

HI in Groups with Varying Dynamical Age

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Evolution of Neutral Hydrogen Gas Content in Groups

How many new group members are discovered by HI observations?

How does the distribution of HI rich galaxies change as groups evolve?

What behavior does the HI mass function for groups have at the low mass end?

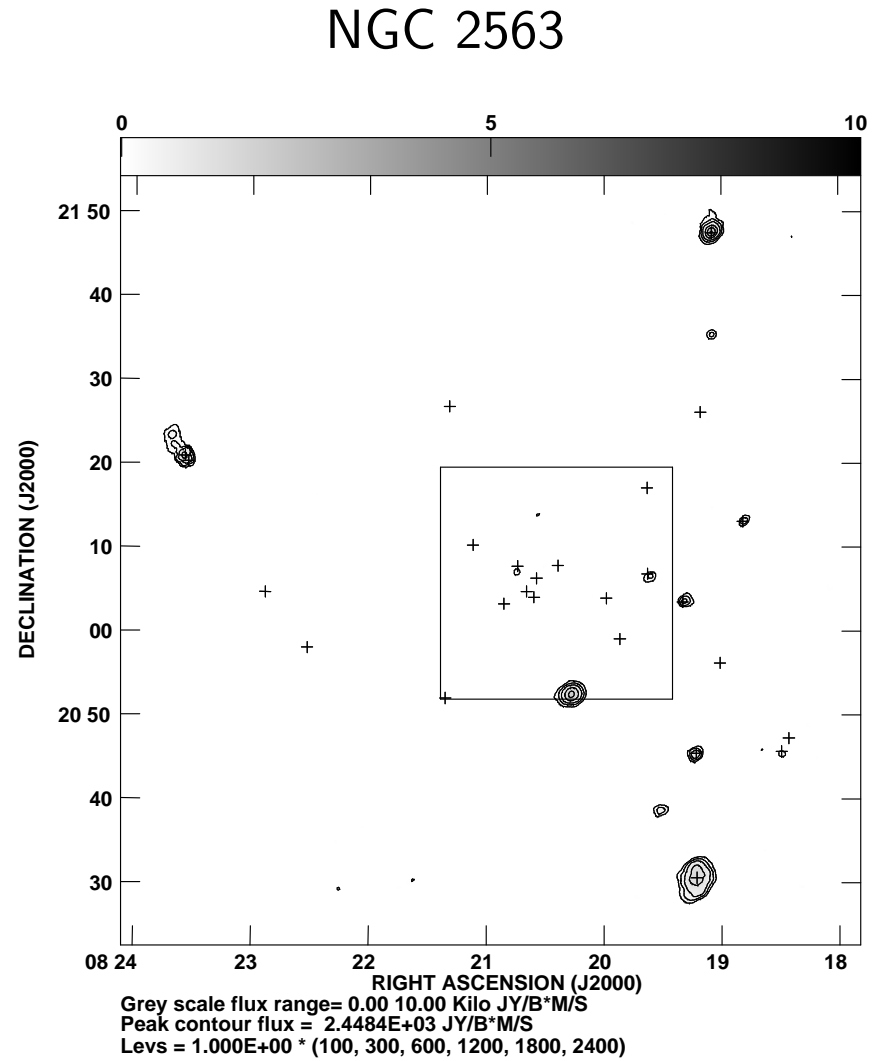
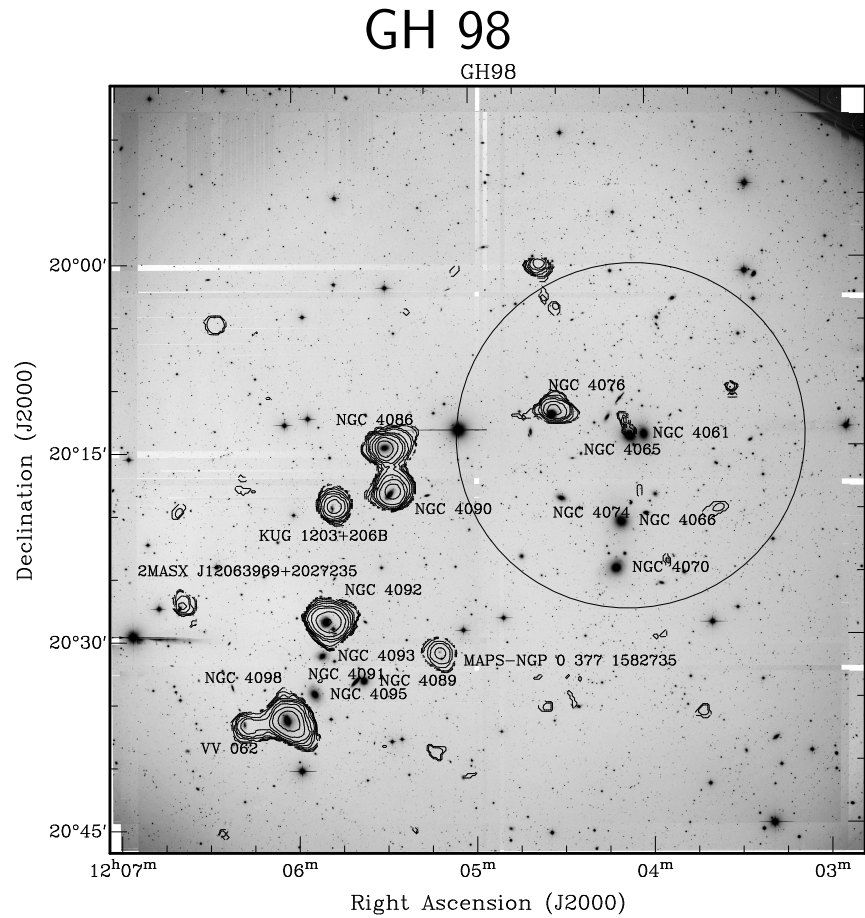
Outline

