# Neutral Hydrogen in Galaxy Groups

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# GEMS: Galaxy Evolution Multiwavelength Study

## HI Imaging Survey

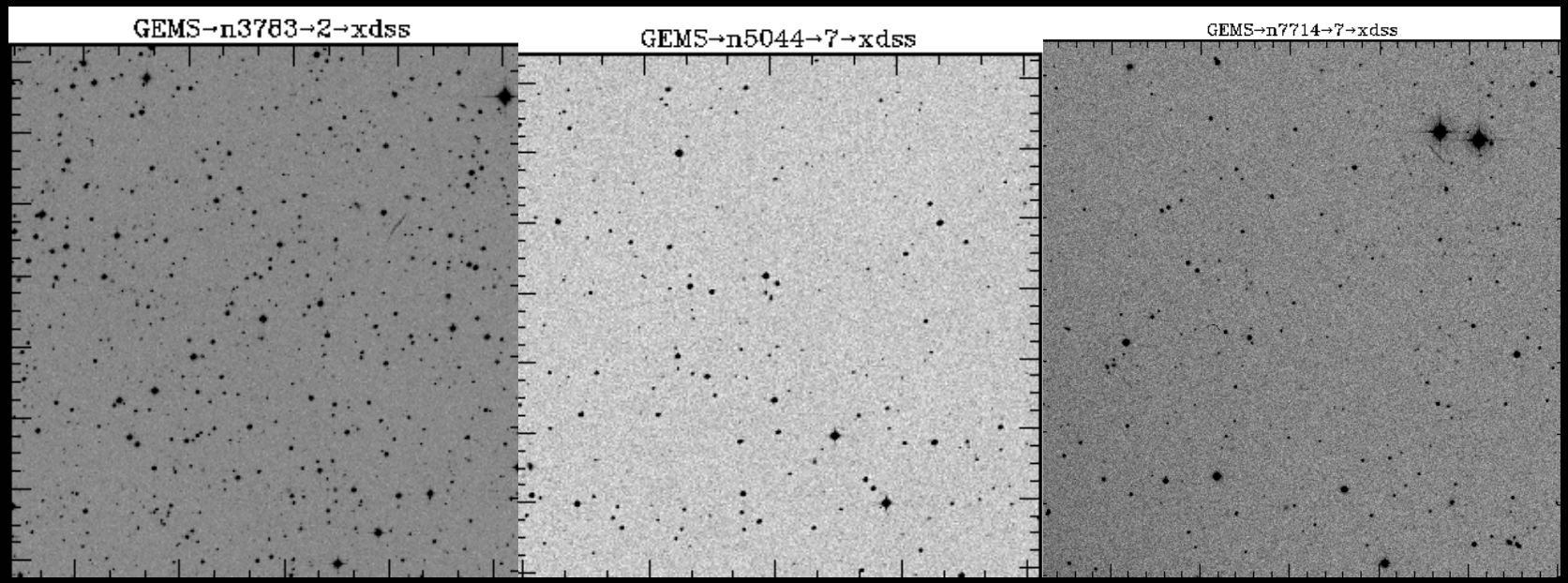
- Aims:
  - To investigate the interplay between hot and cold gas in groups
  - To study the evolutionary history of the groups and the part evolution plays in gas content of the groups
  - To study gas removal mechanisms in low-density parts of the Universe
  - To find new group members, and look for intra-group HI gas

# HI in GEMS groups

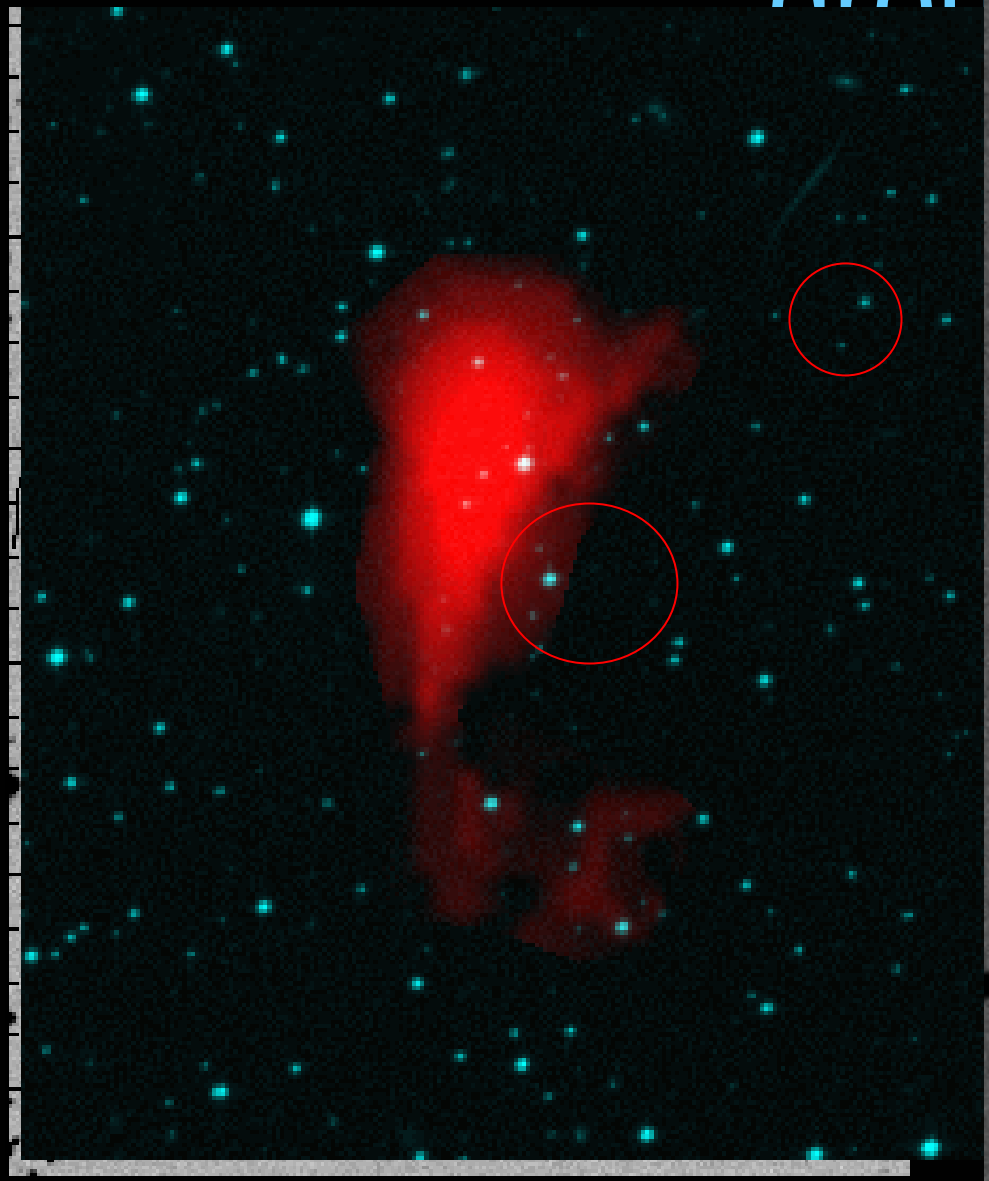
- 16 groups were observed at Parkes using the multibeam receiver - 5.5x5.5 degree fields
- Groups have varying X-ray properties
  - 8 have intra-group X-ray emission
  - 6 have X-rays from central group galaxy
  - 2 undetected in X-rays
- The 16 groups lie between 1000-3000 km/s (~13-40 Mpc)
- Detection limit for HI is around $5 \times 10^8$ $M_\odot$

