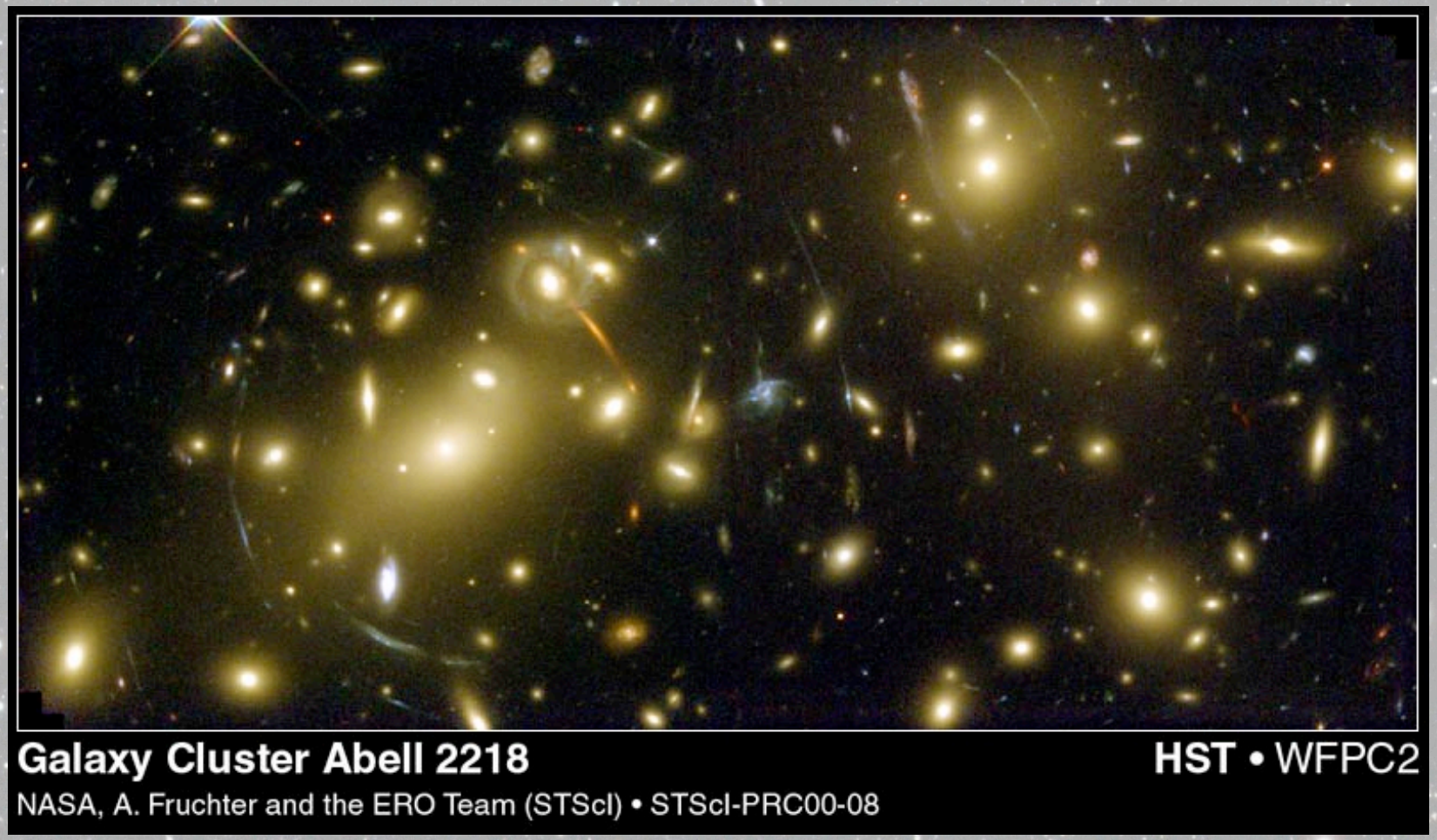
