

TRANSIT OF MERCURY, 2006

A transit of Mercury over the disk of the Sun will occur on November 8–9. The entire transit will be visible in eastern Australia, New Zealand, part of Antarctica, western North America, western Mexico, the southern coast of Chile, and most of the Pacific Ocean.

The times provided in the following tables are given provisionally in Universal Time, using $\Delta T(A) = +67.6$ seconds. Once the value of ΔT is known, the data on these pages may be expressed in Universal Time as follows:

Define $\delta T = \Delta T - \Delta T(A)$, in units of seconds of time.

Change the times given in provisional Universal Time by subtracting δT .

Apply the correction $0.00417807 \delta T$ degrees to the longitudes in such a way that if δT is positive, the longitudes shift to the east.

Leave all other quantities unchanged.

Longitude is positive to the east and negative to the west.

GEOCENTRIC PHASES

	UT	Position Angle P °	Mercury being in the Zenith in	
			Longitude ° ' "	Latitude ° ' "
	d h m s			
Ingress, exterior contact	November 8 19 12 01.7	140.9	-111 53.3	-16 54.4
Ingress, interior contact	8 19 13 54.6	141.2	-112 21.7	-16 54.3
Least angular distance	8 21 41 01.7		-149 22.0	-16 50.0
Egress, interior contact	9 00 08 13.6	269.0	+173 36.5	-16 45.6
Egress, exterior contact	9 00 10 06.5	269.3	+173 08.1	-16 45.5

Least angular distance: 7' 02".9

The position angle P of the point of contact is reckoned from the north point of the limb of the Sun towards the east.

The position angle V of the point of contact, reckoned from the vertex of the limb of the Sun towards the east, is found by:

$$V = P - C$$

where C , the parallactic angle, is given by:

$$\tan C = \frac{\cos \phi' \sin h}{\sin \phi' \cos \delta - \cos \phi' \sin \delta \cos h}$$

in which ϕ' is the geocentric latitude of the place, δ is the declination of the Sun, and h is the local hour angle of the Sun; $\sin C$ has the same algebraic sign as $\sin h$.

