The Environmental Impact on Galaxy Evolution: Highlighting the Structure of the Local Cosmic Web

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In collaboration with:
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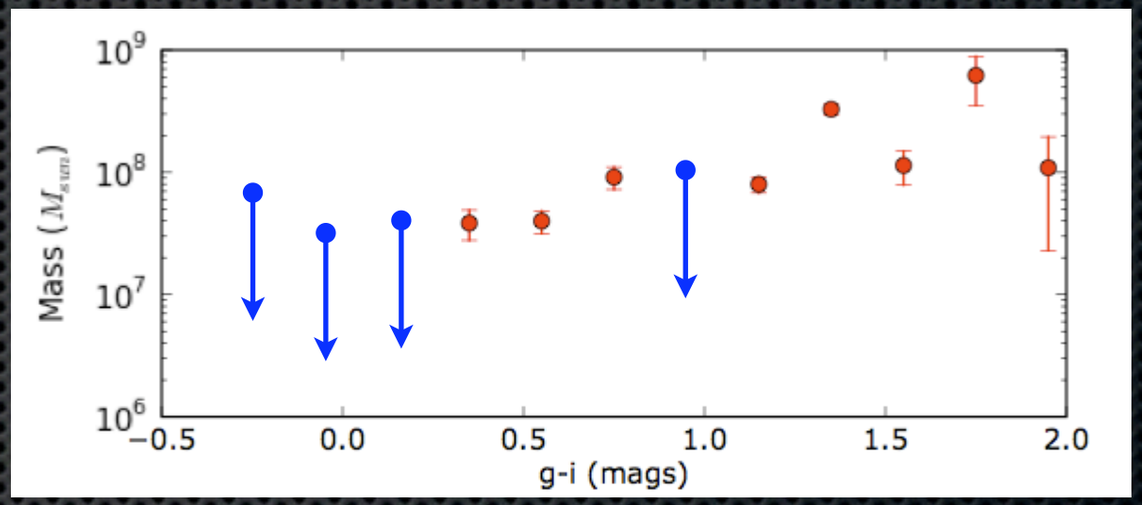
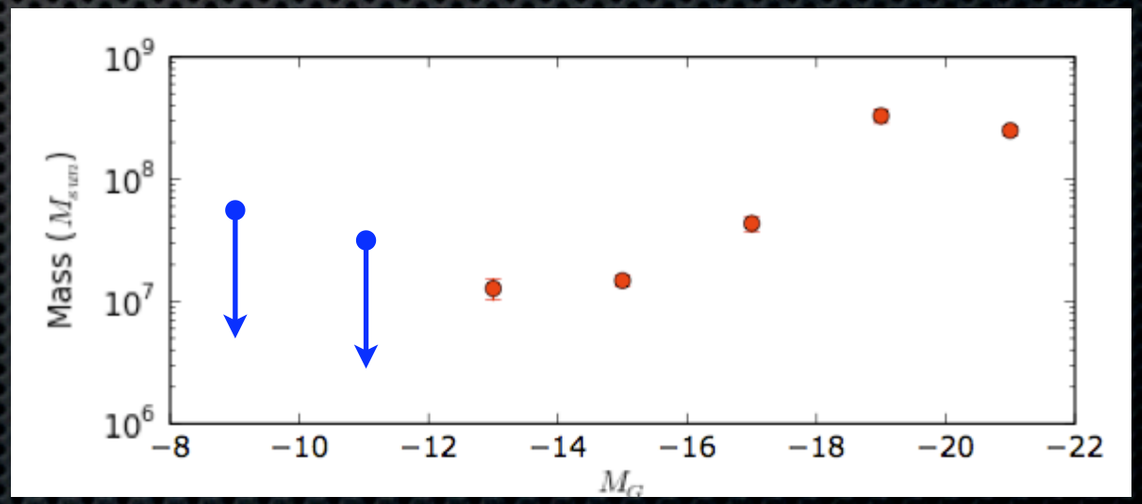
Measuring (and understanding) the global properties of nearby galaxies

- HI survey of galaxies in the southern hemisphere (Local, CenA and Sculptor groups)
  Bouchard et al. 2005, 2006, 2007
- Hα survey of dwarfs in CenA and Sculptor
  Bouchard et al. 2009, Côté et al. 2009 (submitted)
- CRUMBS: Characterising Radio-Undetected Masses in Baryonic Surveys (leftovers from NIBLES)
  in collaboration with S.L. Blyth (talk was on Tuesday)

