

Eclipse Chaser

User Manual

10/10/14



Warning!!!

Never look at the Sun, eclipsed or not, without proper and certificated eye protection. Looking at the Sun without such protection will result in permanent eye damage and possibly blindness. 100% UVA/UVB sunglasses do **NOT** provide eye protection for looking at the Sun.

I. Introduction

The EclipseChaser mobile application allows you to use your mobile device as a powerful eclipse circumstance computer. Using your device's GPS coordinates, solar eclipse circumstance information can be derived for your location.

II. Disclaimer

All times, numbers, map plots, and visualizations contained within this application are estimates only and may have inaccuracies. No guaranties are made or implied. Please always double check eclipse circumstances.

III. Required Permissions

This application will require the following permissions:


1. Internet Access
For downloading and displaying maps, along with approximate position information.
2. Your Location: Coarse and Fine
Uses your device's IP address and / or GPS to derive your location. Used to make accurate astronomical calculations for your exact position.

IV. Lower Toolbar Display


Lat:	Long:	Alt:	Time:
37.82	-112.44	6623.61 ft	3:21:54 PM

1. **Lat:**
Displays your current GPS derived latitude, or if in manual location mode, the selected latitude.
2. **Long:**
Displays your current GPS derived longitude, or if in manual location mode, the selected longitude.
3. **Alt:**
Your current elevation in feet. This is either derived from the device's internal GPS, set to zero if over the ocean, or derived from an online DEM (Digital Elevation Model of the Earth). You may touch this indication to force an update to your derived elevation. *NOTE: DEM information not available offline and is set to zero.*
4. **Time:**
This is the current time for your current position and is displayed in the local time zone. Touch the time to activate "[Time Travel Mode](#)". *NOTE: The time displayed may be different than your actual local time if you have manually selected another location. Example: It's 2:30pm in Chicago, but you have selected Los Angeles in [Manual Location Mode](#), the time displayed will be 12:30pm. Some timezone information is not available offline.*

V. Navigation Menu

To navigate to various sections of the app, simply touch the menu button  in the upper left corner of the screen.

1. **Close menu**
Simply closes the menu
2. [Circumstances](#)
Displays eclipse event times and circumstances.
3. [Choose Eclipse](#)
Select solar eclipses from the years 1900 to 2100.
4. [The Eclipse Map](#)
Shows the eclipse area of visibility and Moon's shadow.
5. [Simulation](#)
Simulate the view of the Sun and the Moon from your location during the time of the eclipse.
6. **About**
About the application, credits, and version information.

Menu	Circumstances				
	Total Eclipse Occurs August 21, 2017				
Statistics					
Cov: 100.0%	Mag: 100.9%	Depth: 69.0% N			
Local Sunrise					
6:20:27 AM	-1048:15:55:31				
Partial Eclipse Begins					
9:05:23 AM	-1048:18:40:28				
Total Phase Begins					
10:17:18 AM	-1048:19:52:22				
Mid Eclipse At					
10:18:15 AM	-1048:19:53:19				
Total Phase Ends					
10:19:12 AM	-1048:19:54:16				
Partial Eclipse Ends					
11:37:47 AM	-1048:21:12:51				
Local Sunset					
8:10:16 PM	-1049:05:45:20				
Lat: 44.94	Long: -123.04	Alt: 156.68 ft	Time: 2:24:55 PM		

Header

Statistics

Entire
Eclipse
Duration

Total or
Annular
Phase
Duration

Countdown

VI. Circumstances

Here you can see key solar eclipse event times and circumstance data. All times are given for your local timezone. All eclipse times and statistics will change for your given location. The application uses your location information to calculate when the eclipse will occur for your specific location, so as you move, these numbers will change. [Manual Location Mode](#): If you have manually selected your location, event times will be given for that selected location's timezone.

1. Header

Dependent on your location you will see “No Eclipse Occurs”, “Partial Eclipse Occurs”, “Annular Eclipse Occurs”, “Total Eclipse Occurs”. If an eclipse does not occur for your location no further information is given.