1. Group Sample
2. Old and Young Groups
3. Distribution of HI rich galaxies
 - (a) Distance from Dynamical Center
 - (b) Overall
4. HI Deficiency : Two Cases
5. Are there X-rays in HCG 58?
6. HI Mass Function

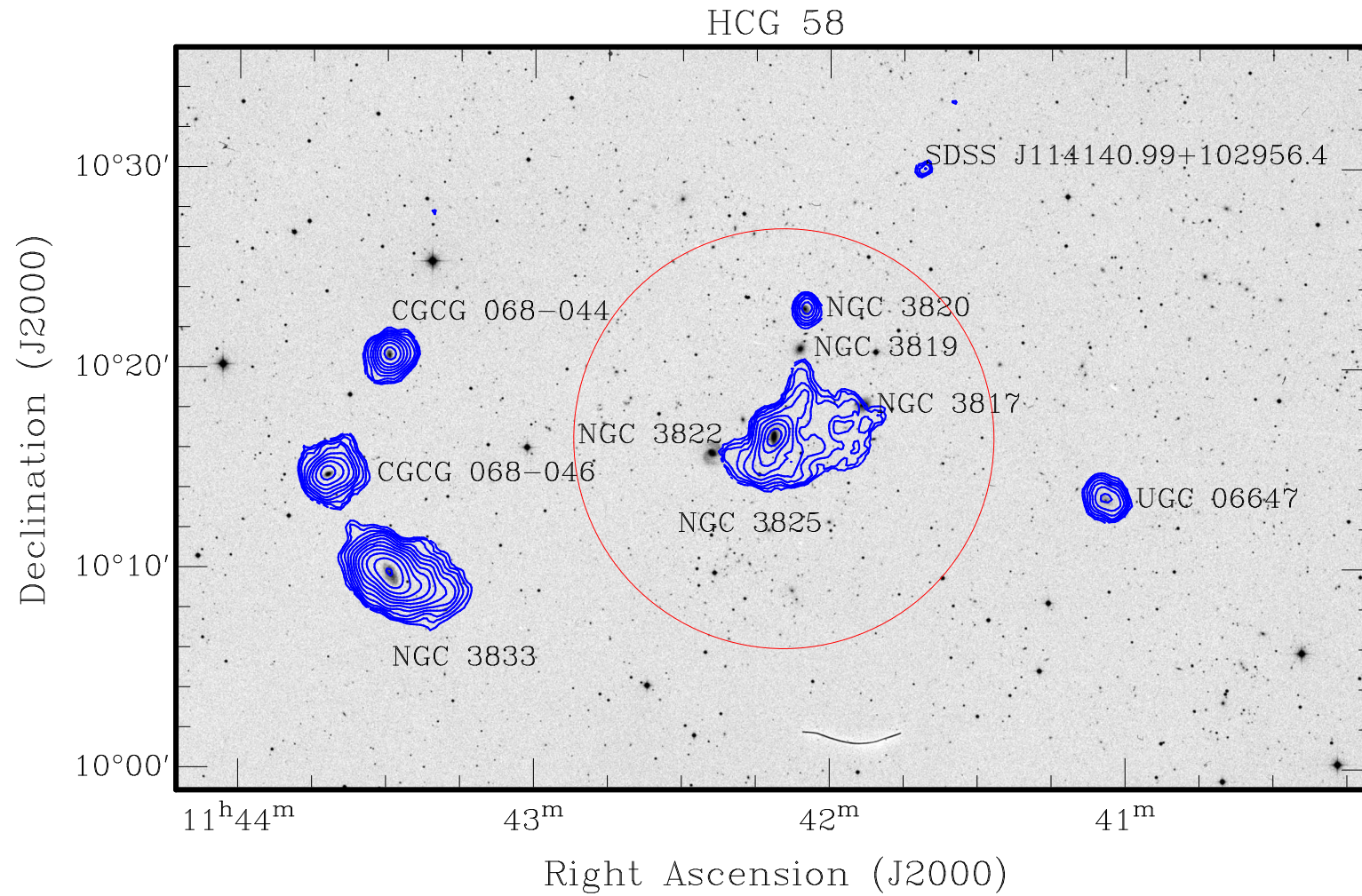
Group Sample

Group Name	$\alpha(2000)$	$\delta(2000)$	N	f_{sp}	σ_v	D (Mpc)	X-rays?
NGC 664	01 44 02.7	+04 19 02	3	1.0	106	72	no
NGC 7582	23 18 54.5	-42 18 28	8	1.0	38	21	no
HCG 58	11 42 09.0	+10 16 30	10	≥ 0.90	168	84	yes?
GH 40	09 08 43.2	+37 36 07	7	≥ 0.80	177	94	no
NGC 2563	08 20 24.4	+21 05 46	29	0.59	336	65	yes
GH 109	12 35 45.3	+26 37 23	7	0.57	568	96	no
GH 98	12 04 06.2	+20 14 06	17	≤ 0.53	388	94	yes
NGC 5846	15 05 47.0	+01 34 25	20	0.50	368	25	yes