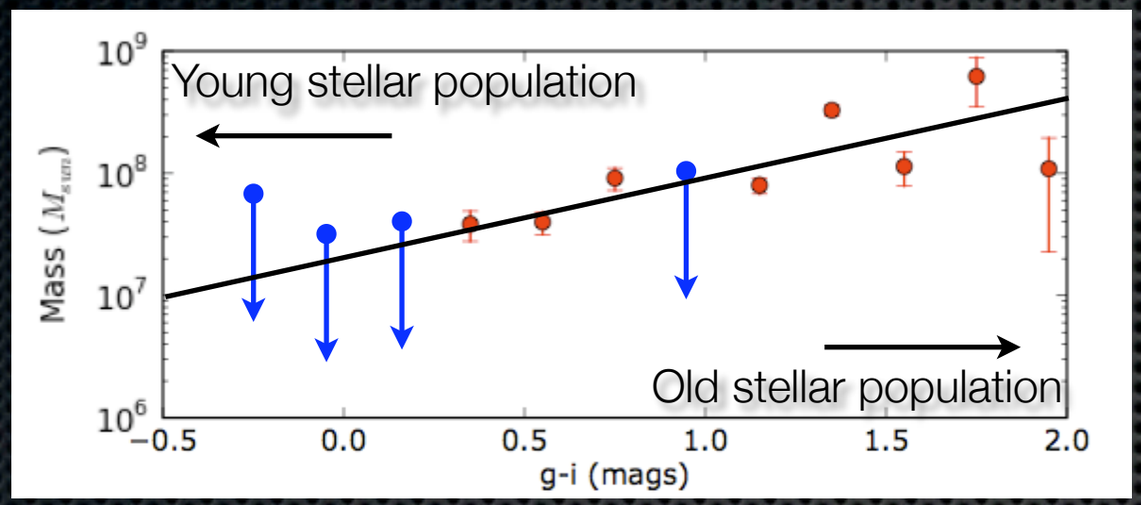
Global HI properties of galaxies

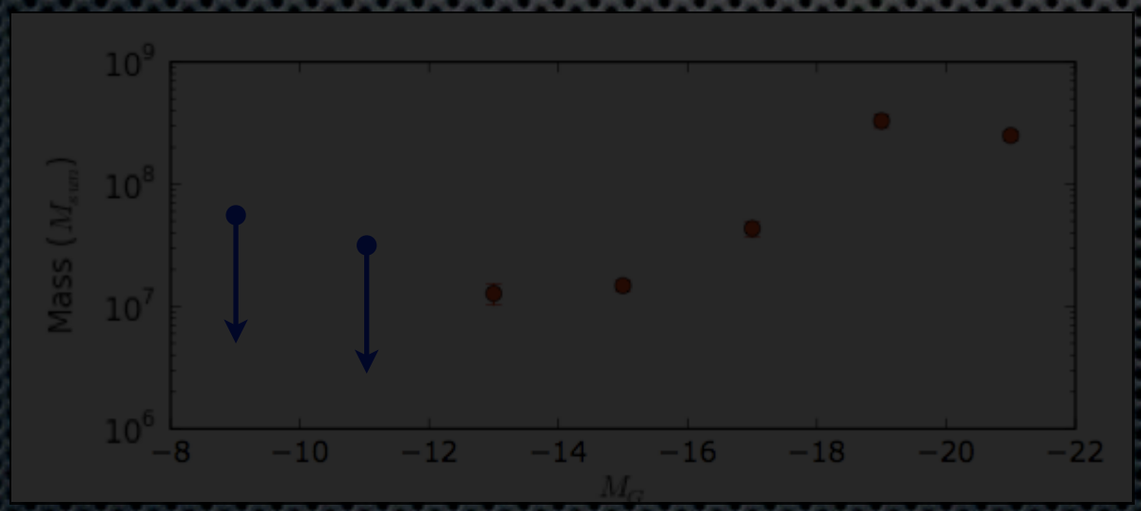
- CRUMBS preliminary results
- CRUMBS: Stacking the leftovers from NIBLES
- Caveats:
  - Detected galaxies were explicitly removed from the dataset
  - These are averages





Global HI properties of galaxies

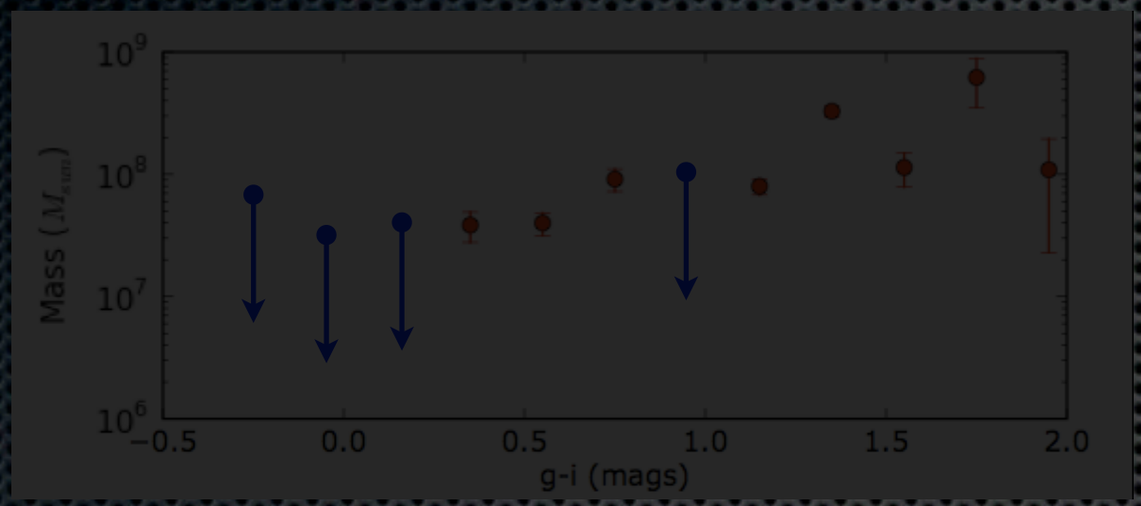


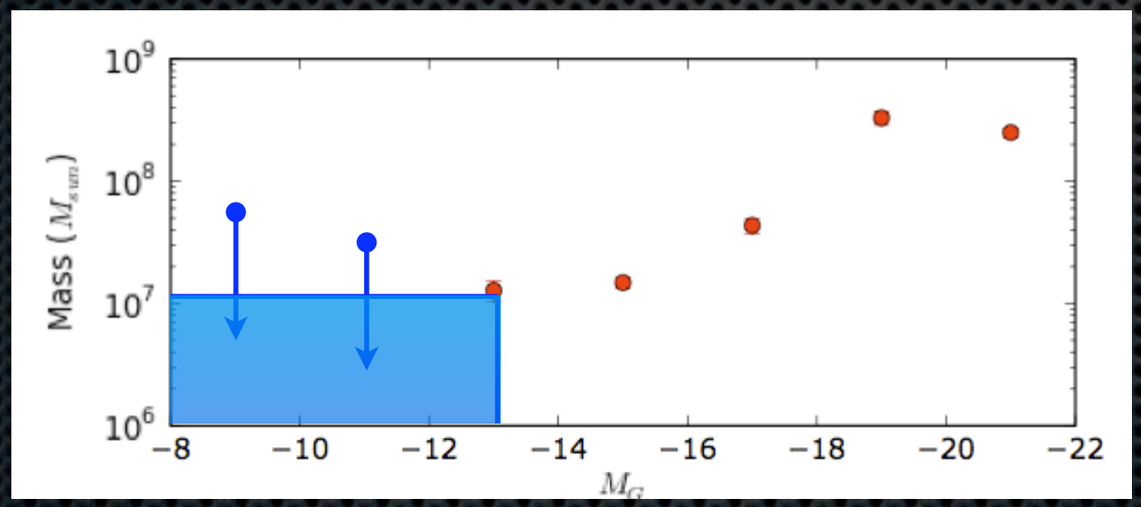


CRUMBS

- Wrong slope?!?!
- Blue galaxies are mostly detected by NIBLES
- Red (ie early-type) galaxies have (more) HI (than expected)
- Where does the ISM come from and why is it not forming new stars?

