

The Technique used by the Muslim astronomers Ahmed and Mohammed sons of Mosa Ibn Shakir at the time of Caliph Al-Mamoon of the Abbasside Caliphate to measure the size of the earth was to find the size (circumference) of the earth by measuring the altitude of Polaris (North Star) at two different locations on earth knowing the distance between them, and having almost the same longitudes.

Simply measure the altitudes of Polaris at the two locations (β, α), then

$$\lambda + \beta + \pi/2 = \pi \rightarrow \lambda = \pi/2 - \beta$$

$$\kappa = \alpha + \pi/2 = \pi - \delta$$

$$\text{since } \theta + \lambda + \kappa = \pi$$

$$\therefore \text{the angle } \theta = \beta - \alpha$$

$$\text{since } C = \pi \times D = 2 \times \pi \times R \text{ and } s = R \theta$$

$$\therefore C = 2 \times \pi \times s / \theta$$

where θ is in radians

C = Circumference,

D = Diameter

R = Radius

NP = North Pole

NCP = North Celestial Pole

