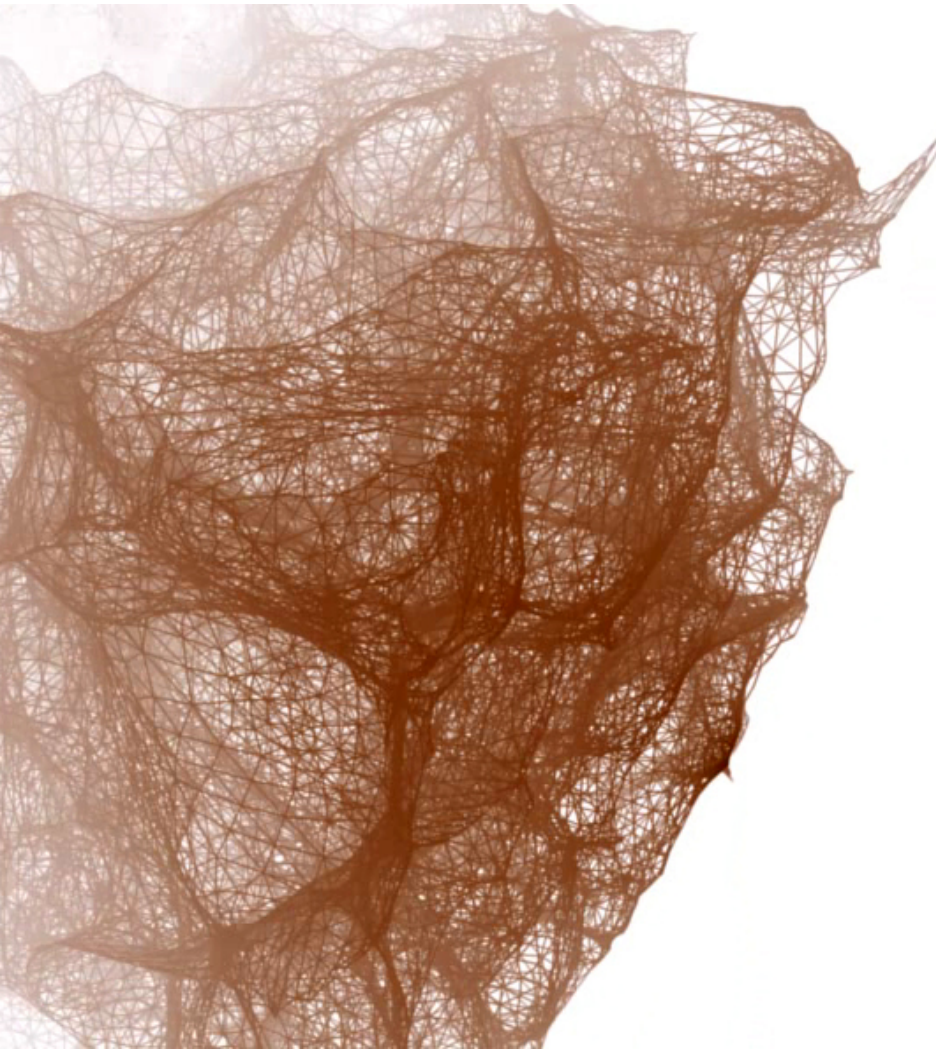


The Search for Void-Galaxies only the lonely



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The Search for Void-Galaxies

Miguel Aragon Calvo



Kathryn Stanonik



The Trouble with Void-Galaxies

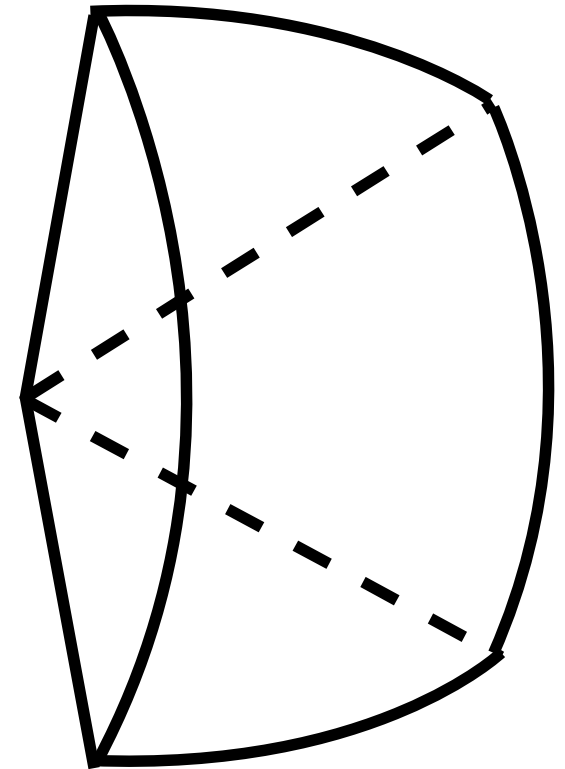
- Voids are inhabited by small faint Galaxies
→ restricted to nearby distances

