2.14 Solar Time

太阳时

Local Solar Time (LST) and Local Time (LT)

地方太阳时与地方时

Twelve noon local solar time (LST) is defined as when the sun is highest in the sky. Local time (LT) usually varies from LST because of the eccentricity of the Earth's orbit, and because of human adjustments such as time zones and daylight saving.

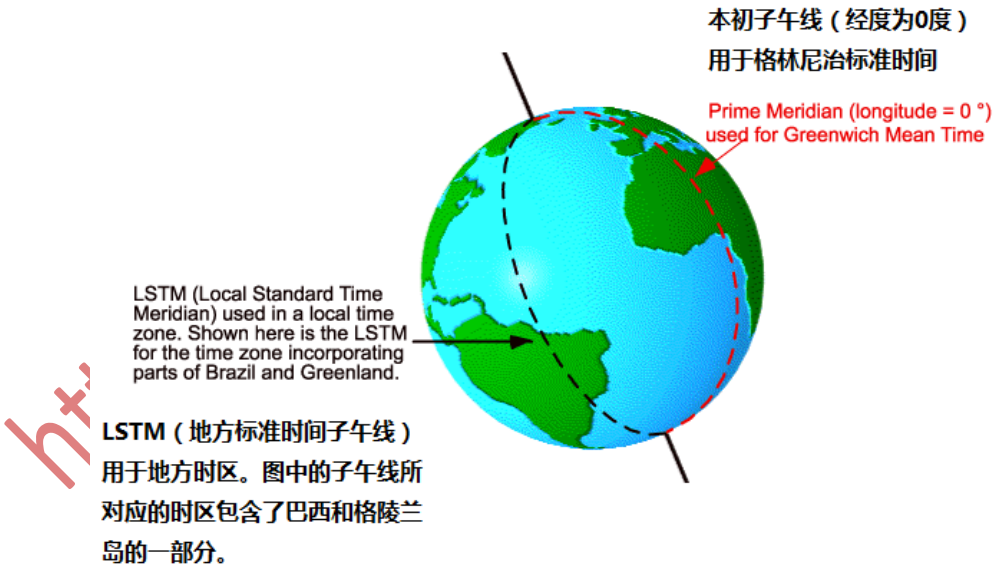
地方太阳时（LST）中午 12 点指的是当一天中太阳升到最高处的时刻。由于地球轨道的离心率以及人们对于时区和夏令时的调整，地方时（LT）一般不等于地方太阳时。

Local Standard Time Meridian (LSTM)

地方标准时间子午线

The Local Standard Time Meridian (LSTM) is a reference meridian used for a particular time zone and is similar to the Prime Meridian, which is used for Greenwich Mean Time. The LSTM is illustrated below.

地方标准时间子午线（LSTM）是对于某一特定时区的参考子午线，它与格林尼治标准时间使用的本初子午线很类似。地方标准时间子午线如下图所示。



The (LSTM) is calculated according to the equation:

$$LSTM = 15° \cdot \Delta T_{GMT}$$

where ΔT_{GMT} is the difference of the Local Time (LT) from Greenwich Mean Time (GMT) in hours. $15° = 360°/24\ hours$.

地方标准时间子午线可通过下面的公式计算

$$LSTM = 15° \cdot \Delta T_{GMT}$$

公式中，ΔT_{GMT}为地方时与格林尼治时间的小时差。$15° = 360°/24$ 小时。

Equation of Time (EoT)

时间公式

The equation of time (EoT) (in minutes) is an empirical equation that corrects for the eccentricity of the Earth's orbit and the Earth's axial tilt.

$$EoT = 9.87\sin(2B) - 7.53\cos(B) - 1.5\sin(B)$$

where

$$B = \frac{360}{365}(d - 81)$$

in degrees and d is the number of days since the start of the year. The time correction EoT is plotted in the figure below.

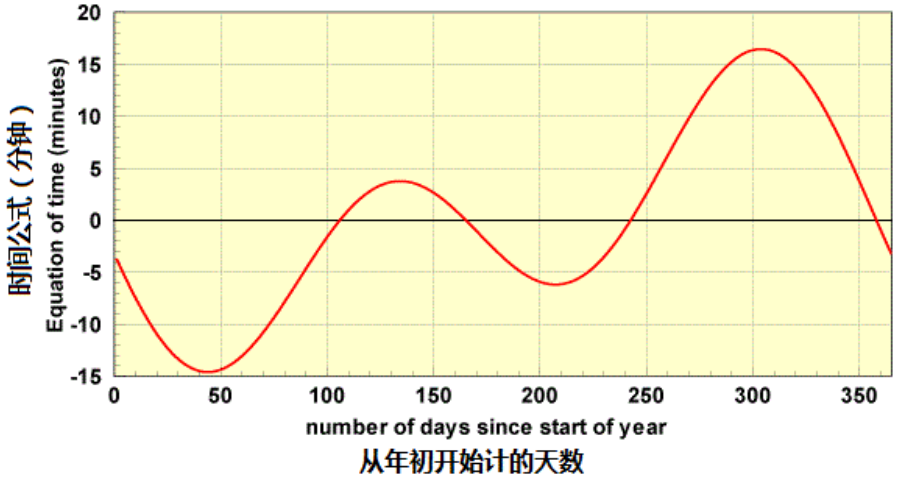
时间公式（以分钟为单位）是一个用于修正地球轨道离心率和地球轴向倾角的经验方程。

$$EoT = 9.87\sin(2B) - 7.53\cos(B) - 1.5\sin(B)$$

公式中

$$B = \frac{360}{365}(d - 81)$$

单位为度，d是某一天在一年中的序数（以一年的第一天为 1）。下图描绘了时间修正公式。



Time Correction Factor (TC)

时间修正因子

The net Time Correction Factor (in minutes) accounts for the variation of the Local Solar Time (LST) within a given time zone due to the longitude variations within the time zone and also incorporates the EoT above.

$$TC = 4(Longtitude - LSTM) + EoT$$

The factor of 4 minutes comes from the fact that the Earth rotates 1° every 4 minutes.

净时间修正因子（TC，以分钟为单位）考虑了某一时区内因为经度变化和时间公式造成的地方太阳时的变化。

$$TC = 4(\text{经度} - LSTM) + EoT$$

方程中的 4 分钟源于地球每 4 分钟转过 1 度。

Local Solar Time (LST)

地方太阳时

The Local Solar Time (LST) can be found by using the previous two corrections to adjust the local time (LT).

$$LST = LT + \frac{TC}{60}$$

运用之前的两个修正因子来调整地方时，我们可以得到地方太阳时。

$$LST = LT + \frac{TC}{60}$$

Hour Angle (HRA)

小时角

The Hour Angle converts the local solar time (LST) into the number of degrees which the sun moves across the sky. By definition, the Hour Angle is 0° at solar noon. Since the Earth rotates 15° per hour, each hour away from solar noon corresponds to an angular motion of the sun in the sky of 15°. In the morning the hour angle is negative, in the afternoon the hour angle is positive.

$$HRA = 15°(LST - 12)$$

通过小时角，我们可以把地方太阳时转换成太阳在天空运动过的角度数。按照定义，太阳时正午对应的小时角为 0 度。因为地球每小时转过 15 度，与太阳时的正午每差一个小时，相当于太阳在天空中多运动了 15 度。上午的小时角是负值，下午的小时角为正值。

$$HRA = 15°(LST - 12)$$

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