Global HI properties of galaxies





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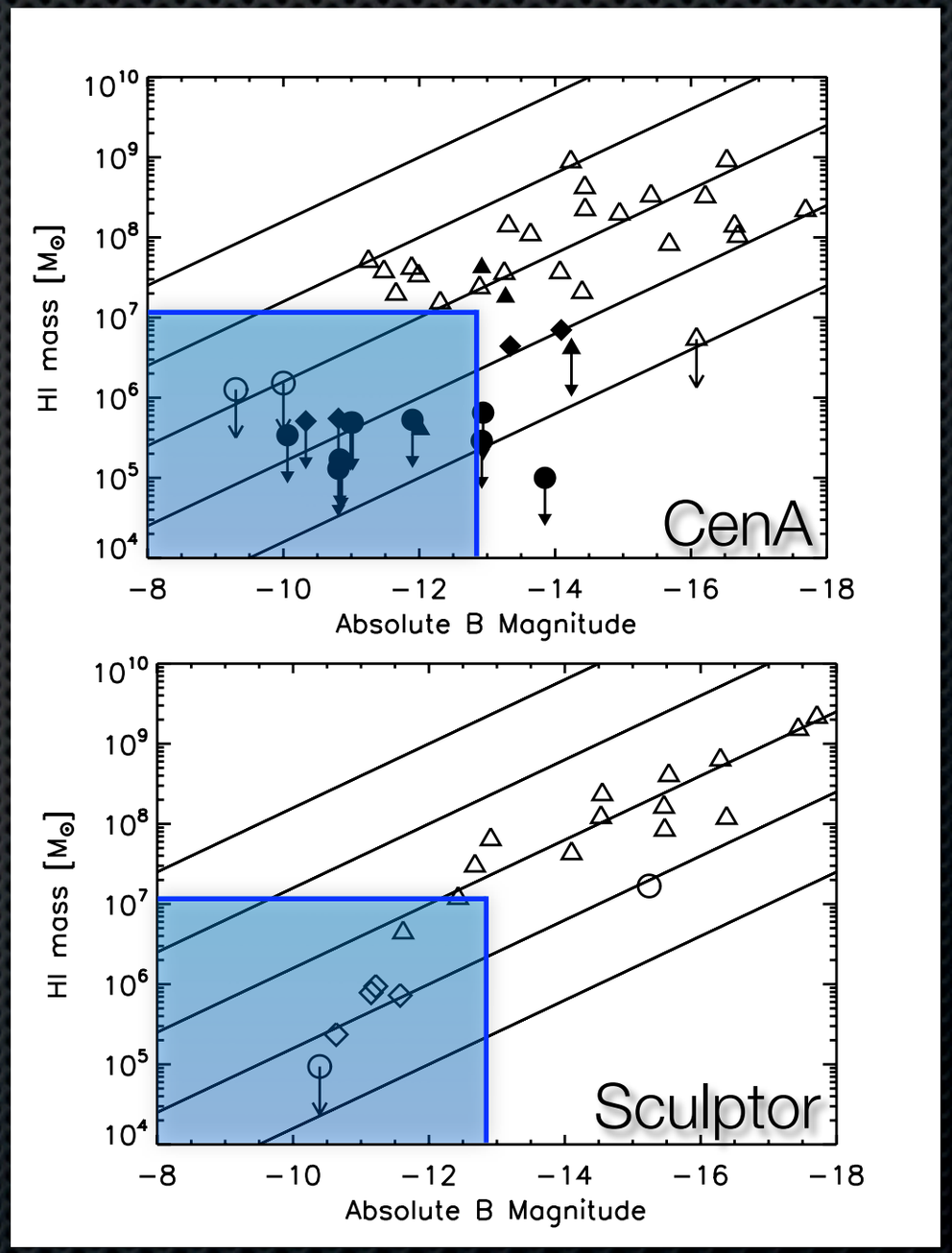
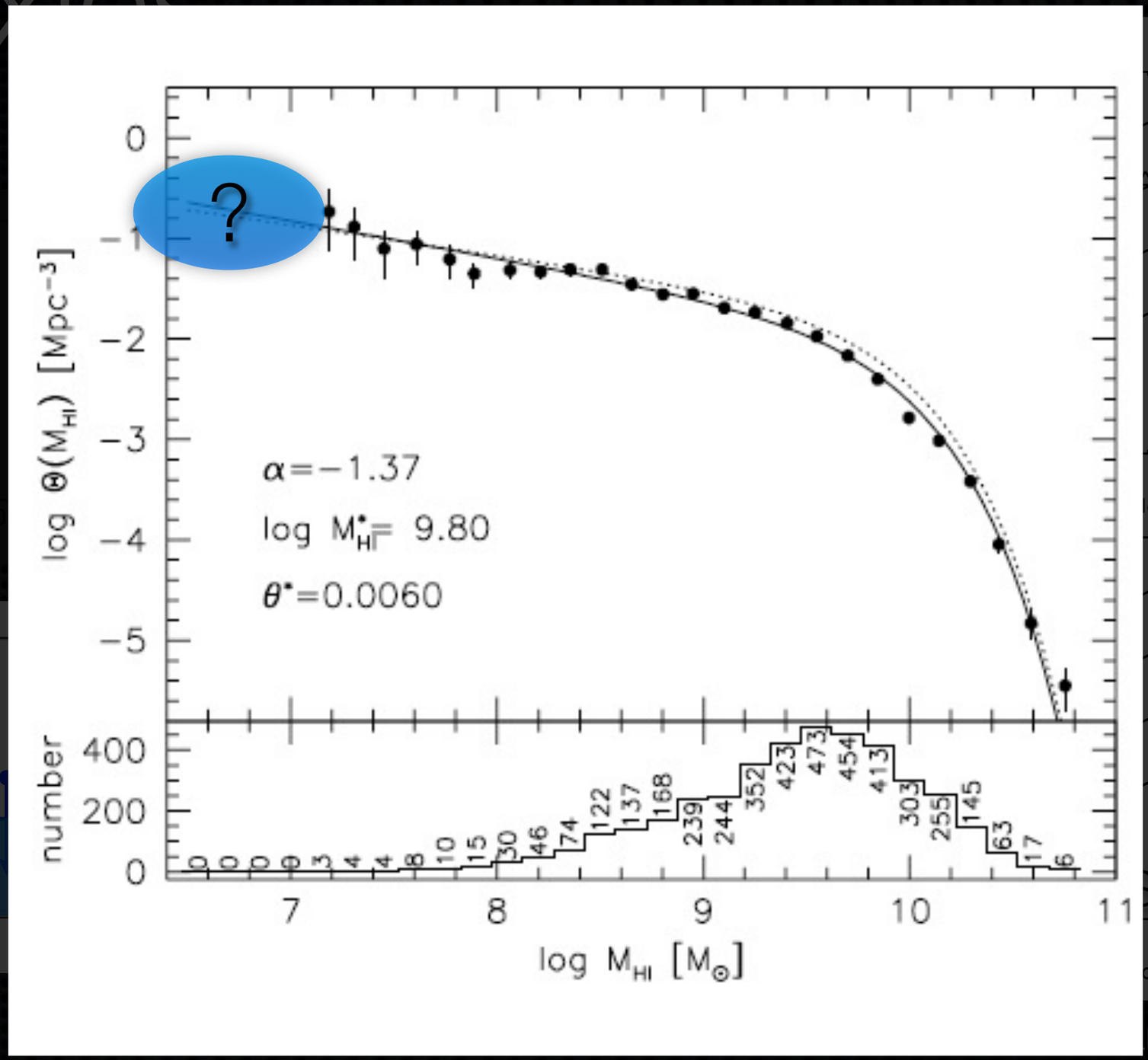
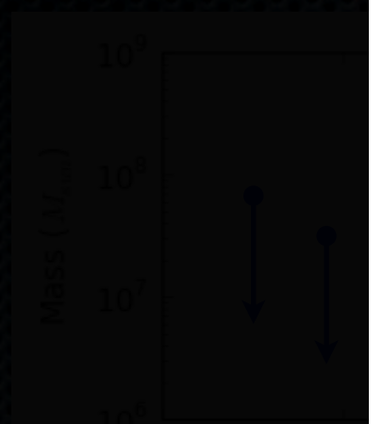
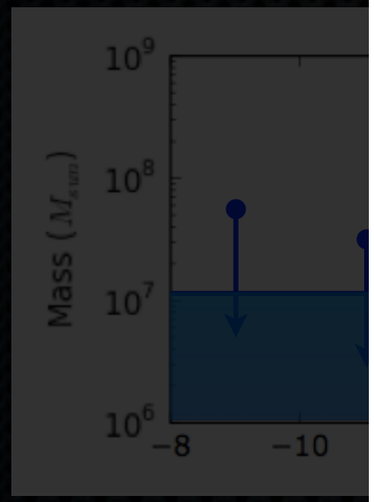


