Koordinaatide teisendamine

Saskia

October 2021

1 Sfääriline trigonomeetria

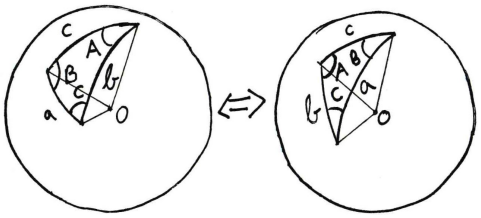
Tuletame meelde sfäärilise trigonomeetria valemid

$$\frac{sina}{sinA} = \frac{sinb}{sinB} = \frac{sinc}{sinC} (1)$$

$$cosa = cosb\ cosc + sinb\ sinc\ cosA (2)$$

$$cosB\ sina = cosb\ sinc - cosA\ sinb\ cosc (3)$$

Saame sümmeetria tõttu a ja b ning A ja B ära vahetada...



Saame kolm uut valemit...

$$\frac{sina}{sinA} = \frac{sinb}{sinB} = \frac{sinc}{sinC} (4)$$

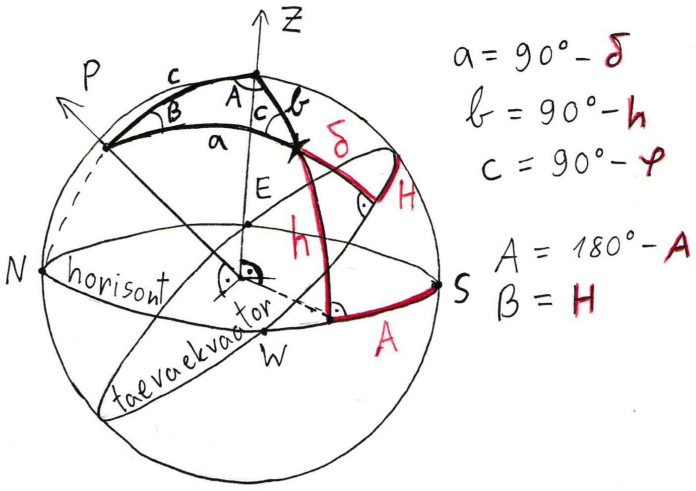
$$cosb = cosa\ cosc + sina\ sinc\ cosB (5)$$

$$cosA\ sinb = cosa\ sinc - cosB\ sina\ cosc (6)$$

2 Horisondiline <=> Ekvatoriaalne

δ

tähistab deklinatsiooni, H tunninurka,h kõrgust ning A asimuuti.



Asendame a, b, c, A ja B joonise järgi valemitesse 1...6.

2.1 => ekvatoriaalne

1)

$$\frac{cos\delta}{sin(180° - A)} = \frac{cosh}{sinH}$$

Kasuta $sin(180° - x) = sinx$

$$\frac{cos\delta}{sinA} = \frac{cosh}{sinH} => \boxed{sinA\ cosh = sinH\ cos\delta}$$

2)

$$sin\delta = sinh\ sin\phi\ + cosh\ cos\phi\ \ cos(180° - A)$$

Kasuta $cos(180° - x) = -cosx$

$$\boxed{sin\delta = sinh\ sin\phi - cosA\ cosh\ cos\phi}$$

3)

$$\boxed{cosH\ cos\delta = sinh\ cos\phi = cosA\ cosh\ sin\phi}$$

Edaspidi on $sin(180° - x) = sinx$ ja $cos(180° - x) = -cosx$ kasutatud ilma ära märkimata.

2.2 => Horisondiline

4)

$$\boxed{sinA\ cosh = sinH\ cos\delta}$$

5)

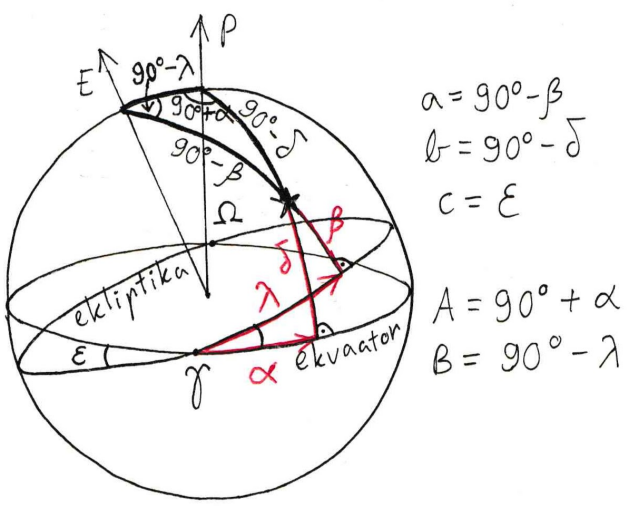
$$\boxed{sinh = sin\delta\ sin\phi + cosH\ cos\delta\ cos\phi}$$

