

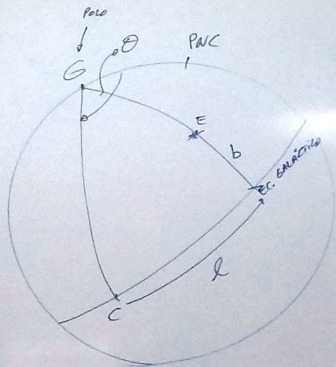
$$\alpha_G = 12^h 45^m$$

$$\delta_G = +27^\circ.4$$

$$\theta = 123^\circ$$

$$\text{LAT. GALÁCTICA: } b \quad -90^\circ \leq b \leq +90^\circ$$

$$\text{LONG. GALÁCTICA: } l \quad 0 < l < 360^\circ$$



$$\alpha_G = 12^h 45^m$$

$$\delta_G = +27^\circ.4$$

$$\theta = 123^\circ$$

LAT. GALÁCTICA: $b \quad -90^\circ \leq b \leq +90^\circ$

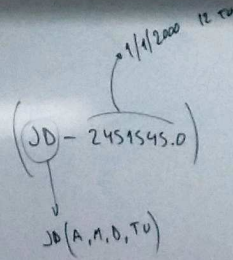
LONG. GALÁCTICA: $l \quad 0 \leq l \leq 360^\circ$

T. SIDÉREO GREENWICH

TSG

$$GMST = 18^h.657375 + 24^h.06570982 \left(\text{JD} - 2451545.0 \right)$$

$$TSL = TSG + \lambda$$



REFRACCIÓN ATMOSFÉRICA

T. SIDÉREO GREENWICH

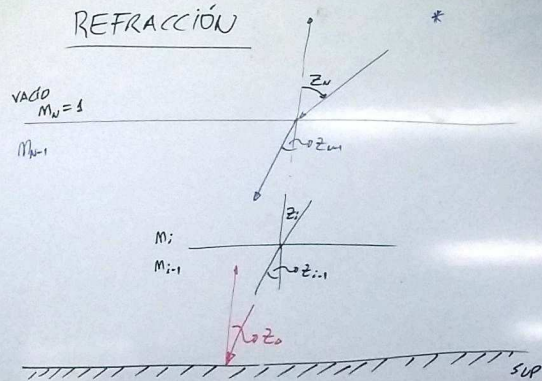
TSG

$$GMST = 18^h.697375 + 24^h.06570982 \left(\text{JD} - 2451545.0 \right)$$

$$TSC_{LOCAL} = TSG + \lambda$$

 $\uparrow 1/4/2000 \text{ 12 TU}$
 \downarrow
 JD(A, M, D, TU)

REFRACCIÓN



Snell

$$M_i \sin Z_i = M_{i-1} \sin(Z_{i-1})$$

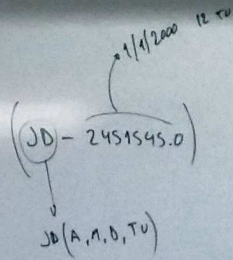
$$M_i \sin Z_i = M_{i-1} \sin Z_{i-1}$$

T. SIDÉREO GREENWICH

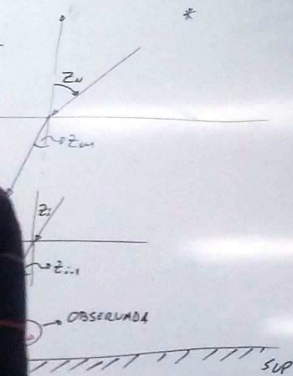
TSG

$$GMST = 18^h.697375 + 24^h.06570982 \left(\text{JD} - 2451545.0 \right)$$

$$TSC = TSG + \lambda$$



REFRACCIÓN



SUCEL

$$M_n \mu_n z_n = M_{n-1} \mu_{n-1} (z_{n-1})$$

$$M_i \mu_i z_i = M_{i-1} \mu_{i-1} z_{i-1}$$

$$M_1 \mu_1 z_1 = M_0 \mu_0 z_0$$

$$M_n \mu_n z_n = M_0 \mu_0 z_0 \rightarrow \text{OBSERVADA}$$

↓
z
"TOPOCÉNTRICO"

