08:34:37.7 and 01/27/2018 12:09:26.8  
Mid-occultation observing point (lat., long.) 57.8 134.0

Occultation of Regulus 1.35 by moon 98% illuminated at phase= 197 degrees  
02/01/2018 19:12:51.8 Geocentric minimum 0.9 degrees  
Global start/end: 02/01/2018 17:45:58.2 and 02/01/2018 20:39:48.7  
Mid-occultation observing point (lat., long.) 71.5 142.2

Eclipse of the sun by moon 0% illuminated at phase= 360 degrees  
02/15/2018 20:51:23.1 Geocentric minimum 1.1 degrees  
Global start/end: 02/15/2018 18:55:22.0 and 02/15/2018 22:47:19.1  
Mid-occultation observing point (lat., long.) -70.4 3.3  
At HVO the miss angle is 4146.0 arc-sec at 02/15/2018 22:52:13.1

Occultation of Aldebaran 0.85 by moon 54% illuminated at phase= 95 degrees  
02/23/2018 17:20:11.0 Geocentric minimum 0.7 degrees  
Global start/end: 02/23/2018 15:33:44.0 and 02/23/2018 19:06:34.8  
Mid-occultation observing point (lat., long.) 61.1 0.3

Occultation of Regulus 1.35 by moon 99% illuminated at phase= 169 degrees  
03/01/2018 05:57:39.9 Geocentric minimum 0.9 degrees  
Global start/end: 03/01/2018 04:30:06.1 and 03/01/2018 07:25:15.0  
Mid-occultation observing point (lat., long.) 71.1 -47.2  
At HVO the miss angle is 631.2 arc-sec at 03/01/2018 05:31:16.6

Occultation of Aldebaran 0.85 by moon 31% illuminated at phase= 68 degrees  
03/22/2018 22:42:50.0 Geocentric minimum 0.9 degrees  
Global start/end: 03/22/2018 21:09:19.6 and 03/23/2018 00:16:19.5  
Mid-occultation observing point (lat., long.) 74.7 -128.3  
At HVO the miss angle is 402.0 arc-sec at 03/22/2018 22:28:21.0

Occultation of Regulus 1.35 by moon 90% illuminated at phase= 142 degrees  
03/28/2018 14:30:02.7 Geocentric minimum 1.0 degrees  
Global start/end: 03/28/2018 13:10:06.3 and 03/28/2018 15:49:59.6  
Mid-occultation observing point (lat., long.) 73.7 -143.0

Occultation of Aldebaran 0.85 by moon 12% illuminated at phase= 41 degrees  
04/19/2018 04:50:48.9 Geocentric minimum 1.0 degrees  
Global start/end: 04/19/2018 03:40:13.2 and 04/19/2018 06:01:24.3  
Mid-occultation observing point (lat., long.) 69.5 0.6

Occultation of Regulus 1.35 by moon 72% illuminated at phase= 115 degrees  
04/24/2018 20:38:28.8 Geocentric minimum 1.2 degrees  
Global start/end: 04/24/2018 19:52:53.0 and 04/24/2018 21:24:05.0  
Mid-occultation observing point (lat., long.) 69.7 118.7

Occultation of Aldebaran 0.85 by moon 2% illuminated at phase= 14 degrees  
05/16/2018 13:06:46.2 Geocentric minimum 1.2 degrees  
Global start/end: 05/16/2018 12:15:07.6 and 05/16/2018 13:58:24.4  
Mid-occultation observing point (lat., long.) 69.4 -149.9

Occultation of Aldebaran 0.85 by moon 11% illuminated at phase= 322 degrees  
07/10/2018 09:33:28.7 Geocentric minimum 1.1 degrees  
Global start/end: 07/10/2018 08:29:39.0 and 07/10/2018 10:37:16.0  
Mid-occultation observing point (lat., long.) 69.3 -149.9

Eclipse of the sun by moon 0% illuminated at phase= 0 degrees  
07/13/2018 03:01:05.6 Geocentric minimum 1.4 degrees  
Global start/end: 07/13/2018 01:47:55.9 and 07/13/2018 04:14:15.0  
Mid-occultation observing point (lat., long.) -69.3 126.9

Occultation of Aldebaran 0.85 by moon 29% illuminated at phase= 296 degrees  
08/06/2018 18:39:33.5 Geocentric minimum 1.1 degrees  
Global start/end: 08/06/2018 17:34:22.2 and 08/06/2018 19:44:42.3  
Mid-occultation observing point (lat., long.) 69.3 46.6  
At HVO the miss angle is 1174.9 arc-sec at 08/06/2018 20:08:07.2