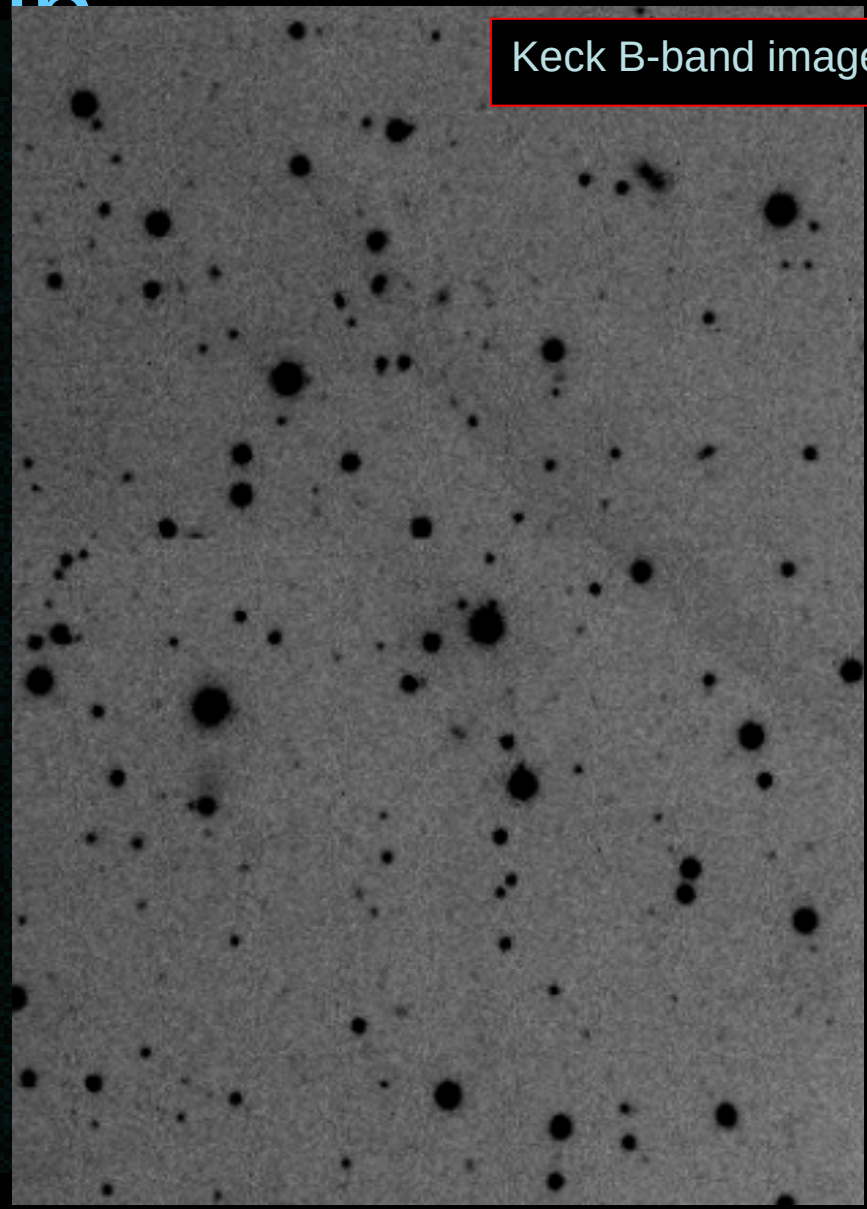
# Results of HI Survey

- 204 galaxies detected in 16 groups
- 10 previously uncatalogued detections (3 without visible optical galaxies in the field)
- 11 new redshifts
- Total of 10% new group members providing a more complete picture of the groups
- >98% of HI mass we detect in groups lies within galaxies


