AWB Solar System Help

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2 Introduction

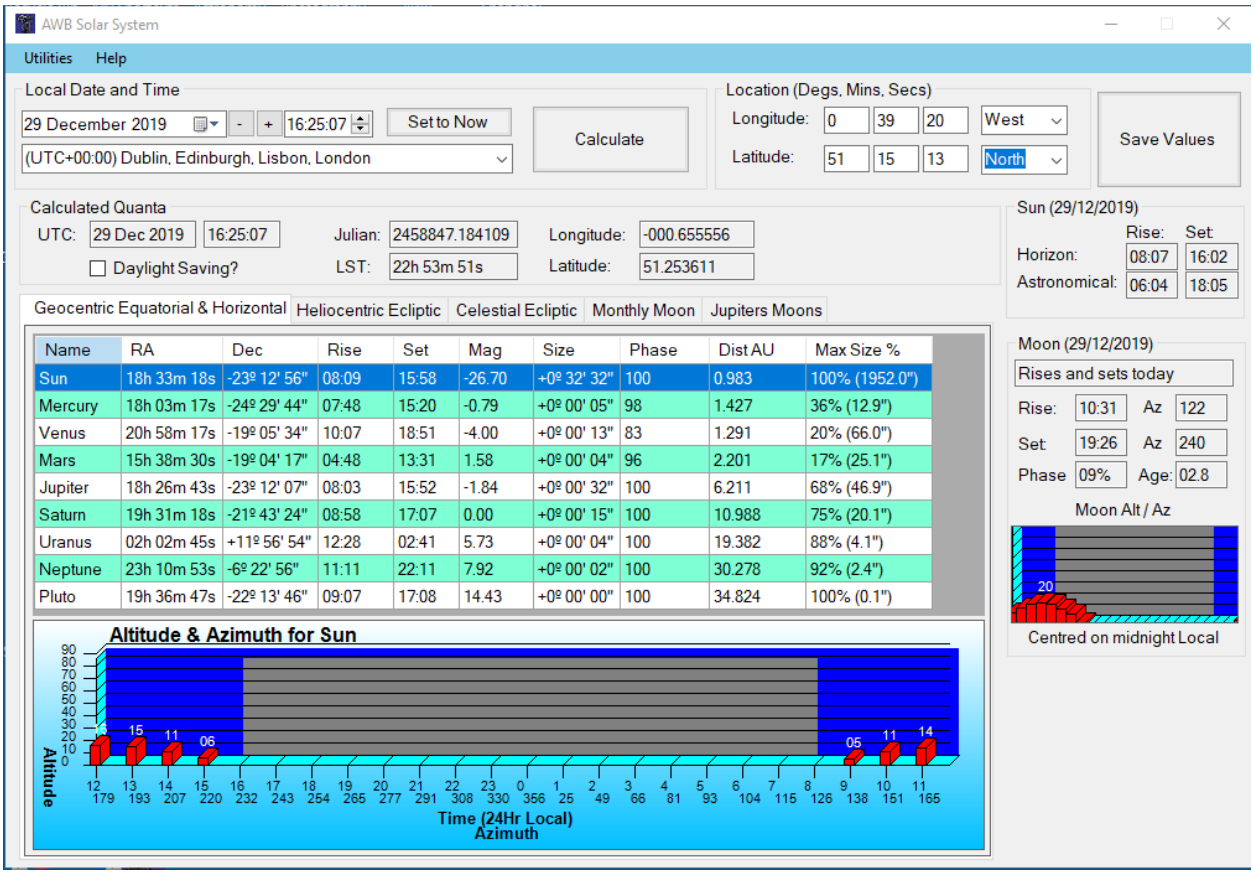
AWB Solar System is one of a set of applications under my AstroWorkBench (AWB) collection that I use during my observational sessions. I wrote this application with the purpose of calculating and displaying key Solar System object's information for the specified date and location.