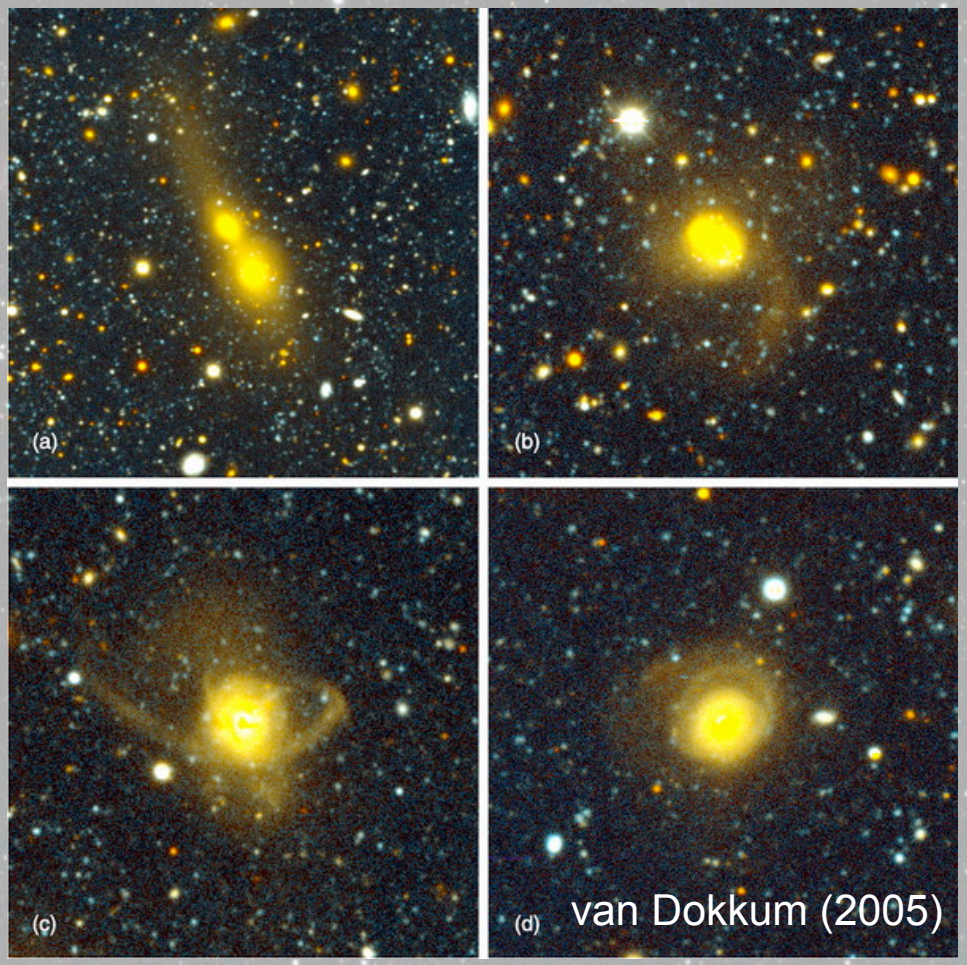


