

Determining the Distance to The Horizon

To determine the distance to the horizon, see the diagram below. The distance to the horizon is denoted by s in the diagram. The distance R is the radius of the Earth (or other planetary body upon which you are standing) and the distance h is the height of your eyes above the Earth (or planet's) surface. From the diagram you can see that the angle theta (θ) is defined by a right triangle with R , $R+h$ and L .

Now we know that:

$$\cos(\theta) = \frac{R}{R+h} \text{ and } s = \theta \cdot R$$

Performing a Taylor Expansion on $\cos(\theta)$:

$$\cos(\theta) = 1 - \frac{\theta^2}{2} \text{ plus higher order terms.}$$

Now we can equate the two terms,

$$\frac{R}{R+h} = 1 - \frac{\theta^2}{2}$$

and, substituting $\theta = \frac{s}{R}$,

$$\frac{R}{R+h} = 1 - \frac{s^2}{2R^2}$$

Performing a little algebra, I get

$$s = R \sqrt{2 \frac{h}{R+h}}$$

