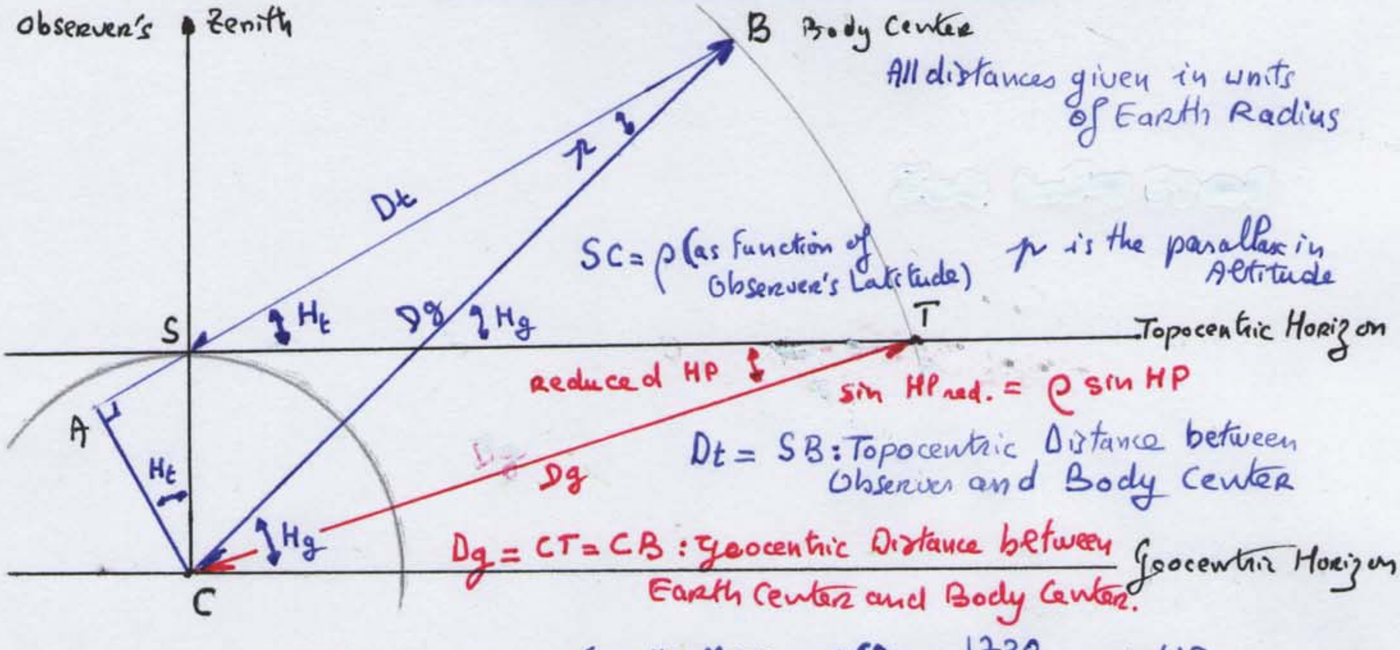
ALMOST PERFECTLY *ACCURATE COMPUTATION FOR PARALLAX IN HORIZONTAL COORDINATES



$\sin HP = \frac{\text{Earth Radius}}{CT} = \frac{1}{Dg}$ For the MOON, $\sin SDg = \frac{1738}{6378.137} \sin HP$

Let Rb be the Body Radius, SD_g : Geocentric SD and SD_t : Topocentric SD

then: $\sin SD_g = \frac{Rb}{Dg}$ and $\sin SD_t = \sin SD_{augmented} = \frac{Rb}{Dt}$

Principal formulae: • $H_g = H_t + p$

• $\sin p = \frac{CA}{CB} = \frac{SC \cos Ht}{CB} = \frac{\rho \cos Ht}{CT} = \rho \cos H_t \sin HP$

• $\tan Ht = (\sin H_g - \rho \sin HP)/\cos H_g$

If you know Ht, Start here → (1) From H_t, compute $\sin p = \rho \cos H_t \sin HP$

(2) $H_g = H_t + p$

If you know Hg, start here → (3) Compute $(D_g \cos H_g,\ D_g \sin H_g)$

(4) Compute $\begin{cases} D_t \cos H_t = D_g \cos H_g \\ D_t \sin H_t = D_g \sin H_g - \rho \end{cases}$

(5) Compute $Dt = \sqrt{(Dt \cos H_t)^2 + (Dt \sin H_t)^2}$

Compute $H_t = \mathrm{Atan}\left(\frac{Dt \sin Ht}{Dt \cos Ht}\right)$

(6) Compute $\sin SD_t = \frac{Dg}{Dt} \sin SDg$

(7) Compute $SD_t = \mathrm{ARCSIN}(\sin SDt)$

MOON EXAMPLE with $Dg = 60$, $HP = 0°9549739$, $SD_g = 0°2602129$

(1) $H_t = 53°$, $\rho = 0.985$, $\sin p = 0.0098798$

(2) $H_g = 53° + 0°5660799 = 53°5660799$

(3) $D_g \cos H_g = 35,633177$ $D_g \sin H_g = 48.2725405$

(4) $Dt \cos Ht = 35.633177$
$Dt \sin Ht = 47.2875405$

(5) $Dt = 59.2104156$

$Ht = 53°0000000$
(Ht value hereabove is a check)

(6) $\sin SDt = 0.0046021$

(7) $SD_t = SD_{augmented} = 0.2636829$

NOTE (1) If you know Ht, in order to compute SD augmented, you need to "travel" all the way from step (1) through step (7)

* NOTE (2) The algorithm hereabove is almost "perfectly" accurate and quite sufficient for the MOON (better than 0.01"). However, because on an Ellipsoid, the Earth center is generally NOT on the Observer's vertical line (NADIR), for utmost accuracy (satellites) computations cannot be carried out in a 2 dimension plan, but in 3 dimension space -

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