

Using Declinations Circles on Any Planet¹

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What if Earth's Obliquity Changes or We Travel to New Planets?

There are a wide variety of obliquities for planets in our solar system (Figure 1), and even Earth's obliquity cyclically changes between 21.5° and 24.5° every 41,000 years – and you can draw declination circles for these different obliquities and determine the planet's climate patterns.

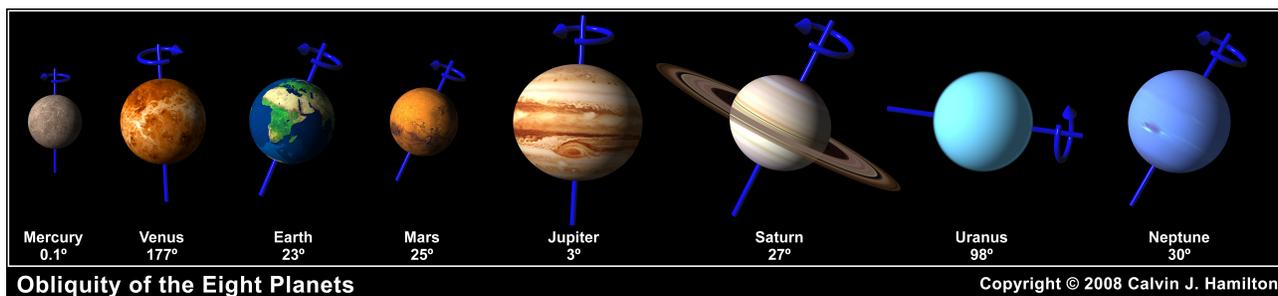


Figure 1. Obliquities of the planets in our solar system. Image from <http://solarviews.com/cap/vss/VSS00105.htm>.

Using our declination circles, we can anticipate how the Sun would appear to move across the sky throughout the year (time to orbit the Sun) for any planet. First, regardless of obliquity, the *equinox* declination circle will always be the same for a given latitude. To draw the *solstice* declination circles, rather than go $\pm 23.5^\circ$ from the equinox declination circle, use the obliquity for the planet.

So what would happen if Earth's obliquity were 0° and you were living at 30°S ? The Sun would appear to move in the same path every day of the year (Figure 2).

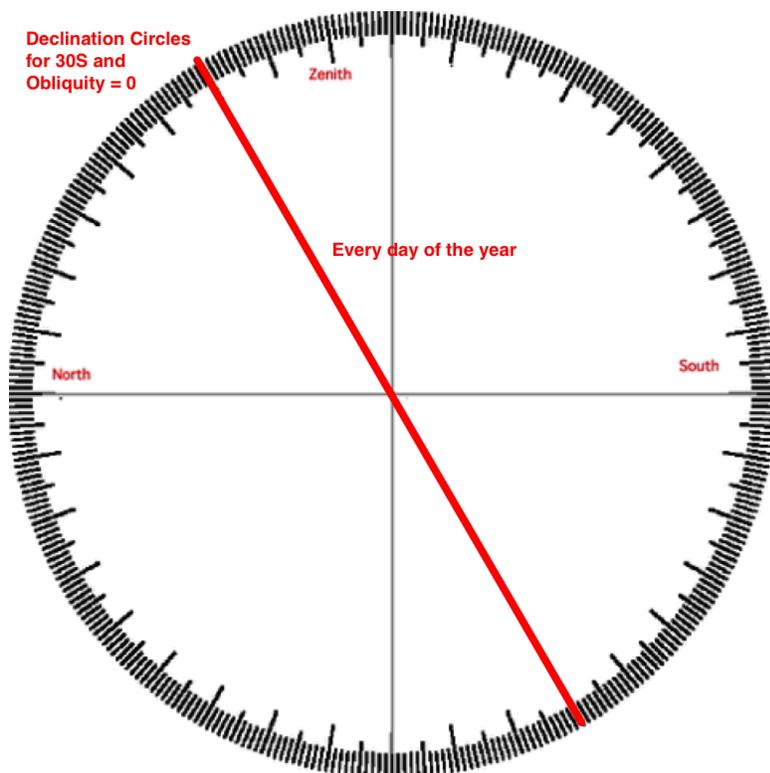


Figure 2. The declination circles for 30°S throughout a year if the planet's obliquity was 0° .

¹ This works for planets orbiting one star. There are planets that orbit two stars and also rogue planets that do not orbit a star.