Selecting/
both deep

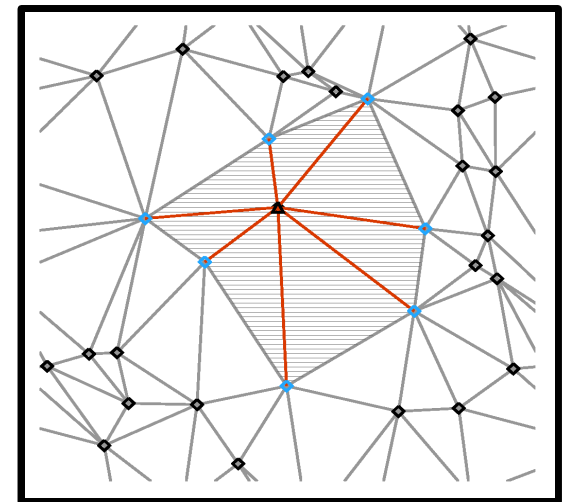
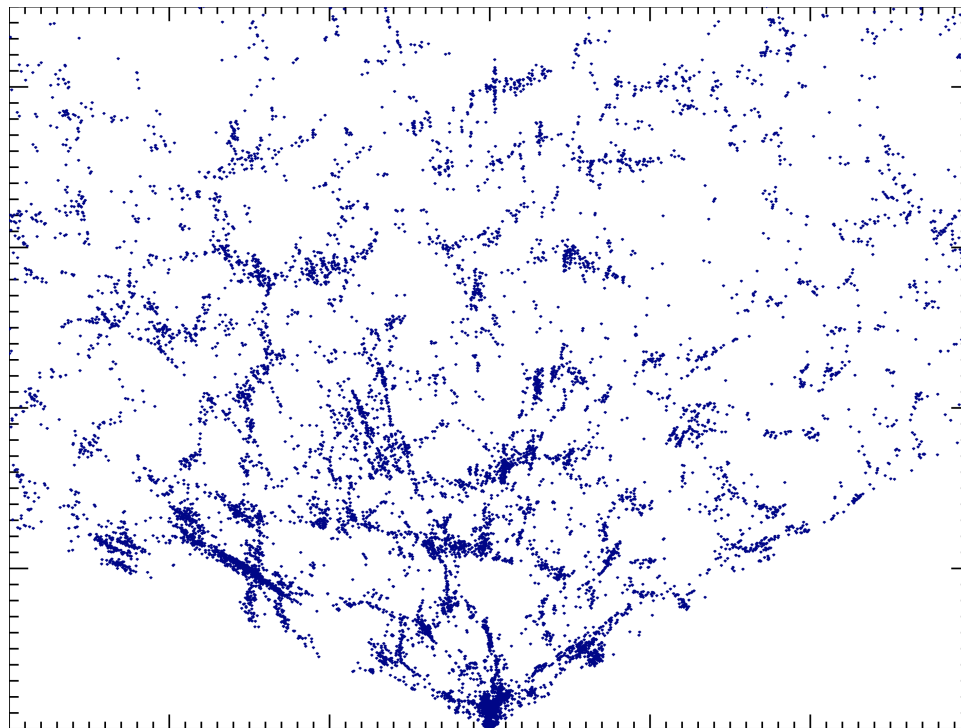
Optical Surveys:
SDSS-DR7 or 6dF-DR3

