Physics 224: Paper Discussion 1
Spring 2018

Field, Goldsmith & Habing 1969:

- Why did they not extend their curves with depleted cooling agents to lower densities? Could this affect the stability of the high temperature gas phase F?
- Both in previous papers and through Field, Goldsmith, and Habing's model, it is shown that low-energy cosmic rays sufficiently heat the ISM. Is there any way for us to directly detect low-energy cosmic rays, or is it impossible because they are kept out of the solar system by the sun? - What are impurity atoms? Are they just metals? - Is a private communication citation still valid for publishing today?
- Clarification question: this model of the ISM consists of a hot gas that is heated through large flux of low-energy cosmic rays that surrounds cooler dense clouds. The hot gas is what is called the "inter-cloud medium" throughout the paper? Also, why low-energy cosmic rays?
- I assume that pressure equilibrium is valid when clouds are not expanding? Do we need to consider other factors such that this condition is applicable?
- Can supernovae explosion actually provide a constant cosmic ray background, both in energy distribution and in time...?

Wolfire et al. 1995:

- It's impressive that they came up with such a good model that is in equilibrium when the ISM is constantly changing. - Has this model been applied to starburst regions yet? If so, does it hold up?
- When talking about photoelectric ejection of electrons, they say that most of the electrons don't reach the surface, but there is a fraction that is ejected from the grain. They then go on to say how energy is lost in the electron before it can break free? I wanted to clarify that there is energy lost in the /electron's collisions/ with other atoms in the grain, and there must be enough energy after that to overcome the work function and Coulomb potential. Also, they state that the O abundance found by Cunha and Lambert is a factor of 2 less than the solar abundance. I thought with the values given, the O abundance is greater than the solar abundance? I think I'm missing something here.

- Looking at Figure 3. In regards to metal line cooling, why is it that as density increases the cooling rates for OI decrease past $n_H > 1$ cm^{-3} while CII and CI increase? Also, how accurate is it to attribute all metal line cooling to just C and O? Are there no density ranges where another element might dominate?

- This paper is pretty consistent with the local ISM observations. How good is this model when we apply it to the non-local ISM and (maybe) ISM around other galaxies?