Formation and Evolution of Galaxies - Paper Reading 3

Teaching Assistant: Fernanda Roman de Oliveira - **romanoliveira@astro.rug.nl**

13-10-2023

1 From halos to galaxies

Read first **White & Rees (1978)**.

1. Describe how galaxies form according to White & Rees (1978) and how it compares to our current understanding of galaxy formation.
2. What is the cooling function? Explain it by using formulae and plots.
3. How is the cooling function related to the cooling time? What are the main cooling processes?

2 The role of quasars in galaxy formation

Read first **Silk & Rees (1998)**.

4. Describe which processes are involved in the formation of a super-massive black hole (SMBH) according to Silk & Rees (1998).
5. What is the role of Quasar winds?
6. What is the relation proposed between the SMBH mass and its surrounding environment? Explain the meaning of the parameters involved and give an interpretation of this relation.
7. Describe the impact of quasar activity on star formation in a galaxy.

3 Simulations of Galaxy Formation

Read first **Springel et al. (2005)**.

8. Mention two problems that galaxy simulations suffer from.
9. Describe the number of particles, redshift range and region considered in the Millenium simulation.
10. Describe the principal structure of GADGET-2.
11. Figure 2 in Springel et al. (2005) show the halo number density as function of halo mass. Is it well-fitted by a Schechter Function?
12. Describe the environment and evolution of high-redshift quasars as found from the simulation.

13. What do they refer to with so-called "baryon wiggles"? Why are these important to constrain with the simulation? What important result do they find regarding the evolution of the power spectrum with redshift?

14. List the physical processes considered in the semi-analytical model of the Millenium simulation.

References

Silk, J. & Rees, M. J. 1998, A&A, 331, L1

Springel, V., White, S. D. M., Jenkins, A., et al. 2005, Nature, 435, 629

White, S. D. M. & Rees, M. J. 1978, MNRAS, 183, 341