HI Surveys:
ALFALFA

- Voids are
→ covering large fraction of the sky



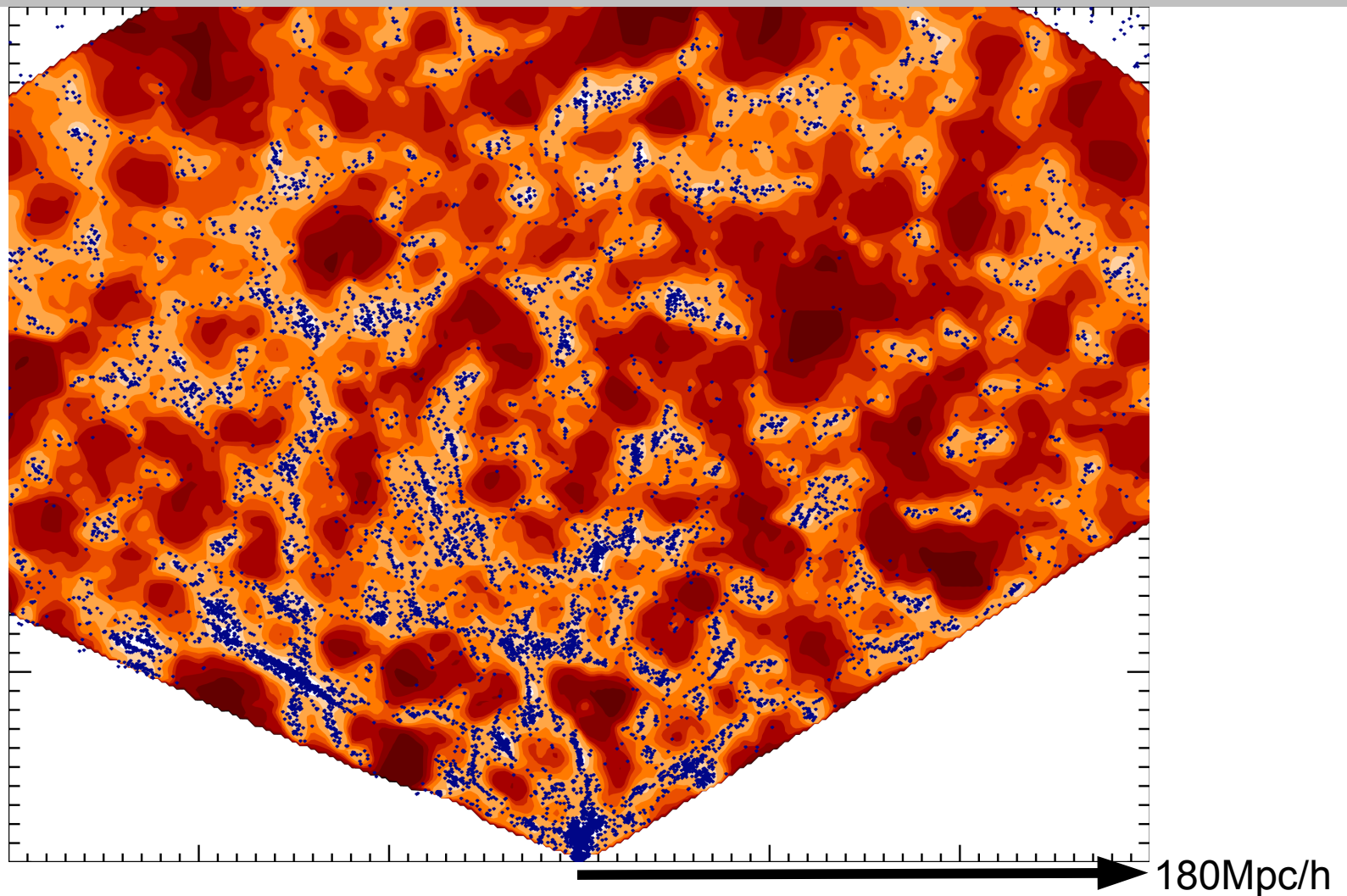
SDSS Density Reconstruction



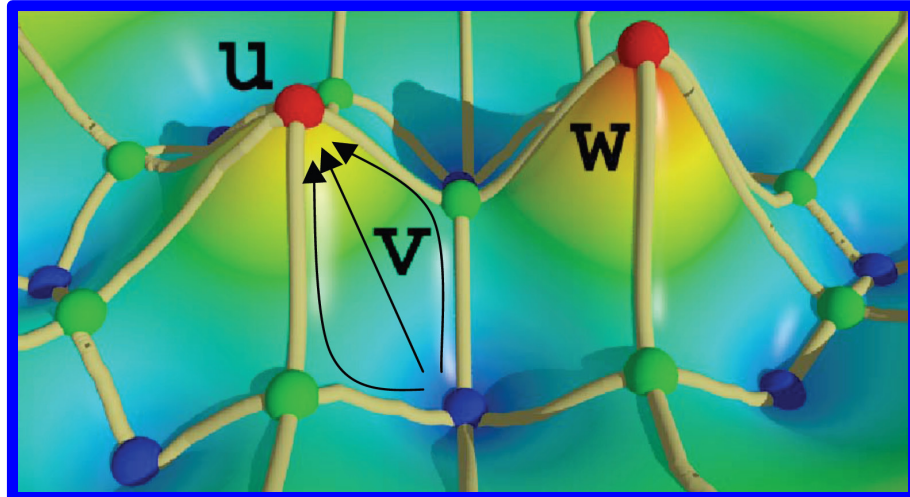
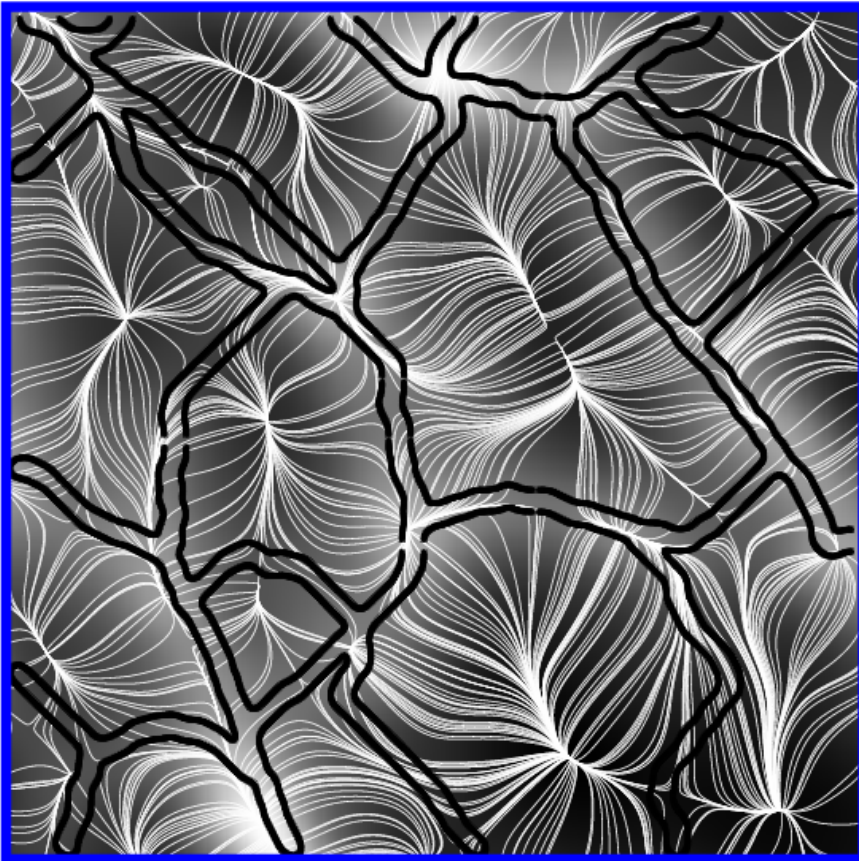
Spatial Point Distribution → Density Field