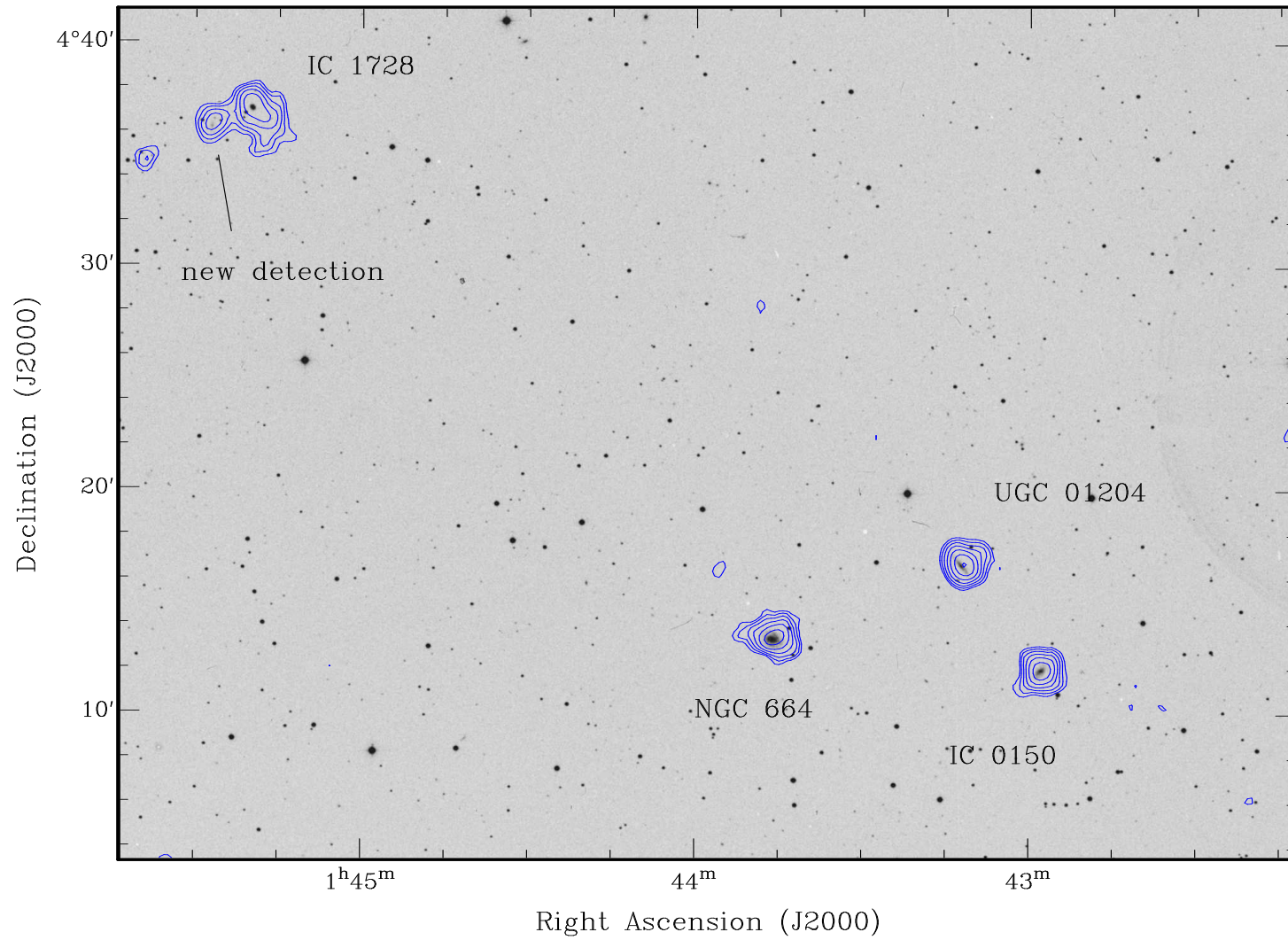
Two More Evolved Groups



Two Dynamically Young Groups

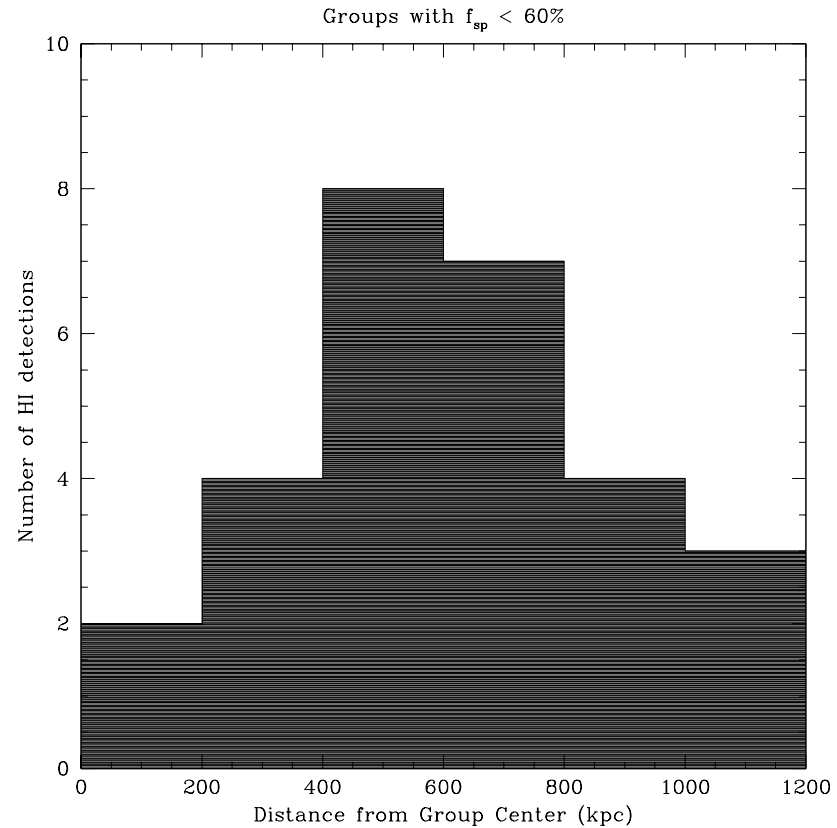
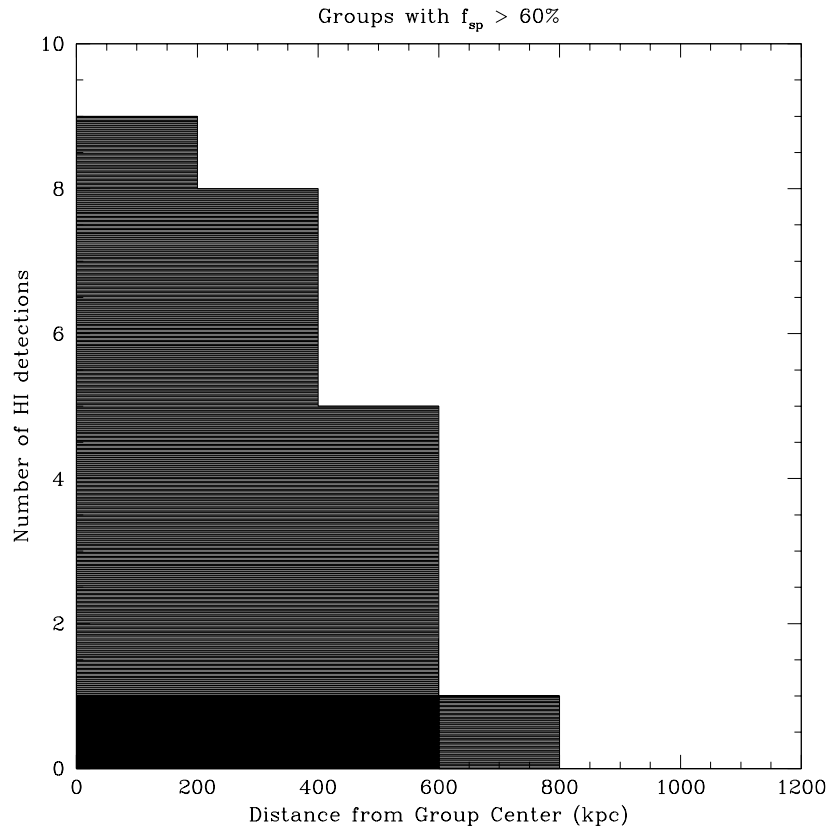


NGC 664



The Distribution of HI Rich Galaxies

HI rich galaxies are found farther from the group center in dynamically evolved groups compared with younger groups. As the group evolves tidal interactions strip HI from the central galaxies into the intragroup medium where the gas changes state.

