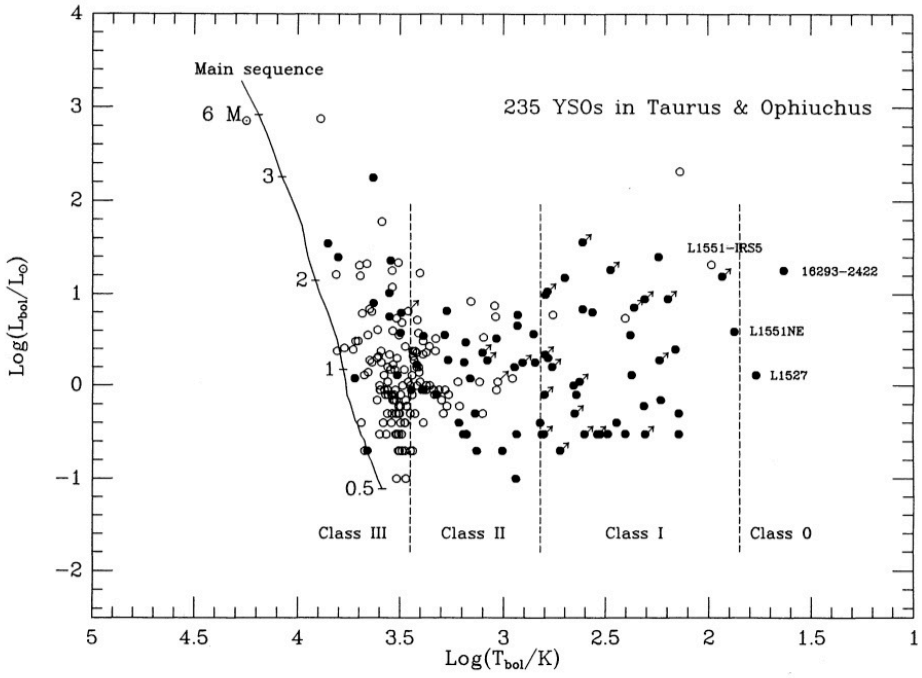
AST 300B – Spring 2018

In-class/take-home Problems Due: Friday January 26

7. We sometimes plot νF_ν when we want to approximate total flux from a (monochromatic) flux density. Calculate how good of an approximation this is for a blackbody like the Sun by comparing the solar total emergent flux with an approximation of the total emergent flux given by the equation $F^+ = \nu_{max} F_\nu^+$ evaluated at ν_{max}, the peak of the solar Spectral Energy Distribution (SED).

8. Protostars are classified (Class 0/I/II/III) by how deeply embedded they are within the dusty cores in which they form within molecular clouds. One evolutionary metric is the "Bolometric Temperature" (T_{bol}) which is defined as the temperature of the blackbody that has the same mean frequency as the observed SED of the protostar. In a seminal paper by Chen et al. 1995 ApJ 445, 377, T_{bol} was determined for protostars in different evolutionary phases. Derive their equation:

$$T_{\rm bol} = \frac{\zeta(4)}{4\zeta(5)} \frac{h\langle\nu\rangle}{k} = 1.25 \times 10^{-11} \langle\nu\rangle \ {\rm K\ Hz^{-1}}$$



.—Bolometric luminosity-temperature diagrams of all 235 YSOs in the three regions. The open circles are the sources with a known spectral type, and the les are the sources without a known spectral type. The solid line shows the zero-age main sequence for stellar mass of 0.4–6 $M_\odot$. Sources without peaks in tra are shown with the arrows. The dashed lines show the regimes approximately corresponding to the YSO spectral energy distribution classes 0, I, II,