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Location	Position		Ingress Exterior Contact		Ingress Interior Contact		Least Angular Distance		Egress Interior Contact		Egress Exterior Contact	
	Latitude	Longitude	UT	P	UT	P	UT	Separation	UT	P	UT	P
United States	° ' "	° ' "	h m s	°	h m s	°	h m s	' "	h m s	°	h m s	°
Boston, MA	+42 20.0	- 71 05.0	19 12 16.7	141.1	19 14 09.6	141.4	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Black Moshannon Obs., Univ. Park, PA	+40 55.3	- 78 00.2	19 12 18.6	141.1	19 14 11.5	141.4	21 40 47.9	7 06.8	. . . . .	. . . . .	. . . . .	. . . . .
USNO, Washington, DC	+38 55.3	- 77 04.0	19 12 17.1	141.1	19 14 10.0	141.4	21 40 46.6	7 06.7	. . . . .	. . . . .	. . . . .	. . . . .
Morehead Obs., Chapel Hill, NC	+35 54.8	- 79 03.0	19 12 16.2	141.1	19 14 09.1	141.4	21 40 45.1	7 06.7	. . . . .	. . . . .	. . . . .	. . . . .
Fernbank Obs., Atlanta, GA	+33 46.7	- 84 19.1	19 12 17.4	141.1	19 14 10.2	141.4	21 40 44.9	7 06.6	. . . . .	. . . . .	. . . . .	. . . . .
Miami, FL	+25 45.0	- 80 15.0	19 12 10.9	141.1	19 14 03.7	141.4	21 40 39.8	7 06.3	. . . . .	. . . . .	. . . . .	. . . . .
Univ. of Fl. Radio Obs., Gainesville, FL	+29 31.7	- 83 02.1	19 12 14.4	141.1	19 14 07.3	141.4	21 40 42.3	7 06.5	. . . . .	. . . . .	. . . . .	. . . . .
Univ. of Alabama Obs., Tuscaloosa, AL	+33 12.6	- 87 32.5	19 12 18.5	141.1	19 14 11.4	141.4	21 40 45.3	7 06.6	. . . . .	. . . . .	. . . . .	. . . . .
Goethe Link Obs., Bloomington, IN	+39 33.0	- 86 23.7	19 12 21.3	141.1	19 14 14.2	141.4	21 40 48.6	7 06.8	. . . . .	. . . . .	. . . . .	. . . . .
Yerkes Obs., Williams Bay, WI	+42 34.2	- 88 33.4	19 12 23.7	141.1	19 14 16.6	141.4	21 40 50.8	7 06.9	. . . . .	. . . . .	. . . . .	. . . . .
Clyde W. Tombaugh Obs., Lawrence, KS	+38 57.6	- 95 15.0	19 12 24.8	141.1	19 14 17.7	141.4	21 40 50.4	7 06.8	. . . . .	. . . . .	. . . . .	. . . . .
Tiara Obs., Colorado Springs, CO	+38 58.2	-105 31.0	19 12 29.1	141.1	19 14 22.0	141.4	21 40 53.5	7 06.7	. . . . .	. . . . .	. . . . .	. . . . .
Salt Lake City, UT	+40 45.0	-111 55.0	19 12 32.3	141.1	19 14 25.2	141.4	21 40 56.6	7 06.7	0 07 38.6	268.8	0 09 31.7	269.1
McDonald Obs., Fort Davis, TX	+30 40.3	-104 01.3	19 12 24.9	141.1	19 14 17.7	141.3	21 40 48.9	7 06.5	. . . . .	. . . . .	. . . . .	. . . . .
Nat. Solar Obs., Sunspot, NM	+32 47.2	-105 49.1	19 12 26.7	141.1	19 14 19.5	141.4	21 40 50.6	7 06.5	. . . . .	. . . . .	. . . . .	. . . . .
Kitt Peak Nat. Obs., Tucson, AZ	+31 57.8	-111 36.0	19 12 28.9	141.1	19 14 21.7	141.3	21 40 52.4	7 06.5	0 07 34.6	268.8	0 09 27.6	269.1