GEMS→n3783→2→xdss
GEMS→n5044→7→xdss
GEMS→n7714→7→xdss

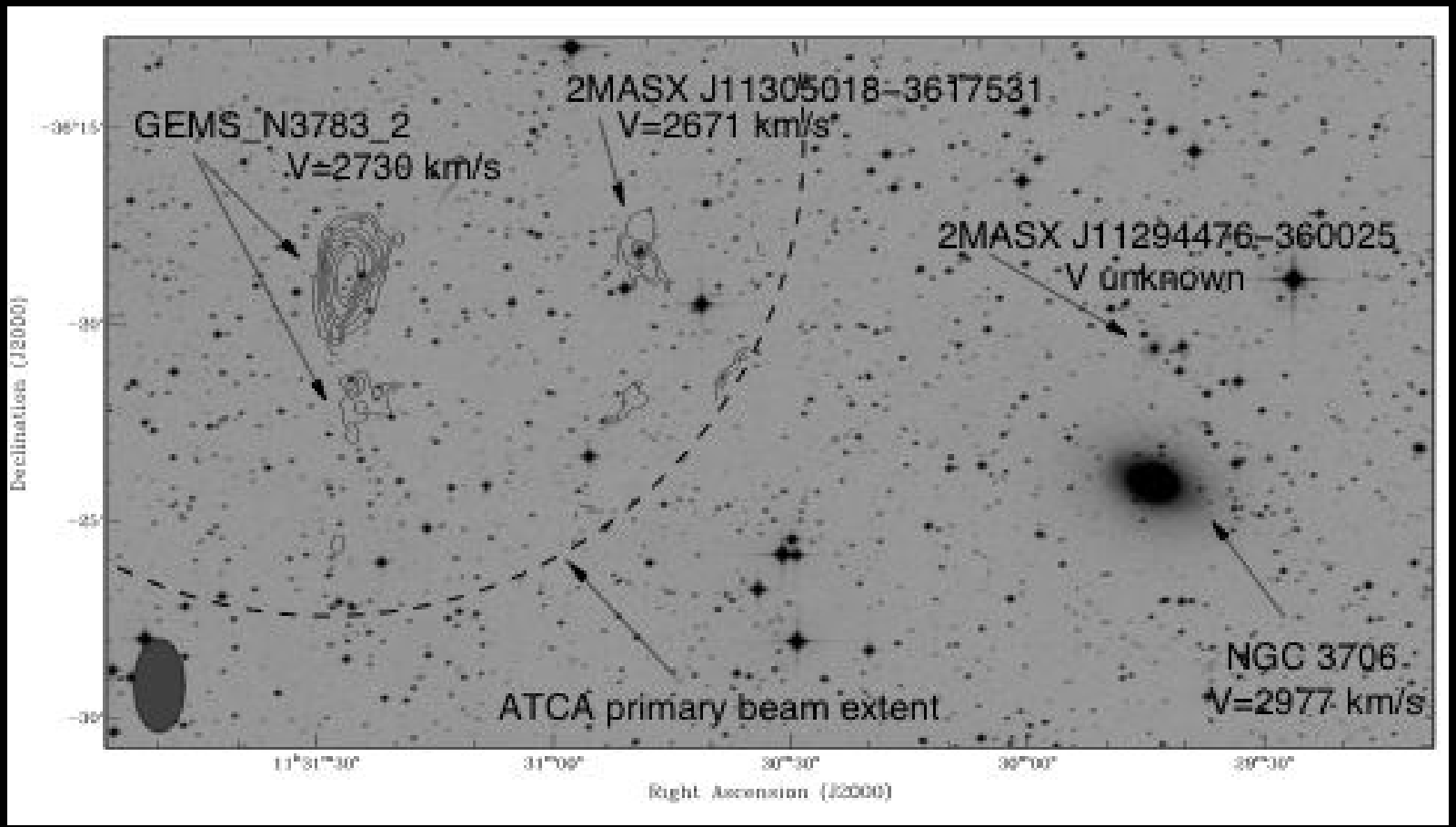
# New galaxies in the NGC 3783 group





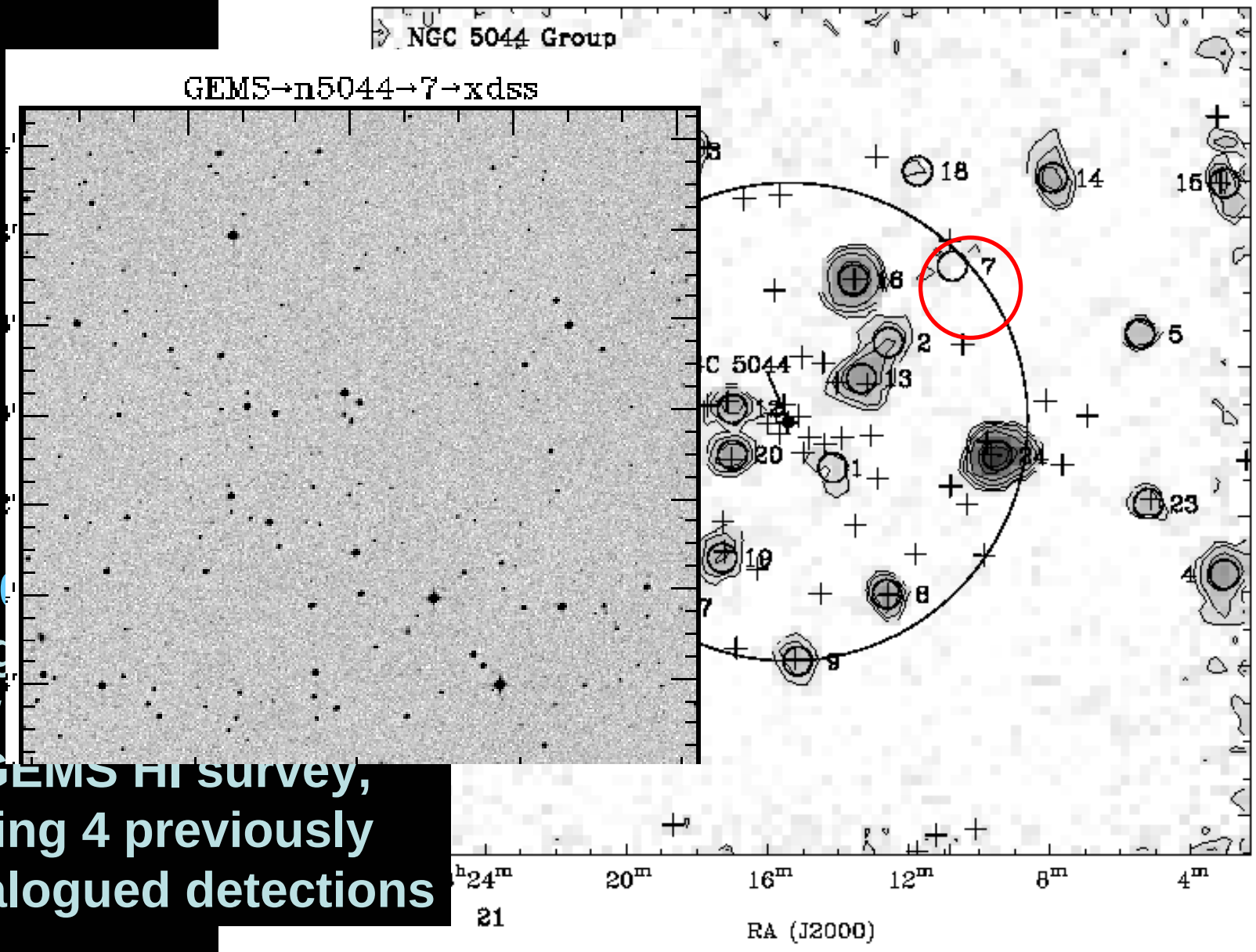

**Kilborn et al. 2005, MNRAS, *submitted***

# NGC 3783 - HI Distribution



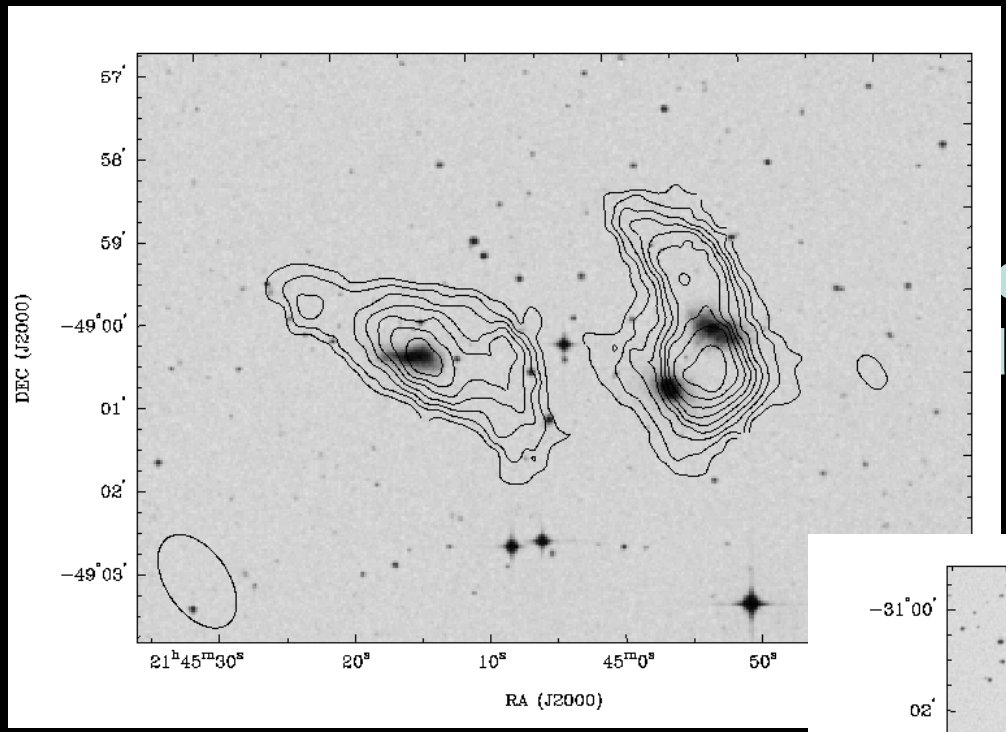

