

Annular Solar Eclipse of 2020 Jun 21

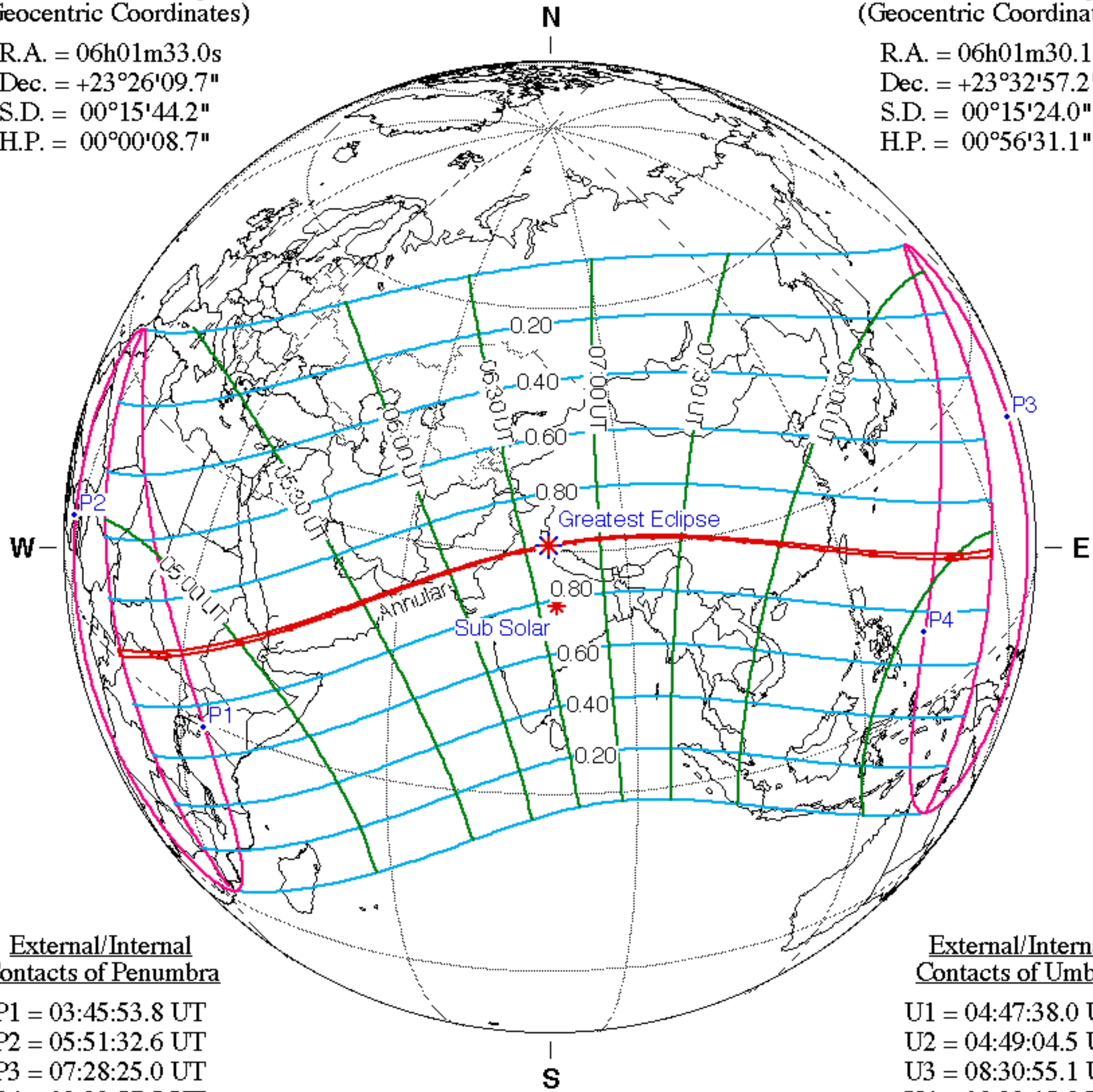
Geocentric Conjunction = 06:41:18.4 UT J.D. = 2459021.778685
 Greatest Eclipse = 06:39:59.3 UT J.D. = 2459021.777769
 Eclipse Magnitude = 0.9940 Gamma = 0.1210
 Saros Series = 137 Member = 36 of 70

Sun at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 06h01m33.0s
 Dec. = +23°26'09.7"
 S.D. = 00°15'44.2"
 H.P. = 00°00'08.7"

Moon at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 06h01m30.1s
 Dec. = +23°32'57.2"
 S.D. = 00°15'24.0"
 H.P. = 00°56'31.1"



External/Internal
Contacts of Penumbra

P1 = 03:45:53.8 UT
 P2 = 05:51:32.6 UT
 P3 = 07:28:25.0 UT
 P4 = 09:33:57.5 UT

External/Internal
Contacts of Umbra

U1 = 04:47:38.0 UT
 U2 = 04:49:04.5 UT
 U3 = 08:30:55.1 UT
 U4 = 08:32:15.8 UT

Local Circumstances at Greatest Eclipse

Lat. = 30°31.6'N Sun Alt. = 82.9°
 Long. = 079°41.3'E Sun Azm. = 174.3°
 Path Width = 21.2 km Duration = 00m38.2s