2. Statistics

- Coverage:** Denoted by “Cov:” The percentage of the Sun's disc covered by the Moon at the eclipse mid point for your specific location.
- Magnitude:** Denoted by “Mag:”. The percentage of the Sun's diameter covered by the Moon at the eclipse mid point for your specific location.
- Depth:** If a total or annular eclipse will occur at your location a depth indication will be given. This number denotes your relative distance from the exact centerline of the Moon's (ant)umbral path. The closer the number to 100%, the closer you are the eclipse centerline. An 'S' indicates you are south of the centerline and an 'N' indicates you are north of the centerline.

3. Countdowns

All times have a countdown clock. The countdowns are formatted as such: DD:HH:MM:SS or Days:Hours:Minutes:Seconds. The number will turn positive when the event time has passed. *Example: -61:12:13:15 equates to 61 days, 12 hours, 13 minutes, and 15 seconds until that event occurs.*

4. Local Sunrise

The time the Sun will rise on the day of the selected eclipse for your specific location.

5. Partial Eclipse Begins

Astronomically referred to as “first contact”. This is the time the Moon will first start to cross in front of the Sun. Just to the right of “Partial Eclipse Begins” you will notice a time, which is the total duration of the eclipse. *Example: 02:31:09 means the eclipse will last for a total of 2 hours, 31 minutes, and 9 seconds for your specific location.*

6. Total / Annular Eclipse Begins (Only displayed if this occurs)

Astronomically referred to as “second contact”. For a total eclipse, totality has begun at this moment and the Sun is completely covered by the Moon. For an annular eclipse the Moon is now just completely inside the Sun's limb and annularity has begun. Just to the right of “Total / Annular Eclipse Begins” you will note the length of totality or annularity at your locations. *Example: 02:17 indicates totality or annularity will last for 2 minutes and 17 seconds.*

7. Mid Eclipse At

This is the point in time in which the Moon has covered the largest portion of the Sun for your specific location. Up until this time the Moon has been moving to “cover” the disc of the Sun. After this time, the Moon will begin to “retreat” from the disc of the Sun.

8. Total / Annular Eclipse Ends (Only displayed if this occurs)

Astronomically referred to as “third contact”. For a total eclipse, totality now ends and Sun begins to reappear from behind the Moon. For an annular eclipse the Moon exits from inside the limb of the Sun and annularity has now ended.

9. Partial Eclipse Ends

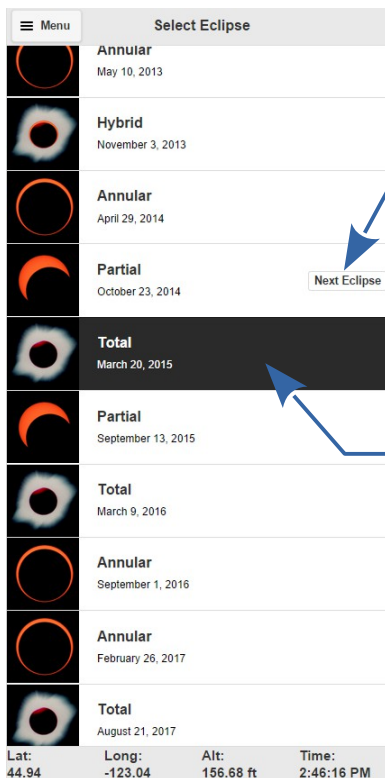
Astronomically referred to as “fourth contact”. This is the moment in time the Moon leaves the disc of the Sun and the solar eclipse ends for your specific location.

10. Local Sunset

The time the Sun will set on the day of the selected eclipse for your specific location.