USNO, Flagstaff, AZ	+35 11.0	-111 44.4	19 12 30.2	141.1	19 14 23.1	141.3	21 40 53.9	7 06.6	0 07 36.0	268.8	0 09 29.0	269.1
Lick Obs., Mt. Hamilton, CA	+37 20.6	-121 38.2	19 12 35.0	141.0	19 14 27.9	141.3	21 40 58.9	7 06.5	0 07 39.2	268.8	0 09 32.2	269.1
Mt. Wilson Obs., Pasadena, CA	+34 13.6	-118 03.4	19 12 32.5	141.0	19 14 25.4	141.3	21 40 56.1	7 06.5	0 07 36.9	268.8	0 09 29.9	269.1
Palomar Obs., Palomar Mtn., CA	+33 21.4	-116 51.8	19 12 31.7	141.0	19 14 24.5	141.3	21 40 55.2	7 06.4	0 07 36.2	268.8	0 09 29.3	269.1
Portland, OR	+45 32.0	-122 40.0	19 12 37.6	141.1	19 14 30.5	141.4	21 41 02.7	7 06.7	0 07 43.4	268.8	0 09 36.4	269.1
Manastash Ridge Obs., Seattle, WA	+46 57.1	-120 43.4	19 12 37.3	141.1	19 14 30.2	141.4	21 41 02.5	7 06.8	0 07 43.6	268.8	0 09 36.7	269.1
Fairbanks, AK	+64 50.0	-147 50.0	19 12 44.2	141.1	19 14 37.2	141.4	21 41 16.6	7 06.6	0 08 00.3	268.8	0 09 53.3	269.1
Nome, AK	+64 30.0	-165 30.0	. . . . .	. . . . .	. . . . .	. . . . .	21 41 21.1	7 06.4	0 08 05.5	268.8	0 09 58.5	269.1
Mauna Kea Obs., Honolulu, HI	+19 49.4	-155 28.2	19 12 39.8	140.9	19 14 32.7	141.2	21 41 10.5	7 05.0	0 07 50.4	268.8	0 09 43.2	269.1
Canada												
Algonquin Radio Obs., Ontario	+45 57.3	- 78 04.4	19 12 21.3	141.1	19 14 14.2	141.4	21 40 51.0	7 06.9	. . . . .	. . . . .	. . . . .	. . . . .
Dominion Astro. Obs., Victoria, BC	+48 31.2	-123 25.0	19 12 38.5	141.1	19 14 31.4	141.4	21 41 04.2	7 06.8	0 07 45.1	268.8	0 09 38.2	269.1
Halifax, Nova Scotia	+44 38.0	- 63 35.0	19 12 15.3	141.1	19 14 08.3	141.4	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Devon Astro. Obs., Edmonton, Alberta	+53 23.4	-113 45.5	19 12 36.4	141.1	19 14 29.4	141.4	21 41 03.1	7 06.9	. . . . .	. . . . .	. . . . .	. . . . .
Ottawa River Solar Obs., Ontario	+45 23.2	- 75 53.6	19 12 20.2	141.1	19 14 13.1	141.4	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Vancouver, British Columbia	+49 13.0	-123 06.0	19 12 38.5	141.1	19 14 31.4	141.4	21 41 04.3	7 06.8	0 07 45.4	268.8	0 09 38.5	269.1
Winnipeg, Manitoba	+49 53.0	- 97 10.0	19 12 30.0	141.1	19 14 22.9	141.4	21 40 56.9	7 07.0	. . . . .	. . . . .	. . . . .	. . . . .
Yellowknife, Northwest Territories	+62 30.0	-114 29.0	19 12 38.0	141.1	19 14 31.0	141.4	21 41 07.5	7 07.0	. . . . .	. . . . .	. . . . .	. . . . .
Hamilton, Bermuda	+32 18.0	- 64 48.0	19 12 08.0	141.1	19 14 00.9	141.4	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Arecibo Obs., Puerto Rico	+18 20.6	- 66 45.2	19 11 59.8	141.1	19 13 52.6	141.4	21 40 34.4	7 05.8
Kingston, Jamaica	+17 58.0	- 76 48.0	19 12 04.4	141.1	19 13 57.2	141.3	21 40 35.4	7 05.9