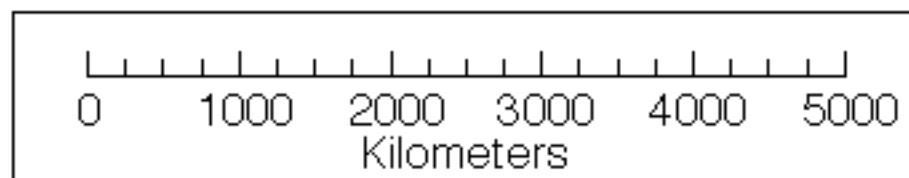
Ephemeris & Constants

Eph. = Newcomb/ILE
 $\Delta T = 77.2$ s
 $k_1 = 0.2724880$
 $k_2 = 0.2722810$
 $\Delta b = 0.0''$ $\Delta l = 0.0''$

Geocentric Libration
(Optical + Physical)

$l = -4.97^\circ$
 $b = -0.11^\circ$
 $c = 1.69^\circ$

Brown Lun. No. = 1206



Total Solar Eclipse of 2020 Dec 14

Geocentric Conjunction = 16:18:05.4 UT J.D. = 2459198.179230

Greatest Eclipse = 16:13:22.9 UT J.D. = 2459198.175959

Eclipse Magnitude = 1.0254 Gamma = -0.2940

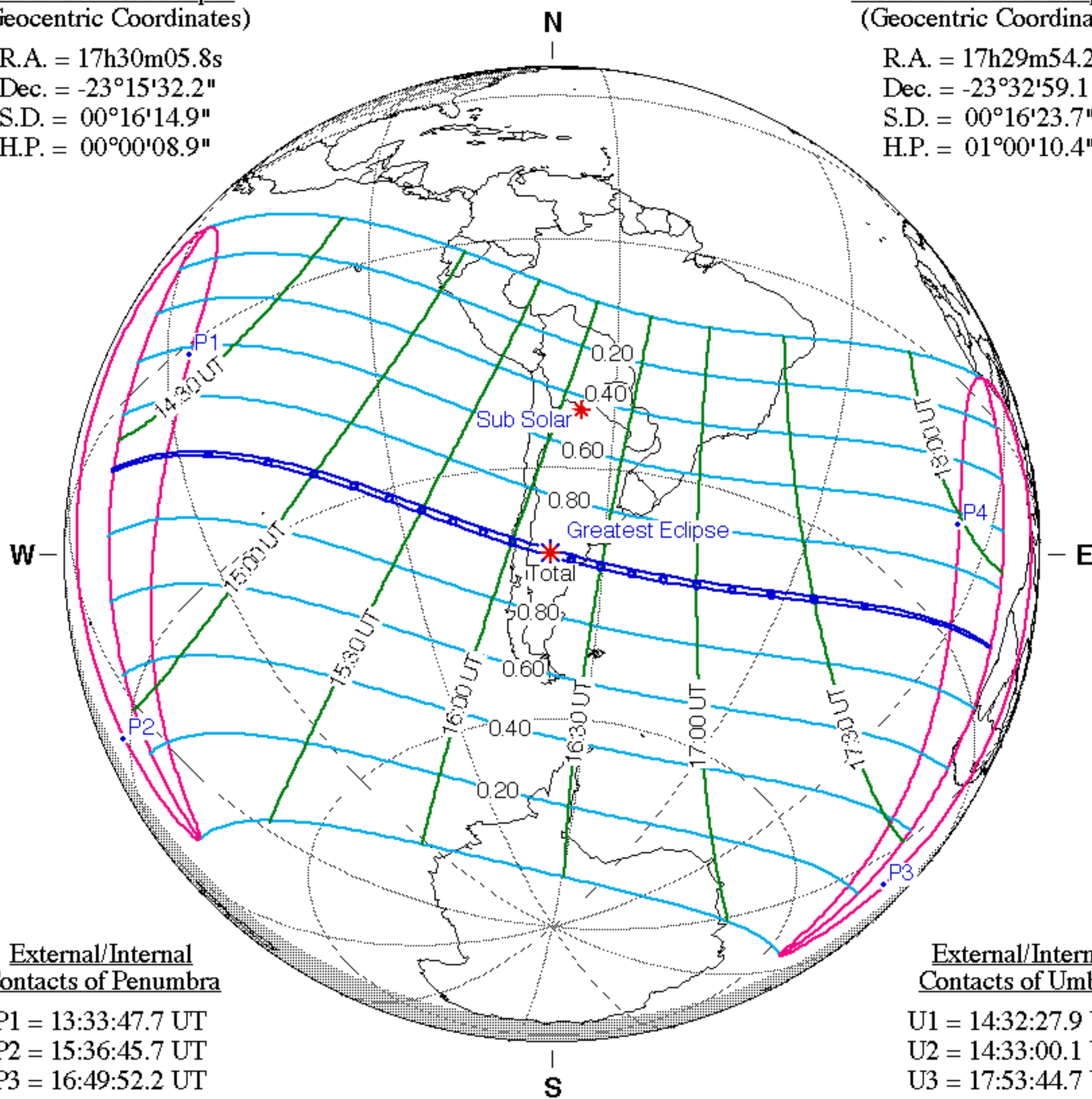
Saros Series = 142 Member = 23 of 72

Sun at Greatest Eclipse (Geocentric Coordinates)

R.A. = 17h30m05.8s
Dec. = -23°15'32.2"
S.D. = 00°16'14.9"
H.P. = 00°00'08.9"

Moon at Greatest Eclipse (Geocentric Coordinates)

R.A. = 17h29m54.2s
Dec. = -23°32'59.1"
S.D. = 00°16'23.7"
H.P. = 01°00'10.4"



