Estimating CO using FIRE

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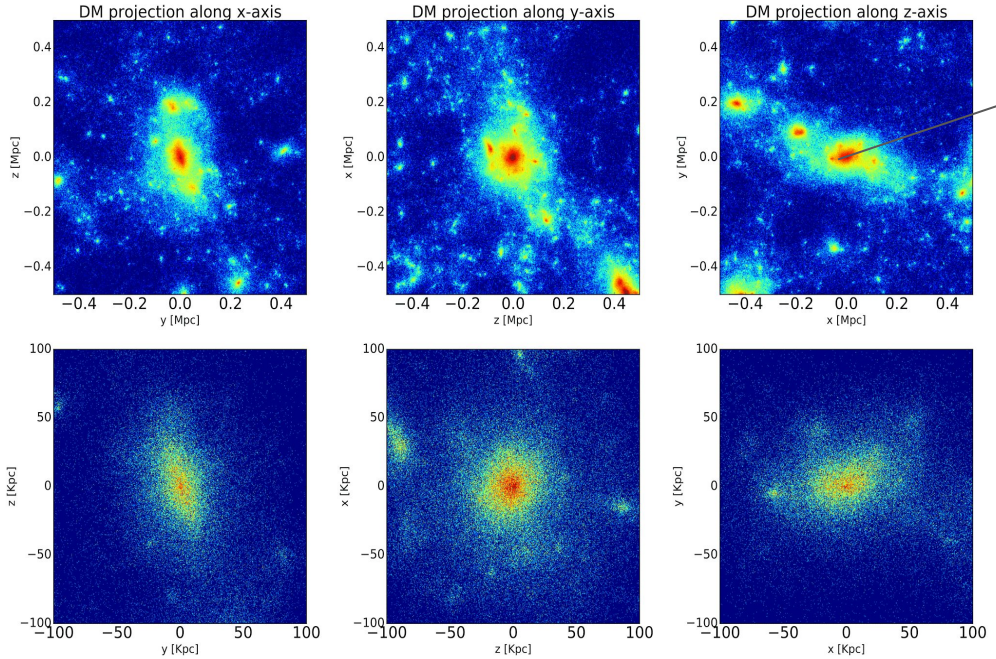
Introduction

- FIRE has a number of galaxy runs, we plan to use these as an ensemble to compute statistics and determine the scaling relations (eg. L_{CO} vs M_{HALO})
- We have looked at galaxy runs of halo mass 10^{12} and 10^{13} M_{SUN} at z = 0, and made projection plots of various quantities.