**Kilborn et al. 2005, MNRAS, *submitted***

# NGC 5044 HI cloud candidate

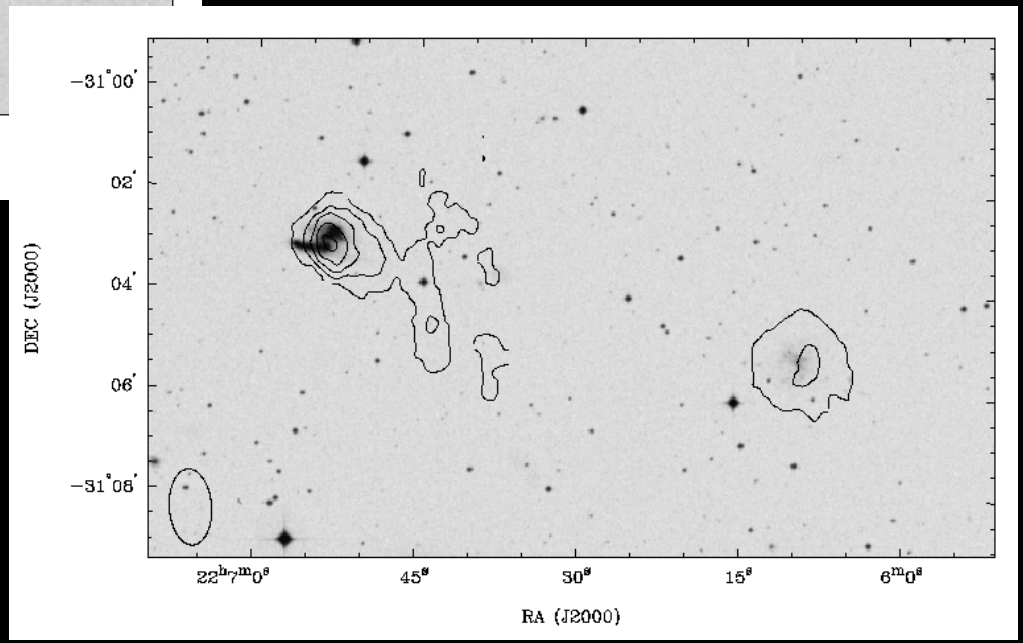



**NGC 5**
**-intra-g**
**-6 new**
**from GEMS HI survey,**
**including 4 previously uncatalogued detections**

# Gas removal mechanisms: Tidal interactions

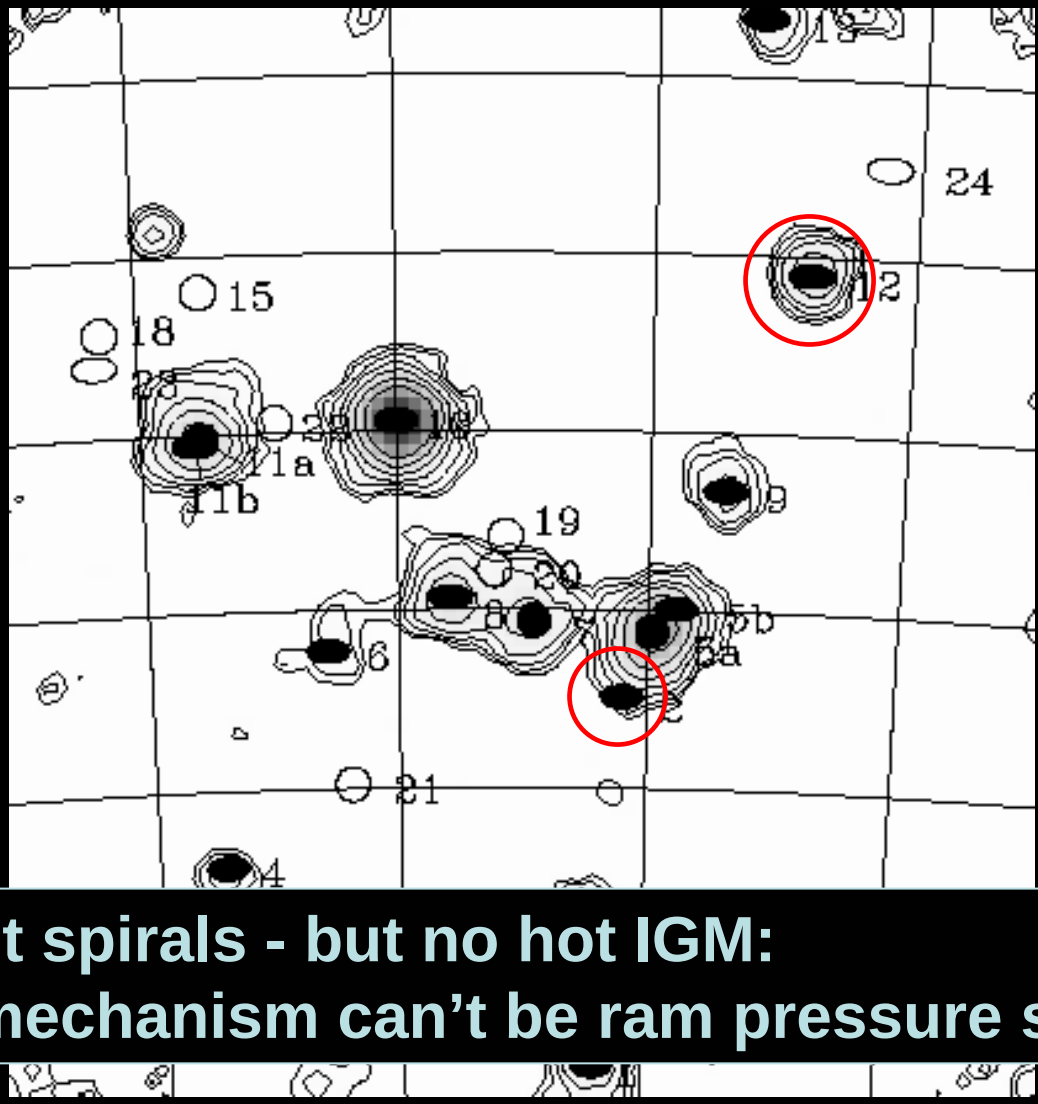