Delaunay Tessellation Fields Estimator Schaap et al. (2000)

SDSS density reconstruction (2)



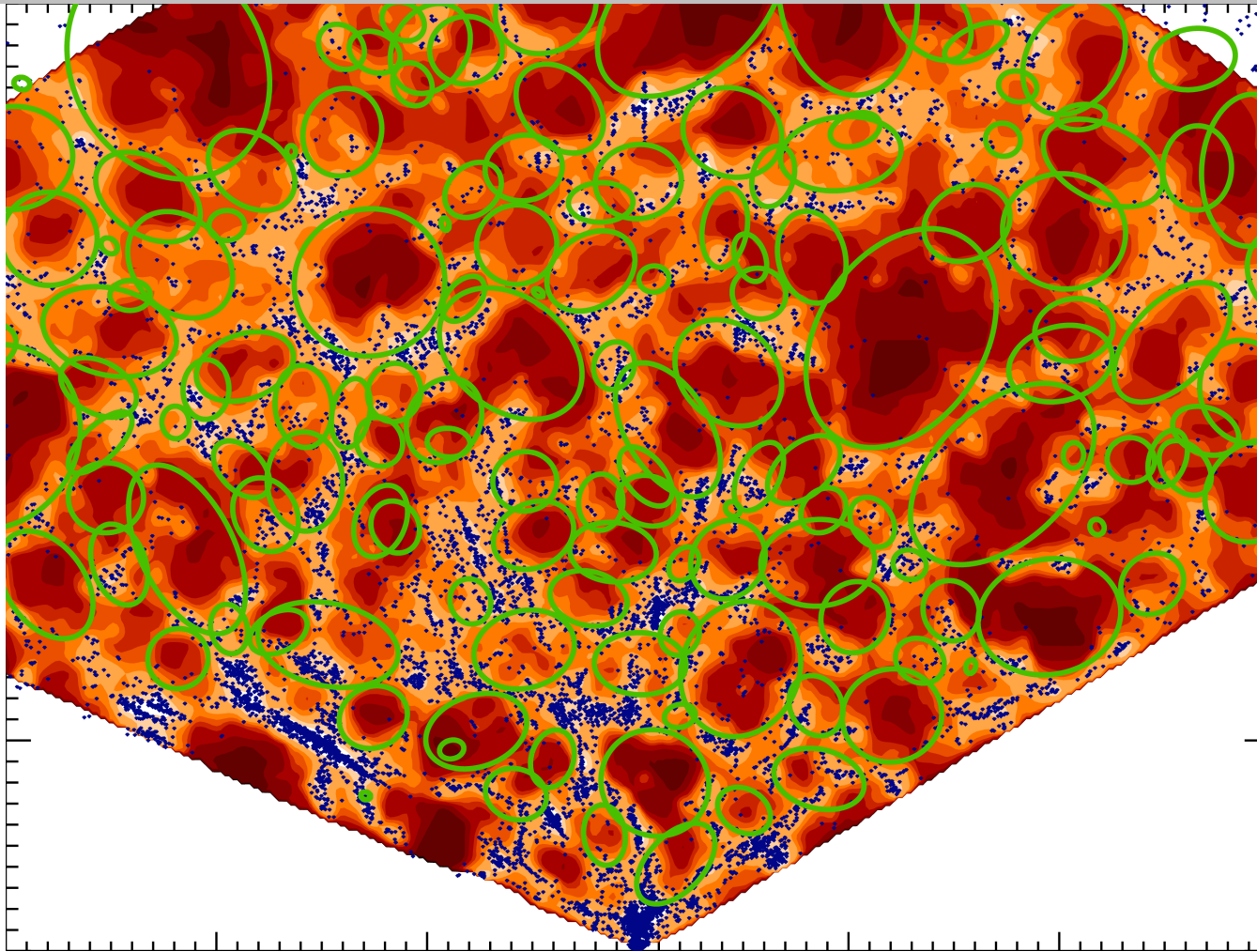
Environment by Gradient Flow



From a minimum we flow upward. When ever two flows from different minima collide we put a devide line. In this way we segment the density field into distinct void patches.