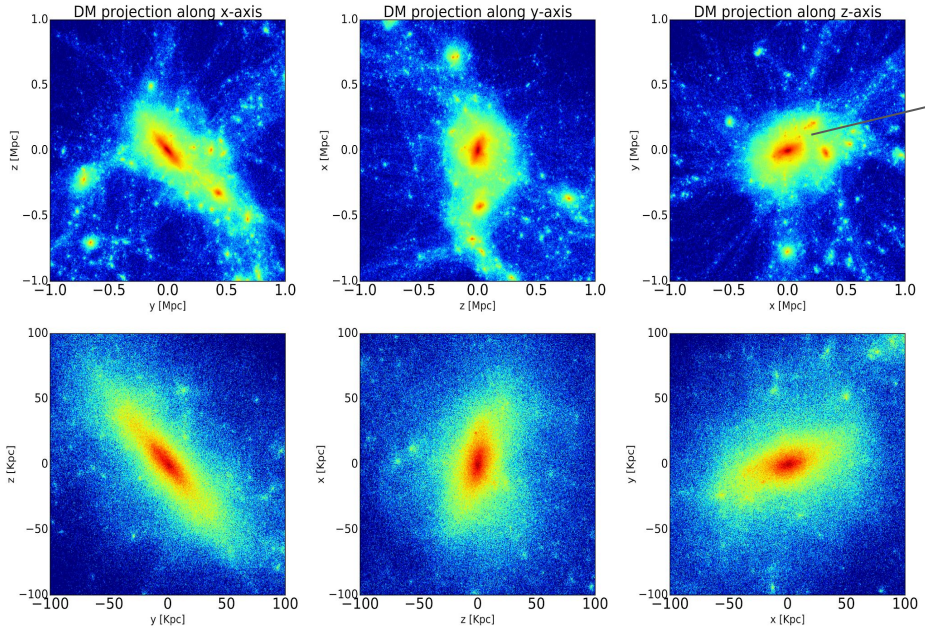
Dark Matter Projections for m13



At z = 2.5,
$M_{HALO} = 4.9 \times 10^{11} M_{SUN}$

Eventually, $M_{HALO} = 10^{13} M_{SUN}$
at z = 0

Dark Matter Projections for m12