T. SIDÉREO GREENWICH

TSG

$$\text{GMST} = 18^{\text{h}}.697375 + 24^{\text{h}}.06570982 \left(\text{JD} - 2451545.0 \right)$$

1/1/2000 12 TU

JD(A.M.O.TU)

$$\text{TSC} = \text{TSG} + \lambda$$

LOCAL

REFRACCIÓN

VACIO
 $n_n = 1$

n_{i-1}

n_i

n_{i-1}

OBSERVADA

SUP

SINEL

$$n_n \sin z_n = n_{i-1} \sin(z_{i-1})$$

$$n_i \sin z_i = n_{i-1} \sin z_{i-1}$$

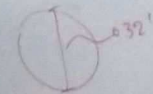
$$n_1 \sin z_1 = n_0 \sin z_0$$

$$n_n \sin z_n = n_0 \sin z_0 \rightarrow \text{OBSERVADO}$$

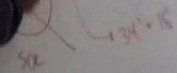
VACIO
1

"TOPOCÉNTRICO"

REF. HORIZONTAL : 34'



Horiz



REFRACCIÓN

"REFRACCIÓN"

$$R = z - z_0 > 0$$

↑
REDUCCIÓN

①: $n_a z = n_0 n_a z_0$

(R+z₀)

SHELL

$$n_0 n_a z_n = n_{a-1} n_a (z_{n-1})$$

$$n_i n_a z_i = n_{i-1} n_a z_{i-1}$$

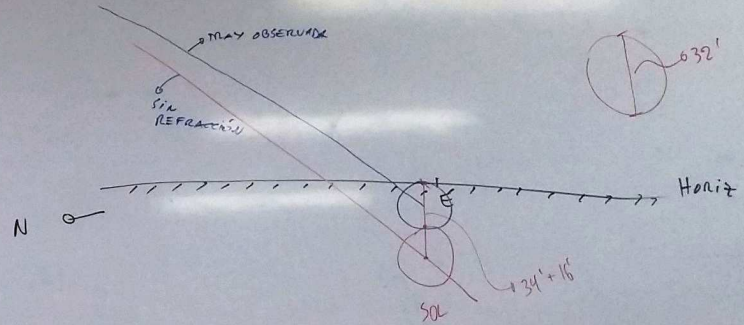
$$n_1 n_a z_1 = n_0 n_a z_0$$

$$n_a n_a z_a = n_0 n_a z_0 \rightarrow \text{OBSERVADO}$$

① VACIO

"TOPOCÉNTRICO"

REF. HORIZONTAL: 34'



REFRACCIÓN

"REFRACCIÓN"

$$R = z - z_0 > 0$$

↑
REDUCCIÓN

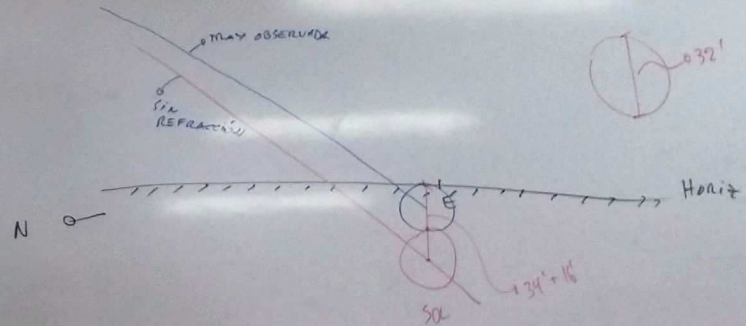
①: $n_1 z = M_0 n_2 z_0$

$$n_1 (R + z_0) = n_2 R \cdot \cos z_0 + n_2 z_0$$

$\sim R$

$$M_0 n_2 z_0 \cong R \cdot \cos z_0 + n_2 z_0$$

REF. HORIZONTAL : 34'



