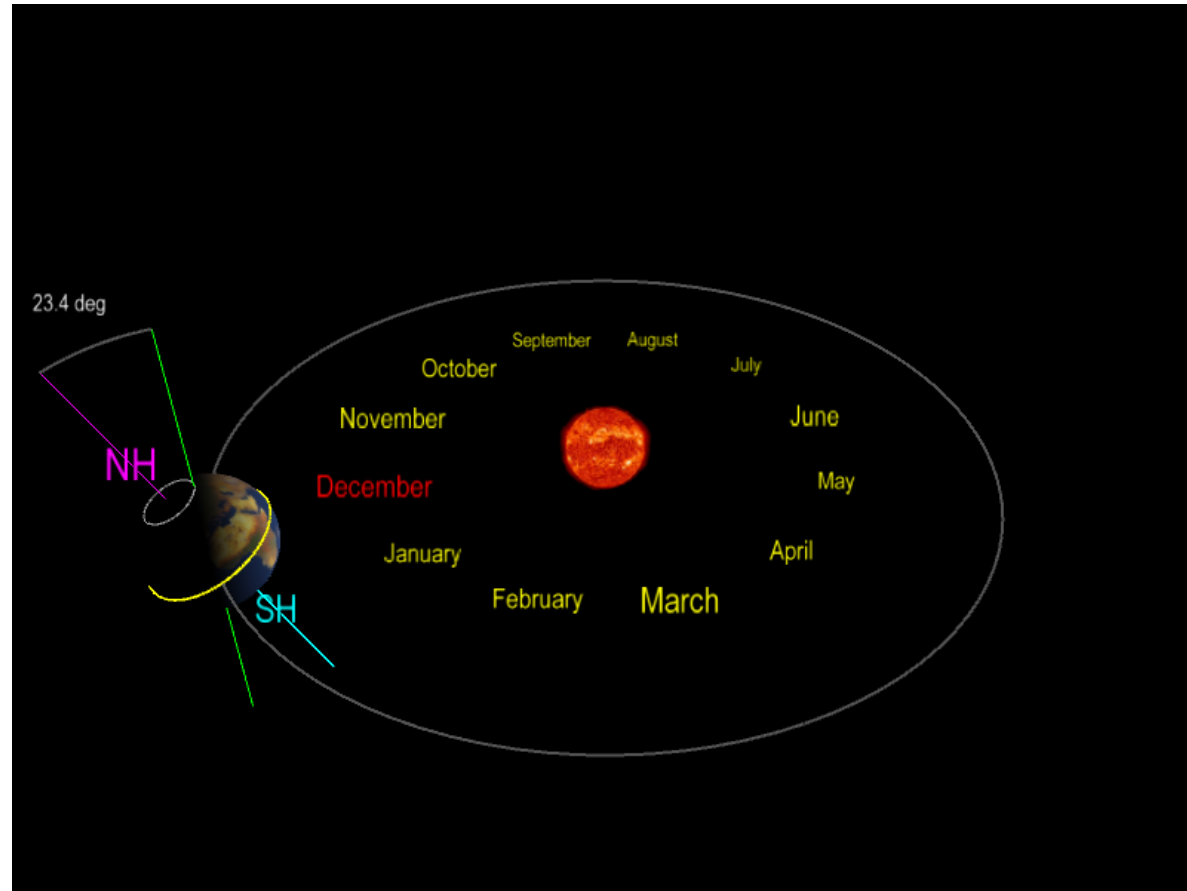


The Seasons



Swinburne Astronomy Online 3D PDF

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1 Description

1.1 The seasons

Throughout the course of the year, the Earth goes through four noticeable seasons: summer, autumn (fall), winter and spring, each lasting for about 3 months. The seasons experienced by the northern and southern hemisphere always differ by six months, so that when it is summer in the northern hemisphere (NH), it is winter in the southern hemisphere (SH), while autumn in the NH occurs at the same time as spring in the SH.

The seasons are a direct consequence of the Earth's tilted rotation axis, which makes an angle of 23.4 degrees to a line drawn perpendicular to the plane of the ecliptic. (In these 3D PDFs, the Earth's rotation axis is shown in magenta in the NH and cyan in the SH, and the line perpendicular to the ecliptic is shown in green). The direction of the Earth's rotation axis stays nearly fixed throughout the Earth's orbit of the Sun, so that at different times during the orbit one hemisphere appears to lean towards the Sun (and that hemisphere experiences summer), while the other hemisphere appears to lean away from the Sun (experiencing winter). Six months later, the Earth has travelled to the other side of the Sun, and is leaning in the opposite direction.