Galaxy Cluster Abell 2218 **HST** • WFPC2

NASA, A. Fruchter and the ERO Team (STScI) • STScI-PRC00-08


(a)
(b)
(c)
(d)
van Dokkum (2005)

SDSS LRGs

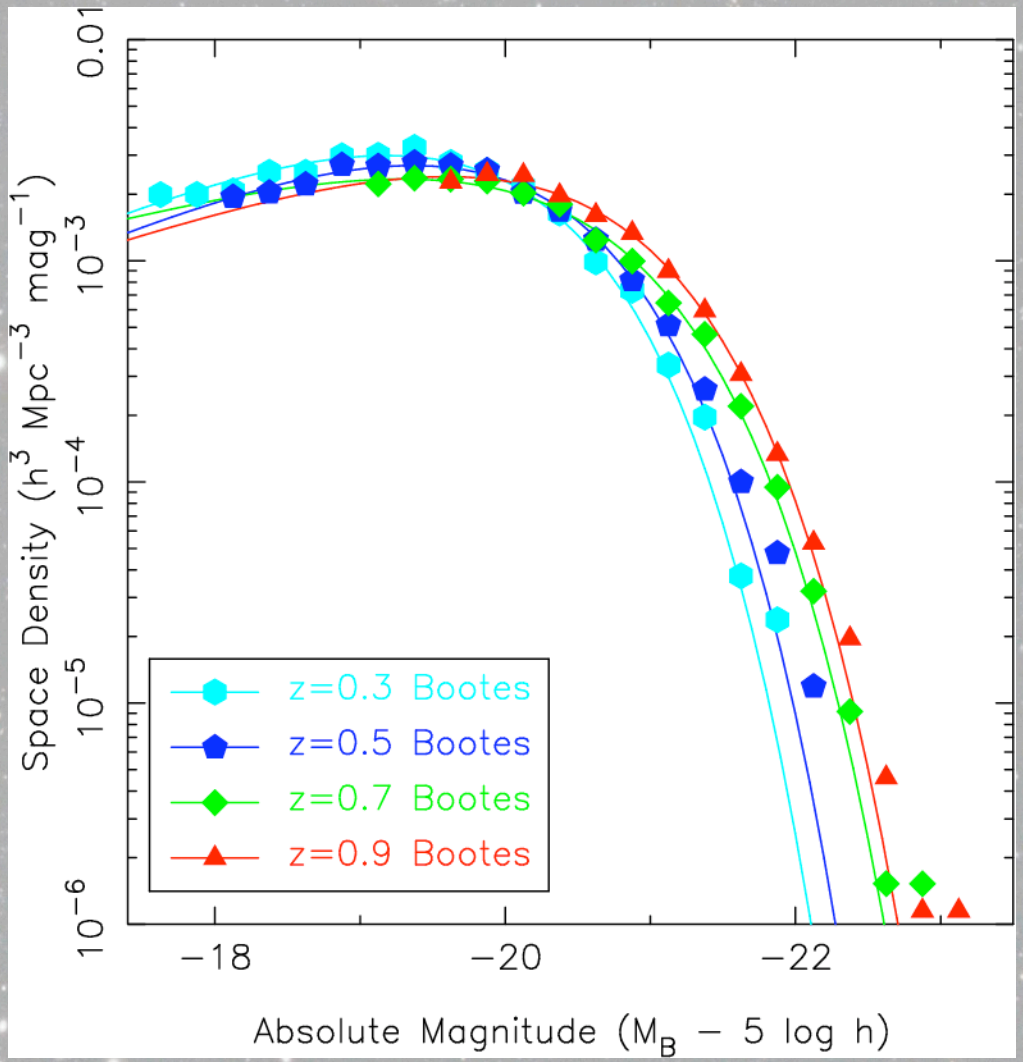
- See Masjedi et al. (2006 & 2008)
- Absolute magnitude of M_B~-22.2
- BH masses of ~6×10^9 Solar Masses
- Space density of ~3.7×10^{-5} Mpc^{-3}
- SDSS LRG-LRG merger rate of 0.6×10^{-4} Gyr^{-1} Gpc^{-3}
- No $(1+z)^3$ evolution. Lower bound?

$$0.6 \times 10^{-4}\ \mathrm{Gyr}^{-1}\ \mathrm{Gpc}^{-3} \times 167\ \mathrm{Gpc}^{3}$$

$$\sim 10^{-2}\ \mathrm{Gyr}^{-1}$$

$$\sim 10^{-7}\ \mathrm{yr}^{-1}$$

Space Density



Evolving LF

- Absolute magnitude of M_B~-22.2
- BH masses of 6×10^9 Solar Masses
- Space density of ~3.7×10^{-5} Mpc^{-3}
- 30% growth between z=1 and z=0.
- Assume all growth from 1:1 mergers. Upper bound?

$$3.7 \times 10^{-5}\ \mathrm{Mpc}^{-3} \times \frac{0.3}{7\ \mathrm{Gyr}} \times 167 \times 10^{9}$$

$$\sim 2.6 \times 10^{5}\ \mathrm{Gyr}^{-1}$$

$$\sim 2.6 \times 10^{-4}\ \mathrm{yr}^{-1}$$

~M87 Merger rate

- BH mass of ~3x10^9 Solar Masses
- Absolute mag of M_B=-21.4 (B=9.6 d=16.1 Mpc).
- Space density of 10^{-3} Mpc^{-3}
- ~30% stellar mass growth at z<1 (luminosity function)
- Upper limit!

$$10^{-3}\ \mathrm{Mpc}^{-3} \times \frac{0.3}{7\ \mathrm{Gyr}} \times 167 \times 10^{9}$$

$$\sim 7.2 \times 10^{6}\ \mathrm{Gyr}^{-1}$$

$$\sim 7.2 \times 10^{-3}\ \mathrm{yr}^{-1}$$

Merger rate

- BH mass of 10^{10} Solar Masses
- Absolute mag of M_B=-22.6
- Space density of ~10^{-6} Mpc^{-3}
- ~30% stellar mass growth at z<1 (luminosity function)
- Upper limit

$$10^{-6}\ \mathrm{Mpc}^{-3} \times \frac{0.3}{7\ \mathrm{Gyr}} \times 167 \times 10^{9}\ \mathrm{Mpc}^{3}$$

$$\sim 7.2 \times 10^{3}\ \mathrm{Gyr}^{-1}$$

$$\sim 7.2 \times 10^{-6}\ \mathrm{yr}^{-1}$$