Eclipse of the sun by moon 0% illuminated at phase= 360 degrees  
08/11/2018 09:46:17.1 Geocentric minimum 1.2 degrees  
Global start/end: 08/11/2018 08:01:43.8 and 08/11/2018 11:30:52.3  
Mid-occultation observing point (lat., long.) 69.5 176.8

Occultation of Aldebaran 0.85 by moon 51% illuminated at phase= 269 degrees  
09/03/2018 01:37:11.5 Geocentric minimum 1.2 degrees  
Global start/end: 09/03/2018 00:57:49.7 and 09/03/2018 02:16:32.6  
Mid-occultation observing point (lat., long.) 69.3 -84.7

Occultation of Mars -0.3 by moon 56% illuminated at phase= 96 degrees  
11/16/2018 04:51:59.7 Geocentric minimum 1.0 degrees  
Global start/end: 11/16/2018 03:28:52.6 and 11/16/2018 06:15:05.2  
Mid-occultation observing point (lat., long.) -68.9 -24.8

Occultation of Saturn 0.5 by moon 4% illuminated at phase= 22 degrees  
12/09/2018 05:20:09.9 Geocentric minimum 1.1 degrees  
Global start/end: 12/09/2018 04:46:02.2 and 12/09/2018 05:54:18.0  
Mid-occultation observing point (lat., long.) 68.6 124.7

Eclipse of the sun by moon 0% illuminated at phase= 0 degrees  
01/06/2019 01:41:26.0 Geocentric minimum 1.0 degrees  
Global start/end: 01/05/2019 23:33:52.6 and 01/06/2019 03:49:03.8  
Mid-occultation observing point (lat., long.) 68.7 153.4

Occultation of Venus -4.3 by moon 15% illuminated at phase= 315 degrees  
01/31/2019 17:35:50.2 Geocentric minimum 0.1 degrees  
Global start/end: 01/31/2019 15:04:37.4 and 01/31/2019 20:07:03.5  
Mid-occultation observing point (lat., long.) -15.3 -127.9  
At HVO the miss angle is 1718.9 arc-sec at 01/31/2019 18:22:28.5

Occultation of Saturn 0.6 by moon 6% illuminated at phase= 332 degrees  
02/02/2019 07:03:44.2 Geocentric minimum 0.6 degrees  
Global start/end: 02/02/2019 05:05:43.3 and 02/02/2019 09:01:46.1  
Mid-occultation observing point (lat., long.) 21.3 47.3

Occultation of Saturn 0.6 by moon 20% illuminated at phase= 307 degrees  
03/01/2019 18:26:20.1 Geocentric minimum 0.3 degrees  
Global start/end: 03/01/2019 16:11:10.0 and 03/01/2019 20:41:30.6  
Mid-occultation observing point (lat., long.) -1.7 -147.4

Occultation of Saturn 0.6 by moon 40% illuminated at phase= 281 degrees  
03/29/2019 04:59:18.5 Geocentric minimum 0.1 degrees  
Global start/end: 03/29/2019 02:39:43.9 and 03/29/2019 07:18:53.0  
Mid-occultation observing point (lat., long.) -25.1 30.3

Occultation of Saturn 0.5 by moon 63% illuminated at phase= 255 degrees  
04/25/2019 14:29:18.0 Geocentric minimum 0.4 degrees  
Global start/end: 04/25/2019 12:18:20.9 and 04/25/2019 16:40:19.1  
Mid-occultation observing point (lat., long.) -45.6 -136.5  
At HVO the miss angle is 2941.9 arc-sec at 04/25/2019 15:58:50.8

Occultation of Saturn 0.3 by moon 83% illuminated at phase= 229 degrees  
05/22/2019 22:17:01.1 Geocentric minimum 0.5 degrees  
Global start/end: 05/22/2019 20:14:36.1 and 05/23/2019 00:19:31.1  
Mid-occultation observing point (lat., long.) -56.0 80.5

Occultation of Saturn 0.2 by moon 97% illuminated at phase= 201 degrees  
06/19/2019 03:48:42.6 Geocentric minimum 0.4 degrees  
Global start/end: 06/19/2019 01:43:09.3 and 06/19/2019 05:54:19.7  
Mid-occultation observing point (lat., long.) -50.6 -32.1