11. Below Horizon

Depending on your location you may see the words “Below Horizon” for certain eclipse events. This means that particular event occurs before sunrise or after sunset. Refer to the local sunrise and sunset times. *Example: The words “Below Horizon” appear next to “Partial Eclipse Ends”: This indicates the Sun and Moon will set together before the eclipse ends for your specific location.*



VII. Choose Eclipse

A scrollable list of all solar eclipses that occur in the years 1900 to 2100.

1. Selected Eclipse

The selected eclipse will be indicated by a dark background. Simply select an eclipse by touching the desired eclipse.

2. Autoselected Eclipse

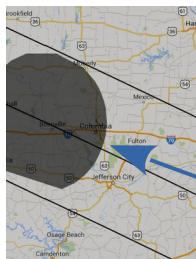
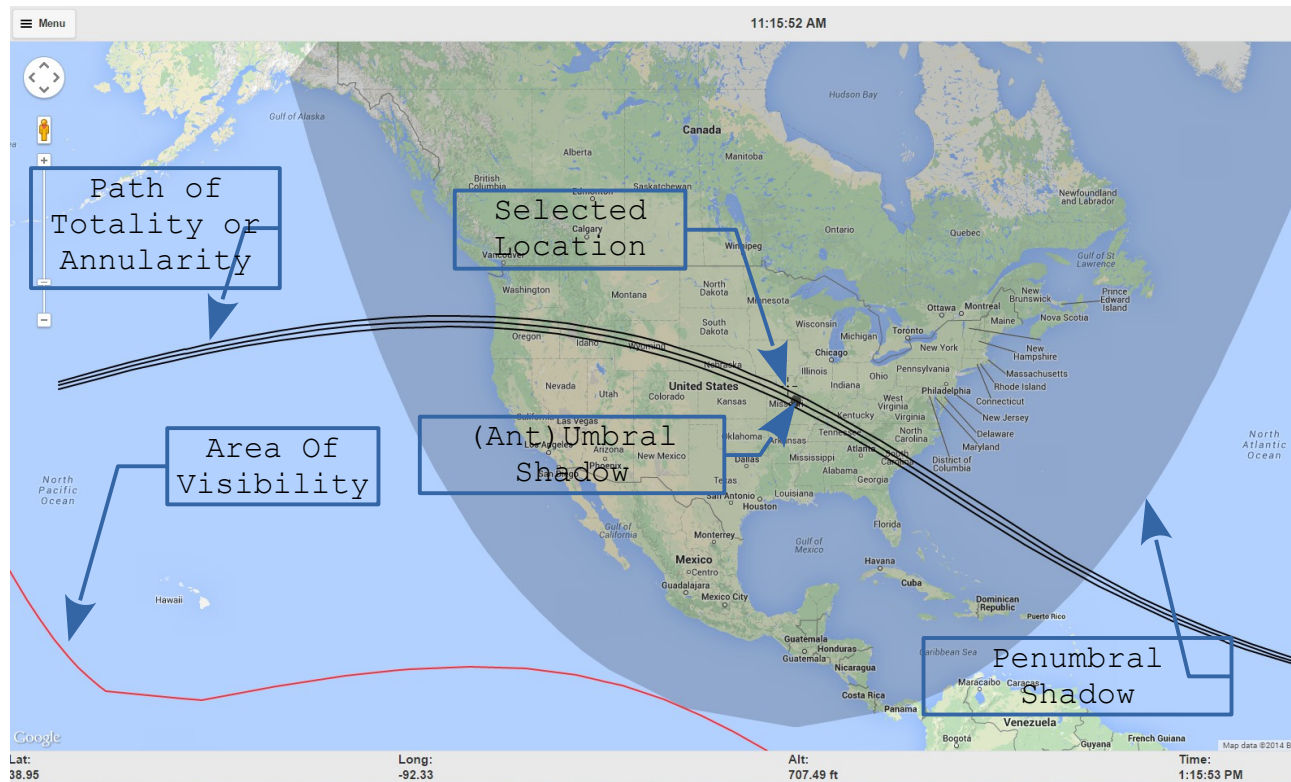
The next solar eclipse that will occur on Earth will be selected by default.