dispersions then clusters
l mergers to be important




Kern et al. 2005

# Evidence of gas removal - HI deficiencies in groups?




**Two HI deficient spirals - but no hot IGM:**
**Thus removal mechanism can't be ram pressure stripping**

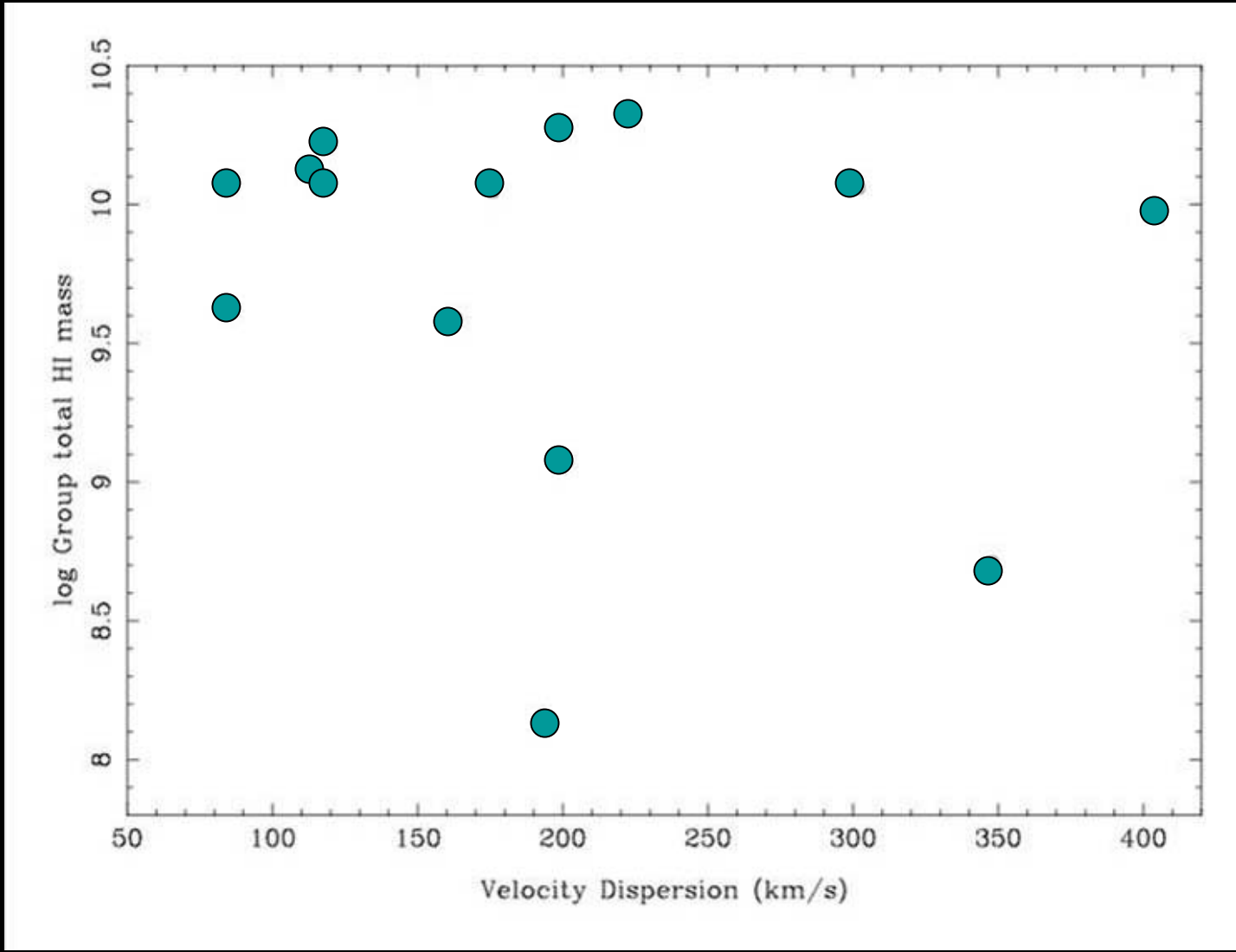
Kilborn et al. 2005, MNRAS, 356, 77