Bouchard et al. 2007

Global HI properties of galaxies







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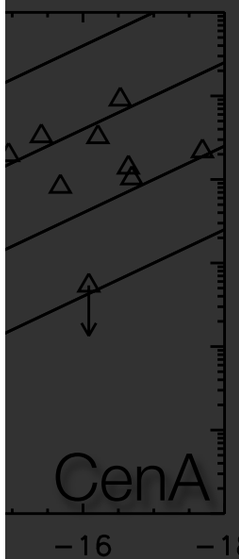
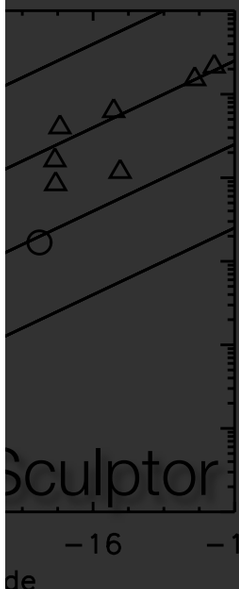
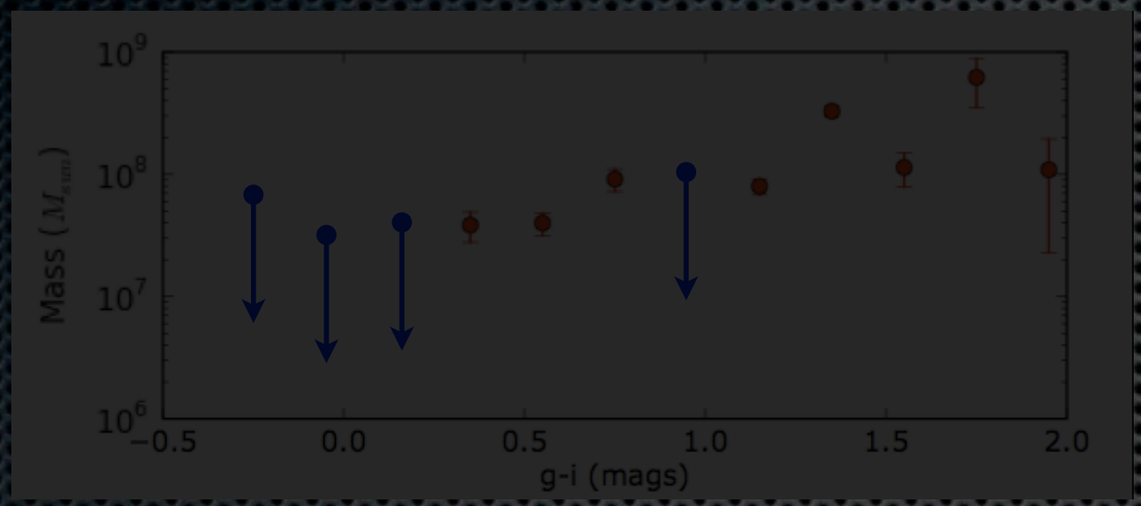