3. Next Eclipse

Whether selected or not, the next solar eclipse to occur on Earth will have a bubble indication.

Next Eclipse

VIII. Eclipse Map



This section of the app allows you to view where the solar eclipse will be seen on Earth, animate the Moon's shadow, and plot the Moon's shadow in real-time. *NOTE: If you do not have an internet connection the map cannot be displayed.*

Central shadow zoomed in.

1. Map Controls

Map controls are based upon the Google Maps(c) application. The plus and minus buttons in the lower left corner will zoom in and out. You may also two finger pinch to zoom out and two finger spread to zoom in. Please keep in mind the map will automatically center on your current GPS position or manually selected location. In GPS location mode (default) your location is marked by a blue location marker. In manual location mode your location is marked by a cross-hair pattern.

2. Eclipse Area of Visibility

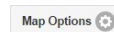
The map defaults to display the eclipse area of visibility. (Also marks the path of the Moon's shadow will take the day of the eclipse). The larger area marked by red lines indicates the part of Earth that will experience at least a partial eclipse. If a total or annular eclipse occurs, a smaller path marked by black lines indicates where a total or annular eclipse will be visible.

Close menu	×
Center Loc	📍
Animate Shadow	+
Realtime Shadow	+
Manual Loc	+

Columbia, MO, United St.

3. Map Options

Touch the Map Options Button in the upper right corner of the Eclipse Map to open the map options menu.



A. Close Menu

Closes the map menu.

B. Center Loc

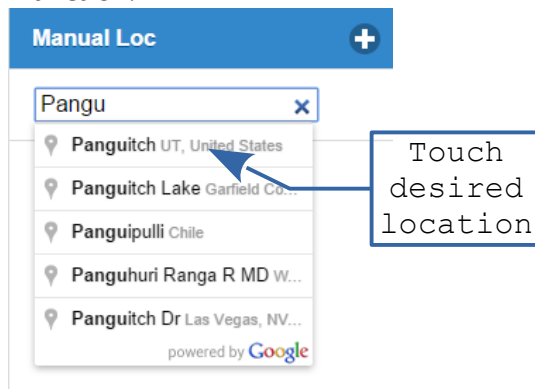
Toggles the center location function on and off. Default: ON. When highlighted the map will always stay centered on your GPS location. When off you may swipe the map freely. Touch to toggle on or off.

C. Animate Shadow

Select to animate the motion of the Moon's shadow across the Earth on the day of the eclipse. You will see the shadow move and change shape as the Moon crosses between the Earth and the Sun. *NOTE: Because this function is computationally intensive it may take a while before you see the animation. Remain patient and remember the shadow generally moves from west to east.*

D. Realtime Shadow

This function will display the current location of the Moon's shadow on the day of the eclipse. The shadow will move in real-time across the Earth as the eclipse progresses. This function is only available when the eclipse is occurring or by using the [Time Travel](#) function.

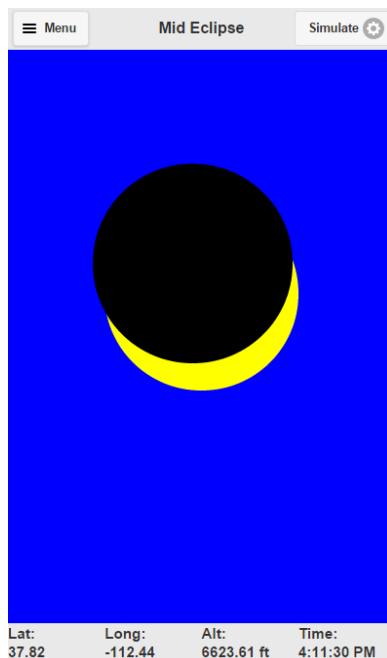


E. Manual Loc

Toggles the manual location mode on and off. Default: Off. When highlighted the app ceases to use your GPS derived location and you may set your location manually. You will notice the location marker is now a cross-hair pattern. You may set your location by touching anywhere on the map. You may also type in a desired location in the location text box displayed just under “Manual Loc” in the Map options menu.