External/Internal Contacts of Penumbra

P1 = 13:33:47.7 UT
P2 = 15:36:45.7 UT
P3 = 16:49:52.2 UT
P4 = 18:52:59.8 UT

External/Internal Contacts of Umbra

U1 = 14:32:27.9 UT
U2 = 14:33:00.1 UT
U3 = 17:53:44.7 UT
U4 = 17:54:12.9 UT

Local Circumstances at Greatest Eclipse

Lat. = 40°20.5'S Sun Alt. = 72.7°
Long. = 067°56.1'W Sun Azm. = 10.3°
Path Width = 90.2 km Duration = 02m09.6s

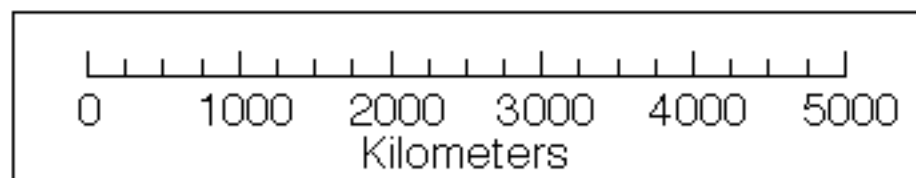
Ephemeris & Constants

Eph. = Newcomb/ILE
 $\Delta T = 77.7$ s
k1 = 0.2724880
k2 = 0.2722810
 $\Delta b = 0.0''$ $\Delta l = 0.0''$

Geocentric Libration (Optical + Physical)

l = 3.49°
b = 0.41°
c = 1.47°

Brown Lun. No. = 1212



F. Espenak, NASA's GSFC - Fri, Jul 2,

sunearth.gsfc.nasa.gov/eclipse/eclipse.html

Penumbral Lunar Eclipse of 2020 Jan 10

Ecliptic Conjunction = 19:22:27.6 TD (= 19:21:16.1 UT)

Greatest Eclipse = 19:11:10.8 TD (= 19:09:59.2 UT)

Penumbral Magnitude = 0.8956

P. Radius = 1.2669°

Gamma = 1.0726

Umbral Magnitude = -0.1160

U. Radius = 0.7248°

Axis = 1.0549°

Saros Series = 144 Member = 16 of 71

Sun at Greatest Eclipse (Geocentric Coordinates)

R.A. = 19h26m32.0s

Dec. = -21°56'49.6"

S.D. = 00°16'15.9"

H.P. = 00°00'08.9"

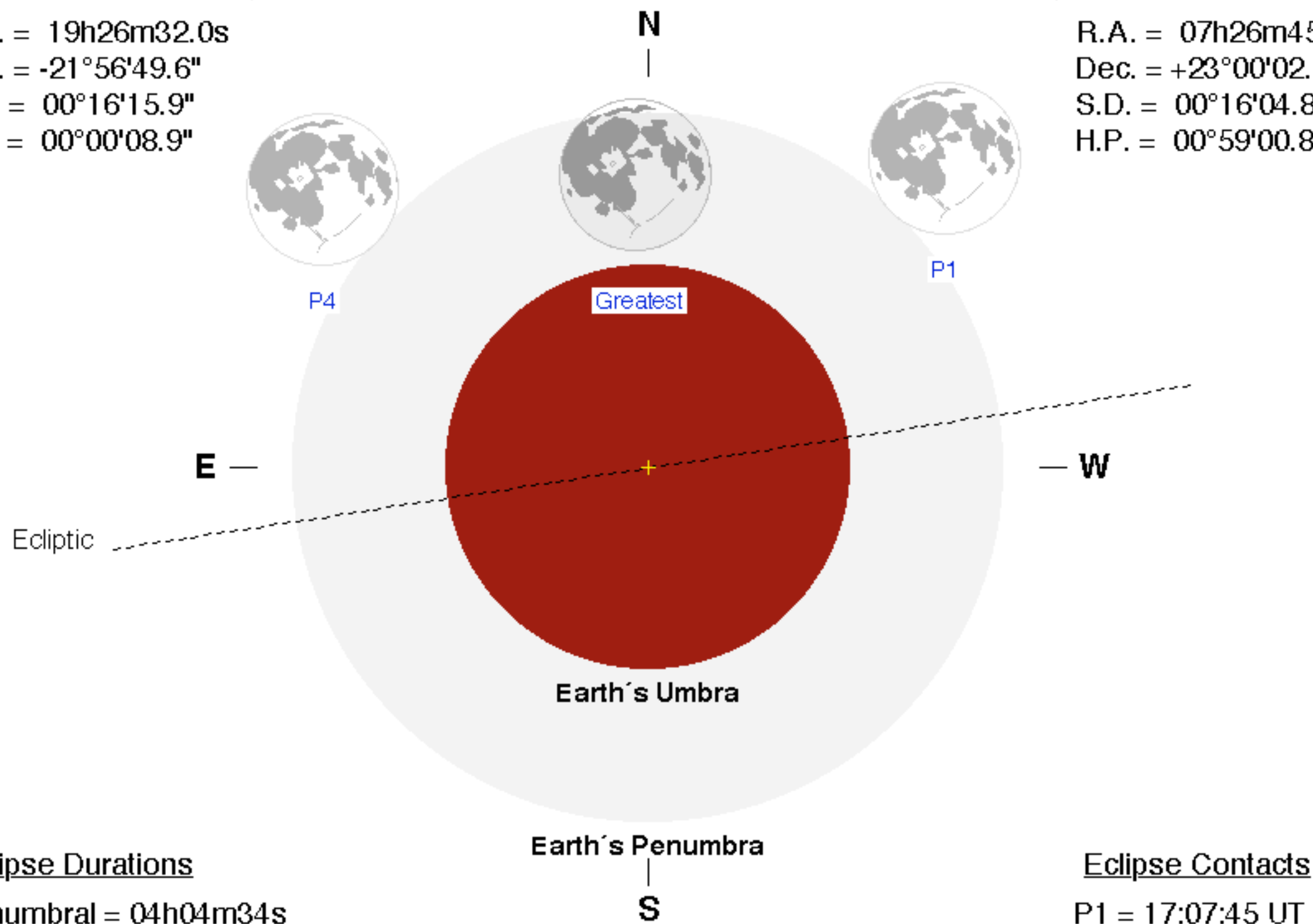
Moon at Greatest Eclipse (Geocentric Coordinates)