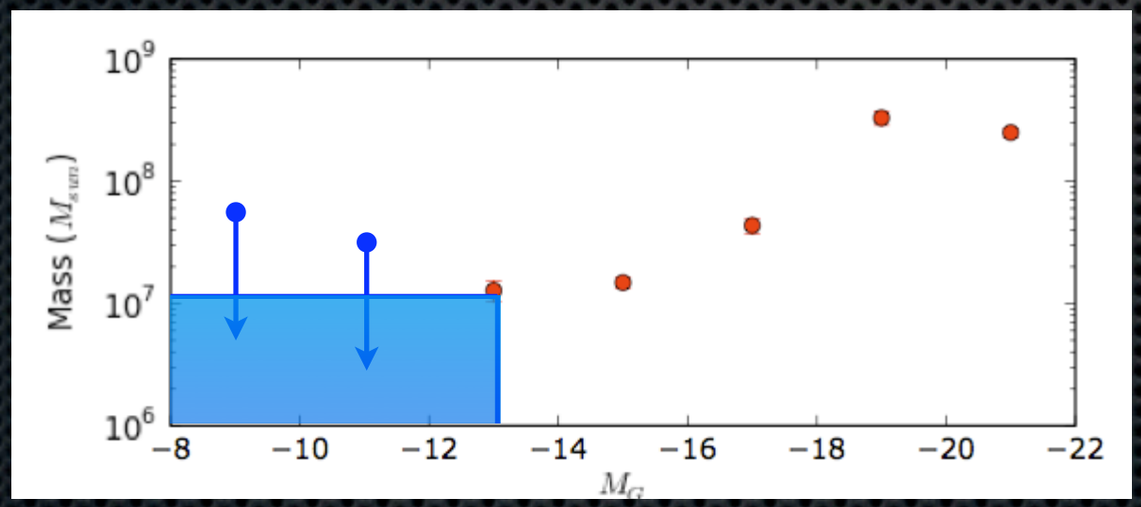


rd et al. 2007

Zwaan et al. 2005

Global HI properties of galaxies





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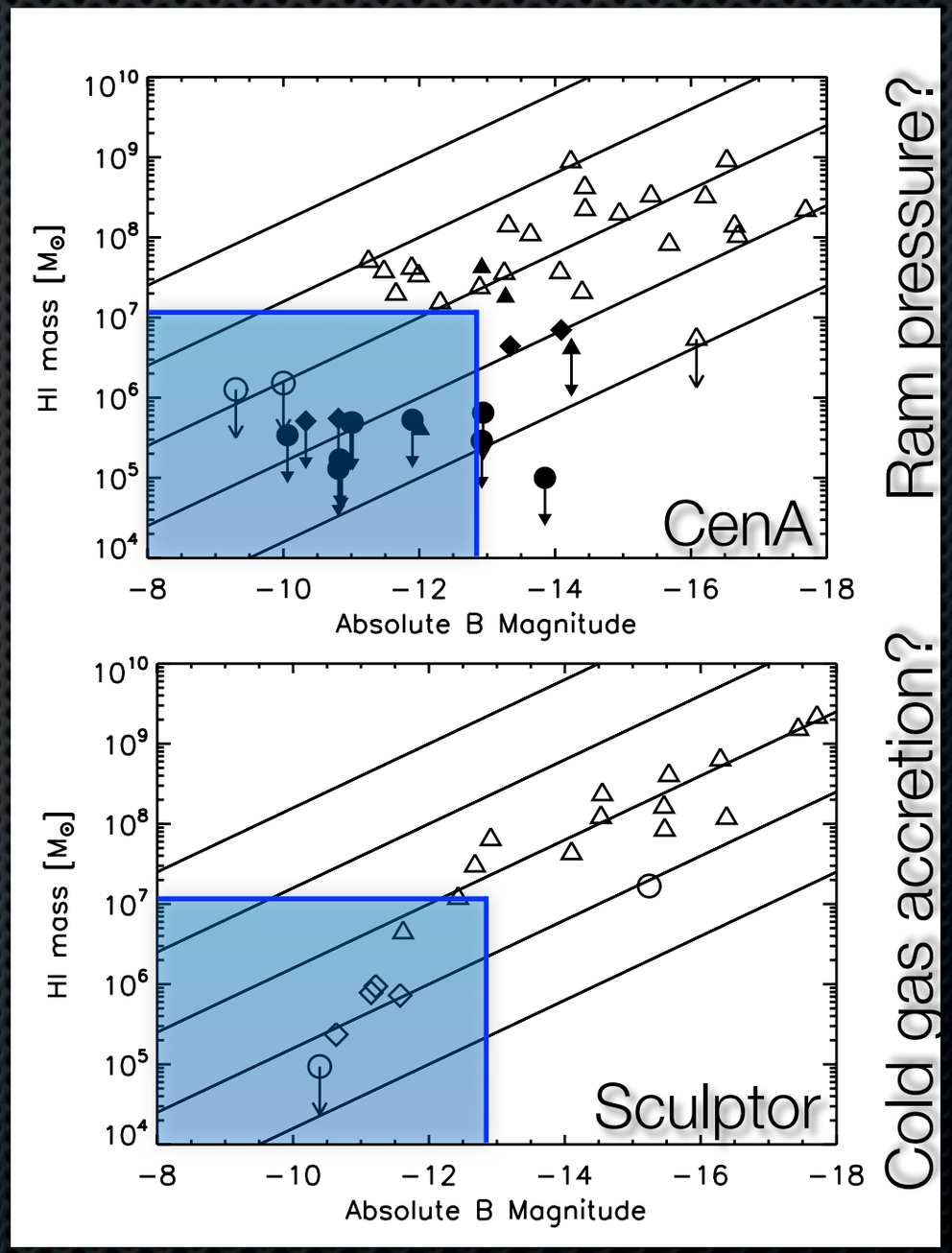
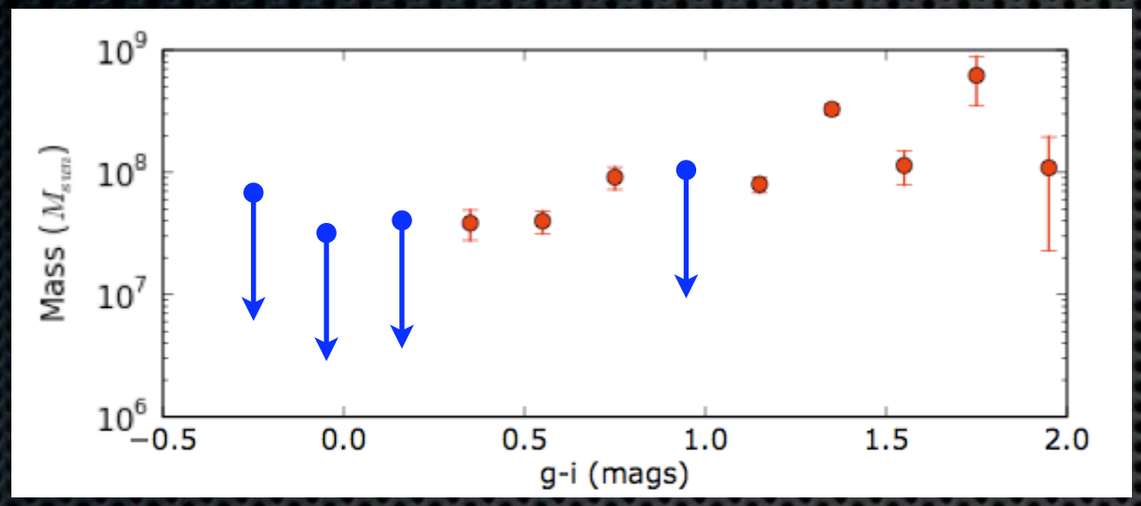
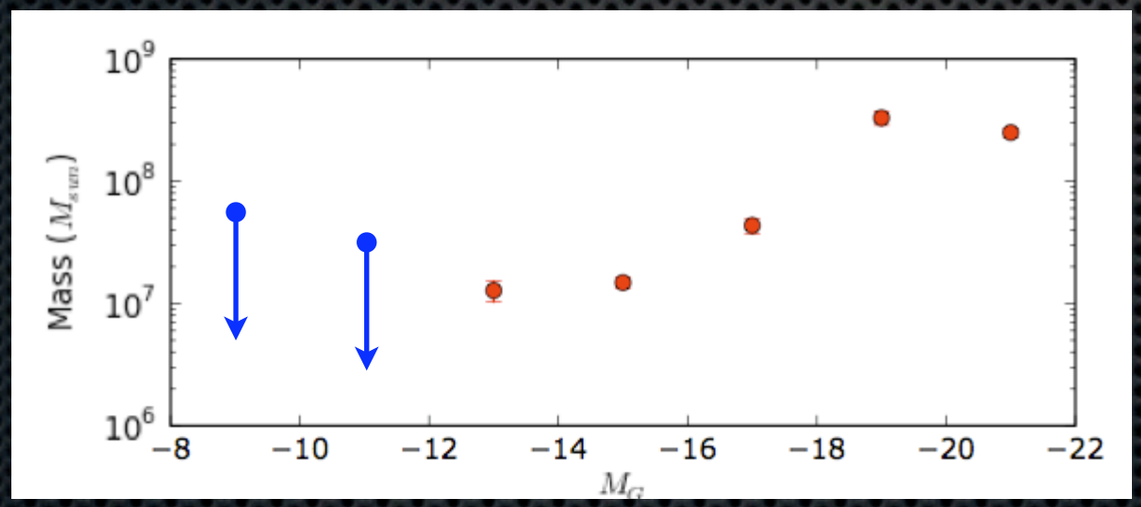


