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Declination Angle

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Basics

Declination Angle Definition

The declination angle**(δ)**, varies every season due to the Earth rotation around the sun and the Earth on its axis of rotation. It would always be zero if not for the tilt f the Earth on its axis of rotation. As a fact, the tilt of the Earth is around **23.45°** and it varies above or below this number. **The δ is equal to Zero only at the spring and fall equinoxes**. The declination angle of the sun is defined as the angle between the equator and the line drawn between the centers of the Earth and the sun Despite the fact of Earth revolving around the sun, it is easier for calculations to consider the sun revolving around a fixed Earth.

Declination Angle Calculation

year The declination angle equals zero at the equinoxes **(March 22 and September 22)**, positive during the summer in northern hemisphere and negative during winter in the northern hemisphere. The declination reaches a maximum angle on **June 22 which is 23.45°** (the northern hemisphere summer solstice) and a minimum angle on **December 21-22 which is of -23.45°** (the northern hemisphere winter solstice). In the above equation, the +10 is due to the fact that the winter solstice occurs before the start of the year. The equation also assumes the orbit of the sun to be a perfect circle and the fraction of **360/365** converts the number of days to the position in the orbit. The apparent northward movement of the Sun during the northern spring, reaching the celestial equator during the March equinox. The declination reaches a maximum angle equal to the axial tilt of the **Earth's axial tilt (23.44°) on the June solstice**, then starts decreasing until reaching **its minimum (−23.44°) on the December solstice**, where its value is equal to the negative of the axial tilt. Seasons are a direct product of this variation.

Declination Angle variance

A line graph plotted for the Sun's declination throughout a year will resemble a sine wave with the amplitude being **23.44**. Since the orbit of the Earth is in fact elliptical, in early Jan the movement of the Earth around the sun is more rapid near the perihelion than in early July near the aphelion. This makes Solar declination variation happen really faster in Jan than in July. Also, since perihelion and aphelion do not happen on the exact dates as solstices, the minima and maxima become slightly asymmetrical, and the change rate are not really equal before and after.

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