REFRACCIÓN

"REFRACCIÓN"

$$= z - z_0 > 0$$

$M_0 \sin z_0$

$$= n_1 R \cdot \cos z_0 + \cos R \cdot n_2 z_0$$

$\sim R$

$$z_0 \approx R \cdot \cos z_0 + n_2 z_0$$

$$R \cdot \cos z_0 = (n_0 - 1) \cdot n_2 z_0$$

$$\Rightarrow R = (n_0 - 1) \cdot \frac{1}{\cos z_0} z_0$$

RADIALES

$$R = 206265 \cdot \overset{\text{ATM STD}}{1.0002922} \cdot \frac{1}{\cos z_0} z_0$$

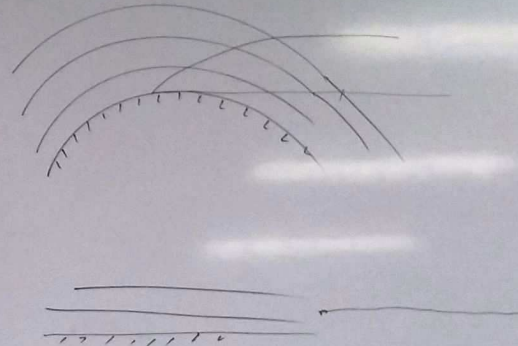
(")

$$\Rightarrow R^{(')} = (K) \cdot \frac{1}{\cos z_0} z_0$$

$\cdot 60'' \cdot 4$

CTE REFRACCIÓN

REF. HORIZONTAL : 34'



REFRACCIÓN

"REFRACCIÓN"

$$R = z - z_0 > 0$$

↑
REDUCCIÓN

①: $n_n z = n_0 n_n z_0$

$$n_n (R + z_0) = n_0 n_n z_0$$

$\sim R$

$$\rightarrow n_0 n_n z_0 \cong R \cdot \cos z_0$$

$$R \cdot \cos z_0 = (n_0 - 1) \cdot n_n z_0$$

$$\Rightarrow R = (n_0 - 1) \cdot \frac{1}{n_n} z_0$$

↑
DIALES

206265 (Astr. 570 1.0002522) $(n_0 - 1) \cdot \frac{1}{n_n} z_0$

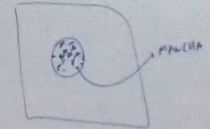
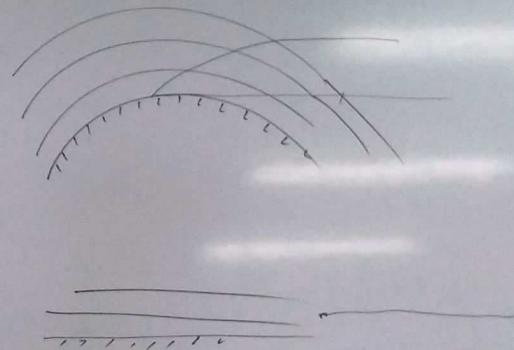
$$R^{(n)} = K \cdot \frac{1}{n_n} z_0$$

VALE PARA $z < 75^\circ$

$\cdot 60'' \cdot 4$

CTE REFRACCIÓN

REF. HORIZONTAL : 34'