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Location	Position		Ingress Exterior Contact		Ingress Interior Contact		Least Angular Distance		Egress Interior Contact		Egress Exterior Contact	
	Latitude	Longitude	UT	P	UT	P	UT	Separation	UT	P	UT	P
New Zealand												
Auckland Obs.	° ' ° ' °	° ' ° ' °	h m s °	°	h m s °	°	h m s ' "	' "	h m s °	°	h m s °	°
Carter Obs., Black Birch Sta., Blenheim	-36 54.4 +174 46.7		19 12 06.1	140.7	19 13 58.8	140.9	21 41 07.4	7 00.7	0 08 13.0	269.1	0 10 05.5	269.4
Wellington	-41 44.9 +173 48.2		19 12 02.1	140.6	19 13 54.8	140.9	21 41 05.6	7 00.4	0 08 13.7	269.1	0 10 06.2	269.4
Christchurch	-41 17.0 +174 47.0		19 12 02.5	140.6	19 13 55.2	140.9	21 41 05.5	7 00.5	0 08 13.1	269.1	0 10 05.6	269.4
Mt. John Univ. Obs., South Canterbury	-43 33.0 +172 40.0		19 12 00.6	140.6	19 13 53.3	140.9	21 41 05.2	7 00.3	0 08 14.4	269.1	0 10 06.9	269.4
	-43 59.2 +170 27.9		19 12 00.2	140.6	19 13 52.9	140.9	21 41 05.7	7 00.2	0 08 15.7	269.2	0 10 08.2	269.4
Australia												
Anglo-Aust. Obs., Coonabarabran	-31 16.4 +149 03.7		19 12 07.4	140.6	19 14 00.2	140.9	21 41 18.8	7 00.2	0 08 30.4	269.1	0 10 22.9	269.4
Aust. Nat. Radio Ast. Obs., Parkes	-33 00.0 +148 15.7		19 12 05.9	140.6	19 13 58.7	140.9	21 41 18.1	7 00.1	0 08 30.6	269.2	0 10 23.1	269.4
Brisbane	-27 30.0 +153 00.0		19 12 11.1	140.7	19 14 03.9	140.9	21 41 19.6	7 00.5	0 08 28.3	269.1	0 10 20.8	269.4
Darwin	-12 23.0 +130 44.0		. . . . .	. . . . .	. . . . .	. . . . .	21 41 31.4	7 00.7	0 08 44.7	269.1	0 10 37.2	269.4
Melbourne	-37 45.0 +144 58.0		19 12 01.5	140.6	19 13 54.3	140.9	21 41 16.2	6 59.8	0 08 31.6	269.2	0 10 24.1	269.5
Mt. Stromlo Obs., Weston Creek	-35 19.2 +149 00.5		19 12 04.3	140.6	19 13 57.1	140.9	21 41 16.6	7 00.0	0 08 29.7	269.2	0 10 22.2	269.4
Perth	-31 58.0 +115 49.0		. . . . .	. . . . .	. . . . .	. . . . .	21 41 22.1	6 59.5	0 08 47.5	269.2	0 10 40.0	269.5
Sydney	-33 55.0 +151 10.0		19 12 05.8	140.6	19 13 58.6	140.9	21 41 16.8	7 00.1	0 08 28.6	269.2	0 10 21.1	269.4
Alice Springs	-23 42.0 +133 52.0		. . . . .	. . . . .	. . . . .	. . . . .	21 41 25.7	7 00.1	0 08 41.1	269.1	0 10 33.6	269.4
Papeete, Tahiti	-17 32.0 -149 34.0		19 12 16.5	140.8	19 14 09.2	141.1	21 40 56.3	7 02.9	0 07 46.8	269.0	0 09 39.5	269.3
Pago Pago, Samoa	-14 16.0 -170 43.0		19 12 23.0	140.7	19 14 15.8	141.0	21 41 09.3	7 02.4	0 08 01.2	269.0	0 09 53.8	269.3
Port Moresby, Papua New Guinea	- 9 30.0 +147 07.0		. . . . .	. . . . .	. . . . .	. . . . .	21 41 29.3	7 01.3	0 08 34.1	269.1	0 10 26.6	269.3
Suva (Viti Levu), Fiji	-18 08.0 +178 25.0		19 12 20.9	140.7	19 14 13.6	141.0	21 41 13.6	7 01.8	0 08 09.8	269.0	0 10 02.4	269.3
Majuro, Marshall Islands	+ 7 05.0 +171 08.0		19 12 37.0	140.8	19 14 29.8	141.1	21 41 25.3	7 03.1	0 08 15.2	268.9	0 10 07.9	269.2
Japan												
Nobeyama Solar Radio Obs., Nagano-ken	+35 56.3 +138 28.8		. . . . .	. . . . .	. . . . .	. . . . .	21 41 38.4	7 03.9	0 08 34.9	268.9	0 10 27.6	269.2
Norikura Solar Obs., Nagano	+36 06.8 +137 33.3		. . . . .	. . . . .	. . . . .	. . . . .	21 41 38.5	7 03.9	0 08 35.3	268.9	0 10 28.1	269.2
Nat. Ast. Obs., Tokyo	+35 40.3 +139 32.5		. . . . .	. . . . .	. . . . .	. . . . .	21 41 38.2	7 03.9	0 08 34.3	268.9	0 10 27.1	269.2
Kyoto Univ. Astro. Obs.	+35 01.7 +135 47.2		. . . . .	. . . . .	. . . . .	. . . . .	21 41 38.9	7 03.8	0 08 36.6	268.9	0 10 29.3	269.2
Osaka	+34 40.0 +135 30.0		. . . . .	. . . . .	. . . . .	. . . . .	21 41 38.9	7 03.8	0 08 36.8	268.9	0 10 29.6	269.2
Sapporo	+43 05.0 +141 21.0		. . . . .	. . . . .	. . . . .	. . . . .	21 41 37.0	7 04.4	0 08 31.2	268.9	0 10 24.0	269.2