3 Startup

Upon startup the screen below is presented with the local date and time defaulted to now.

It is **very important** that you change the Time Zone, Longitude and Latitude values to match your location and then click the 'Save Values' button and then the 'Calculate' button.

Subsequent invocations of this application will then default the Time Zone, Longitude and Latitude to the previous values you entered and saved.

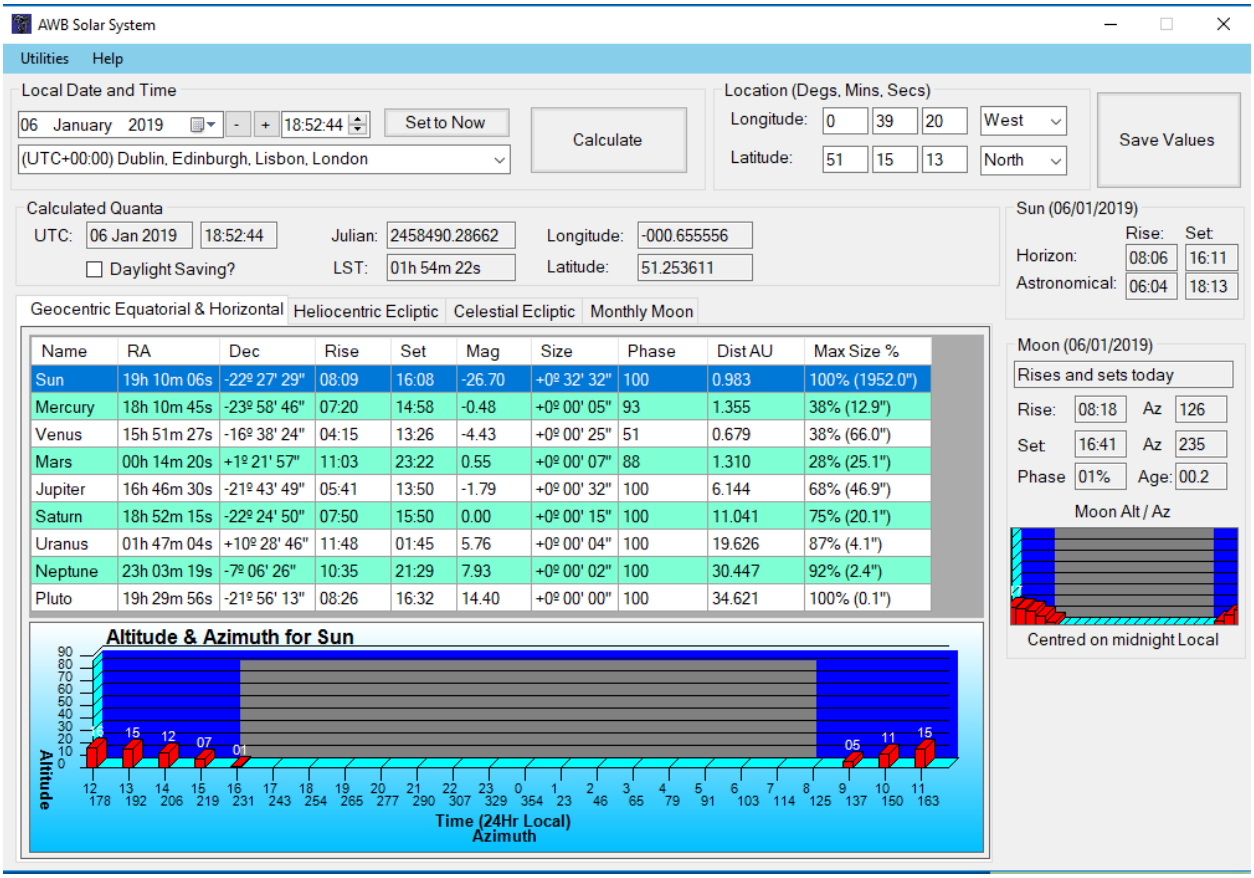


4 Usage

All of the data displayed on the main screen (as shown above) and the data on the four additional tab pages (detailed in subsequent sections below) is re-calculated every time you click the 'Calculate' button which uses the specified date, time, time zone, longitude and latitude to calculate all of the data shown.