Bouchard et al. 2007

Global HI properties of galaxies

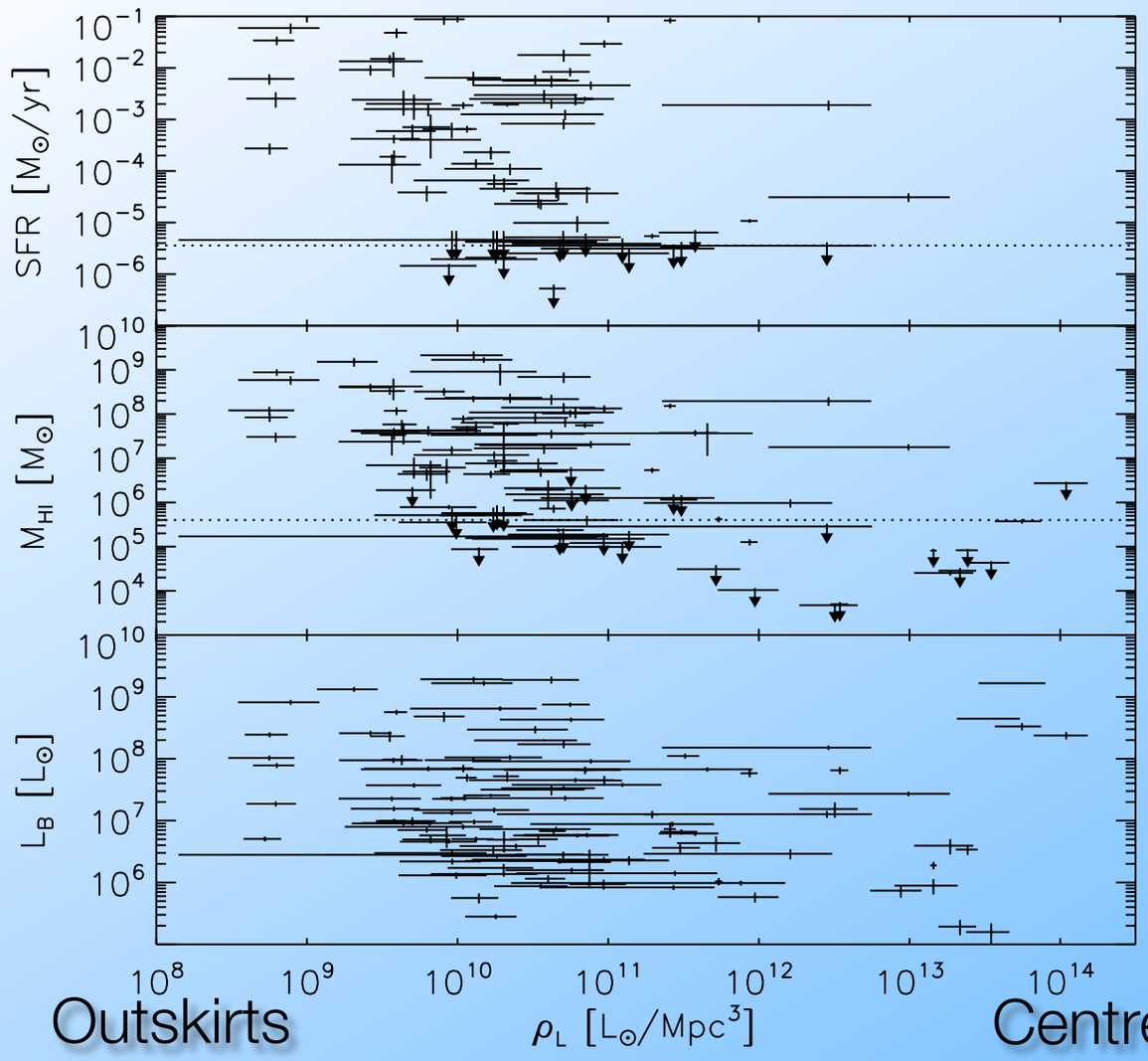




CRUMBS

- What is the faint end of the HI mass function?
  - Does it exist?
- How do low mass galaxies evolve?
- How do galaxy properties vary with environment?

Environmental influence on dwarf galaxy evolution ?



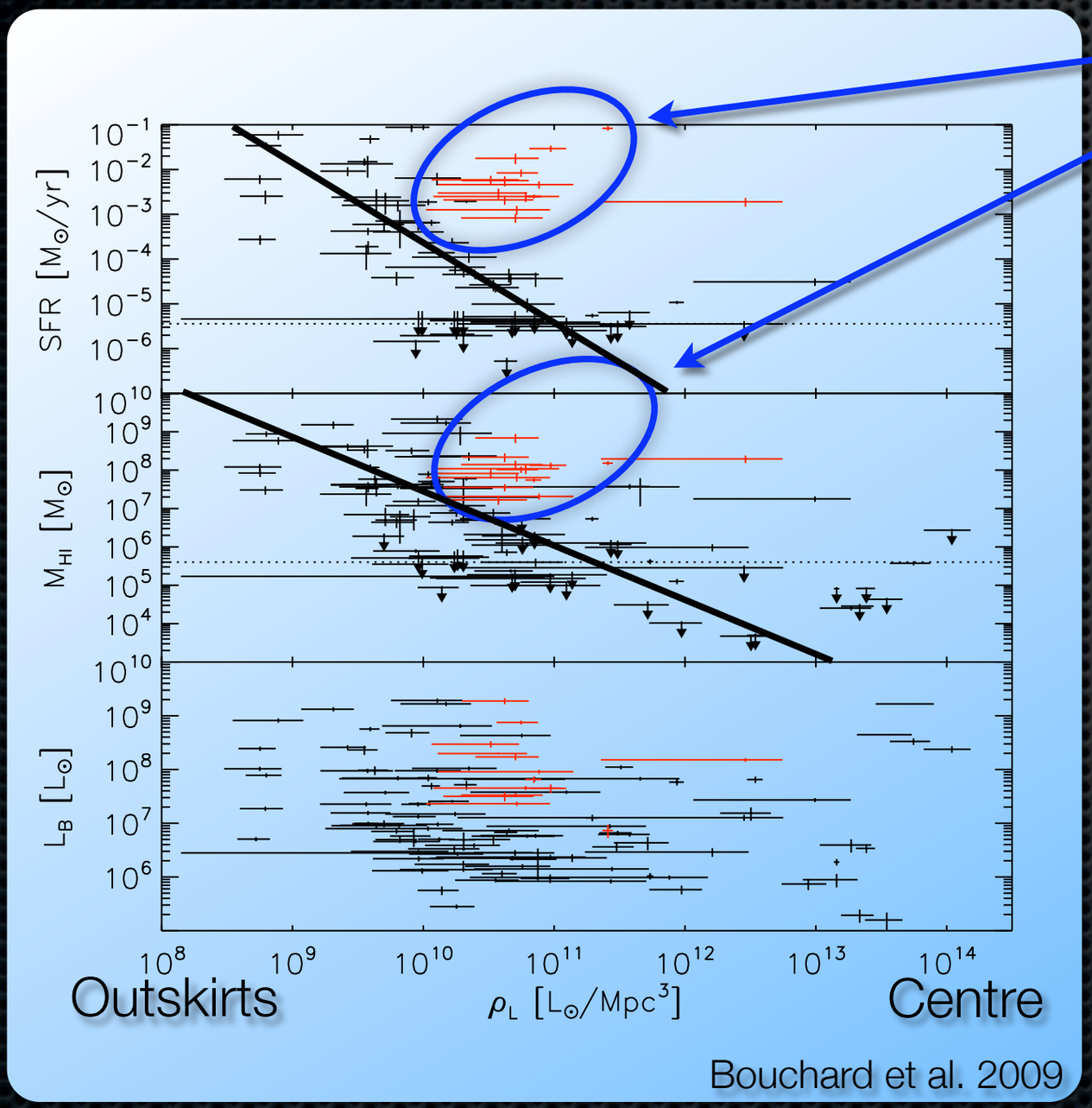
Bouchard et al. 2009

Star Formation Rate (SFR)