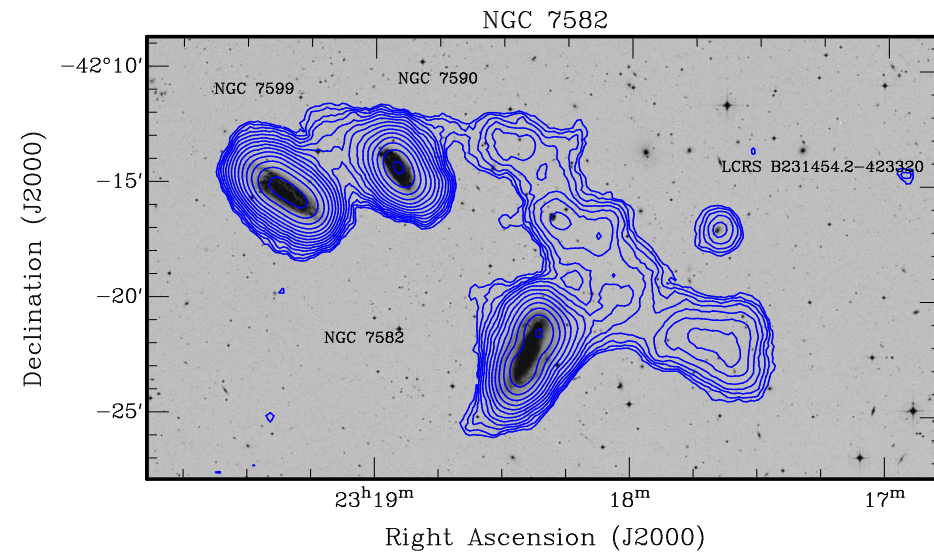
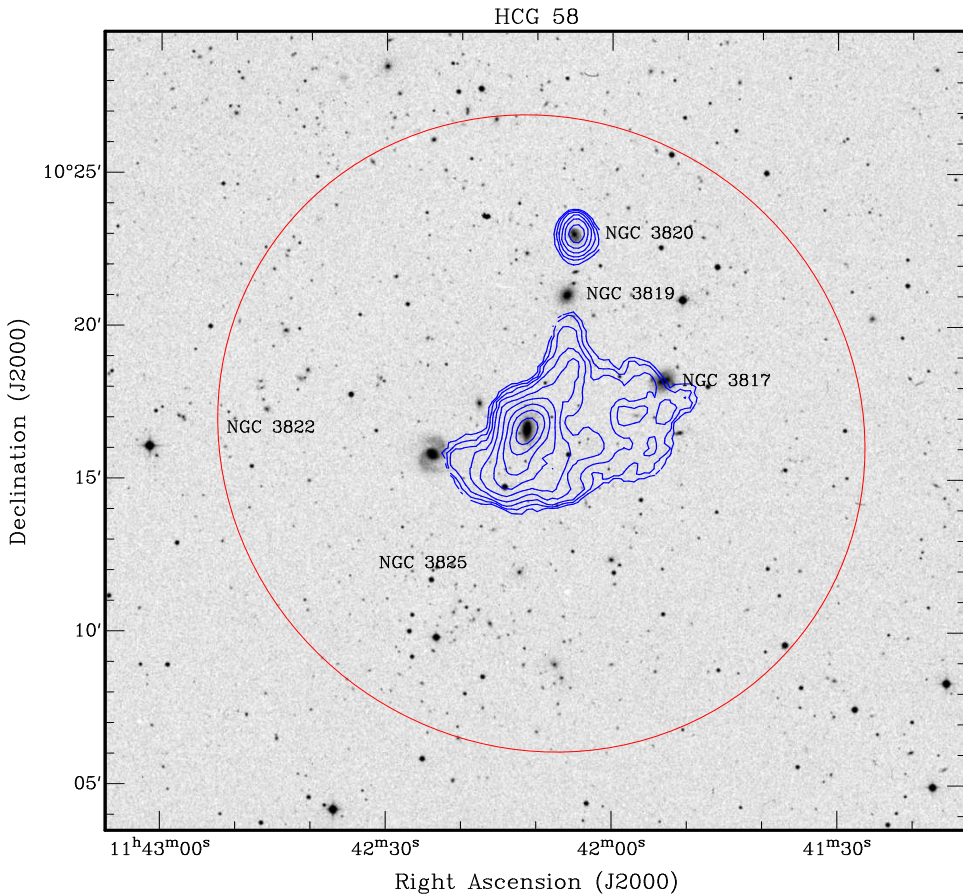


HI Deficiency : Two Examples

HCG 58 : deficient (Verdes-Montenegro et al. 2001)

NGC 7582 : deficient (Dahlem 2005)

Dynamically young HI deficient groups may have lots of intergalactic neutral gas.



Are there diffuse X-rays in HCG 58?

The data:

Dell'Antonio et al. (1994), Einstein X-ray Satellite, $L_x = 0.90 \times 10^{42}$ ergs sec⁻¹