6)

$$-cosA\ cosh = sin\delta\ cos\phi - cosH\ cos\delta\ sin\phi => \boxed{cosA\ cosh = cosH\ cos\delta\ sin\phi - sin\delta\ cos\phi}$$

3 Ekliptiline <=> Ekvatoriaalne

3.1 => ekvatoriaalne



1)

$$\frac{cos\beta}{cos\alpha} = \frac{cos\delta}{cos\lambda} => \boxed{cos\beta\ cos\lambda = cos\delta\ cos\alpha}$$

2)

$$\boxed{sin\delta = sin\beta\ cos\epsilon - cos\beta\ cos\epsilon\ sin\lambda}$$

3)

$$-cos\delta\ sin\alpha = sin\beta\ sin\epsilon - cos\beta\ cos\epsilon\ sin\lambda => \boxed{cos\delta\ sin\alpha = cos\beta\ cos\epsilon\ sin\lambda - sin\beta\ sin\epsilon}$$

3.2 => ekliptiline

4)

$$\frac{cos\beta}{cos\alpha} = \frac{cos\delta}{cos\lambda} => \boxed{cos\beta\ cos\lambda = cos\delta\ cos\alpha}$$

5)

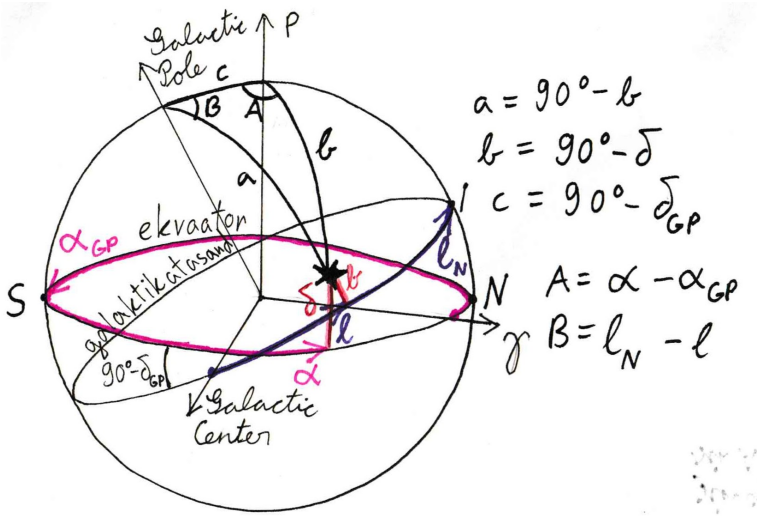
$$\boxed{sin\beta = sin\delta\ cos\epsilon\ \ - cos\delta\ cos\epsilon\ sin\alpha}$$

6)

$$\boxed{sin\lambda\ cos\beta = sin\delta\ sin\epsilon + sin\alpha\ cos\delta\ cos\epsilon}$$

4 Galaktiline <=> Ekvatoriaalne

4.1 => galaktiline



1)

$$\frac{cosb}{sin(\alpha - \alpha_{GP})} = \frac{cos\delta}{sin(l_N - l)} => \boxed{cosb\ sin(l_N - l) = cos\delta\ sin(\alpha - \alpha_{GP})}$$

2)

$$\boxed{sinb = sin\delta\ sin\delta_{GP} - cos\delta\ cos\delta_{GP}\ cos(\alpha - \alpha_{GP})}$$

3)

$$\boxed{cosb\ cos(l_N - l) = sin\delta\ cos\delta_{GP} - cos\delta\ sin\delta_{GP}\ cos(\alpha - \alpha_{GP})}$$

4.2 => ekvatoriaalne

4)

$$\frac{cosb}{sin(\alpha - \alpha_{GP})} = \frac{cos\delta}{sin(l_N - l)} => \boxed{cosb\ sin(l_N - l) = cos\delta\ sin(\alpha - \alpha_{GP})}$$

5)

$$\boxed{sin\delta = sinb\ sin\delta_{GP} - cosb\ cos\delta_{GP}\ cos(l_N - l)}$$

6)

$$\boxed{cos\delta\ cos(\alpha - \alpha_{GP}) = sinb\ cos\delta_{GP} - cosb\ sin\delta_{GP}\ cos(l_N - l)}$$