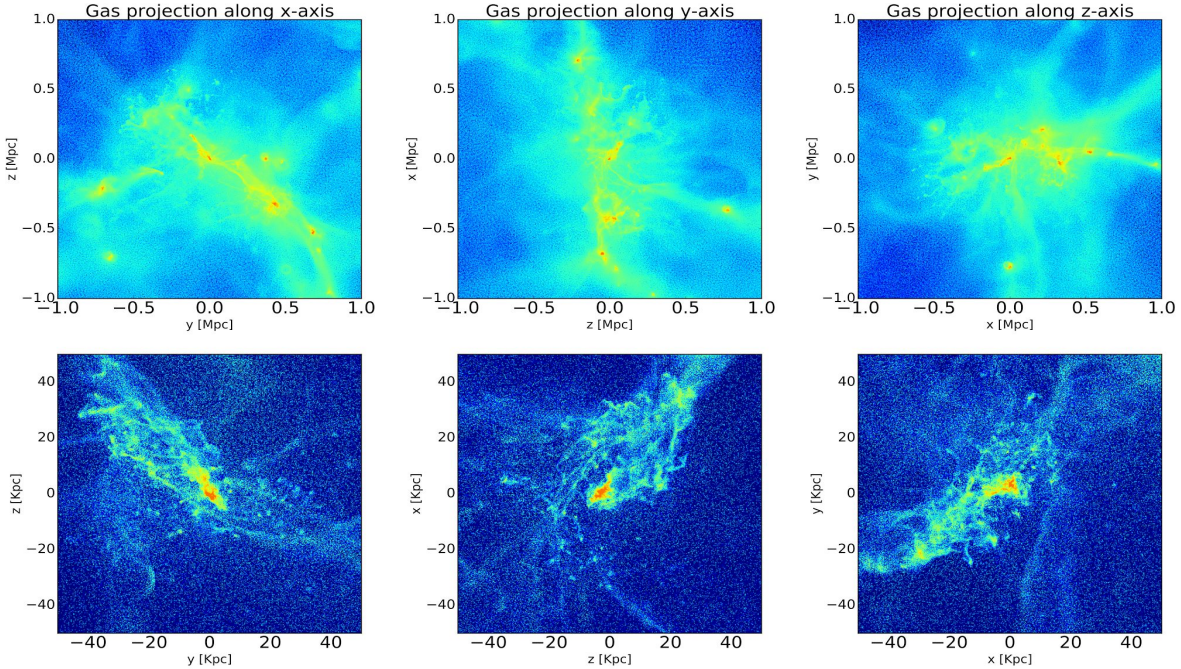
At z = 2.5,

$M_{HALO} = 2.3x10^{11} M_{SUN}$

Eventually at z = 0,

$M_{HALO} = 10^{12} M_{SUN}$

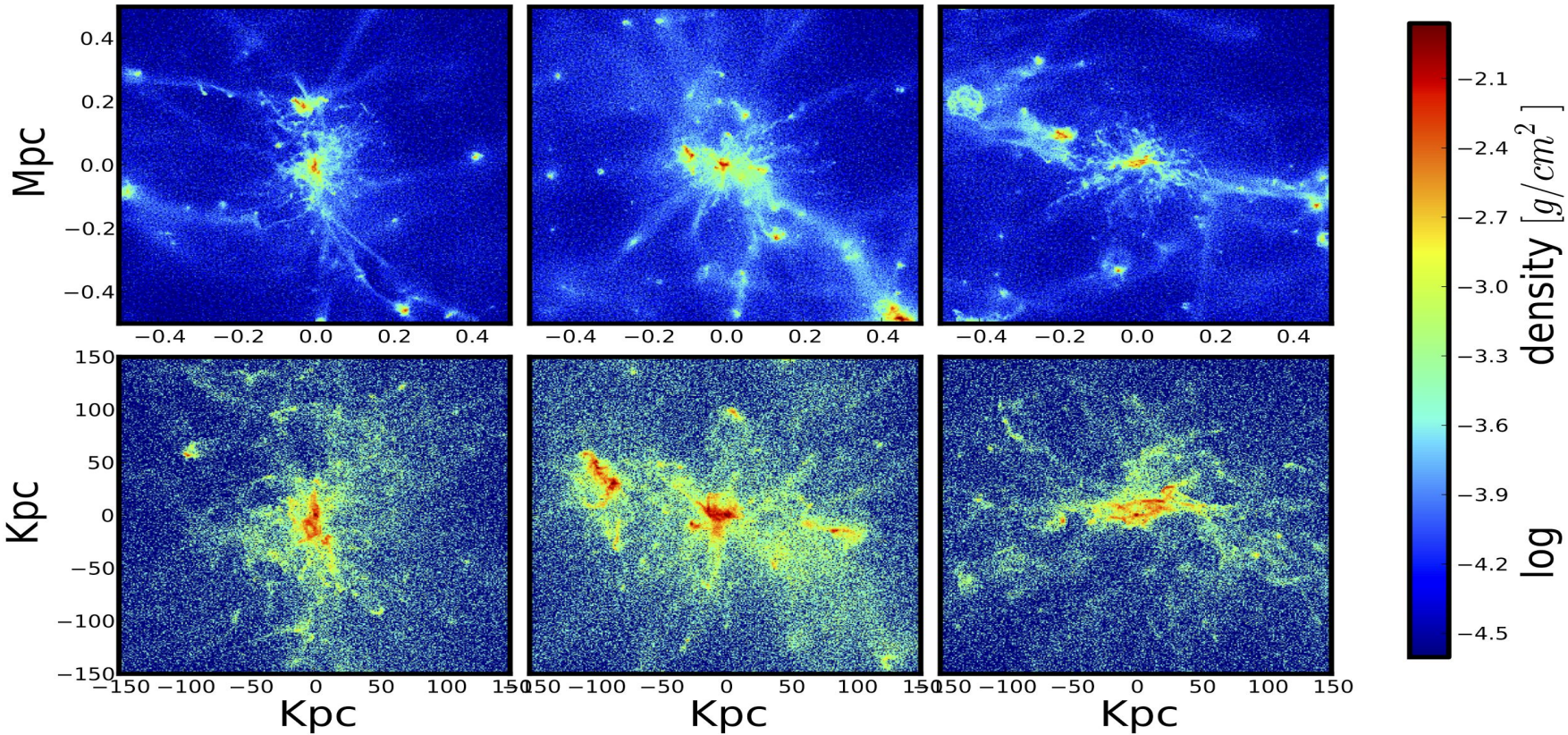
Gas Mass projections for m12 (z = 2.5)