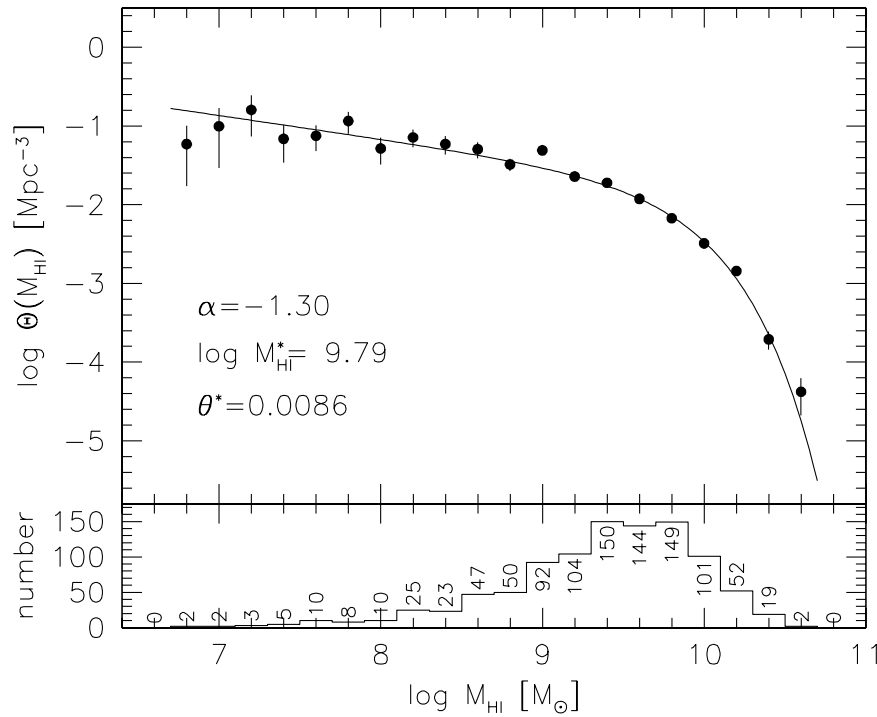
RASSCALs, Mahdavi et al. (2000), ROSAT All Sky Survey,
 $L_x = 1.349 \times 10^{42}$ ergs sec⁻¹

Mulchaey et al. (2003), ROSAT Pointed Mode, $L_x < 7.586 \times 10^{40}$ ergs sec⁻¹

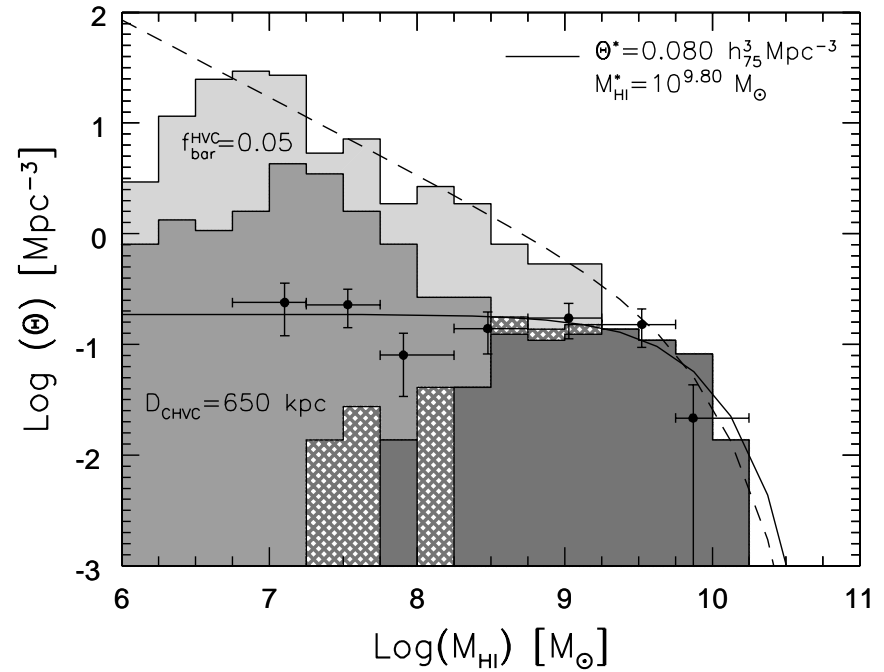
GEMS, Osmond & Ponman (2004), ROSAT Pointed Mode,
 $L_x < 2.138 \times 10^{41}$ ergs sec⁻¹

It seems likely that there are no X-rays associated with HCG 58.