In this 3D PDF, we cycle through the four seasons, starting with the vernal (or NH spring) equinox in March, when neither hemisphere leans towards the Sun and both the NH and SH receive the same amount of sunlight. We then move to the (NH) summer solstice in June, when the NH leans in towards the Sun and experiences long summer days (compared with the short winter days experienced in the SH during the same period). We then move to the (NH) autumnal equinox in September, when again both hemispheres receive the same amount of sunlight. Finally we move to the (NH) winter solstice in December, when the NH leans away from the sun and experiences short winter days (compared with the long summer days experienced in the SH during the same period).

1.2 How to use this 3D PDF

The interactive 3D content appears on the next page of this document. You can interact with the 3D content in a variety of ways. Most of these can be found in the 3D toolbar (see below) that appears when you move the mouse cursor over the 3D figure.



To start, click and hold the left mouse button anywhere within the 3D figure. Then move the mouse around and see how the orientation changes. You can use the right mouse button in the same way to zoom in and out. Other interaction modes are also available. You can explore these by clicking on the drop-down menu of the left-most icon on the 3D toolbar.

Every 3D figure has a default view, which can be returned to by selecting View 1 from the toolbar Views menu. Some figures may also have other interesting views available for you to try.

There are some additional keyboard shortcuts for you to use. (Note that you must first left mouse click on the 3D figure to utilise these shortcuts.)

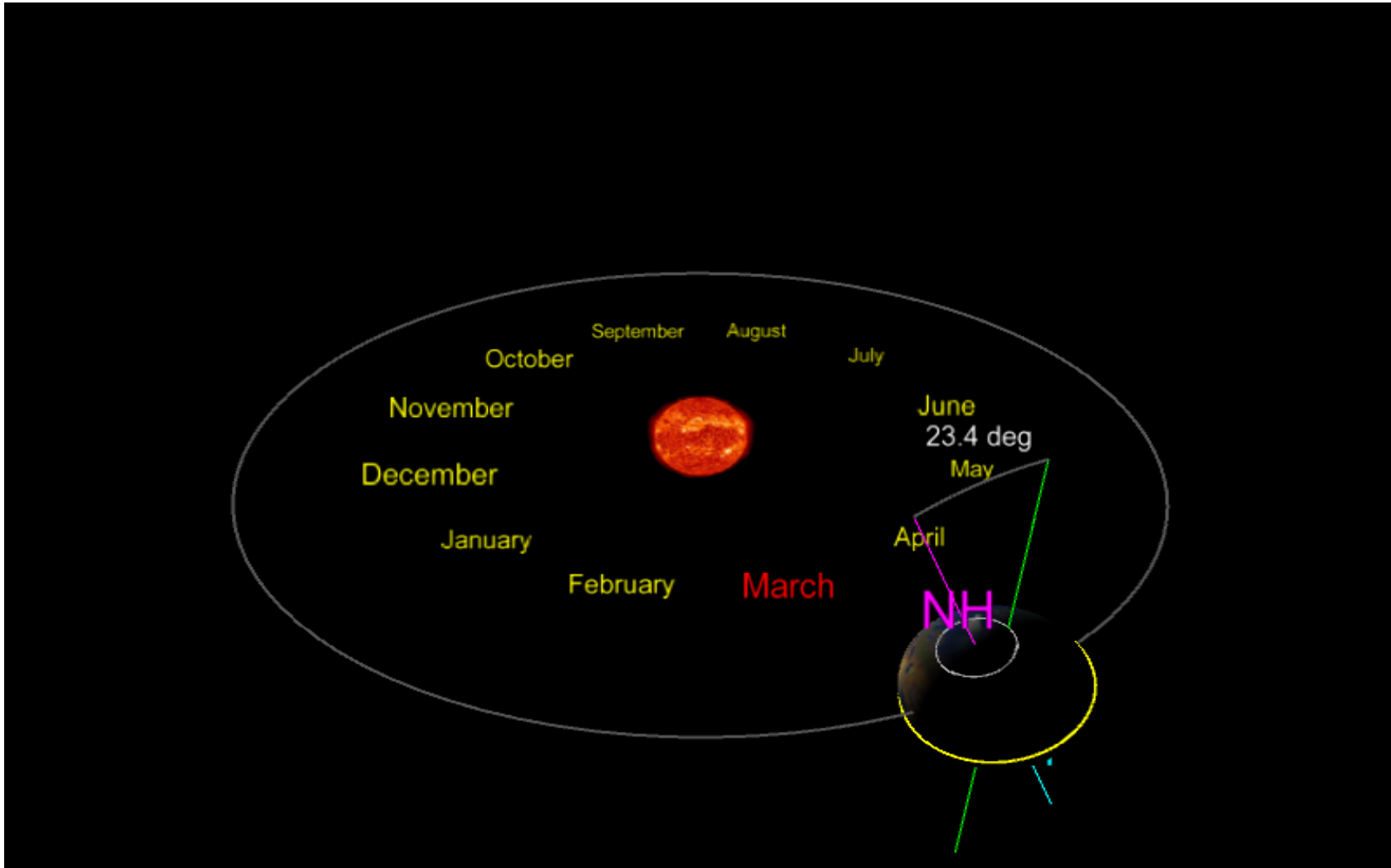
arrow keys (up, down, left, right)	rotate the object
+ , -	zoom in or out
a	autospin
* , /	increase, decrease the autospin speed
[,]	roll the object clockwise, anti-clockwise
h	return to the default view

