

Rotating Universe

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Our universe is eternal as all the existence, it has no beginning.

Hubble constant: $H_0 = 2.3 \times 10^{-18} \text{ Hz}$

Local gravitational acceleration:

$$g_U = cH_0 = 6.9 \times 10^{-10}$$

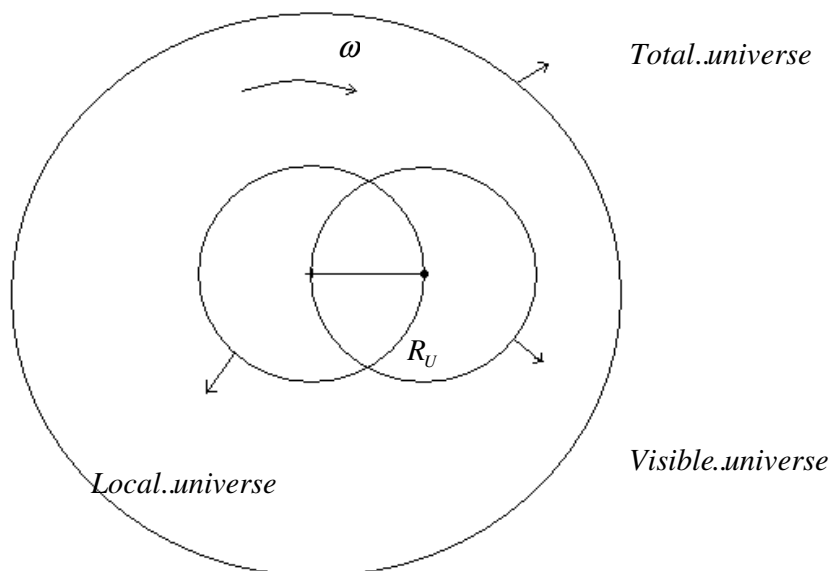
Our universe is rotating with a constant angular speed ω :

$$\omega = 2\pi H_U ; \quad c = \omega R_U = 2\pi H_U R_U$$

$$H_U = \frac{H_0}{2\pi} = 3.66 \times 10^{-19} \text{ -- Frequency of the universe}$$

The local orbital speed is equal to light speed.

R_U = Radius of the local universe



Universe period:

$$T_U = \frac{1}{H_U} = 2.73 \times 10^{18} \text{ s} = 86.51 \text{ Gy}$$

Radius:

$$R_U = \frac{c}{H_0} = 1.3 \times 10^{26} \text{ m}$$

The local orbital speed is light speed:

$$c^2 = \frac{GM_U}{R_U} \quad \Leftrightarrow \quad M_U = 1.76 \times 10^{53} \text{ kg}$$

Some formulas:

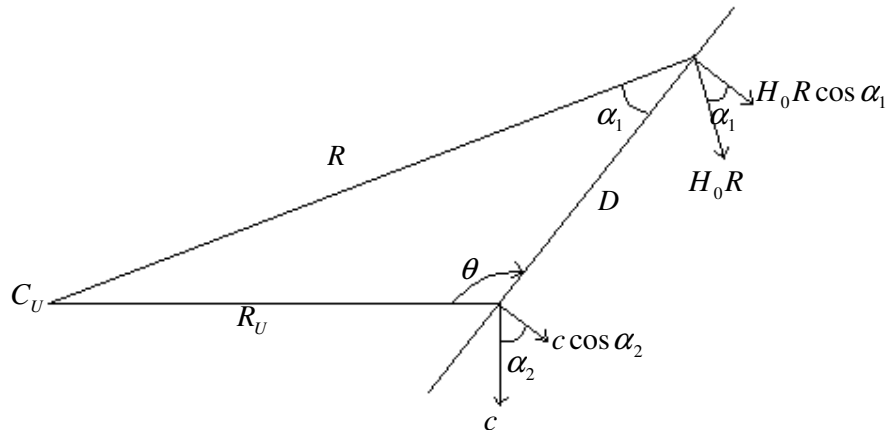
$$T_U = 2\pi \sqrt{\frac{R_U^3}{GM_U}}$$

$$g_U = \frac{GM_U}{R_U^2}$$

$$2\pi R_U = c T_U$$

Apparent linear expansion

The red shift is due to the relativistic dilatation of the wavelengths by transverse relative speed.



Relative longitudinal speed

$$v = H_0 R \sin \alpha_1 - c \sin \alpha_2$$

$$v = H_0 R \sin \alpha_1 - c \sin \theta \quad \text{and} \quad \sin \alpha_1 = \frac{R_U}{R} \sin \theta$$

$$v = H_0 R_U \sin \theta - c \sin \theta \quad \text{and} \quad H_0 R_U = c$$

$$\Leftrightarrow v = 0$$

Relative transverse speed

$$R = \sqrt{R_U^2 + D^2 - 2R_U D \cos \theta}$$

$$v = H_0 R \cos \alpha_1 - c \cos \alpha_2$$

$$R_U^2 = R^2 + D^2 - 2DR_U \cos \alpha_1 \quad \Leftrightarrow \quad \cos \alpha_1 = \frac{R^2 + D^2 - R_U^2}{2RD}$$

$$v = H_0 \frac{R^2 + D^2 - R_U^2}{2D} + c \cos \theta$$

$$v = H_0 (D - R_U \cos \theta) + c \cos \theta \quad \Leftrightarrow$$

$$\Leftrightarrow v = DH_0$$

We found the Hubble law but this speed is transverse.

Transverse red shift

$$x_0 = \frac{cx}{\sqrt{c^2 - v^2}} \quad \Leftrightarrow \quad \frac{\Delta x_0}{x} = \frac{cv \Delta v}{(c^2 - v^2)^{3/2}}$$

$$v \text{ is the relative speed; } \Delta v = c - 0 = c$$

$$\frac{\Delta x_0}{x} \approx \frac{v}{c}$$

For a local speed equal to c the transverse red shift behaves as a longitudinal red shift:

$$x_0 = x \frac{c+v}{c} \quad \Leftrightarrow \quad \frac{\Delta x_0}{x} = \frac{\Delta v}{c}$$

So, a rotating universe with a constant angular speed appears to be expanding.