5 Solar System Data explained

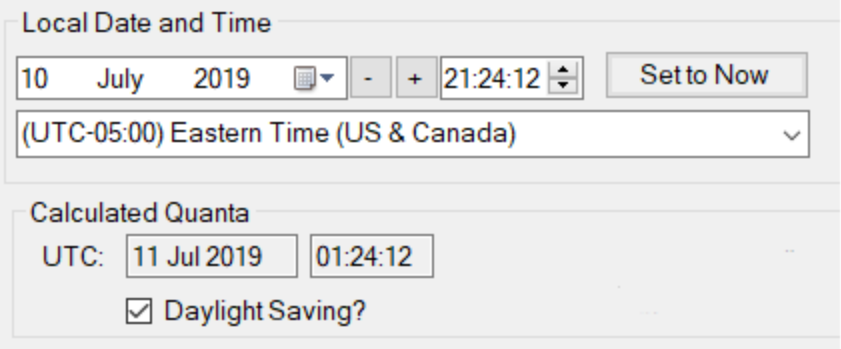
The main screen (as shown below) displays the following data calculated for the specified local date, time, time zone, longitude and latitude.



UTC: The calculated Coordinated Universal Time (also known as just UT) for the local date, time and time zone specified. The application also determines if Daylight Saving time is currently active which is also taken into account when calculating the UTC.

In the example screen shown above the local and UTC are the same as the location and time zone are for near London, England in the winter when local time is always the same as UTC.

In the example screen snippet shown below the UTC date and time is one day and 4 hours ahead of the local entered date as the time zone is 5 hours behind UTC and daylight saving is in affect for the local date specified. Note that this means that the UTC date is the next day.



Daylight Saving: This checkbox is ticked if the local date entered has daylight saving in effect.

Julian: This is the Julian date for the specified date and time.

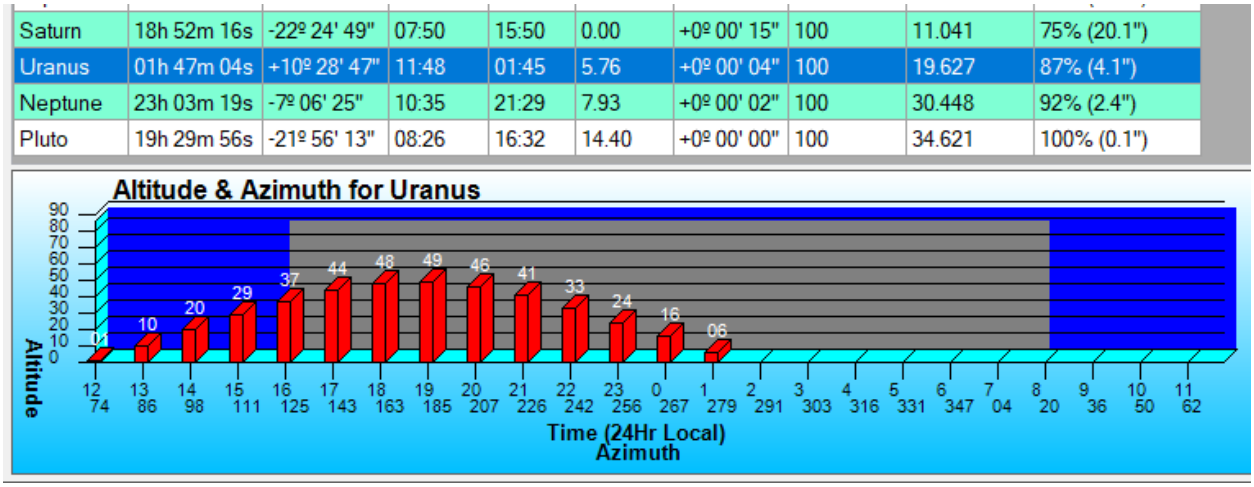
Longitude: This is a real number representation of the longitude degrees, minutes and second specified (negative if West)

Latitude: This is a real number representation of the latitude degrees, minutes and second specified (negative if South)

Geocentric Planet data: This table shows fundamental data for the Sun and nine planets (my vote is that Pluto is a planet!). Times are 24Hr local.