REFRACCIÓN

"REFRACCIÓN"

$$R = z - z_0 > 0$$

↑
REDUCCIÓN

①: $n(z) = M_0 n(z_0)$

$$n(R+z_0) = n(R) \cdot \cos z_0 + \cos R \cdot n(z_0)$$

$\sim R$

$$M_0 n(z_0) \approx R \cdot \cos z_0 + n(z_0)$$

$$R \cdot \cos z_0 = (M_0 - 1) \cdot n(z_0)$$

$$\Rightarrow R = (M_0 - 1) \cdot \frac{1}{\cos z_0}$$

↑
RADIANTES

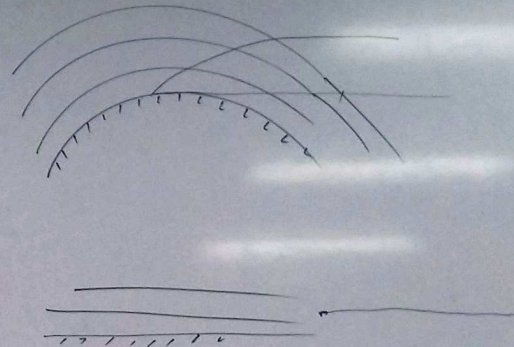
$$R = 206265 \cdot \left(\frac{M_0}{M_0 - 1} \right) \cdot \frac{1}{\cos z_0}$$

↑
ATM 570
1.0002522

↑
(1)

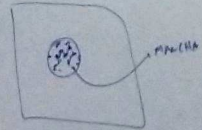
$$\Rightarrow R^{(1)} = K \cdot \frac{1}{\cos z_0}$$

VALE PARA
 $z < 75^\circ$
· 60".4
CTE REFRACCIÓN



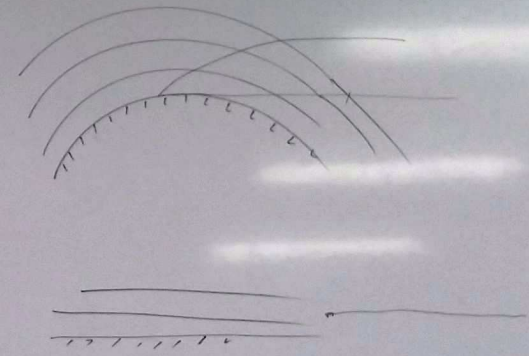
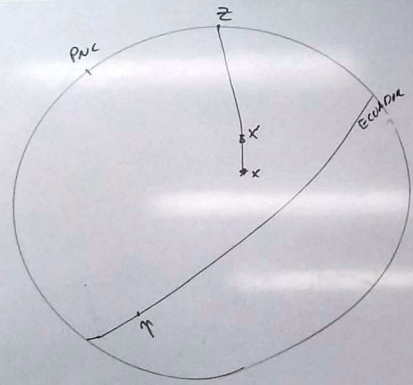
REF. HORIZONTAL : 34'

SEEING



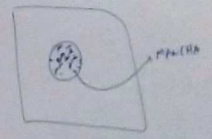
EFFECTO EN α y δ

$A = 0$
 $= R$
 $\Delta\alpha, \Delta\delta?$
 $X = R$



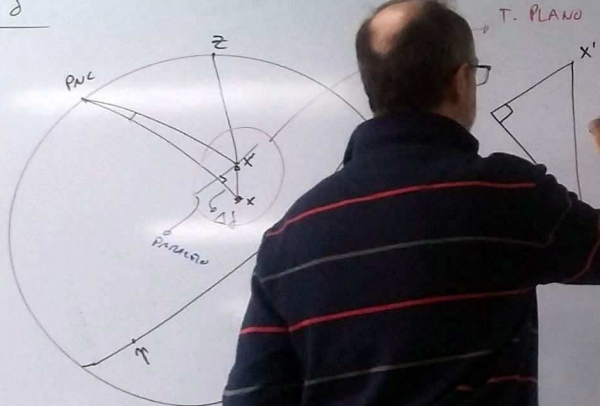
REF. HORIZONTAL : 34'

SEEING



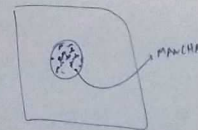
EFFECTO EN α y δ

$$\begin{cases} \Delta A = 0 \\ \Delta a = R \\ \Delta \alpha, \Delta \delta? \\ X'X = R \end{cases}$$