Voids in SDSS

See Poster 65 by Danny Pan



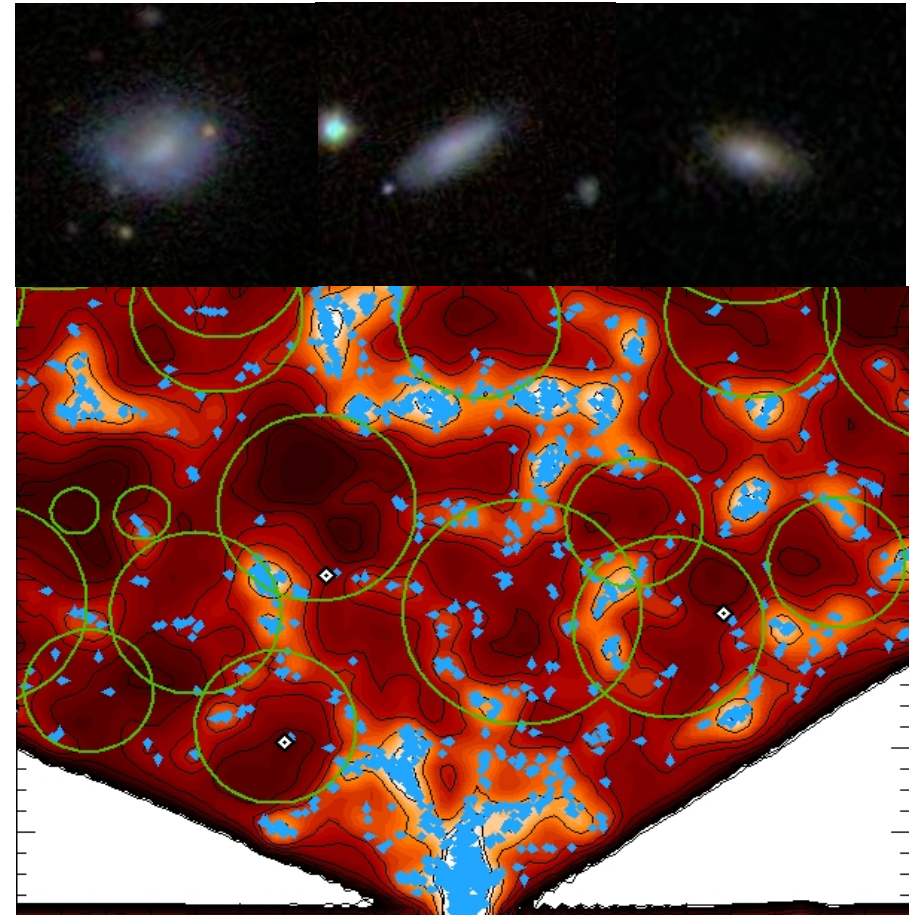
Date:04-03-2009

Overhead sheet 7

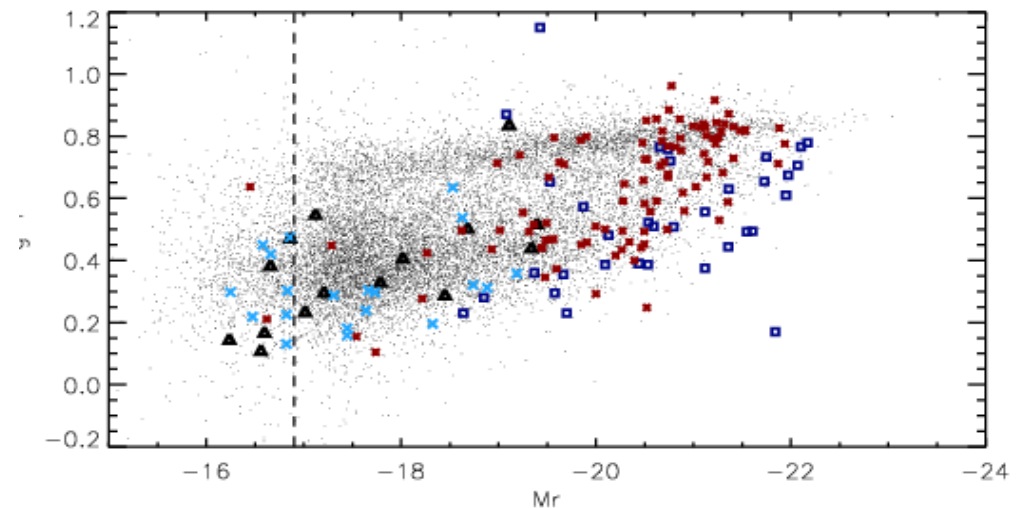
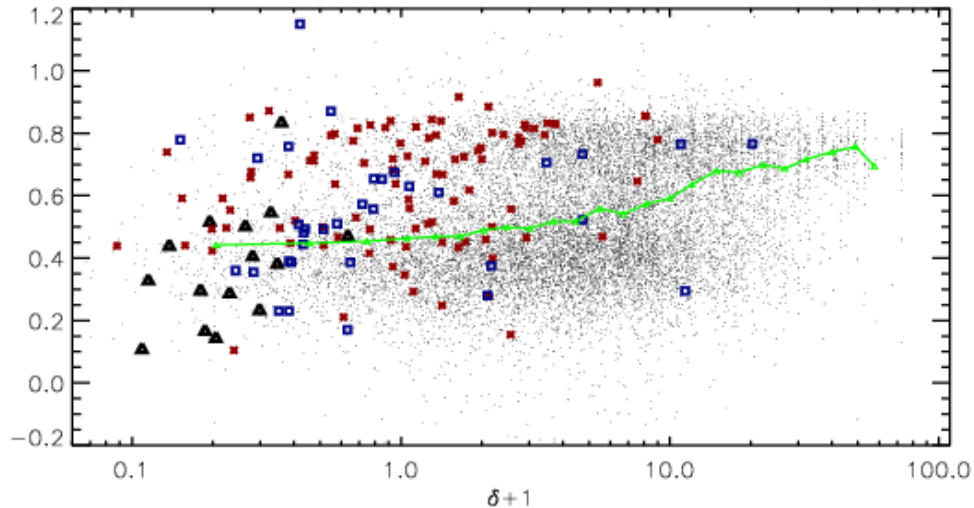
Void-Galaxy Sample