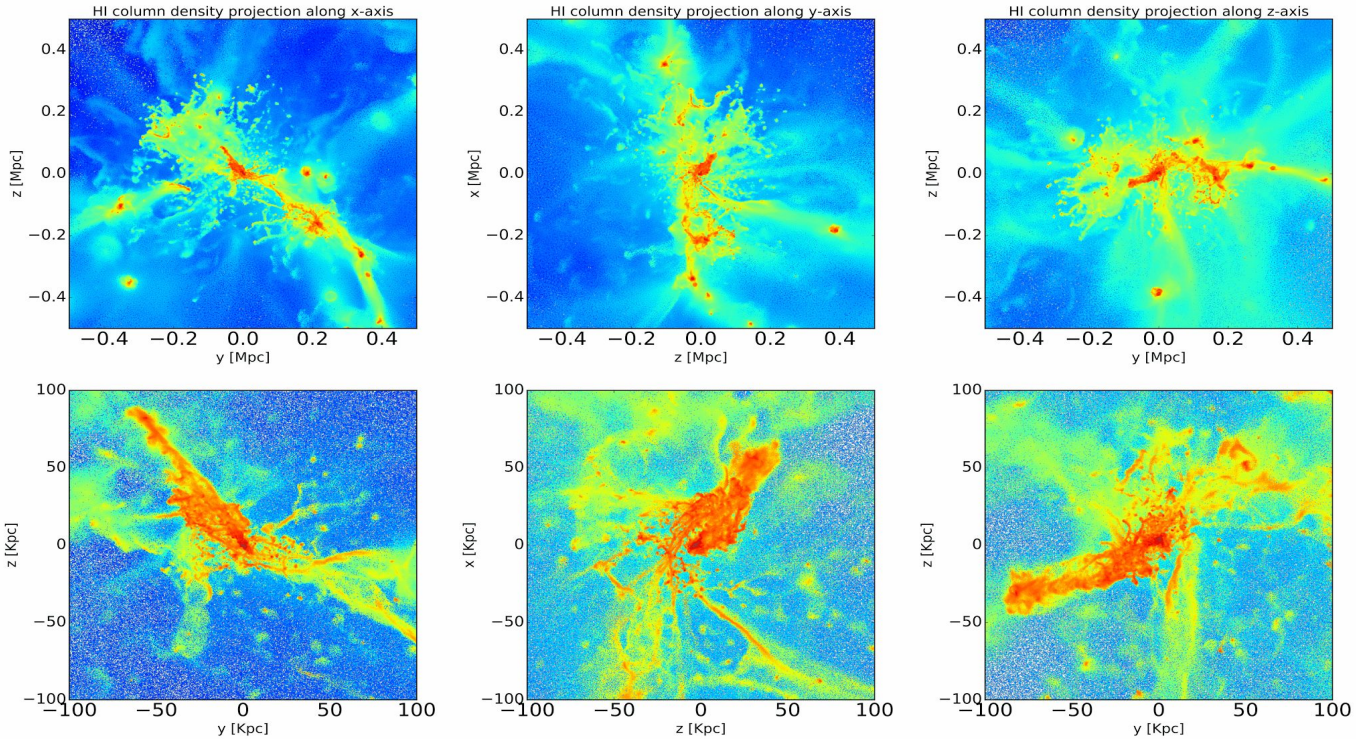
Red ≈ 10^7 (M_{SUN}/kpc^2)

Blue ≈ 10^4 (M_{SUN}/kpc^2)

Gas Mass projections for m13 (z = 2.5)



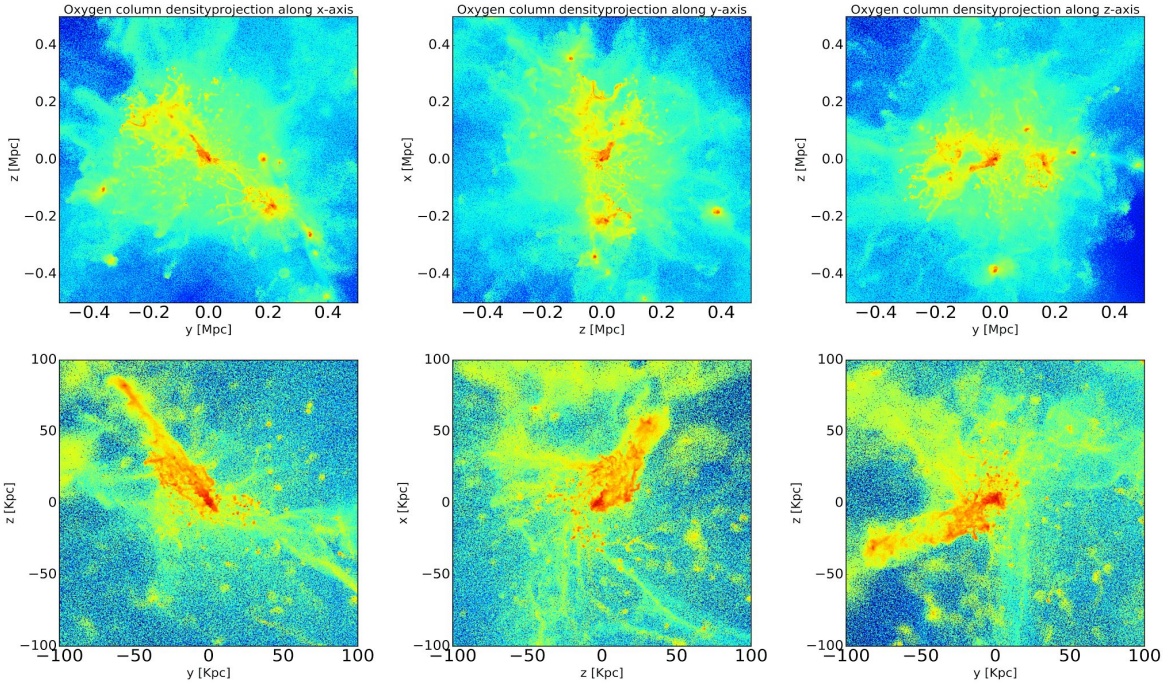
HI Column Density for m12 (z = 2.5)