Some 3D figures may also allow you to show or hide certain types of objects from view. If available, this option will appear as a text link below the 3D figure, e.g. [Click here to...](#)

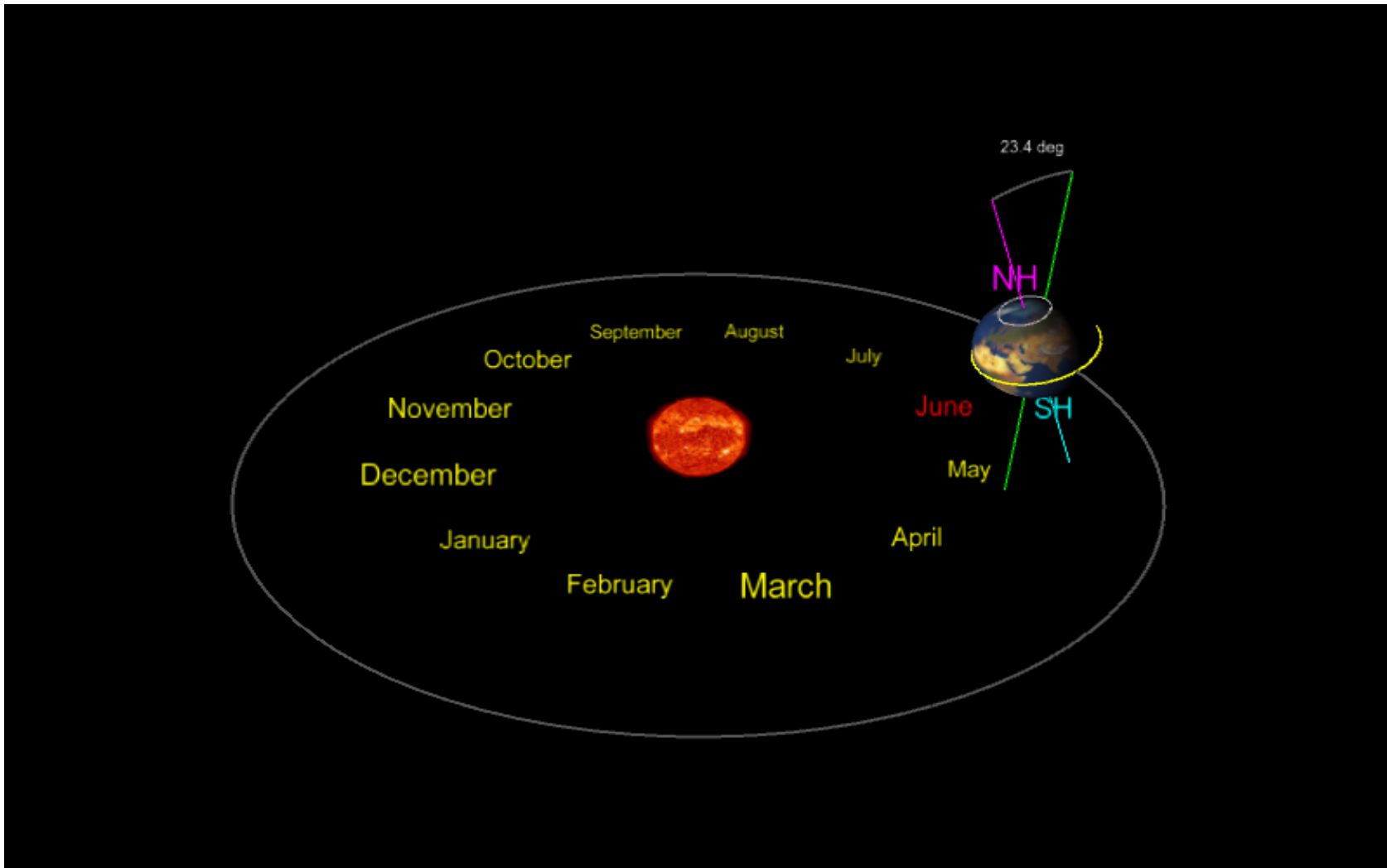
Note: The free Adobe Reader (Version 8 or higher) is required for these 3D PDFs.

