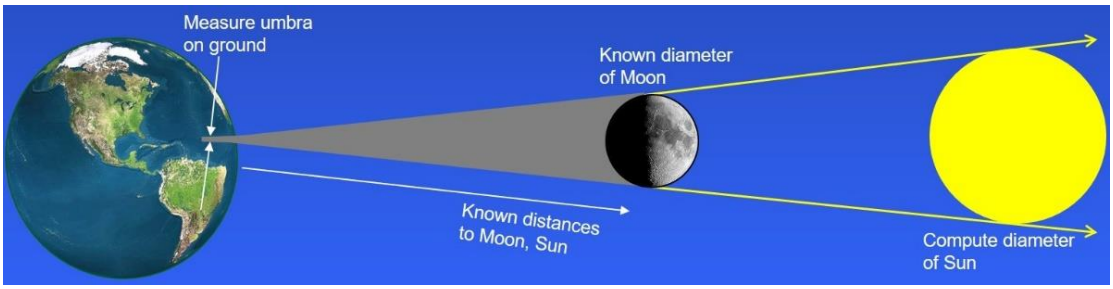
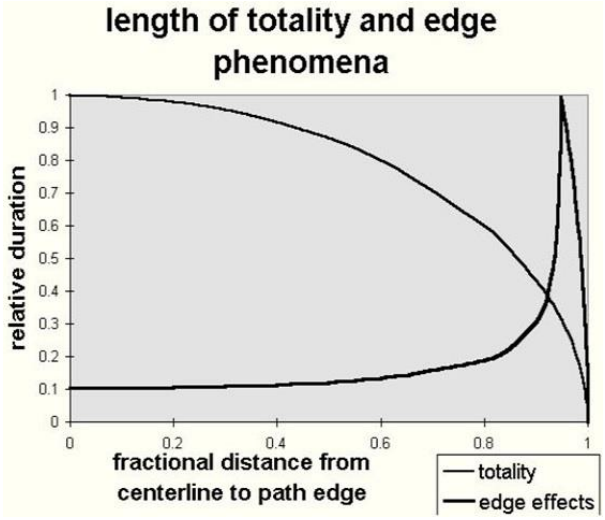
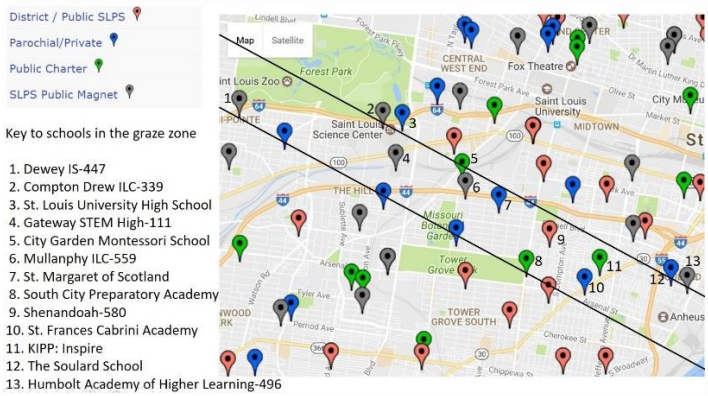
IOTA's Eclipse Edge Determination Experiment



The International Occultation Timing Association (IOTA) plans to organize a citizen science effort to determine the location of the edge of the path of totality near Minden, Nebraska, which is crossed by the predicted southern limit, with details at http://www.eclipsetours.com/eclipse-edge-2017/. We have begun to organize similar efforts in Kansas City and St. Louis, and we invite others to make similar measurements at other sites near the limits of the Moon's umbral (dark inner) shadow. Cities and towns intersected by the limits, where such efforts would be possible, are listed at the bottom of the above Web site. Besides lines of observers with cell phones bracketing the "graze zone" at the limits, we also hope to obtain observations with most of the different techniques that have been used at past eclipses, to determine their consistency. We will be collaborating with the Eclipse Megamovie Project. The goals are to help determine the accuracy to which the edge of the path of totality can be defined, and to contribute to a long-term study to measure changes in the size of the Sun, and the accuracy to which that can be done.



In the past, IOTA has stressed observations near the edges of the eclipse path. With the many dozens of Baily's beads visible over a period of a few minutes, IOTA considers a total eclipse observed near the path edges, to be the ultimate lunar grazing occultation. As the diagram at the left shows, the visibility of edge phenomena (Baily's beads, chromosphere, shadow bands) is enhanced by a factor of about 10 for locations a short distance inside the path edges, while the duration of totality is still 1/3rd or 1/4th that at the center. IOTA's edge efforts were necessary for our solar radius determination experiment due to the uncertainties of the Watts lunar profile data; those could be ameliorated by the fact that the same lunar features dominate the profile in the polar regions (since the libration in latitude is always near 0 for an eclipse), while the libration in longitude can have nearly any value (so the equatorial profile is always different). Now that much more accurate lunar profile data are available from LRO, as demonstrated from lunar grazing occultation observations, this is less of an issue, so well-timed recordings near the central line are now also useful for solar radius determination, of course limited by the "fuzziness" of the Sun's edge.



IOTA wants to work with local schools, astronomical societies, and other organizations to position observers at 50-meter intervals across the eclipse graze zone, from 300 meters outside the predicted limit to 700 meters inside the limit, as shown across St. Louis to the left. The observers should work in pairs, one operating a smart phone (taking a video) and the other observing naked-eye, being careful to observe only during the two minutes centered on the central time for the location. Outside the two minutes, or anywhere outside the graze zone, the special eclipse viewing glasses, or other safe viewing methods, must be used. We are collaborating with the Eclipse Megamovie Project to use their apps and video reporting system for this project. The following are locations where the edges of the path of totality passes through the urban area proper: Northern Limit: Camden / Lugoff SC, Brevard SC, Warhammer TN, Oak Ridge TN, Bowling Green KY, Central City IN, St. Louis MO, Belleville MO, Moberley MO, Lincoln NE, and Canby OR. Southern Limit: Blue Ridge GA, Murfreesboro TN, St. James MO, Kansas City MO, Minden NE, Wheatland WY, Emmett ID and Redmond OR. Other towns are close enough to the path edge where similar experiments might be conducted, but it will be easiest at the ones listed above (they are listed from east to west along the path).

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