

Stellar Atmosphere and Structure

Problem Set #190919, due in two weeks

- (a) What are the spectral type, expected mass, radius, surface gravity, and surface temperature of the star Vega? (b) What is the apparent magnitude of Vega in V band? In B band? Describe how each of the quantities mentioned above is estimated.
- (a) List the brightness in Jansky of the star Vega from optical (UBVRI) to near-infrared (JHKL) to mid- and far-infrared wavelengths (12, 25, 60 and 100 microns). (d) Plot its spectral energy distribution and compare it with the blackbody radiation of the surface temperature you found in the last question. You may compare your result with that given in <http://vizier.u-strasbg.fr/vizier/sed/>. The discovery of excess emission beyond mid-infrared came as a surprise (Aumann et al. 1984, ApJL, 289, L23) for this spectrophotometric “standard” star. (e) What is the explanation of the infrared excess?
- Sirius, the brightest star in the night sky, has been measured $m_B = -1.47$, $m_V = -1.47$. The star has an annual parallax of $0.379''/\text{yr}$. (a) From the absolute magnitude, what spectral type can be inferred for Sirius? (b) From the observed (B-V) color, what can the spectral type be inferred? Discuss the possible reason(s) why the answers in (a) and (b) differ.
- (a) What is the solar metallicity (Z value)? (b) List the five most abundant chemical elements of the sun. Of the Earth?