Eclipse of the sun by moon 0% illuminated at phase= 0 degrees  
07/02/2019 19:22:58.0 Geocentric minimum 0.6 degrees  
Global start/end: 07/02/2019 16:55:08.9 and 07/02/2019 21:50:39.2  
Mid-occultation observing point (lat., long.) -17.4 -109.0  
At HVO the miss angle is 1709.4 arc-sec at 07/02/2019 19:33:19.4

Occultation of Mars 1.8 by moon 3% illuminated at phase= 19 degrees  
07/04/2019 05:40:19.7 Geocentric minimum 0.1 degrees  
Global start/end: 07/04/2019 03:29:52.5 and 07/04/2019 07:50:47.1  
Mid-occultation observing point (lat., long.) 26.1 117.6

Occultation of Saturn 0.1 by moon 100% illuminated at phase= 173 degrees  
07/16/2019 07:15:36.5 Geocentric minimum 0.2 degrees  
Global start/end: 07/16/2019 05:02:29.6 and 07/16/2019 09:28:44.8  
Mid-occultation observing point (lat., long.) -36.2 -114.1  
At HVO the miss angle is 2843.6 arc-sec at 07/16/2019 07:57:21.0

Occultation of Saturn 0.2 by moon 91% illuminated at phase= 146 degrees  
08/12/2019 09:52:44.7 Geocentric minimum 0.0 degrees  
Global start/end: 08/12/2019 07:36:19.0 and 08/12/2019 12:09:09.4  
Mid-occultation observing point (lat., long.) -24.9 177.5

Occultation of Saturn 0.4 by moon 74% illuminated at phase= 118 degrees  
09/08/2019 13:41:38.4 Geocentric minimum 0.0 degrees  
Global start/end: 09/08/2019 11:24:30.3 and 09/08/2019 15:58:45.7  
Mid-occultation observing point (lat., long.) -25.1 92.5

Occultation of Saturn 0.5 by moon 52% illuminated at phase= 92 degrees  
10/05/2019 20:36:48.6 Geocentric minimum 0.3 degrees  
Global start/end: 10/05/2019 18:23:08.2 and 10/05/2019 22:50:32.5  
Mid-occultation observing point (lat., long.) -38.7 -37.7

Occultation of Saturn 0.6 by moon 30% illuminated at phase= 66 degrees  
11/02/2019 07:22:27.4 Geocentric minimum 0.6 degrees  
Global start/end: 11/02/2019 05:24:34.0 and 11/02/2019 09:20:27.3  
Mid-occultation observing point (lat., long.) -61.9 136.9

Occultation of Jupiter -1.8 by moon 4% illuminated at phase= 23 degrees  
11/28/2019 10:56:46.8 Geocentric minimum 0.7 degrees  
Global start/end: 11/28/2019 09:09:11.7 and 11/28/2019 12:44:27.5  
Mid-occultation observing point (lat., long.) 25.7 42.4

Occultation of Saturn 0.6 by moon 12% illuminated at phase= 40 degrees  
11/29/2019 21:07:04.5 Geocentric minimum 0.9 degrees  
Global start/end: 11/29/2019 19:41:29.1 and 11/29/2019 22:32:44.2  
Mid-occultation observing point (lat., long.) -76.5 74.3  
At HVO the miss angle is 5534.5 arc-sec at 11/29/2019 20:53:54.0

Eclipse of the sun by moon 0% illuminated at phase= 0 degrees  
12/26/2019 05:17:38.9 Geocentric minimum 0.4 degrees  
Global start/end: 12/26/2019 02:29:47.1 and 12/26/2019 08:05:41.1  
Mid-occultation observing point (lat., long.) 1.0 102.3

Occultation of Venus -3.9 by moon 8% illuminated at phase= 34 degrees  
12/29/2019 01:55:38.8 Geocentric minimum 1.0 degrees  
Global start/end: 12/29/2019 00:32:40.0 and 12/29/2019 03:18:41.4  
Mid-occultation observing point (lat., long.) -67.0 -21.3



Occultation of Jupiter -1.9 by moon 3% illuminated at phase= 339 degrees  
01/23/2020 02:40:52.7 Geocentric minimum 0.4 degrees  
Global start/end: 01/23/2020 00:30:49.4 and 01/23/2020 04:50:58.0  
Mid-occultation observing point (lat., long.) -45.6 120.4

Occultation of Mars 1.2 by moon 24% illuminated at phase= 302 degrees  
02/18/2020 13:24:18.1 Geocentric minimum 0.8 degrees  
Global start/end: 02/18/2020 11:34:16.6 and 02/18/2020 15:14:23.3  
Mid-occultation observing point (lat., long.) 29.4 -73.2