Red = 10^{22} (cm^{-2})

Blue = 10^{13} (cm^{-2})

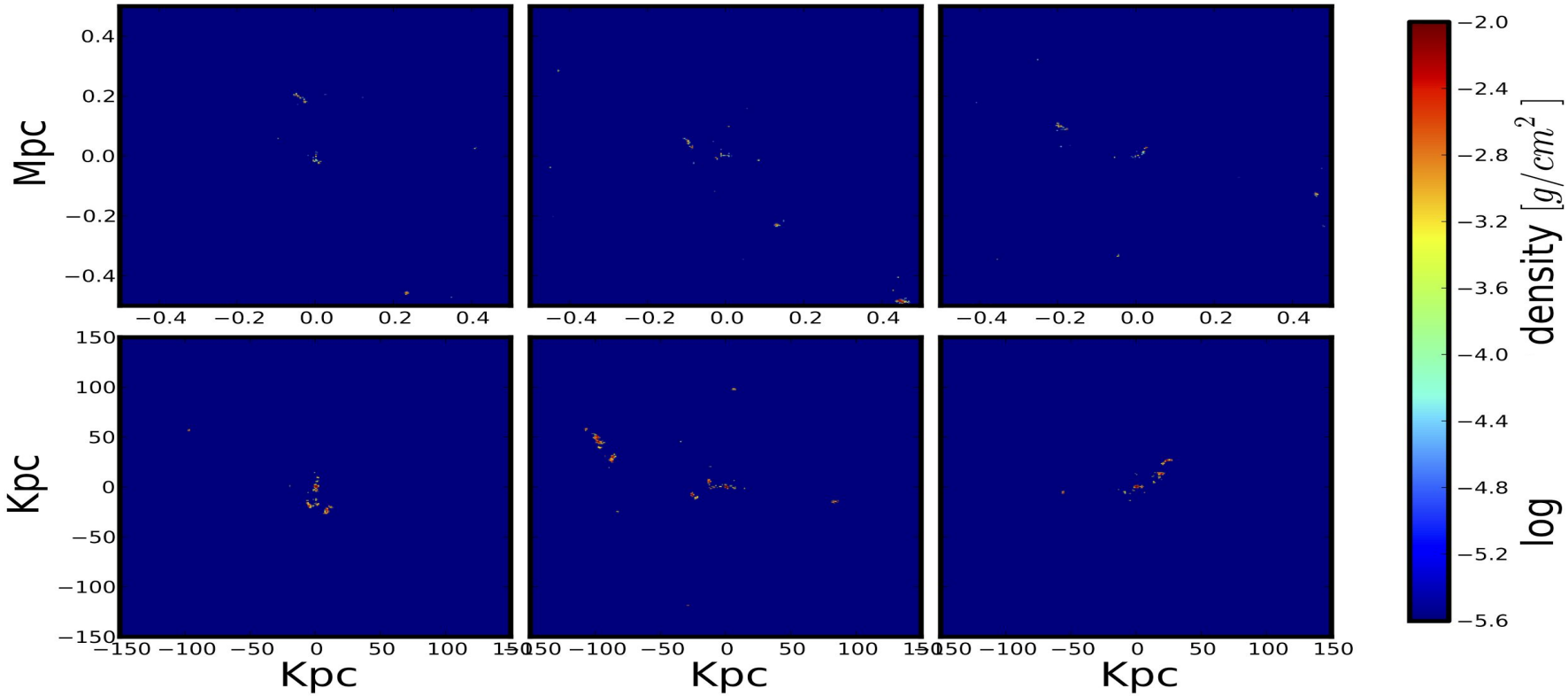
Oxygen Column Density for m12 (z = 2.5)