2 The seasons

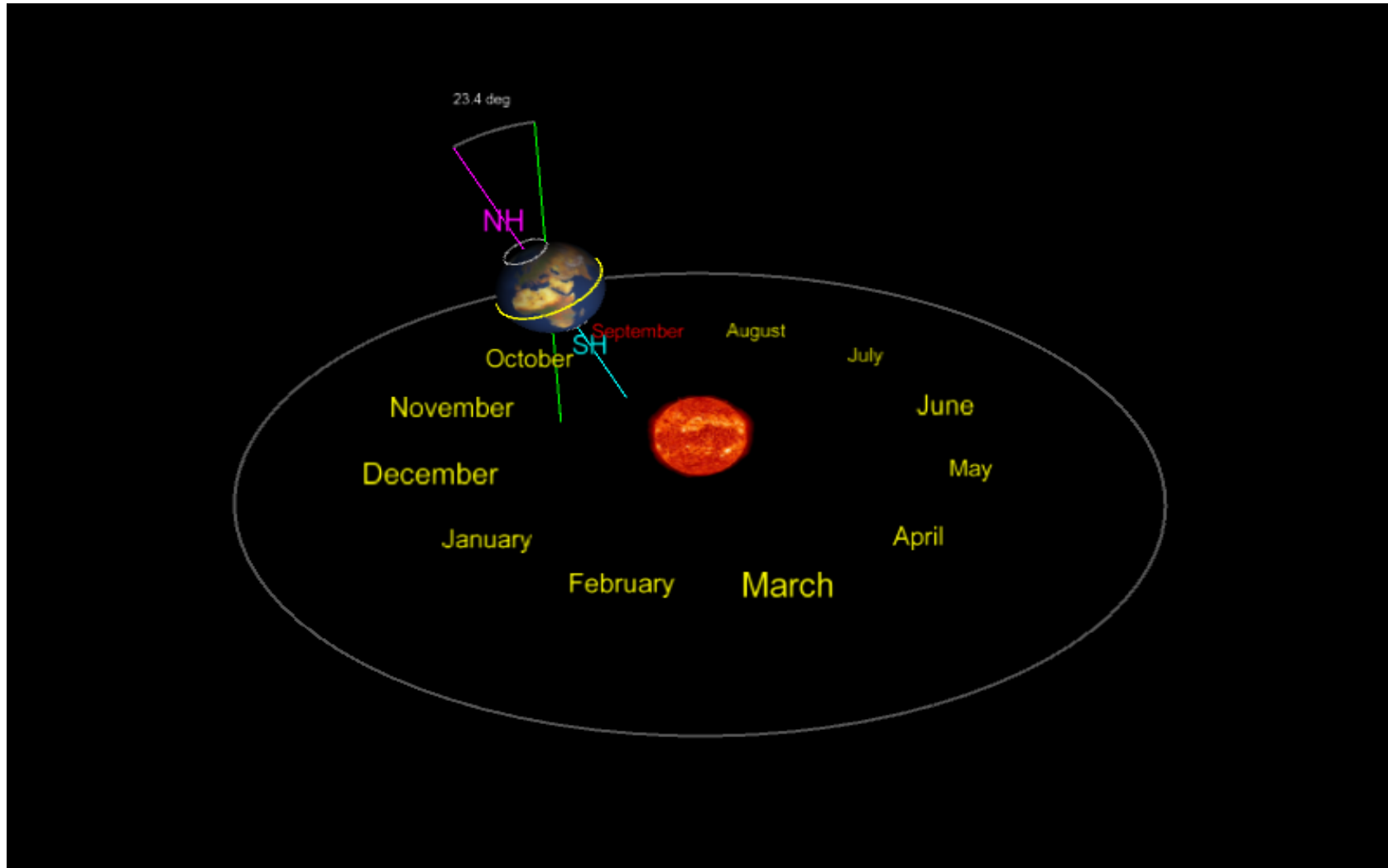
2.1 March



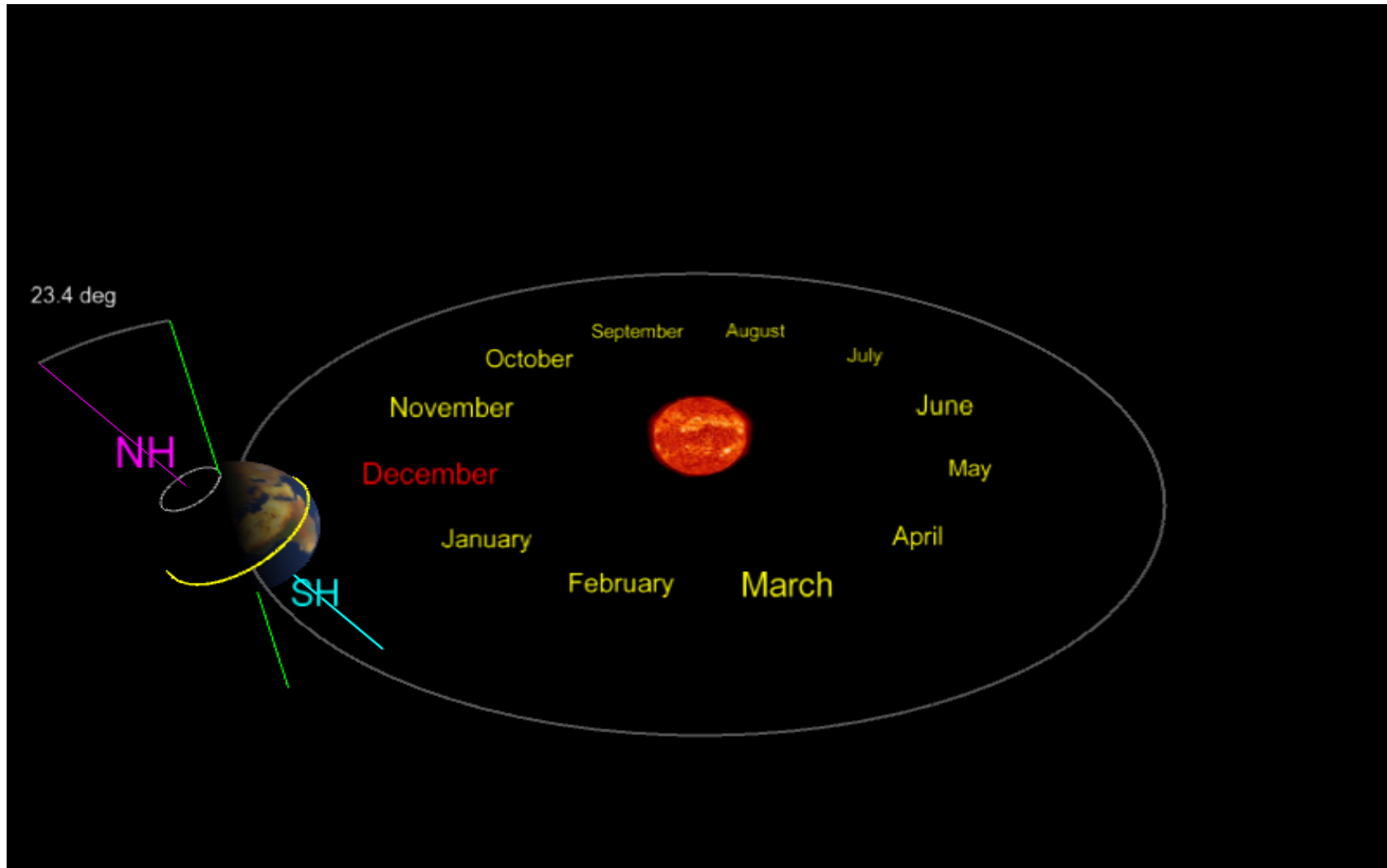
2.2 June



2.3 September



2.4 December



3 Credits

The 3D content in this PDF document was prepared with S2PLOT (Barnes et al., 2006, PASA, 23, 82; Barnes & Fluke, 2008, New Astronomy, 13, 599).

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