R.A. = 07h26m45.8s

Dec. = +23°00'02.8"

S.D. = 00°16'04.8"

H.P. = 00°59'00.8"



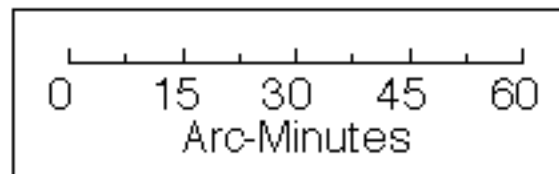
Eclipse Durations

Penumbral = 04h04m34s

Eclipse Contacts

P1 = 17:07:45 UT

P4 = 21:12:19 UT



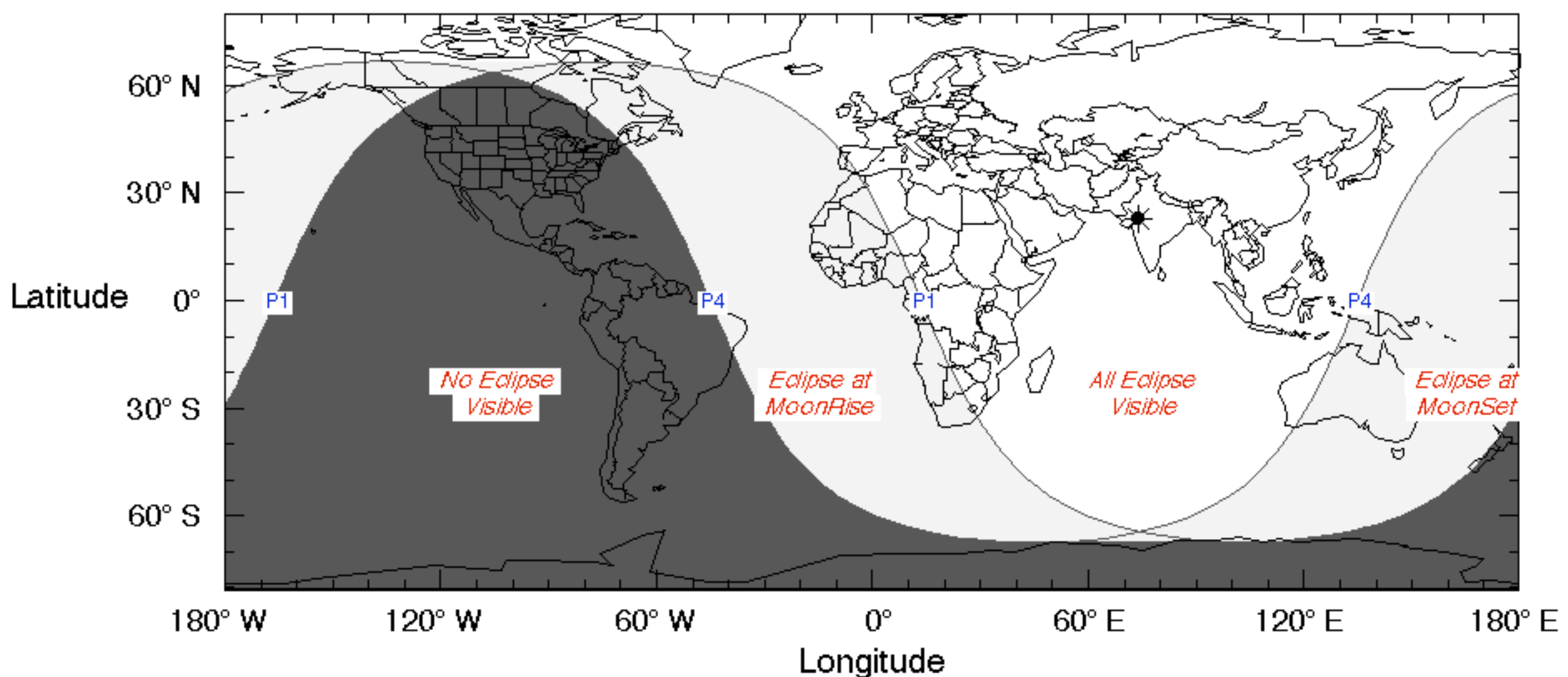
$\Delta T = 72$ s

Rule = CdT (Danjon)

Eph. = VSOP87/ELP2000-85

F. Espenak, NASA's GSFC

eclipse.gsfc.nasa.gov/eclipse.html



Penumbral Lunar Eclipse of 2020 Jun 05

Ecliptic Conjunction = 19:13:32.7 TD (= 19:12:20.9 UT)

Greatest Eclipse = 19:26:13.8 TD (= 19:25:02.0 UT)

Penumbral Magnitude = 0.5683

P. Radius = 1.2653°

Gamma = 1.2406

Umbral Magnitude = -0.4053

U. Radius = 0.7399°

Axis = 1.2285°

Saros Series = 111

Member = 67 of 71

Sun at Greatest Eclipse (Geocentric Coordinates)

R.A. = 04h57m21.6s

Dec. = +22°39'21.3"

S.D. = 00°15'45.7"

H.P. = 00°00'08.7"