severely HI deficient spirals

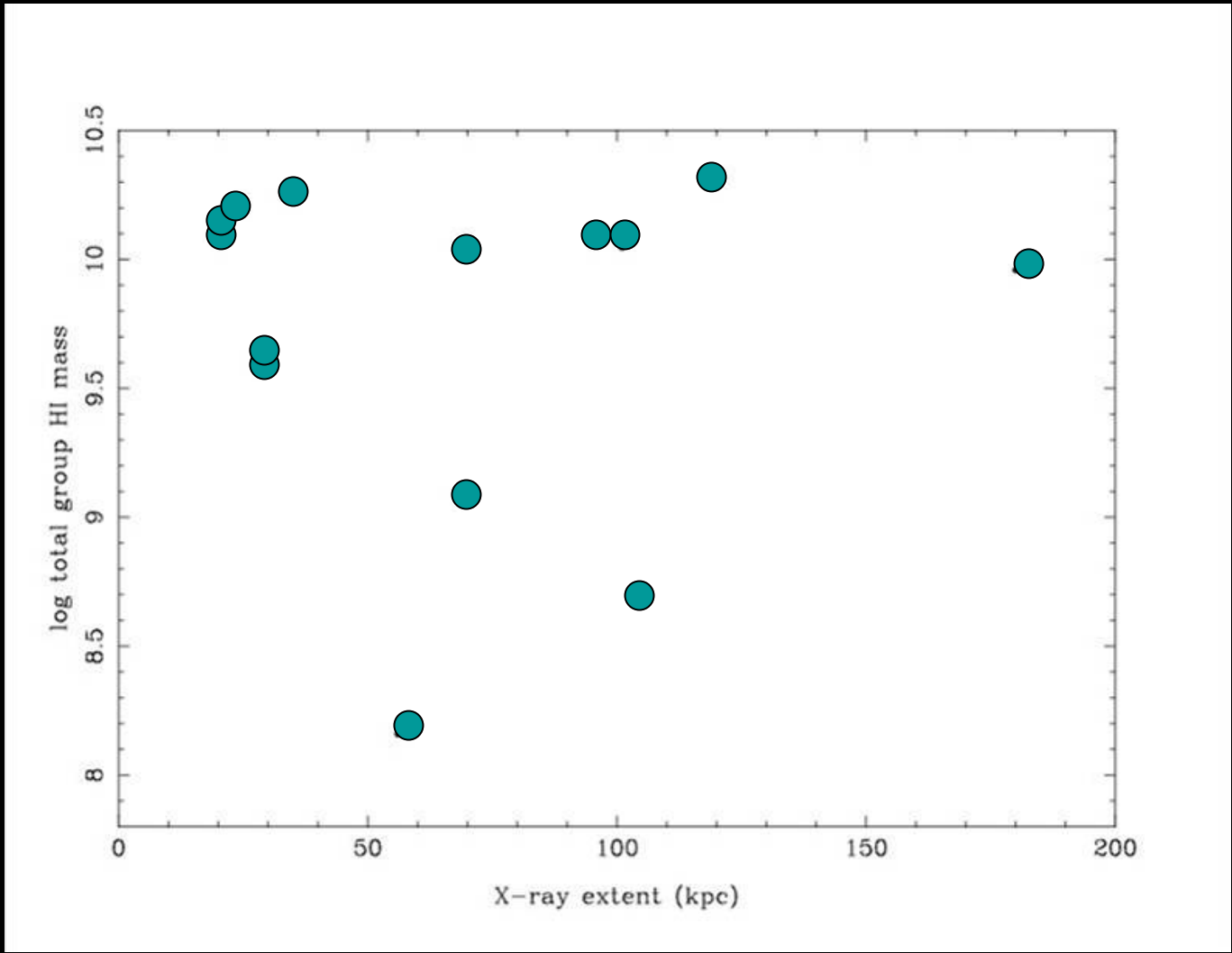
# Global HI versus X-ray properties of Groups

- Use group membership determined by Brough et al. (2005) for group properties such as members, radii, velocity dispersions etc.
- Use Osmond and Ponman (2004) for group X-ray parameters