Altitude and Azimuth Graph: The graph displayed is for the currently selected planet (or the Sun) in the table. It shows the altitude and azimuth over the specified day's 24-hour period and hence is a very quick way to tell if the currently selected object is visible for that day.

For example, the screen snippet below shows that Uranus is well placed for observation, reaching a max altitude of about 49 degrees at azimuth 185 degrees on about 19:00 hours local time (for the date, time, time zone, longitude and latitude specified of course). The rise and set times shown in the grid are also reflected in the graph (rises 11:48, sets 01:45 in this example).

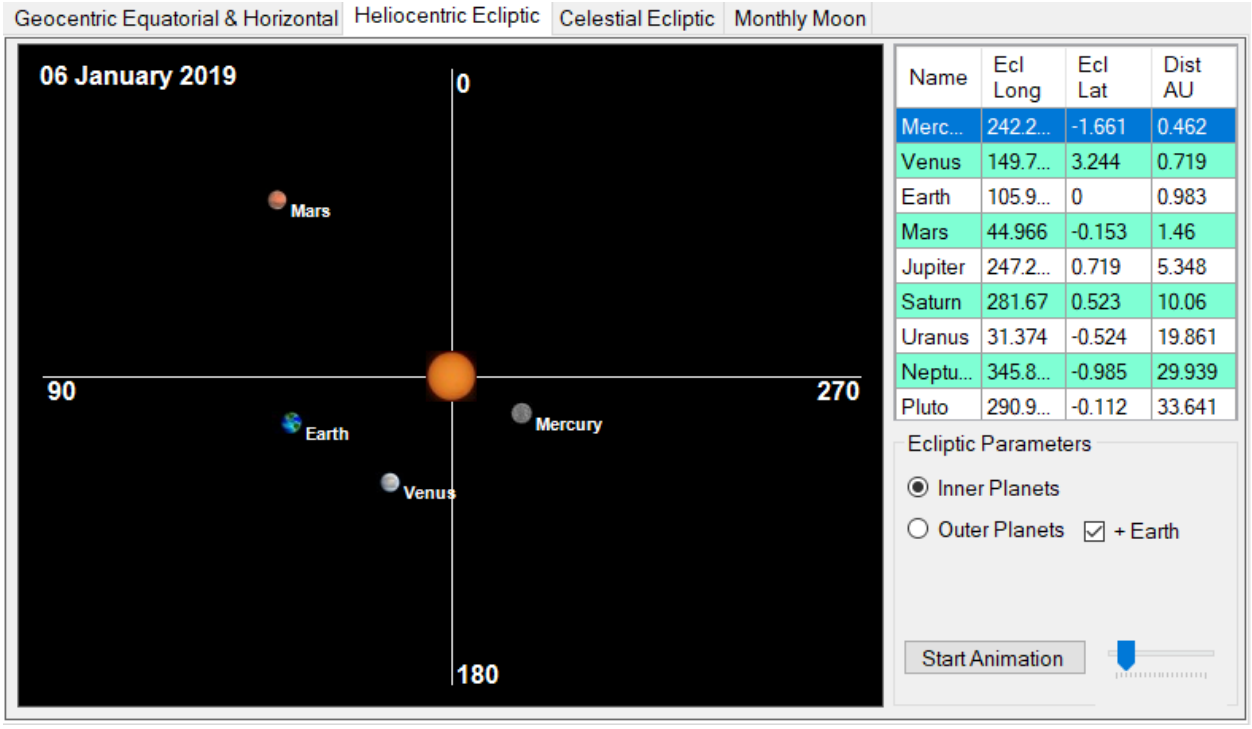


Sun Data: The local times for Civil and Astronomical based Sun rise and set are displayed.