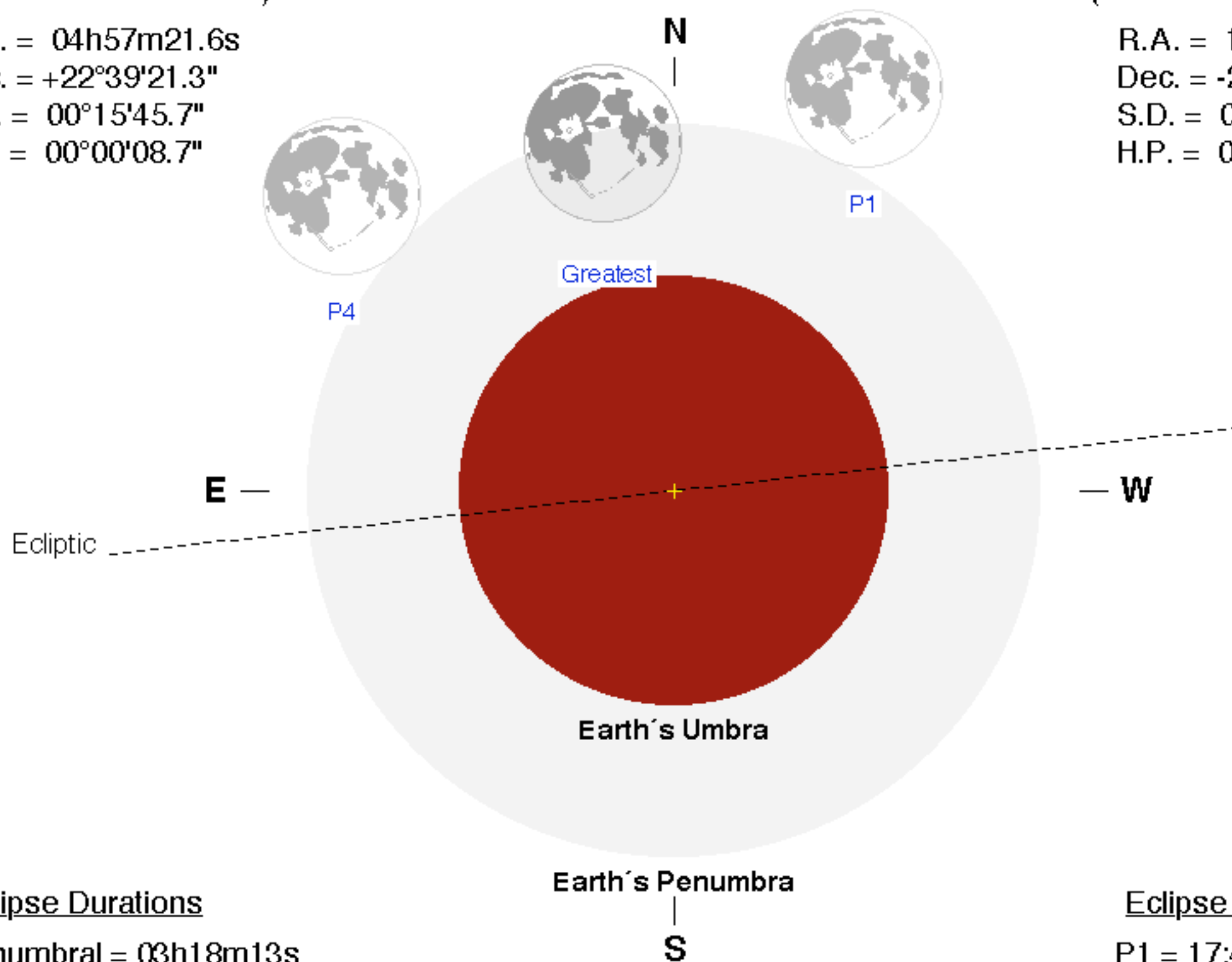
Moon at Greatest Eclipse (Geocentric Coordinates)

R.A. = 16h58m25.5s

Dec. = -21°27'08.8"

S.D. = 00°16'11.4"

H.P. = 00°59'25.1"



