The luminosity-dependent clustering of Hα emitters from z~0.8 to z~2.2 with HiZELS

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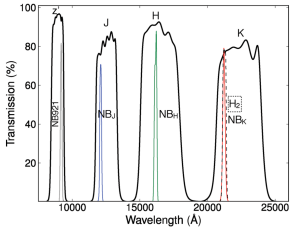
SUMMARY: We study the clustering of star-forming galaxies, using halo models to derive dark matter halo masses. Typical galaxies in our samples are star-forming centrals, residing in host halos of mass $10^{12} M_{\odot}$. We find strong trends between galaxy Hα luminosity and dark matter halo mass at all redshifts.

Quantifying clustering using the 2-point angular correlation function

- The angular clustering amplitude for each sample is easily converted to a spatial one because the redshift distribution of emitters is very well determined.
- Fitting Halo Occupation Distribution (HOD) models to data, we can separate the 1-halo and 2-halo terms and derive dark matter halo masses.



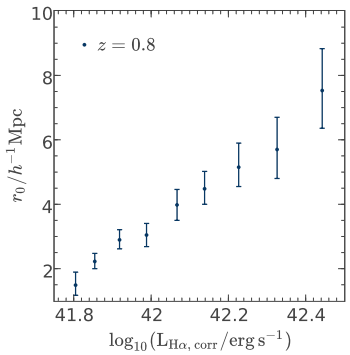
Sobral et al. 2013

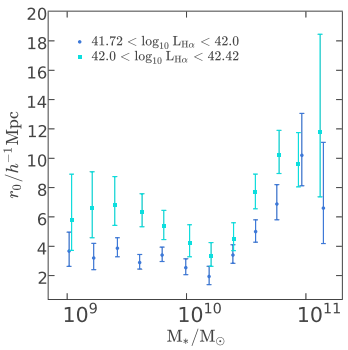
- The **HiZELS narrow-band survey** uses Hα emission to select star-forming galaxies in a consistent manner across the peak and fall of the volume-averaged star-formation rate density (z=0.8, 1.47 & 2.23).
- The survey benefits from known flux limits and well-defined redshift distributions.
- We probe fields with good multi-wavelength coverage: COSMOS, UDS & SA22. The total coverage is several square degrees.

KEY RESULTS

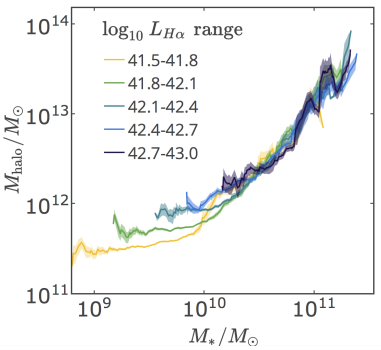
Clustering strength increases broadly linearly with log(Hα luminosity) at all redshifts. At fixed stellar mass, more luminous galaxies are more strongly clustered, particularly at low stellar masses.

Simulating the HiZELS Hα flux selection with EAGLE yields consistent results.





Cochrane et al. 2017

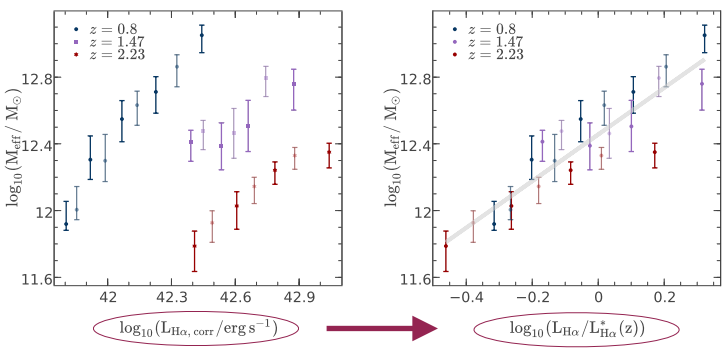


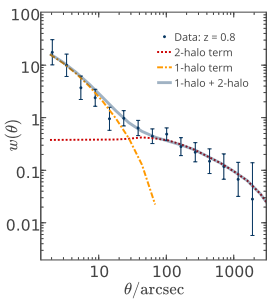
Cochrane et al., in prep.

Highly star-forming low mass galaxies in HiZELS appear to be undergoing environmentally-driven star-formation, perhaps due to enhanced gas supply in small groups compared to the field.

The derived typical dark matter halo mass is tightly correlated with the average Hα luminosity of the subsample. Scaling by the characteristic luminosity at each redshift brings these relations into agreement across the 3 redshift slices, revealing a tight relationship between galaxy star-formation rate and host halo mass.

Cochrane et al. 2017, https://arxiv.org/abs/1704.05472





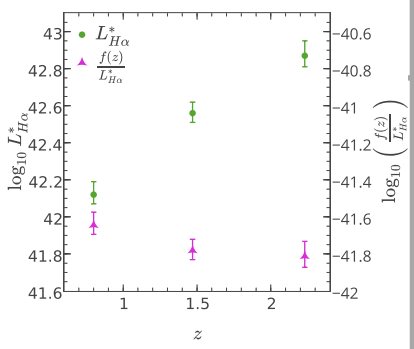
HOD fits use HMF & HALOMOD python packages (Murray et al. 2013).

Satellite fractions for our samples are low (~5%) at all redshifts. Most HiZELS galaxies are centrals.

In the gas-regulator model (e.g. Lilly et al. 2013), the specific star formation rate of a central galaxy tracks the specific mass accretion rate of its dark matter halo. **We find that the characteristic luminosity of our samples evolves in line with the halo accretion rate.**

$$\left\langle \frac{dm_{halo}}{dt} \right\rangle = 46.1 \left(\frac{m_{halo}}{10^{12}} \right)^{1.1} (1+1.11z)\sqrt{\Omega_M (1+z)^3 + \Omega_\Lambda} = f(z)$$

Fakhouri et al. 2010



References

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