You must select your desired location from the drop-down menu. The map will then show your selected location.

IX. Simulation



By computing the position of the Sun and the Moon in the sky you can simulate a view of the eclipse from your location. A yellow Sun will be centered on your screen overlaid by a black Moon simulating your view of the Sun and Moon during the midpoint of the eclipse at your location. Press the “Simulate” button in the upper right corner to access different views. *NOTE: Currently this function is an estimate of the Sun and Moon's position. Differences between what happens in the actual eclipse and what the simulation shows will be seen. Further updates will refine the simulation.*

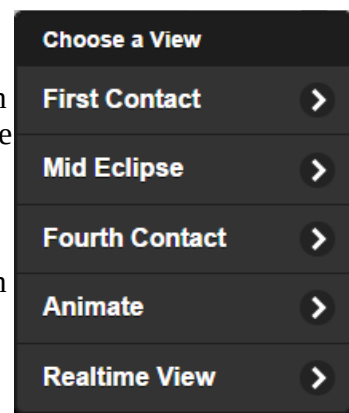
1. Simulate Menu

A. First Contact

This will simulate the position of the Sun and Moon when the eclipse first starts or *First Contact*.

B. Mid Eclipse (Default View)

This will simulate the position



of the Sun and Moon during the maximum part of the eclipse or *Mid Eclipse*. The Moon will be most “centered” or cover the maximum amount of the Sun's disc at this time.

C. Fourth Contact

This will simulate the position of the Sun and Moon when the eclipse ends or *Fourth Contact*.

D. Animate

This will animate the movement of the Moon across the disc of the Sun from the start of the eclipse until the end. The animation will loop until you select another option.

E. Realtime View

This will position the Sun and Moon at your current time or the time selected in *Time Travel Mode*. If the eclipse is not yet occurring a message will indicate “Eclipse Not Yet Occurring” and the Mid Eclipse View will be shown.

X. Time Travel

You may use the time travel function to see the location and movement of the Moon's shadow at different times during the eclipse.

1. Time Travel Methods

A. Circumstances Time Travel

The easiest method of time travel is by navigating to the *Circumstances* display. From here you may touch any event and you will notice the clock in the lower right corner will now display 10 seconds prior to your selected event. The app will navigate to the map display, and if the eclipse is occurring at this time, it will draw the Moon's shadow.

NOTE: The Moon's shadow may not be in your specific area at that selected time, zoom out to find it. If the eclipse is not occurring somewhere on Earth during the time you a message will appear indicating as such.

B. Clock Time Travel

By touching the clock in the lower right corner of the screen a dialog box will appear asking you to select a specific date and time. The internal clock will be set to this date and time. You may go to the [Eclipse Map Options](#) and select [Realtime Shadow](#) to display the Moon's shadow at your selected time.

C. Simulated View

The simulated view of the Moon and Sun also support time travel. After using the above time travel methods, just select [Simulation](#) from the navigation menu and [Realtime View](#) from the simulation menu to see the Sun and Moon's relative positions at the selected time for your location.

2. Time Travel Reset

To reset to the current date and time simply touch the clock in the lower right corner of the screen and the date and time will be set back to the present.

3. Known Issues

The EclipseChaser application is a work in progress. Currently the following are known issues to be fixed in a later version. Other bugs may occur.

- Central eclipse lines do not go through until sunset.
- Central eclipse lines do not have a sunset and sunrise limit line
- South and north view limit lines do not merge well with east west limit lines.
- Hybrid eclipse shadows do not properly phase from annular to total.

- Hybrid eclipse central lines may not show up correctly throughout their full length.
- Simulation of eclipse not yet accurate enough.
- Lunar limb corrections not yet accounted for.
- Atmospheric refraction not yet accounted for.