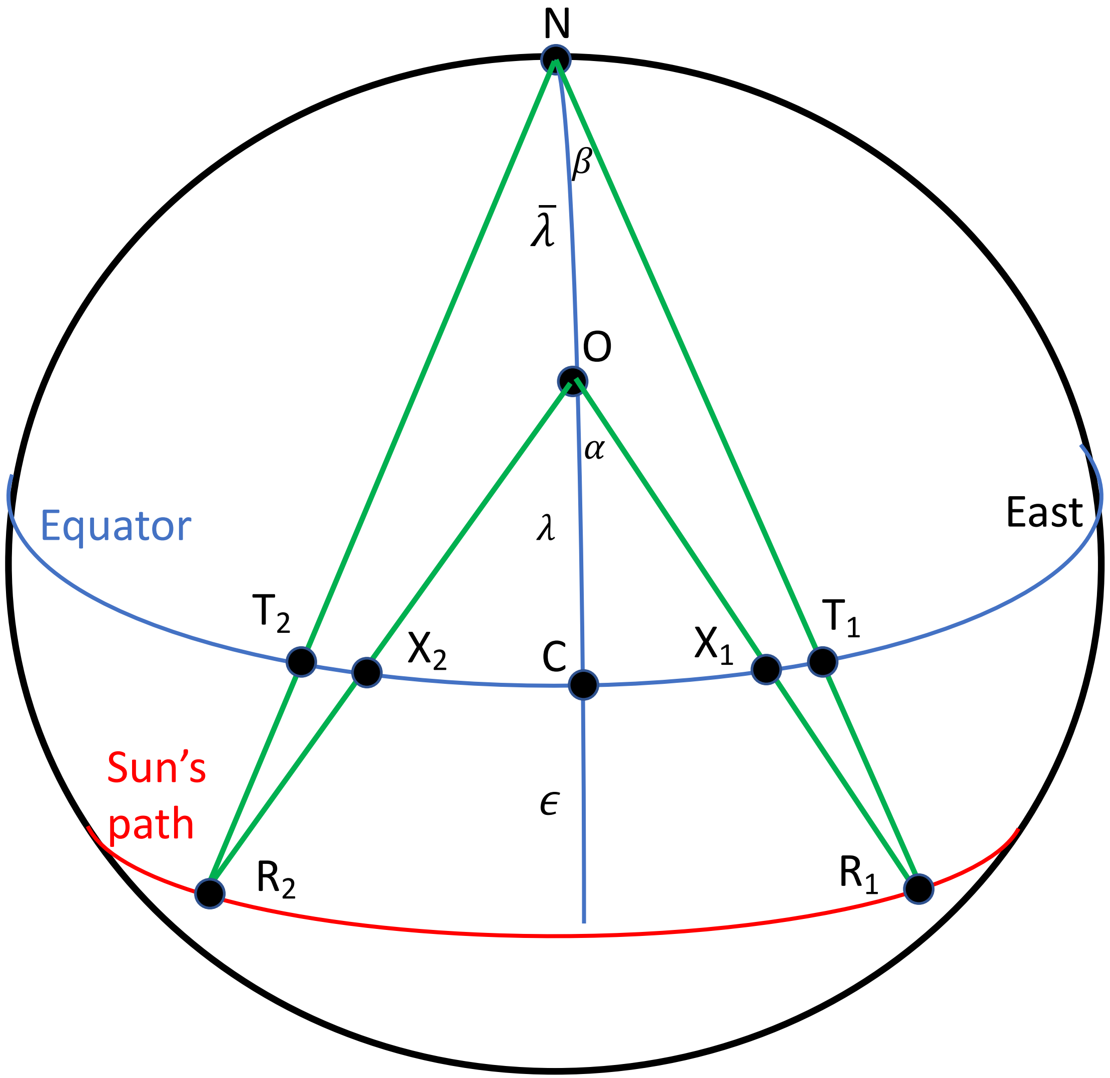

- N is North Pole
- O is observer at latitude λ
- R_1 is position of sun at sunrise OR_1=90
- R_2 is position of sun at sunrise OR_2=90
- T_1 is longitude of sun at sunrise
- T_2 is longitude of sun at sunset

- $NR_1 = \cos(90+\epsilon) = -\cos(\alpha)\cos(\lambda) = -\sin(\epsilon)$
- So, $\cos(\alpha) = \frac{\sin(\epsilon)}{\cos(\lambda)}$ (equation 1)
- $CT_1 = \beta$
- $\sin(\beta) = \frac{\sin(\alpha)}{\cos(\epsilon)}$ (equation 2)

1. Solve for α in equation 1
2. Solve for $CT_1 = \beta$ in equation 2
3. Length of day is $\frac{2CT_1}{180} \cdot 12$ hours

- Note $\epsilon(t) = 23.5 \cdot cos(t)$, t is number of days since December 22 divided by 365.25 times 2π

For spherical triangle

$$\cos(\alpha) = \cos(A)\sin(\beta)\sin(\gamma) + \cos(\beta)\cos(\gamma)$$

$$\frac{\sin(\alpha)}{\sin(A)} = \frac{\sin(\beta)}{\sin(B)} = \frac{\sin(\gamma)}{\sin(C)}$$