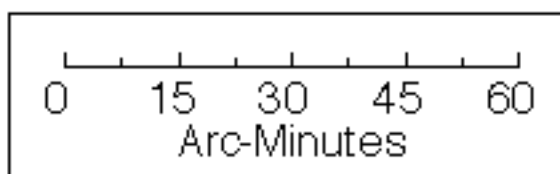
Eclipse Durations

Penumbral = 03h18m13s

Eclipse Contacts

P1 = 17:45:50 UT

P4 = 21:04:03 UT



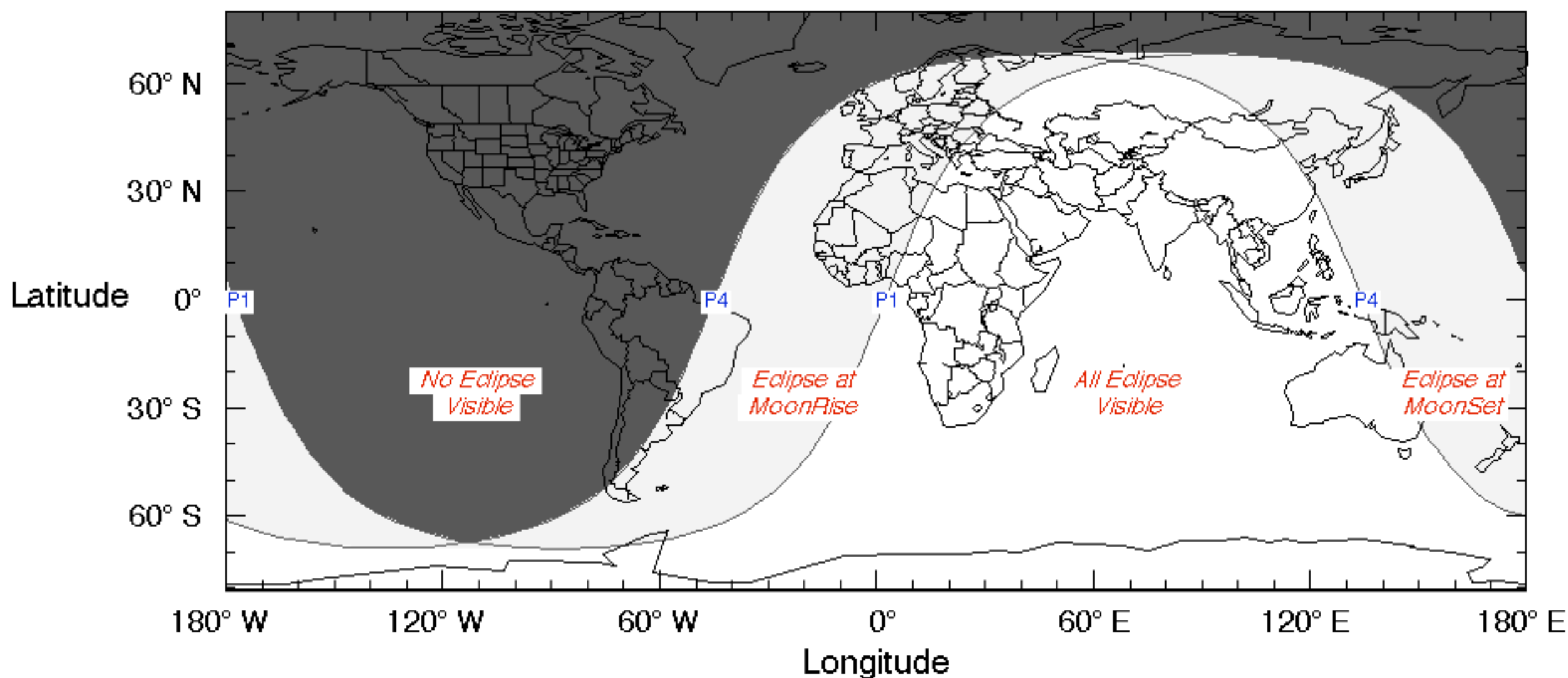
$\Delta T = 72$ s

Rule = CdT (Danjon)

Eph. = VSOP87/ELP2000-85

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Penumbral Lunar Eclipse of 2020 Jul 05

Ecliptic Conjunction = 04:45:33.9 TD (= 04:44:22.1 UT)

Greatest Eclipse = 04:31:11.9 TD (= 04:30:00.1 UT)

Penumbral Magnitude = 0.3546

P. Radius = 1.2382°

Gamma = -1.3638

Umbral Magnitude = -0.6436

U. Radius = 0.7138°

Axis = 1.3146°

Saros Series = 149

Member = 3 of 72

Sun at Greatest Eclipse (Geocentric Coordinates)

R.A. = 06h59m10.5s

Dec. = +22°44'23.3"

S.D. = 00°15'43.9"

H.P. = 00°00'08.6"

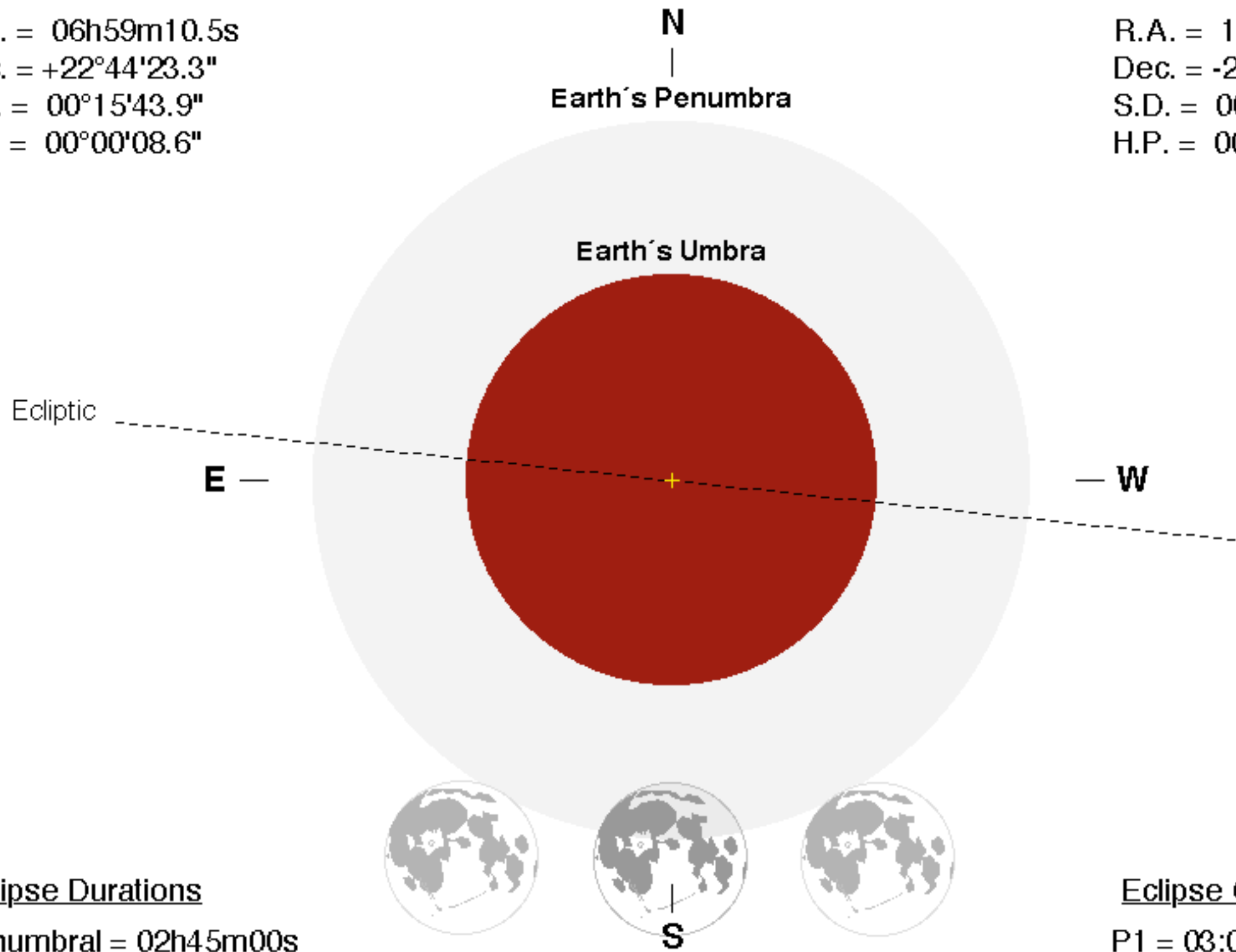
Moon at Greatest Eclipse (Geocentric Coordinates)

