

Explanation of Lunar Eclipse Diagrams

Information on lunar eclipses is presented in the form of a diagram consisting of two parts. The upper panel shows the path of the Moon relative to the penumbral and umbral shadows of the Earth. The lower panel shows the visibility of the eclipse from the surface of the Earth. The title of the upper panel includes the type of eclipse, its place in the sequence of eclipses for the year and the Greenwich calendar date of the eclipse. The inner darker circle is the umbral shadow of the Earth and the outer lighter circle is that of the penumbra. The axis of the shadow of the Earth is denoted by (+) with the ecliptic shown for reference purposes. A 30-arcminute scale bar is provided on the right hand side of the diagram and the orientation is given by the cardinal points displayed on the small graphic on the left hand side of the diagram. The position angle (PA) is measured from North point of the lunar disk along the limb of the Moon to the point of contact. It is shown on the graphic by the use of an arc extending anti-clockwise (eastwards) from North terminated with an arrow head.

Moon symbols are plotted at the principal phases of the eclipse to show its position relative to the umbral and penumbral shadows. The UT times of the different phases of the eclipse to the nearest tenth of a minute are printed above or below the Moon symbols as appropriate. P1 and P4 are the first and last external contacts of the penumbra respectively and denote the beginning and end of the penumbral eclipse respectively. U1 and U4 are the first and last external contacts of the umbra denoting the beginning and end of the partial phase of the eclipse respectively. U2 and U3 are the first and last internal contacts of the umbra and denote the beginning and end of the total phase respectively. MID is the middle of the eclipse. The position angle is given for P1 and P4 for penumbral eclipses and U1 and U4 for partial and total eclipses. The UT time of the geocentric opposition in right ascension of the Sun and Moon and the magnitude of the eclipse are given above or below the Moon symbols as appropriate.

The lower panel is a cylindrical equidistant map projection showing the Earth centered on the longitude at which the Moon is in the zenith at the middle of the eclipse. The visibility of the eclipse is displayed by plotting the Moon rise/set terminator for the principal phases of the eclipse for which timing information is provided in the upper panel. The terminator for the middle of the eclipse is not plotted for the sake of clarity.

The unshaded area indicates the region of the Earth from which all the eclipse is visible whereas the darkest shading indicates the area from which the eclipse is invisible. The different shades of gray indicate regions where the Moon is either rising or setting during the principal phases of the eclipse. The Moon is rising on the left hand side of the diagram after the eclipse has started and is setting on the right hand side of the diagram before the eclipse ends. Labels are provided to this effect.

Symbols are plotted showing the locations for which the Moon is in the zenith at the principal phases of the eclipse. The points at which the Moon is in the zenith at P1 and P4 are denoted by (+), at U1 and U4 by (☉) and at U2 and U3 by (⊕). These symbols are also plotted on the upper panel where appropriate. The value of ΔT used for the calculation of the eclipse circumstances is given below the diagram. Country boundaries are also provided to assist the user in determining the visibility of the eclipse at a particular location.

ASTRONOMICAL APPLICATIONS DEPT.
U.S. NAVAL OBSERVATORY
WASHINGTON, DC 20392-5420 USA