FRS 157: PROBLEM SET 2

DUE WEDNESDAY SEPTEMBER 28

Reading: Aristotle, On the Heavens, Book II.

Problem 1: Suppose the Earth is a perfect sphere with radius R. Suppose that an observer is standing on a beach and looking towards the horizon.

(a) Draw a diagram that indicates how far a person of height h can see into the horizon.

(b) Use your diagram in part (a) to compute the distance an observer can see given h and R.

(c) If $R = 6371$km and $h = 2$m, use your answer in (b) to compute the distance an observer can see into the horizon. Compare this to if an observer is standing on a mountain so that $h = 2000$m.

Problem 2 (Diurnal Parallax): Let the radius of the Earth be R.

(a) Draw a diagram to indicate how to use parallax and the celestial sphere's rotation to measure the distance of a celestial object.

(b) Give a formula for the distance of the object to an observer based on two observations of the observer. The formula should only depend on R, the angle between the observations and the observed parallax angle.

(c) If the observer can only look with the naked eye and so can only detect differences of up to 1°, what is the farthest object for which the observer can tell its distance using this method?