Neutral hydrogen (HI) mass

Luminosity

Environmental influence on dwarf galaxy evolution ?



Bouchard et al. 2009

First infall?

Cold gas accretion?

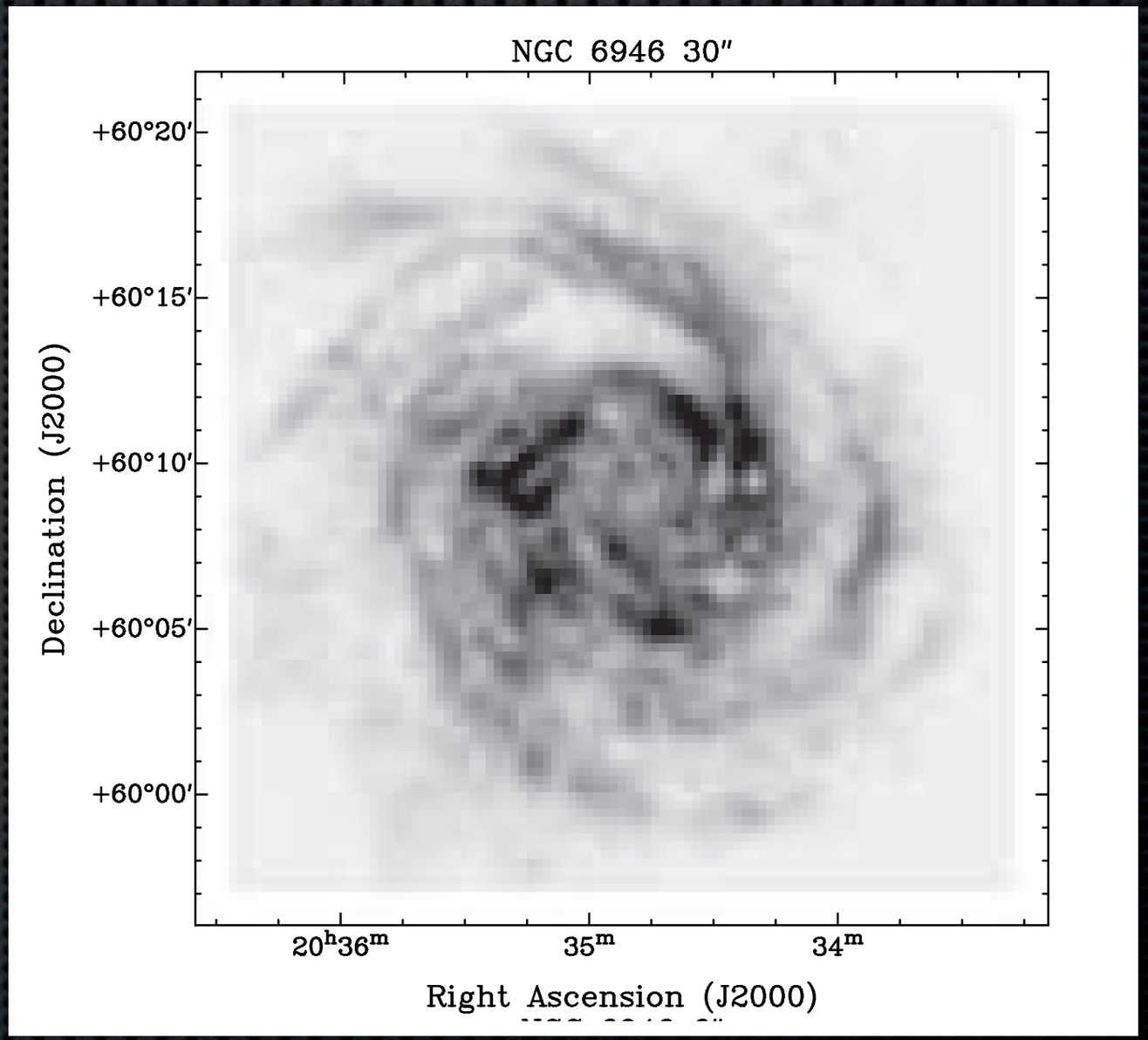
Star Formation Rate (SFR)

Neutral hydrogen (HI) mass

Luminosity

Next step: More galaxy properties

- A systematic survey of all galaxies in the Local Universe (D < 20 Mpc) - MeerKAT THINGS
  - 3 hours per galaxy: 5σ detection limit of 8×10^6 (D/20 Mpc)^2 M_{sol} (assuming an unresolved source with 20 km/s dispersion)
- Low column density HI: sensitive to $N_{HI} = 10^{19}$ cm^{-2} (interactions)
- and high resolution imaging (R=8") (internal processes)



