Physics 224: Paper Discussion 7
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**Haffner et al. 2009:**

- On page 978, the authors discuss how the number of chimneylike structures predicted by models is much larger than the number actually observed. How has this disconnect changed as observations and models have improved? Is there still disagreement?

- The paper claims realistic radiation fields and a higher escape fraction agree better with observations. Could a better escape model along with hot-cool gas interfaces and other mechanisms explored in this paper provide the ionizing flux and temperatures associated with the WIM?

- Since this paper is old ($\sim$10 years ago), has there been an explanation for the source of high/elevated temperatures?

- Section VI briefly discusses the role of hot gas-cool gas interfaces in the UV flux of the galaxy. The examples considered are cold clouds surrounded by much warmer medium. Can this mechanism work in an opposite scenario, i.e. when a rarefied and warmer bubble is surrounded by colder diffuse gas?

- A candidate for this scenario may be the so-called "superbubbles" discussed earlier in the paper, where they act as "chimneys", providing a pathway for the UV photons to escape into the halo. If the interfaces surrounding those superbubbles can indeed emit UV radiation, they would contribute more UV flux than the interfaces considered in the paper, as not only would they emit UV photons, but also provide them with an immediate opportunity to escape.

- This paper has a discussion on the escape of ionization through superbubbles. Is this something that happens a lot in the Milky Way, and if so is there enough of it to have any significant effect on the gas contained in its satellites (like the LMC)?

- this paper is very complete in terms of having lots of information about the ISM. they end the paper by discussing some things for future study. It is always good to study new topics, but how much more information about the ISM can one gather from getting a specific line width or some other fine parameter? Can a change in one o these undiscovered parameters change any of the conclusions of this paper?

- I have two comments. 1) I feel that IFU observations would be advantageous in determining the spatial distribution of the gas. Has there been any effort

on this front? 2) It appears to be established that Galactic Winds are major player in a galaxies evolution. Could shocks generated by Galactic Winds add to the photon ionization budget which drives DIG formation?

- The clumpy ISM models and the leaky HII regions are quite interesting. In Section V. B and C, the authors compare between smooth and clumpy medium. I wonder if there constraints on the density values/profiles they set? For example, does the density of the smooth medium need to be a value between the high and low densities of the clumpy medium? If the clumpy medium has an overall density higher than the smooth medium, will photons still be able to reach to larger distances? Another question is, at the end of Section V, I don't understand what the authors meant by "It cannot yet be ruled out that most of the DIG ionization is produced by later O stars, because the earliest (hard-spectrum) O stars may preferentially have their ionizing radiation absorbed within their parent molecular clouds." Why does earlier O star has hard spectrum, and how is the absorption in parent molecular clouds related to this?

- The WIM permeates throughout galaxies right but how does its localization change as we head away from the disk? So, another way of putting it is what is the kind of scale height we look at when going outward above the plane of a disk. What kind of changes does the WIM exhibit at this boundary?

- We see that as hot and cold gas run anti parallel to each other that threads of turbulence for between them, but not other scenarios. If the hot gas was blowing into cool gas from an exhaust vent it would probably have the same thread like behavior along the side of the vent but towards the end of a vent where it mixes what kind of behavior would be expected? Condensing clouds?

- In discussing warm neutral gas, the authors note: "However, to date there have been no observational studies of the H+ to H0 connection". Why is that?

- I was a bit confused by some of the possible explanations the authors describe for why heavier elements are not ionized at the same rate in the WIM as in HII regions. Has there been any progress in answering this question? It feels like an important distinction between the regions, and would seem important in any model describing the formation and dynamical evolution of the WIM.