Location	Position		Ingress				Least				Egress			
	Latitude Longitude		Exterior Contact		Interior Contact		Angular Distance		Interior Contact		Exterior Contact			
	° ' "	° ' "	UT	P	UT	P	UT	Separation	UT	P	UT	P		
Manila Obs., Philippines	+ 14 38.2	+ 121 04.6	.	.	.	.	.	.	0 08 49.3	269.0	0 10 42.0	269.3
Indonesia														
Bosscha Obs., Bandung	- 6 49.5	+ 107 37.0	.	.	.	.	.	.	0 08 56.1	269.1	0 10 48.8	269.4
Jakarta (Java)	- 6 08.0	+ 106 45.0	.	.	.	.	.	.	0 08 56.4	269.1	0 10 49.1	269.4
Bangkok, Thailand	+ 13 44.0	+ 100 30.0	.	.	.	.	.	.	0 08 57.0	269.1	0 10 49.7	269.4
Korea Ast. Obs., Korea, Rep. of	+ 36 23.9	+ 127 22.3	.	.	.	.	.	.	0 08 40.3	268.9	0 10 33.1	269.2
China, People's Republic of														
Purple Mountain Obs., Nanjing	+ 32 04.0	+ 118 49.3	.	.	.	.	.	.	0 08 45.6	269.0	0 10 38.4	269.2
Yunnan Obs., Kunming	+ 25 01.5	+ 102 47.3	.	.	.	.	.	.	0 08 53.4	269.0	0 10 46.2	269.3
Beijing	+ 39 55.0	+ 116 26.0	.	.	.	.	.	.	0 08 43.3	268.9	0 10 36.1	269.2
Wuhan	+ 30 35.0	+ 114 19.0	.	.	.	.	.	.	0 08 47.9	269.0	0 10 40.7	269.3
Harbin	+ 45 50.0	+ 126 40.0	.	.	.	.	.	.	0 08 36.9	268.9	0 10 29.7	269.2
Victoria, Hong Kong	+ 22 16.0	+ 114 13.0	.	.	.	.	.	.	0 08 50.6	269.0	0 10 43.3	269.3
Taipei Obs., Taiwan	+ 25 04.7	+ 121 31.6	.	.	.	.	.	.	0 08 46.7	269.0	0 10 39.4	269.3
Ulaanbaatar, Mongolia	+ 47 54.0	+ 106 52.0	.	.	.	.	.	.	0 08 41.9	268.9	0 10 34.9	269.2
Hanoi, Vietnam	+ 21 01.0	+ 105 52.0	.	.	.	.	.	.	0 08 53.8	269.0	0 10 46.6	269.3
Yangon, Myanmar	+ 16 47.0	+ 96 10.0	.	.	.	.	.	.	0 08 57.2	269.1	0 10 50.0	269.3
Kuala Lumpur, Malaysia	+ 3 08.0	+ 101 42.0	.	.	.	.	.	.	0 08 58.0	269.1	0 10 50.7	269.4
Russia														
Magadan	+ 59 38.0	+ 150 50.0	.	.	.	.	.	.	0 08 22.0	268.8	0 10 14.9	269.1
Vladivostok	+ 43 09.0	+ 131 53.0	.	.	.	.	.	.	0 08 35.8	268.9	0 10 28.6	269.2

Dot leaders indicate the phenomenon occurs below the horizon. Blanks indicate the phenomenon does not occur for the location.