---For observations at HVO:

02/18/2020 12:24:28.0 OCCULTATION MID-POINT 12.7 -15.8 \*\*\*  
02/18/2020 11:45:18.9 Start Partial 8.1 -22.8 \*\*\*  
02/18/2020 11:45:31.7 Start Total 8.1 -22.8 \*\*\*  
02/18/2020 13:05:41.0 End Total 16.8 -8.5 \*\*\*  
02/18/2020 13:05:55.3 End Partial 16.8 -8.4 \*\*\*

Occultation of Jupiter -1.9 by moon 14% illuminated at phase= 317 degrees  
02/19/2020 19:39:59.8 Geocentric minimum 0.9 degrees  
Global start/end: 02/19/2020 18:14:00.7 and 02/19/2020 21:06:00.9  
Mid-occultation observing point (lat., long.) -66.6 19.1

Occultation of Mars 0.9 by moon 31% illuminated at phase= 293 degrees  
03/18/2020 08:24:27.8 Geocentric minimum 0.7 degrees  
Global start/end: 03/18/2020 06:32:14.7 and 03/18/2020 10:16:45.4  
Mid-occultation observing point (lat., long.) -75.0 2.8

Occultation of Venus -4.4 by moon 4% illuminated at phase= 337 degrees  
06/19/2020 08:31:59.6 Geocentric minimum 0.7 degrees  
Global start/end: 06/19/2020 06:46:04.8 and 06/19/2020 10:17:52.1  
Mid-occultation observing point (lat., long.) 65.9 -1.2

Eclipse of the sun by moon 0% illuminated at phase= 360 degrees  
06/21/2020 06:40:04.9 Geocentric minimum 0.1 degrees  
Global start/end: 06/21/2020 03:45:59.5 and 06/21/2020 09:34:02.5  
Mid-occultation observing point (lat., long.) 30.5 79.7

Occultation of Mars -1.3 by moon 72% illuminated at phase= 244 degrees  
08/09/2020 08:38:32.0 Geocentric minimum 0.7 degrees  
Global start/end: 08/09/2020 06:43:06.6 and 08/09/2020 10:33:58.1  
Mid-occultation observing point (lat., long.) -40.3 -42.4  
At HVO the miss angle is 4090.4 arc-sec at 08/09/2020 08:59:58.7

Occultation of Mars -1.9 by moon 86% illuminated at phase= 224 degrees  
09/06/2020 04:44:47.4 Geocentric minimum 0.0 degrees  
Global start/end: 09/06/2020 02:24:48.0 and 09/06/2020 07:04:47.6  
Mid-occultation observing point (lat., long.) 8.3 -30.0  
At HVO the miss angle is 1949.0 arc-sec at 09/06/2020 04:07:11.4

Occultation of Mars -2.5 by moon 99% illuminated at phase= 194 degrees  
10/03/2020 04:00:07.6 Geocentric minimum 0.7 degrees  
Global start/end: 10/03/2020 02:09:26.5 and 10/03/2020 05:50:49.2  
Mid-occultation observing point (lat., long.) -37.2 -26.5  
At HVO the miss angle is 4244.5 arc-sec at 10/03/2020 03:46:10.4

Occultation of Venus -3.9 by moon 5% illuminated at phase= 335 degrees  
12/12/2020 21:06:16.6 Geocentric minimum 0.8 degrees  
Global start/end: 12/12/2020 19:16:08.2 and 12/12/2020 22:56:24.3  
Mid-occultation observing point (lat., long.) 27.9 -148.6

---For observations at HVO:

12/12/2020 21:52:05.2 OCCULTATION MID-POINT 0.1 10.6  
12/12/2020 21:24:22.9 Start Partial 4.2 13.8  
12/12/2020 21:24:52.4 Start Total 4.1 13.7  
12/12/2020 22:18:11.0 End Total -4.7 7.4  
12/12/2020 22:18:38.2 End Partial -4.8 7.3

Eclipse of the sun by moon 0% illuminated at phase= 360 degrees  
12/14/2020 16:13:26.4 Geocentric minimum 0.3 degrees  
Global start/end: 12/14/2020 13:33:53.1 and 12/14/2020 18:53:06.0  
Mid-occultation observing point (lat., long.) -40.3 -68.0

\*\*\* = The Moon is above the horizon, and the Sun is not a factor.  
Program LOSP3 version 170621a + gglib version 170606a