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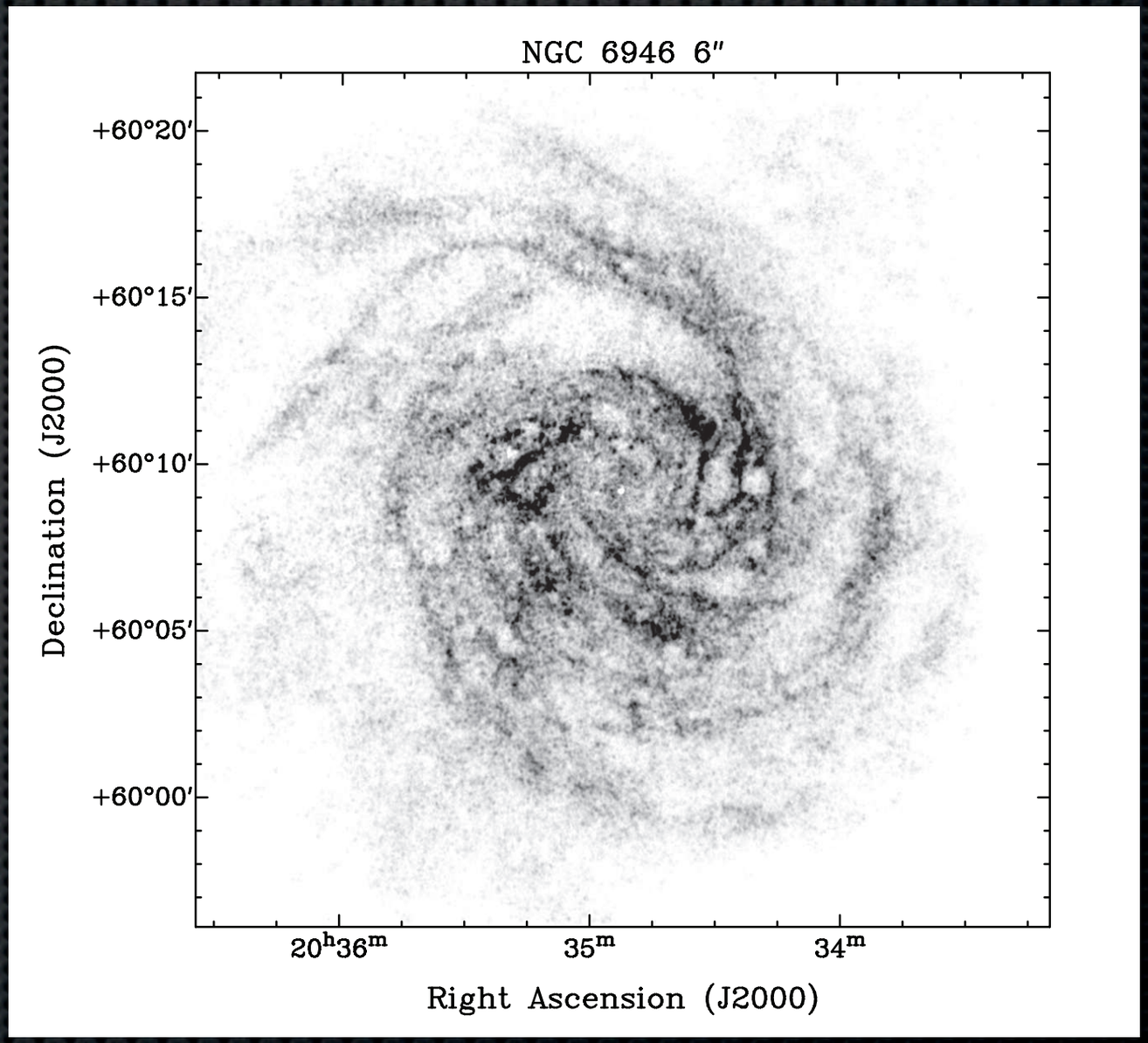
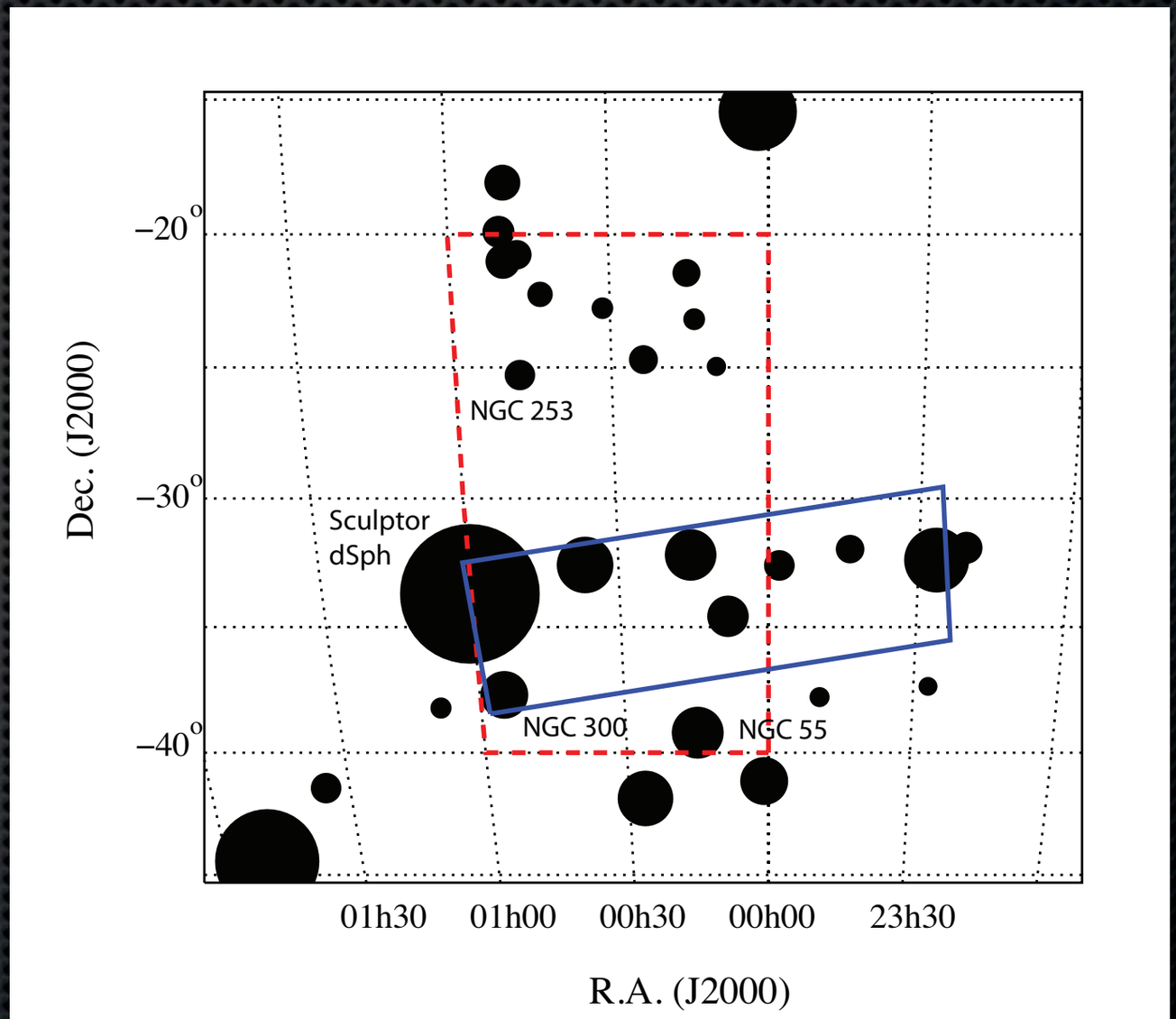


Searching for the Local Cosmic Web

- A deep blind survey of a strip in the Sculptor group
  - Search for the Local Cosmic Web
  - 5σ detection limit of $N_{HI}=10^{18}$ cm^{-2} with 90" resolution requires 155 hours per pointing (MeerKAT)



Conclusions

- The faint end of the HI mass function may be highly dependant on environment
- The environmental parameters affecting galaxy evolution have not all been identified
  - Ram pressure stripping, cold gas accretion (inhomogenous IGM, motion in the IGM)