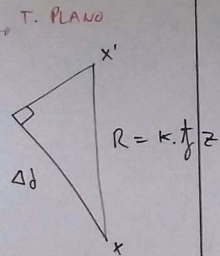
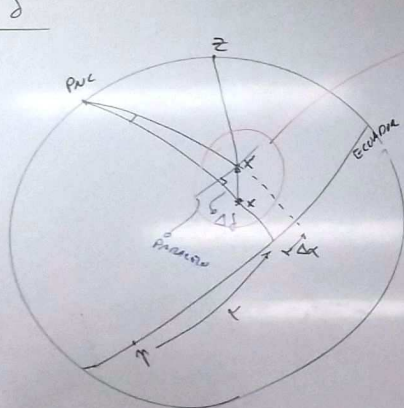


REF. HORIZONTAL : 34'

SEEING



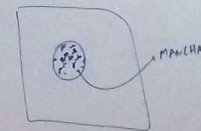
EFFECTO EN α, δ



TOPO

REF. HORIZONTAL : 34'

SEEING

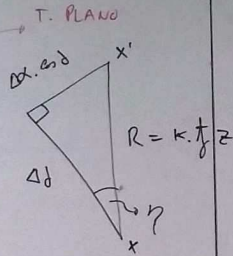
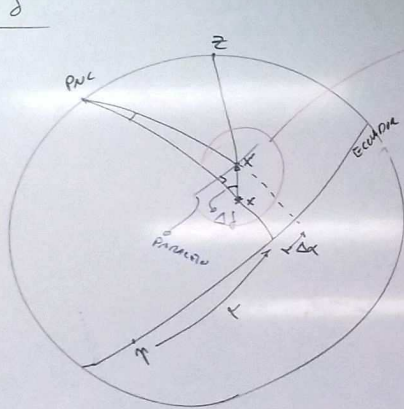


EFFECTO EN α y δ

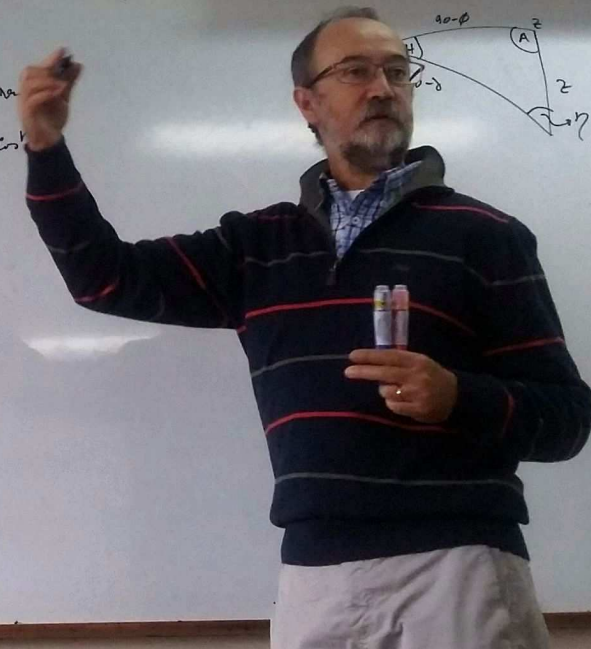
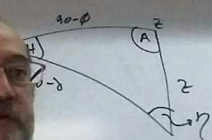
$$\begin{cases} \Delta A = 0 \\ \Delta a = R \\ \Delta \alpha, \Delta \delta? \end{cases}$$

$$X'X = R$$

$$\Delta = \text{OBS} - \text{TOPO}$$



$$\begin{cases} \Delta \alpha \cdot \cos \delta = R \cdot \sin \eta \\ \Delta \delta = R \cdot \cos \eta \end{cases}$$