R.A. = 18h59m12.6s

Dec. = -24°03'16.2"

S.D. = 00°15'45.6"

H.P. = 00°57'50.4"



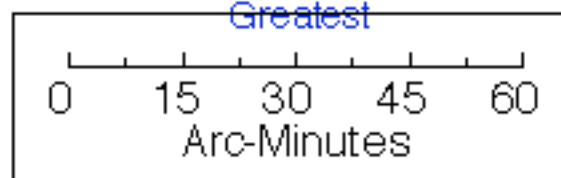
Eclipse Durations

Penumbral = 02h45m00s

Eclipse Contacts

P1 = 03:07:23 UT

P4 = 05:52:23 UT



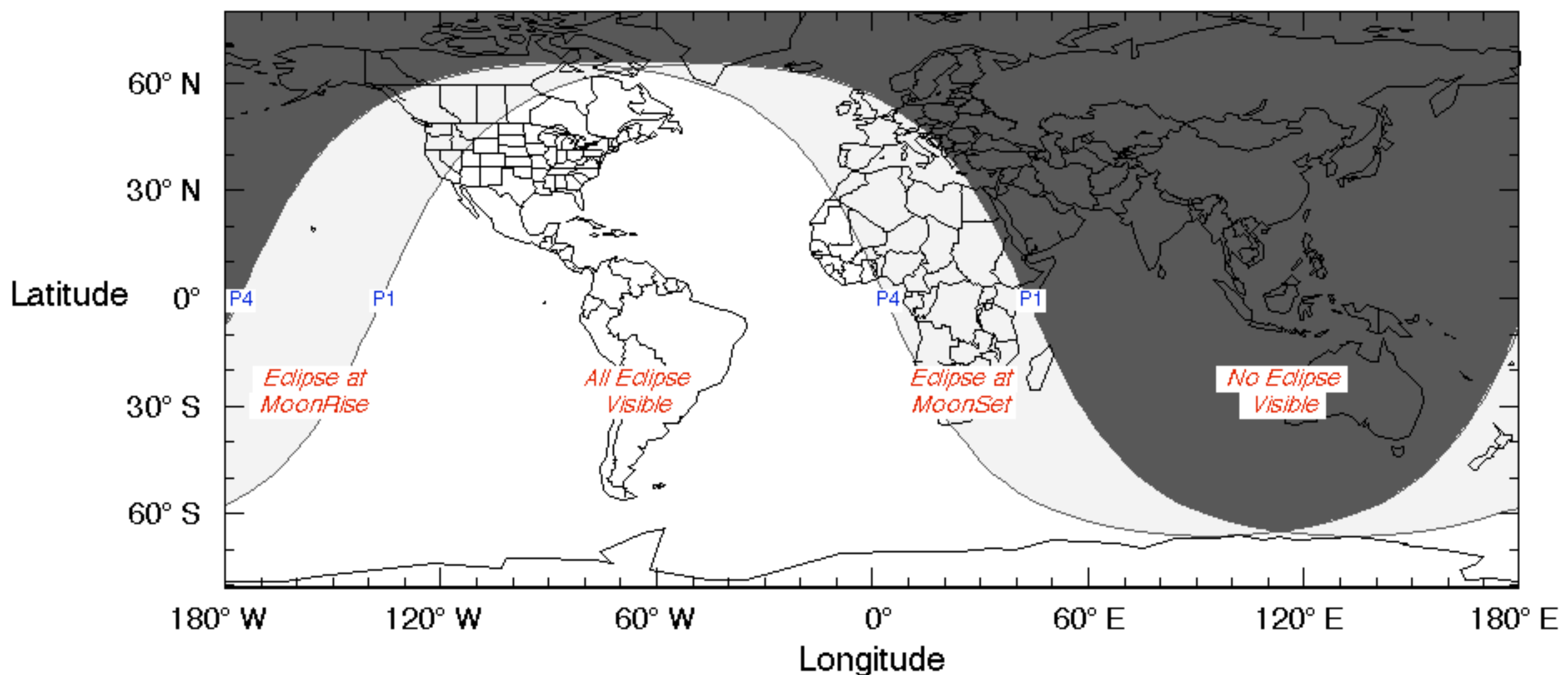
$\Delta T = 72$ s

Rule = CdT (Danjon)