Geometrical Defined Sample

- ◆ Using the SDSS redshift catalogue
- ◆ Within a redshift range from $0.01 < z < 0.025$
- ◆ 250 galaxies with the lowest density values $\sim 0.2 \times$ cosmic mean
- ◆ Avoid galaxies that lie in front or behind clusters of galaxies (fingers of god)
- ◆ Ranked them according to the distance of the void-centers. Pick the most centrally located



Optical Properties of the Selection



Comparison to other VG samples:

Blue boxes;

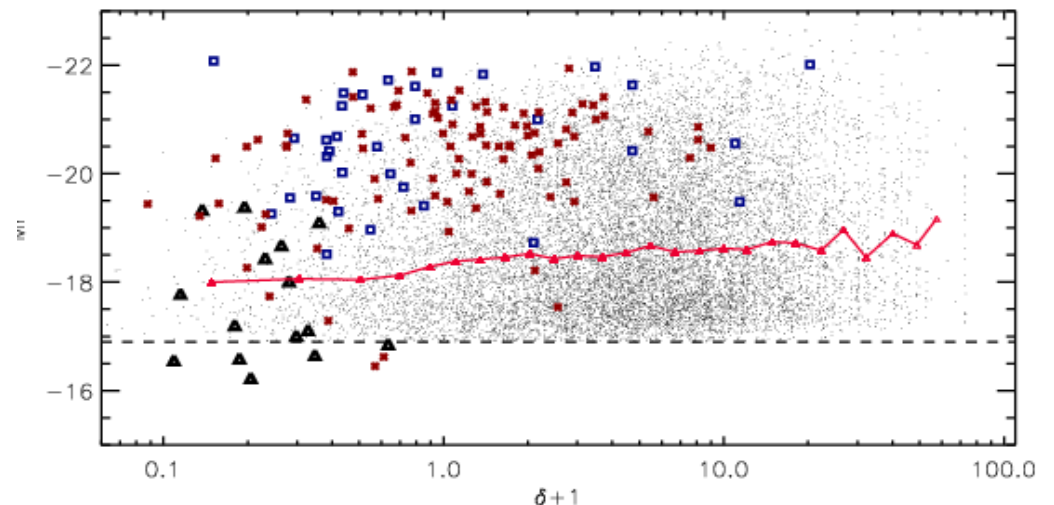
Sample from Szomoru (1996)

Average redshift of $z \sim 0.05$

Red crosses;

Optical Selected sample of Grogin & Geller (2000). Same average distance

$\langle M_r \rangle = -20$, here $\langle M_r \rangle = -18$



HI Void-Galaxy Sample

Geometrical Defined Sample:

- ◆ Using the SDSS redshift catalogue
- ◆ Within a redshift range from $0.01 < z < 0.025$
- ◆ 250 galaxies with the lowest density values ~ 0.2 x cosmic mean
- ◆ Avoid galaxies that lie in front or behind clusters of galaxies (fingers of god)
- ◆ Ranked them according to the distance of the void-centers. Most centrally located