HI Mass Function



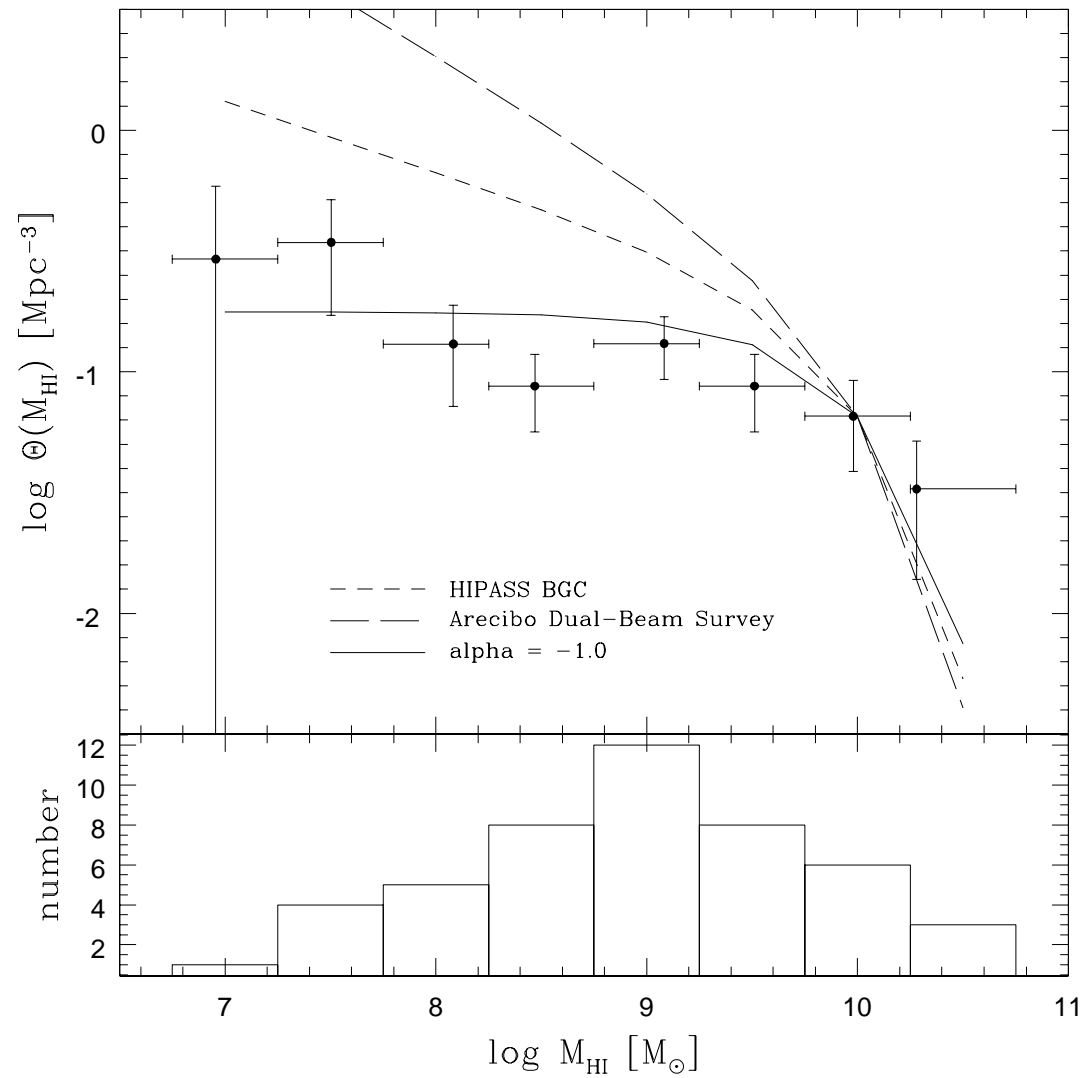
HIPASS Bright Galaxy Catalog HIMF
 (Zwaan et al. 2003)
 $N = 1000$



Ursa Major HIMF
 (Verheijen et al. 2000)
 $N = 32$

HIMF for the Group Environment

8 groups
 $V \sim 90 \text{ Mpc}^3$
 $N = 47$



Summary

New group members are detected in HI in every group.

We find evidence for a difference in the distribution of HI galaxies when comparing dynamically young and evolved groups. The HI rich galaxies are found farther from the centers of evolved groups and are not distributed uniformly. Strong tidal interactions are seen in younger systems.

Our HI mass function is consistent with a flat slope at the low mass end. There is no evidence for a large population of optically dark, low HI mass objects.