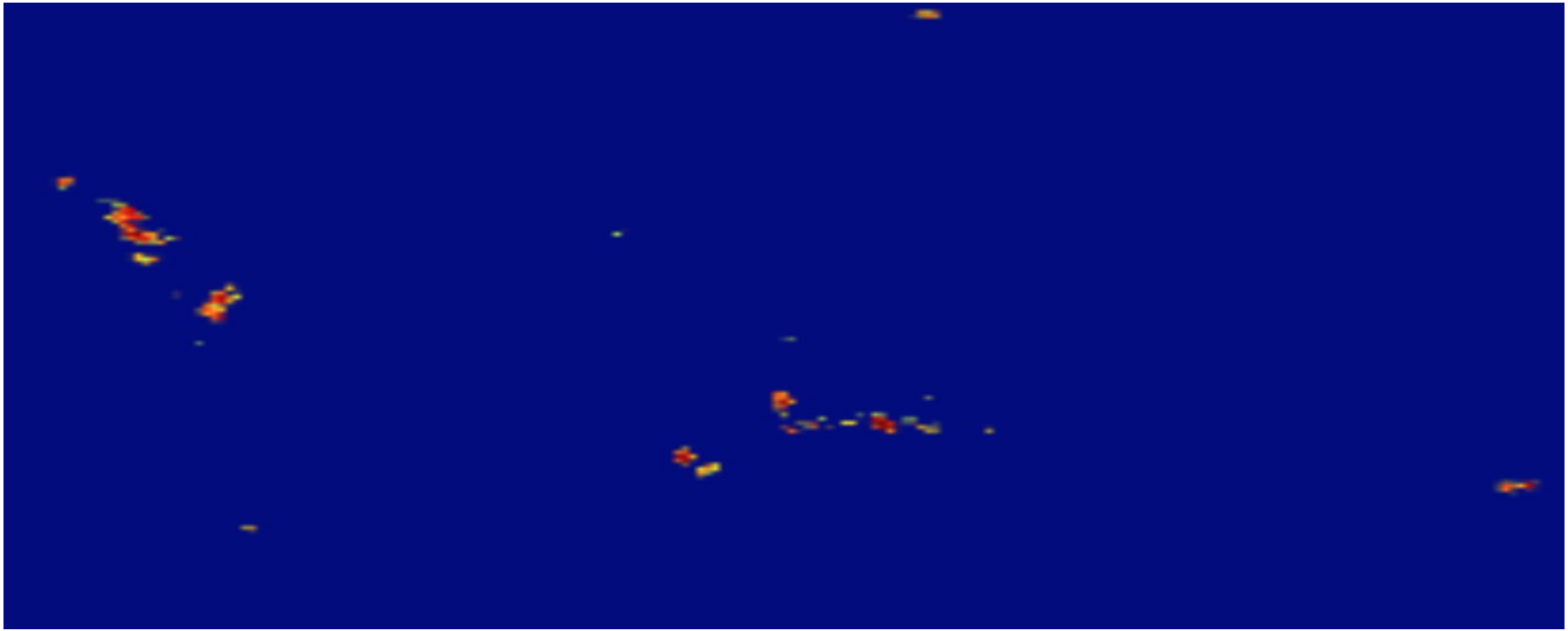
Red ≈ 10^{19} (cm^{-2})

Blue ≈ 10^{13} (cm^{-2})

