

Contributions of Muslims to Astronomy (Phys215: alshukri@kfupm.edu.sa)

- Preservation of previous nations works by looking for all available documents in any form and making careful translations of them (Al-Batreek and Tabit Ibn Qarah).
- Building Major Observatories (Al-Shamasiah in Bagdad at the time of Al-Mamoon, Jabal Al-Moqattam in Cairo at the time of Al-Hakym of Fatamite dynasty, Maragah in Summerkand in Uzbekistan at the time of Ulegh Beg, Istanbul 16th century by Taqi Ud-Deen Mohammed Ibn Maaruf)
- Designing and improving and developing high quality astronomical instruments.
- Revising, improving, and scientifically testing previous works. {Measuring the Earth size by Mosa Ibn Shakir and his sons at the time of Al-Mamoon, Translating books such as Almagest and Sinhana(Sind-hind)}
- Precise observation and producing accurate measurements of solar, lunar, planetary, and stellar positions. Then recording them in specially formatted tables called “Azyaj (single:Zeej)” or ephemeris (ephemerides) to be used for future predictions of positions of celestial objects. Exaples: [Zeej Al-Kabeer Al-Hakimi (Ibn Younis), Zeej Al-Alikhani (Al-Tusi), Kitab Suwar Al-Kawakib (Al-Sufi), Zeej Al-Sabi (Al-Battani), Kitab Al-Kannon Al-Masaudi (Al-Bayrouni), Kitab Suwrat Al-Ardh (Al-Khawarizmi), Zeej Al-Sultani (Ulegh Beg), Kitab Al-Safihah (Al-Khazin), Zeej Al-Shaamil (Al-Bouzzjani), Zeej Al-Mamooni (Al-Majreeti), Mulakhas Al-Hayyah (Al-Farqani)]
- Stellar, Planetary, and constellations catalogues. (Ulegh Beg, Al-Fazzari, AL-Sufi, Al-Kindi, and Al-Bayrouni)

The astronomers Ahmed and Mohammed sons of Mosa Ibn Shakir at the time of Caliph Al-Mamoon of the Abbasside Caliphate measured the size of the earth as Eratosthenes did, but in a different way.

The Technique used by Sons of Mosa Ibn Shakir to measure the size of the earth was in Finding 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 the same longitudes.

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

$$\gamma = \pi/2 - \beta, \lambda = \gamma, \text{ and } \delta = \pi/2 - \alpha \Rightarrow \kappa = \pi/2 + \alpha$$

since $\theta + \lambda + \kappa = \pi \Rightarrow \theta = \beta - \alpha$

Then angle $\theta = \beta - \alpha$

$$\text{Circumference} = \pi \times \text{Diameter} = 2 \times \pi s / \theta$$

where θ is in radians.

