

Exercises for Radiative Transfer in Astrophysics (SS2012)

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Exercise sheet 9 - Extra

Spherical circumstellar dusty envelope model (part IV: CO lines)

4. Introducing a velocity field

- (a) Now introduce a radial velocity field according to the following formula:

$$v(r) = v_{\text{in}} \sqrt{\frac{r_{\text{in}}}{r}} \quad (7)$$

with $v_{\text{in}} = -1$ km/s.

- (b) Make a spectrum.
- (c) Try higher and lower values of $\rho_{\text{dust},0}$ (i.e. higher and lower gas density and CO number density, too). When do you get a nice inverse P-Cygni profile?