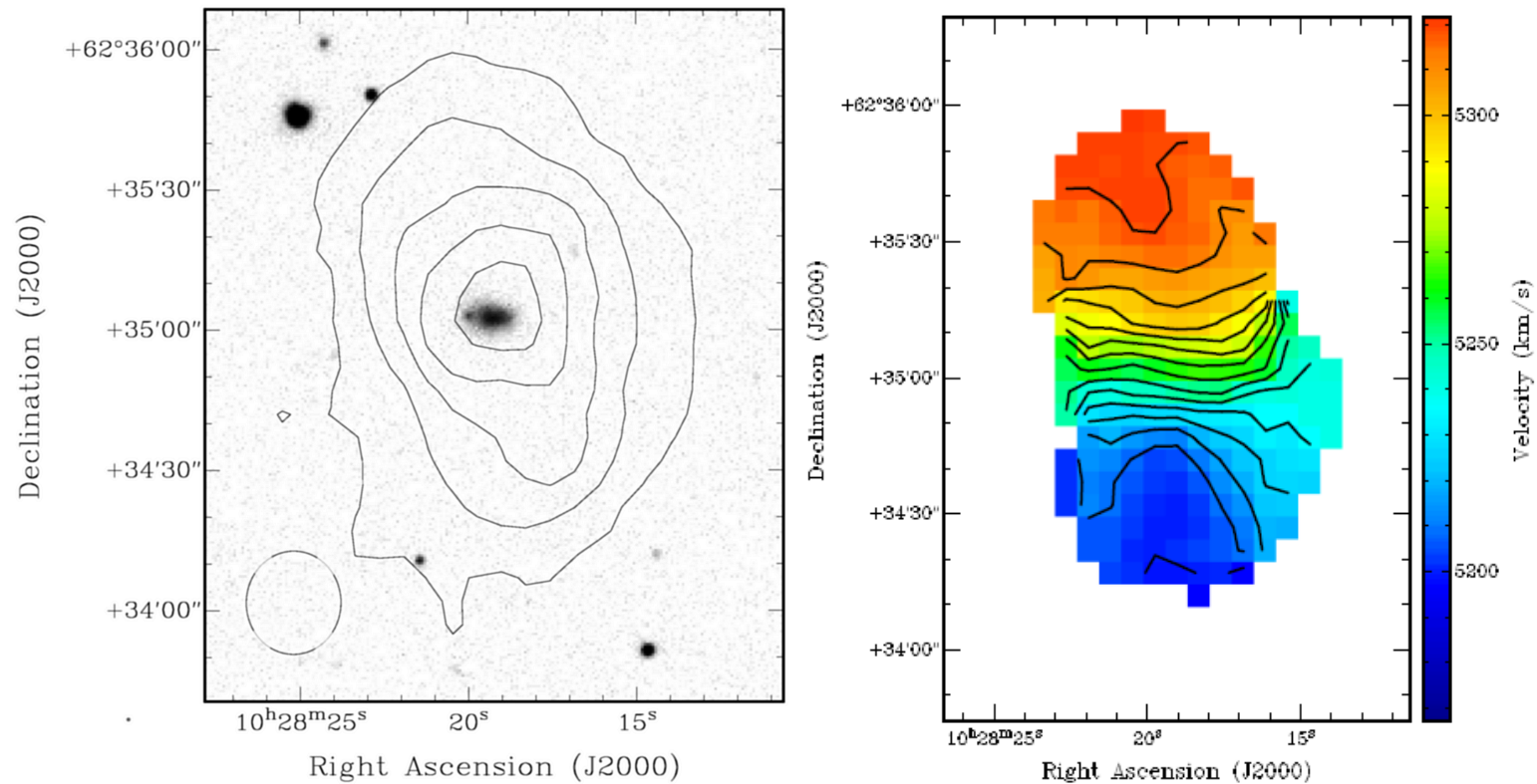
Pilot Study; 15 galaxies were selected for observing with WSRT, each with 12+1 hours integration.
+ 20 galaxies observed 2008/9