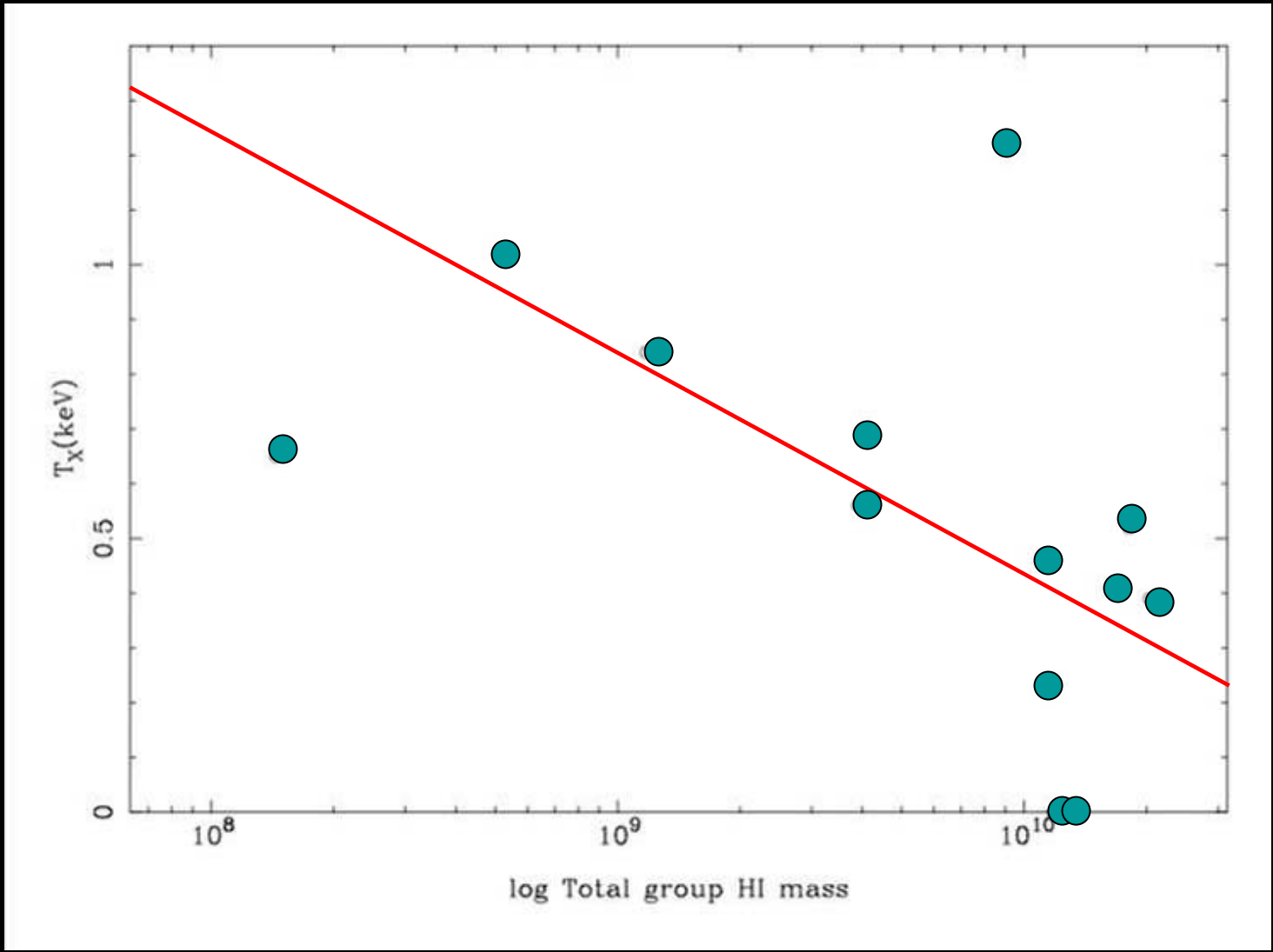
# Total HI versus Velocity dispersion



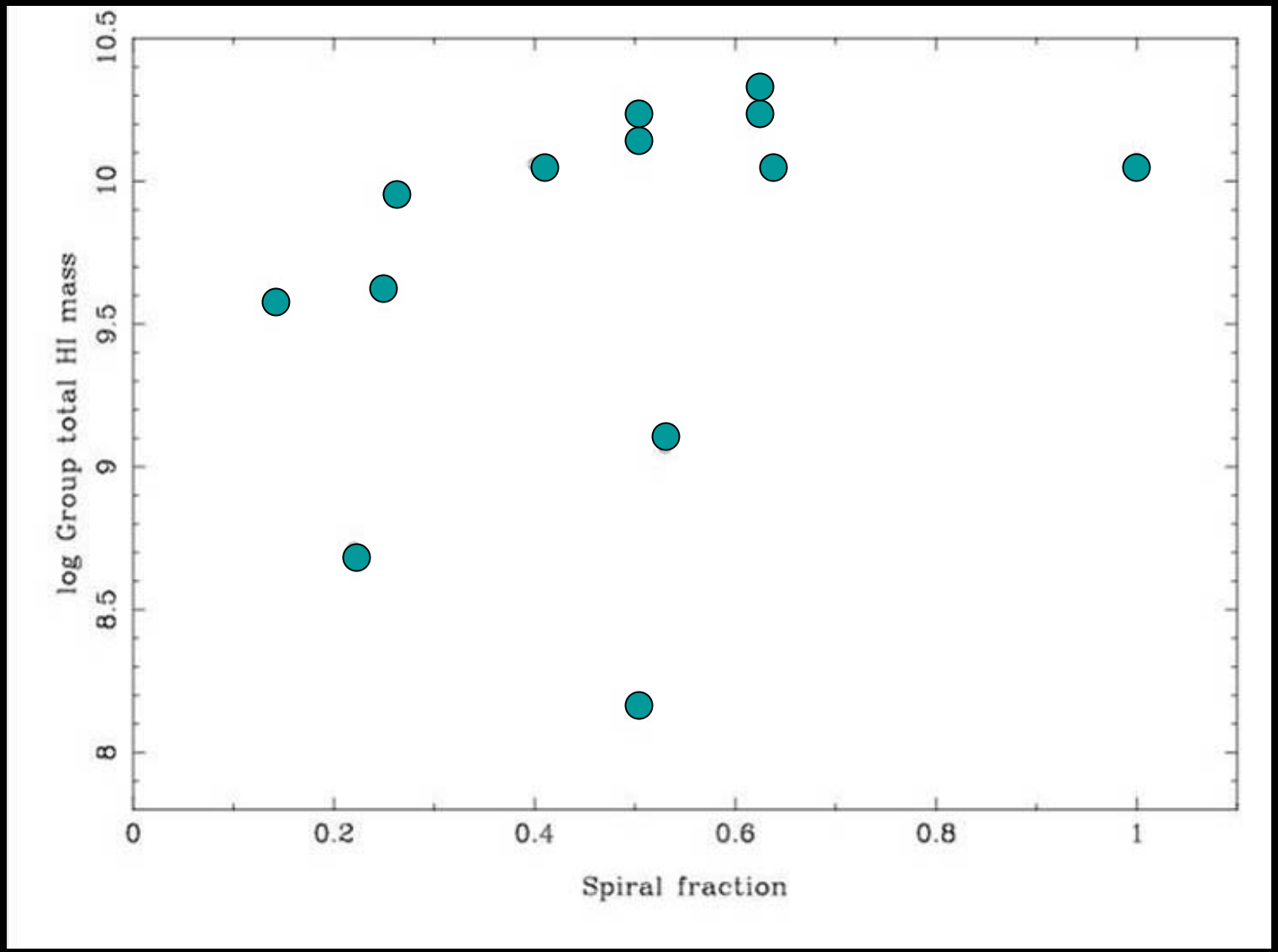
# HI content and X-ray Extent



# Tx versus HI content



# HI versus Spiral fraction



# Conclusions

-HI in loose groups is contained in galaxies (>98% by mass)

-HI deficiency of spirals in loose groups - no systematic deficiency as seen in clusters, gas removal mechanism: tidal interactions?

-One example of an HI ‘cloud’ without optical emission, several more candidates. Likely to be remnants from tidal interactions?

-HI content of groups correlates with Tx rather than X-ray extent

-Future high resolution observations of HI cloud candidates and gas-deficient spirals planned