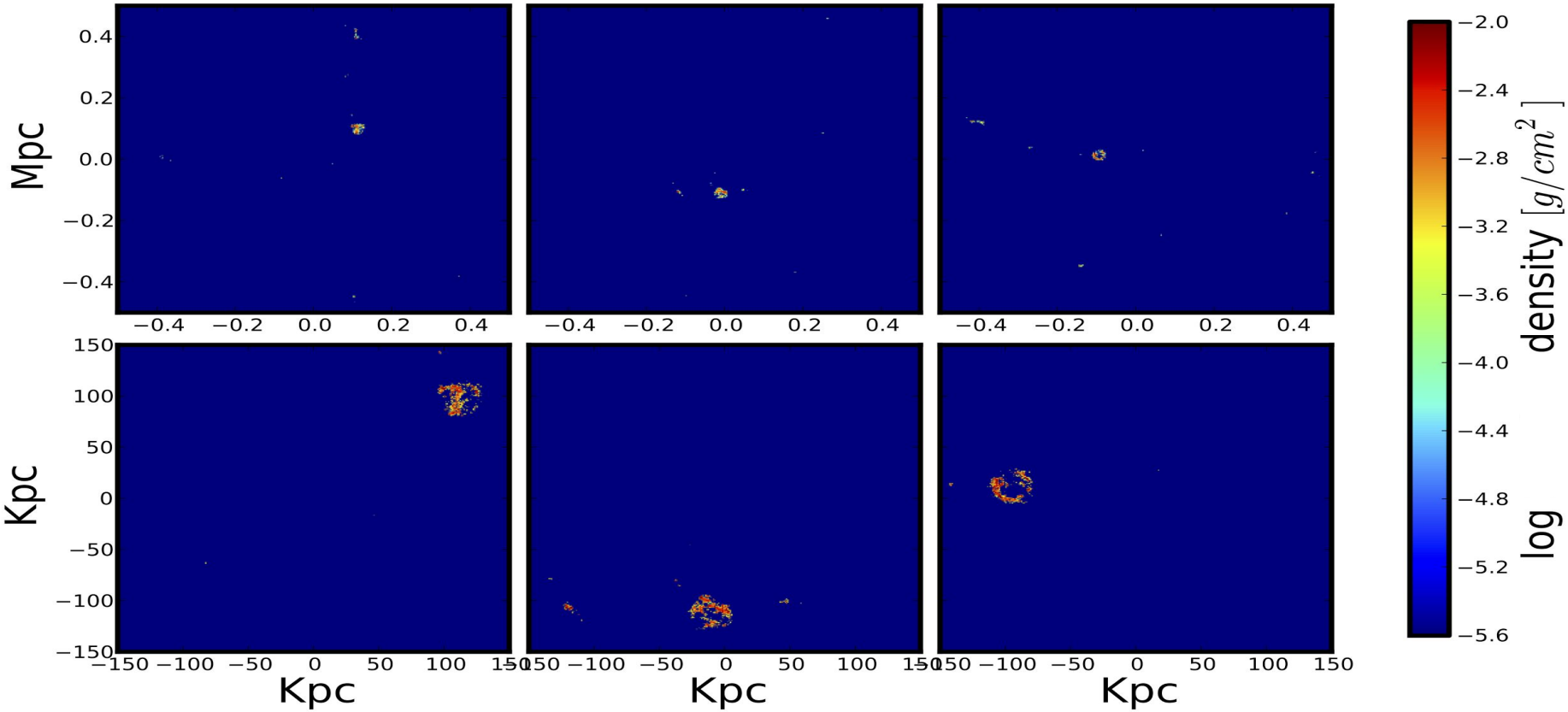
First step in modelling CO, $n_{crit} > 0.1$ (cm^{-3}) (z = 2.5)



Zoom in (z = 2.5)



$n_{crit} > 0.1\ (cm^{-3})\ \ (z = 2.7)$



Future Work

- We need X_{CO} to convert from gas column density to CO density.

- As a start, we plan to compute $X_{CO} = X_{CO}(Z, \Sigma_H)$ using scaling relations given in (2012MNRAS.421.3127N).

- Given X_{CO} get scaling relations between L_{CO} and M_{HALO}.