Eph. = VSOP87/ELP2000-85

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Penumbral Lunar Eclipse of 2020 Nov 30

Ecliptic Conjunction = 09:30:50.1 TD (= 09:29:38.0 UT)

Greatest Eclipse = 09:44:01.0 TD (= 09:42:49.0 UT)

Penumbral Magnitude = 0.8285

P. Radius = 1.1916°

Gamma = -1.1309

Umbral Magnitude = -0.2620

U. Radius = 0.6510°

Axis = 1.0288°

Saros Series = 116 Member = 58 of 73

Sun at Greatest Eclipse (Geocentric Coordinates)

R.A. = 16h27m40.0s

Dec. = -21°44'31.0"

S.D. = 00°16'13.1"

H.P. = 00°00'08.9"

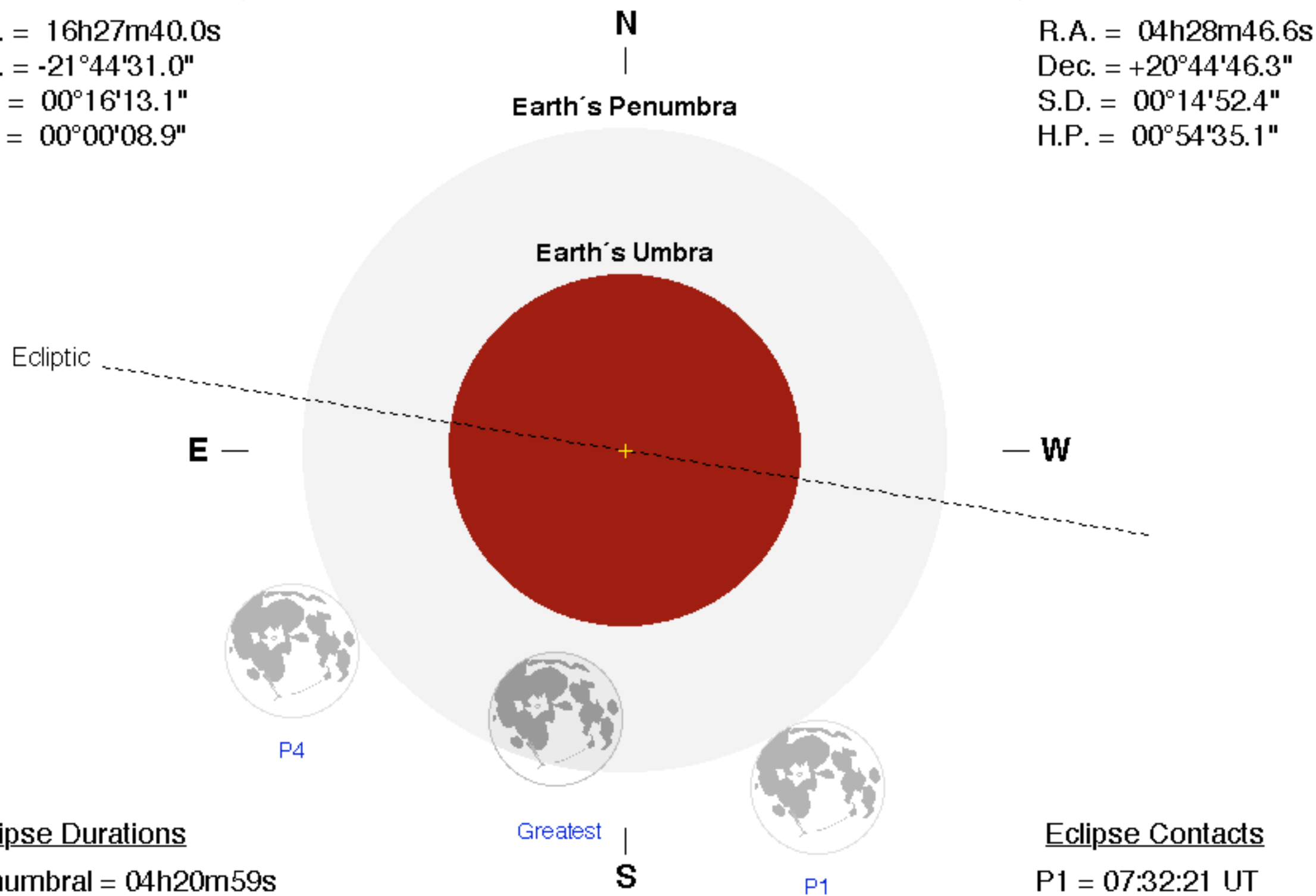
Moon at Greatest Eclipse (Geocentric Coordinates)

R.A. = 04h28m46.6s

Dec. = +20°44'46.3"

S.D. = 00°14'52.4"

H.P. = 00°54'35.1"



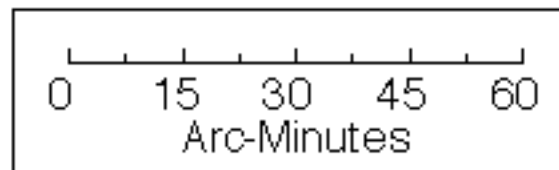
Eclipse Durations

Penumbral = 04h20m59s

Eclipse Contacts

P1 = 07:32:21 UT

P4 = 11:53:20 UT



$\Delta T = 72$ s

Rule = CdT (Danjon)

Eph. = VSOP87/ELP2000-85

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