Chapter 1

from the sun to the COSMOS

1.1 the sun

To measure the property of distant object, we have to know the distance from it to our instruments at first. **to know the distance is the precondition for the measurement of any property of distant object.**

$<$ **geometry** $>$ parallax triangle geometry⇒the distance between the sun and the earth: $1AU \sim 1.5^{11}m \sim 2^4\times$radius of the earth. ⇒radius of the sun$\sim 100\times$radius of the earth.

how to prove the Euclid geometry is reasonable enough to describe the geometry relation between the sun and the earth.

1. we have to know that how many kinds of geometry there are in the view of mathematics.

2. we have to know that how to distinguish them through physical measurement.

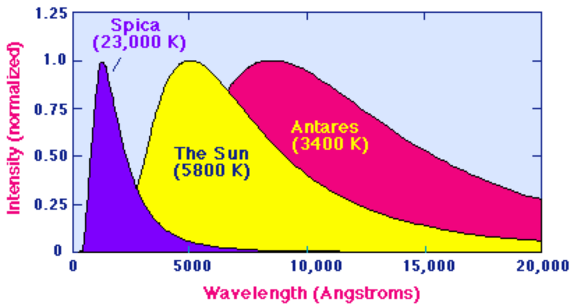
$<$ *light* $>$ sphere + measurement on the earth. ⇒luminosity of the sun.⇒the surface temperature of the sun (Bolzman).

the measurement of luminosity. (ref: classical field→the power of electromagnetical wave.)

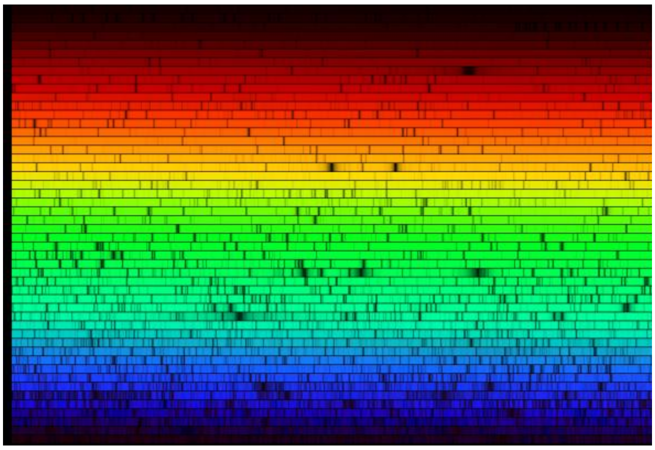
the statistical induction of 2681 stars that their distance from the earth $<$*20pc support such reasoning.*

but, the static geometry view of sphere is wrong when we consider the total luminosity of all the stars that surround the earth.

the spectrum property of the sun: the scene that the sun provide: nearly thermal equilibration and absorption lines, emission lines.



the spectrum properties (black radiation) of Spica, Sun, Antares



the visible spectrum (absorption lines) of solar

$< motion >$ the movement of the earth⇒mass of the sun.

ref: classical mechanics→the two-body central force field

1.2 20pc 100pc from the sun

these

$< geometry >$ parallax triangle geometry based on the anniversary movement of the earth⇒ $1pc = 10^5 AU$; there are 2681 stars<20pc, their average interval is 1pc.

$< radiationspectrum >$ Based on the measurement data of these 2681 stars, we can get elementary understanding about star's luminescence property. Very lucky, it is simple!

(1) blackbody radiation from photosphere of stars. Because that photosphere of stars is nearly thermal equilibration, so the stable stellar radiation is approximate blackbody radiation. For blackbody radiation, the temperature

of blackbody uniquely determine intensity distribution upon the frequencies of radiation.

(2) absorption line from stellar atmosphere, the temperature of stellar photosphere: obafgkm. Integrating radiation intensity distribution on frequencies, we get a function: $F(L, T, R) = 0$, or $L = constant * R^2 * T^4$. where L (luminosity); T(temperature); R(radius).

ref: classical field→black radiation
discontinuous spectrum

1.3 stars

all

$< mainsequencestars >$ the measurement of temperature + luminosity of stars⇒All the stars that we have measured their temperature and luminosity can be obviously sorted into some different classes: most of them belong to main sequence stars, which means that their Hertzsprung-Russell relation: temperature∼luminosity

<the structure theory of main sequence star>$10^2 pc \to 10^5 pc$

<the evolution theory of main sequence star>

1.4 galaxy

Cepheid variables Mpc 10Mpc SN Ia: 10Mpc 100Mpc Hubble

1.5 the principle of universe