EFFECTO EN α, δ

$$\begin{cases} \Delta \alpha = 0 \\ \Delta \delta = R \end{cases}$$

$d(\Delta \alpha, \Delta \delta)$

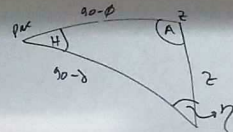
$$X'X = R$$

$$\Delta = \text{OBS} - \text{TOPO}$$

$$\Delta \alpha \cdot \cos \delta = R \sin H$$

$$\begin{cases} \Delta \alpha \cdot \cos \delta = R \sin H \\ \Delta \delta = R \cos H \end{cases}$$

$$\cos \phi = \frac{\sin H}{\sin Z}$$



$$\frac{\sin Z}{\cos \phi} = \frac{\sin H}{\sin Z}$$

$$\cos(90 - \phi) = \cos(90 - \delta) \cdot \cos Z + \sin(90 - \delta) \sin Z \cdot \cos H$$

$$\sin \phi = \sin \delta \cdot \cos Z + \cos \delta \sin Z \cdot \cos H$$

EFFECTO EU

$$\begin{cases} \Delta \alpha = 0 \\ \Delta \delta = R \\ \text{¿} \Delta \alpha, \Delta \delta? \end{cases}$$

$$X'X = R$$

$$\Delta = \text{OBS}$$

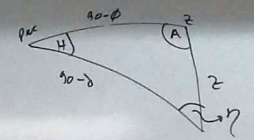
$$\Delta \alpha \cdot \cos \delta = K \frac{f}{z} \cdot \frac{\cos \phi \sin H}{\sin z} = K \cdot \frac{\cos \phi \sin H}{\cos z}$$

$$\Rightarrow \Delta \alpha \cong K \cdot \frac{\cos \phi \sin H}{\cos \delta \cdot \cos z}$$

$\frac{f}{z}$

$$\begin{cases} \Delta \alpha \cdot \cos \delta = R \cdot \sin \eta \\ \Delta \delta = R \cdot \cos \eta \end{cases}$$

$$\cos \phi \cdot \frac{\sin H}{\sin z}$$



$$\frac{\sin z}{\cos \phi} = \frac{\sin H}{\sin z}$$

$$\begin{aligned} \cos(90-\phi) &= \cos(90-d) \cdot \cos z + \sin(90-d) \sin z \cdot \cos \eta \\ \sin \phi &= \sin d \cdot \cos z + \cos d \sin z \cdot \cos \eta \end{aligned}$$

EFFECTO EN α y δ

$$\begin{cases} \Delta A = 0 \\ \Delta a = R \\ \text{¿} \Delta \alpha, \Delta \delta? \end{cases}$$

$$X'X = R$$

$$\Delta = \text{OBS} - \text{TOPO}$$

$$\Delta \alpha \cdot \cos \delta = K f_g z \cdot \frac{\cos \phi \sin H}{\sin z} = K \cdot \frac{\cos \phi \sin H}{\cos z}$$

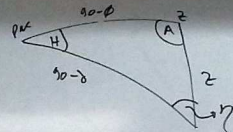
$$\Rightarrow \Delta \alpha \cong K \cdot \frac{\cos \phi \sin H}{\cos \delta \cdot \cos z}$$

$$\Delta \delta = K \cdot f_g z \cdot \frac{(\sin \phi - \sin \delta \cos z)}{\cos \delta \sin z} = K \cdot \frac{(\sin \phi - \sin \delta \cos z)}{\cos \delta \cdot \cos z}$$

\downarrow
 $z \text{ ó } z_0$

$$\begin{cases} \Delta \alpha \cdot \cos \delta = R \cdot \sin \eta \\ \Delta \delta = R \cdot \cos \eta \end{cases}$$

\uparrow $\cos \phi \cdot \frac{\sin H}{\sin z}$



$$\frac{\sin z}{\cos \phi} = \frac{\sin H}{\sin z}$$

$$\begin{aligned} \cos(90 - \phi) &= \cos(90 - \delta) \cdot \cos z + \sin(90 - \delta) \sin z \cdot \cos \eta \\ \sin \phi &= \sin \delta \cdot \cos z + \cos \delta \sin z \cdot \cos \eta \end{aligned}$$