

Homework 3

What is the solar constant (definition and value)? What is the surface brightness of the Sun as seen from Earth? What would the solar constant and surface brightness of the Sun be as seen from Jupiter?

The solar constant is the bolometric flux received from the sun at a distance of 1 astronomical unit (AU)[1]. The solar luminosity is $3.9 \times 10^{33} \text{ erg s}^{-1}$, so at a distance of $1.5 \times 10^{13} \text{ cm}$, the solar constant is equal to $1.73 \times 10^7 \text{ erg s}^{-1} \text{ cm}^{-2}$. The surface brightness of the sun as seen from Earth is

From Jupiter, which is about 5 AU ($7.5 \times 10^{13} \text{ cm}$) from the Sun, the solar constant is about $6.93 \times 10^5 \text{ erg s}^{-1} \text{ cm}^{-2}$. The surface brightness of the Sun is the same as that from Earth, as surface brightness is independent of distance at these scales.

References

- [1] J. R. kuhn, K. G. Libbrecht, and R. H. Dicke. The surface temperature of the sun and changes in the solar constant. *Science*, 242:908–911, November 1988.