Moon Data: The local times for Moon rise and set are displayed along with azimuth, phase (percentage) and age (days).

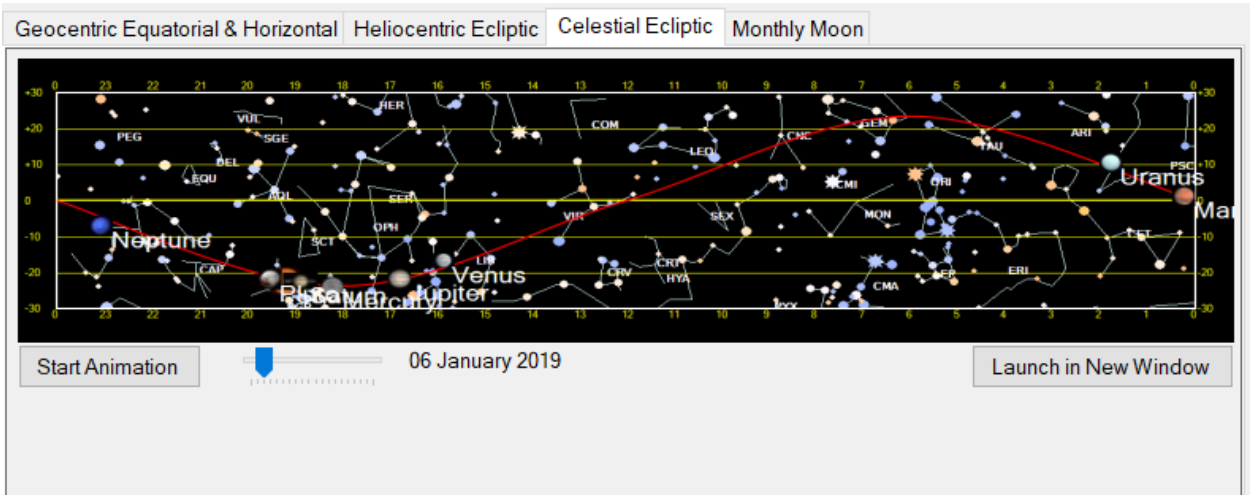
The second tab page (as shown below) displays a Heliocentric view of planets for the specified date, time, time zone, longitude and latitude. The ecliptic longitude and latitude along with the distance from the Sun are displayed in the table which are the metrics used for constructing the diagram.

The diagram can be animated via the 'Start Animation' and the slider which controls the speed. Note the date change as the animation progresses.

