ASTR 792
T/R 9:30 - 10:45 AM
Due October 19

Week #9

Draine 5.3abc

Most interstellar CO is $^{12}\mathrm{C}^{16}\mathrm{O}$. The $J = 1 \to 0$ transition is at $\nu = 115.27$ GHz, or $\lambda = 0.261$ cm, and the $v = 1 \to 0$ transition is at $\lambda = 4.61$ μm (ignoring rotational effects).

(a) Estimate the frequencies of the $J = 1 - 0$ transitions in $^{13}\mathrm{C}^{16}\mathrm{O}$ and $^{12}\mathrm{C}^{17}\mathrm{O}$.

(b) Estimate the wavelengths of the $v = 1 - 0$ transitions in $^{13}\mathrm{C}^{16}\mathrm{O}$ and $^{12}\mathrm{C}^{17}\mathrm{O}$. Ignore rotational effects.

(c) Suppose that the $^{13}\mathrm{C}^{16}\mathrm{O}$ $J = 1 - 0$ line were mistaken for the $^{12}\mathrm{C}^{16}\mathrm{O}$ $J = 1 - 0$ line. What would be the error in the inferred radial velocity of the emitting gas?