

## Cosmology Ay127, Spring 2010

### Problem Set 8

Due: first class of week 9

1. Read the paper, “Model-Independent insights into the nature of the Lyman-alpha forest and the distribution of mater in the Universe,” by Joop Schaye, *Astrophys. J.* 559, 507–515 (2001). This paper goes a bit beyond the arguments given by Peebles’ book (and in class) in an effort to understand the nature of the Lyman-alpha clouds. Try to understand carefully everything that is in the paper. In particular, you should (a) derive Eqs. (1)–(4) and try to understand why he argues that Lyman-alpha absorbers are always in hydrostatic equilibrium. (b) Derive the result  $\langle n_H \rangle = (3/4)n_H(b)$  below Eq. (5). (c) Then derive Eqs. (8)–(16). (d) Then summarize the main points and conclusions of Section 4. Finally, (e) you will notice that several times he says that pressure-confined clouds are ruled out and refers to the 1998 Rauch review. Explain what is meant by “pressure-confined” clouds and why they are ruled out.
- 2 . Read the paper “Imaging the forest of Lyman-limit systems,” by Gould and Weinberg, *Astrophys. J.* 468, 462–468 (1996). Summarize the central points, arguments, and conclusions, including quantitative *estimates* (not detailed calculations). Try to figure out if anybody has pursued observationally the idea they proposed, and if so, whether there have been any detections of Lyman-alpha emission they propose to look for.
3. Read the paper, “Formation of Disk Galaxies” by Dalcanton, Spergel, and Summers, *Astrophys. J.* 482, 659–676 (1997). Read the paper *carefully*, being sure you understand where all the equations come from. Now here’s the assignment: There are nine figures in the paper. Write one paragraph about each figure, in which you describe for somebody (a professional cosmologist) who has not read the paper what each figure contains, and the main point that the authors intended to make with each figure.