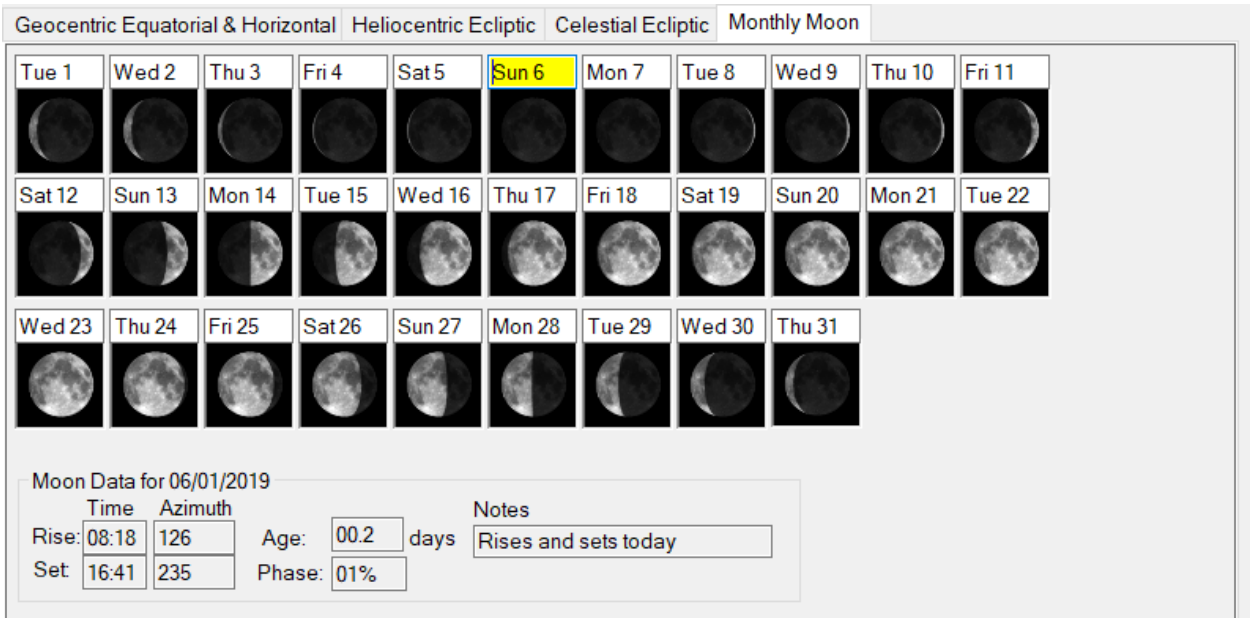


The third tab page (as shown below) displays the Celestial ecliptic with the planetary positions calculated for the specified date, time, time zone, longitude and latitude.

The diagram can be animated via the 'Start Animation' and the slider which controls the speed. Note the date change as the animation progresses.