And what if the obliquity were 90° and living at 30°S (Figure 3)? The equinox declination circle is the same as above, but now go $+90^\circ$ (toward the north) from local noon and midnight to draw the June 21 declination circle, and -90° (toward the south) for December 21 (Note: this assumes the year is the same as Earth's). But this creates a point for each solstice – the Sun will appear at 30° above the horizon and due south for 24 hours on December 21. On June 21, the Sun will be 30° below the horizon and due north for 24 hours. Imagine how the seasons would change throughout the year given this amount of change in declination circles!

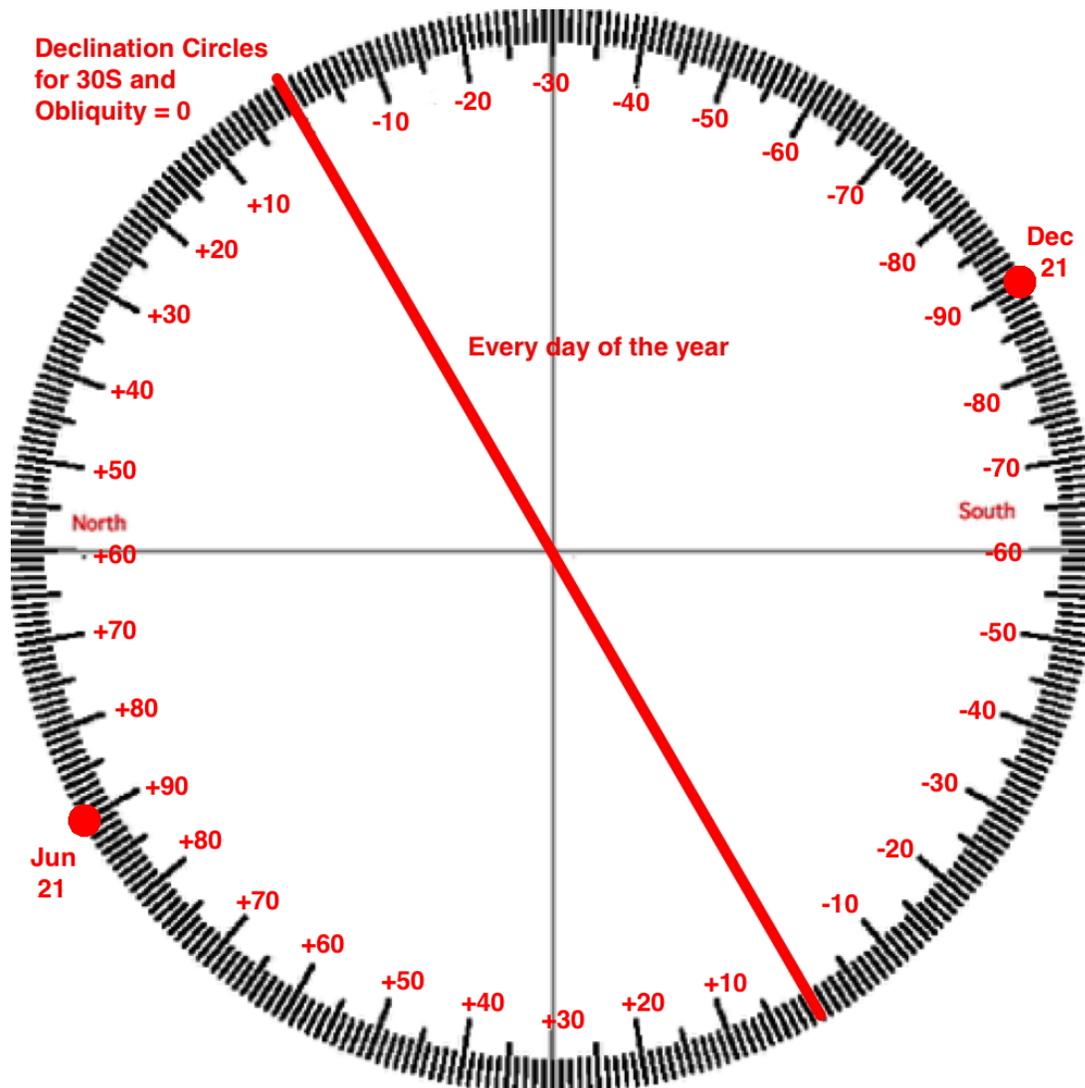


Figure 3. The declination circles for 30°S at the equinoxes and summer (December 21) and winter solstices (June 21).