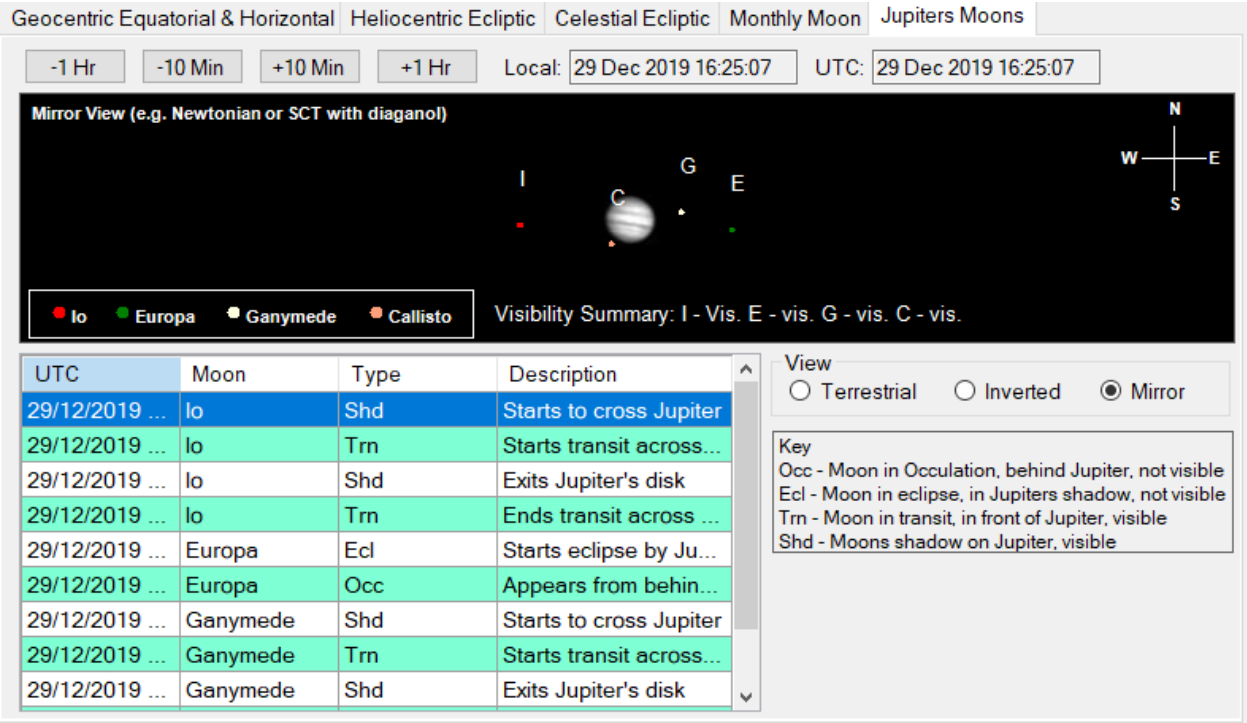


The fourth tab page (as shown below) displays the Lunar data for each day of the month from the specified date, time zone, longitude and latitude.



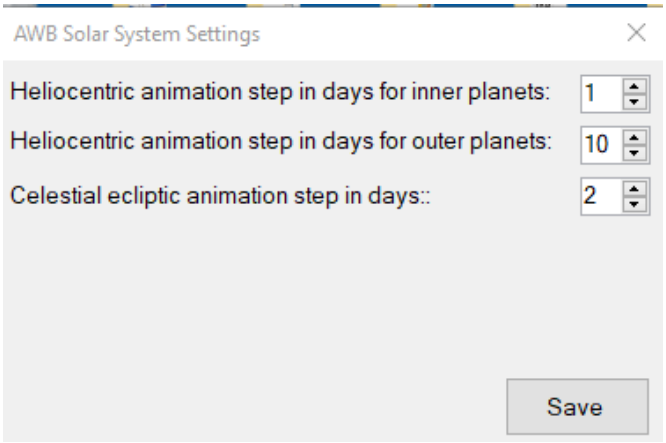
The fifth tab page (as shown below) displays an event summary and animation of the four main Jupiter moons. The four buttons labelled *-1 Hr, -10 Min, +10 Min* and *+1 Hr* may be used to increment or decrement the time and date which will automatically update the event summary table if the time increment of decrement causes a date change, and the animated representation of the moon's positions.

The view may also be changed to Terrestrial, Inverted or Mirror so as to match your optical set up.



The following settings screen is displayed via the *Utilities->Settings* menu option.

The animation options allow some control over the speed of the animations described above.



6 Accuracy and references

This application is a conglomeration and fusion of algorithms and code routines that I have collated and written since the early 1980's up to the present. My main sources and references have been:

- VSOP87 for the Sun and planetary calculations – this is pretty rigorous and should be accurate to a couple arc minutes. Pluto is calculated separately and is nowhere near as accurate;
- Peter Duffett-Smith – his classic book *Astronomy with Your Personal Computer*, mine is a second edition I purchased about 1990 and consists of BASIC routines (full of GOTOs and GOSUBs for those of you old enough to remember coding with those constructs) that I first used on my BBC micro and now reside in my Microsoft Visual Studio .Net solutions (re-written to port to VB.Net);
- O. Montenbruck and T. Pfleger's *Astronomy on the Personal Computer*. Another book I purchased in the early 1990's whose modified code also lives on in my .Net solutions;
- Paul Schlyter and Don Cross have some great math and code snippets online;
- NASA, JPL, NOAA and NIST online apps and websites that I have used to verify my code results as it's safe to assume that those guys are accurate with their calculations;
- Wikipedia and a thousand other online sites and references that together can supply you with every algorithm and equation you need via judicious use of google – and a headache when translating them into code!

7 Further Information

Please visit my website www.astroworkbench.co.uk for further applications, documents and articles.

If you find this application helpful then please consider donating a beer token of £1 via my PayPal account – please see my website www.astroworkbench.co.uk for details.

Thanks.

Keith.