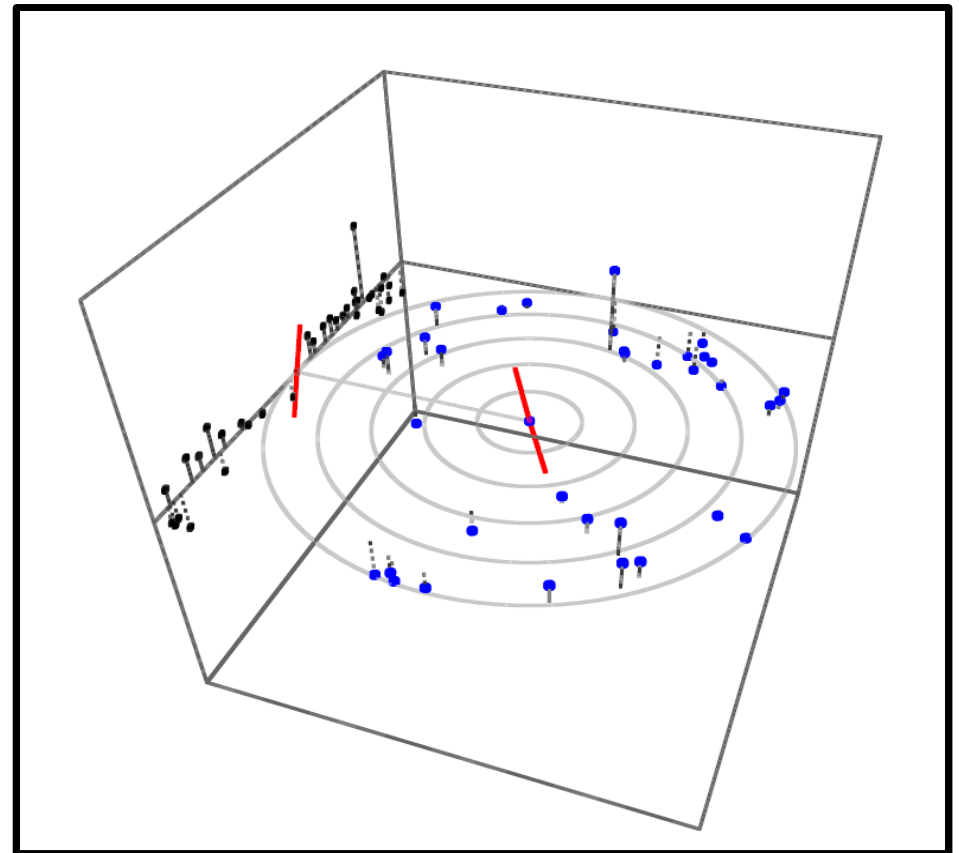
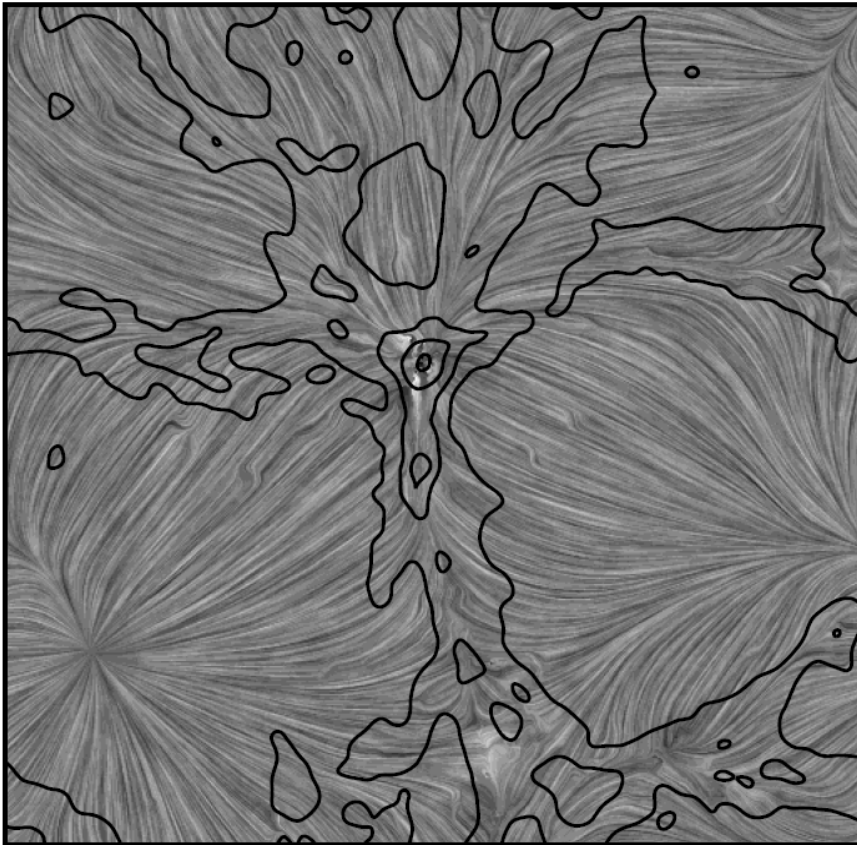
A Void galaxy in HI (Polar Disk)

Stanonik et al (2009) & Poster 20

A void galaxy showing a Polar HI Disk



Cold Accretion out of Voids??

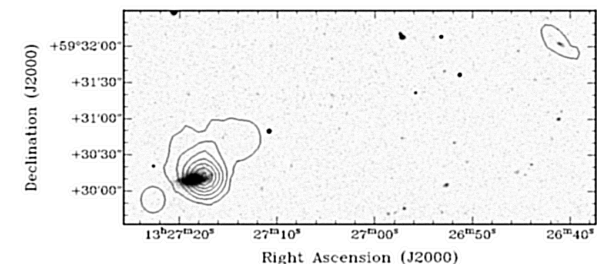
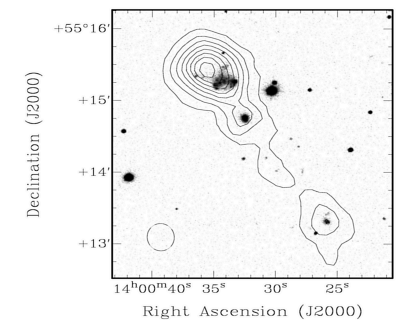
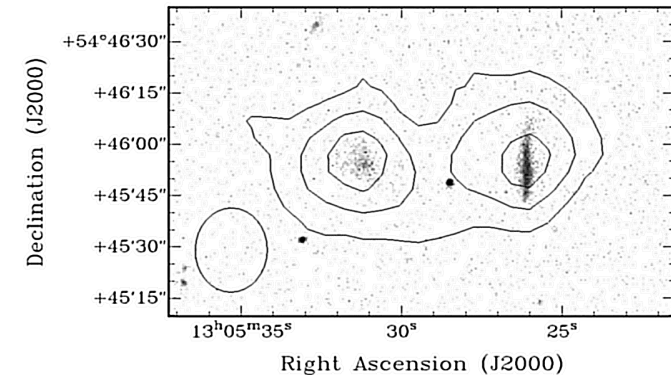


Preliminary Conclusion

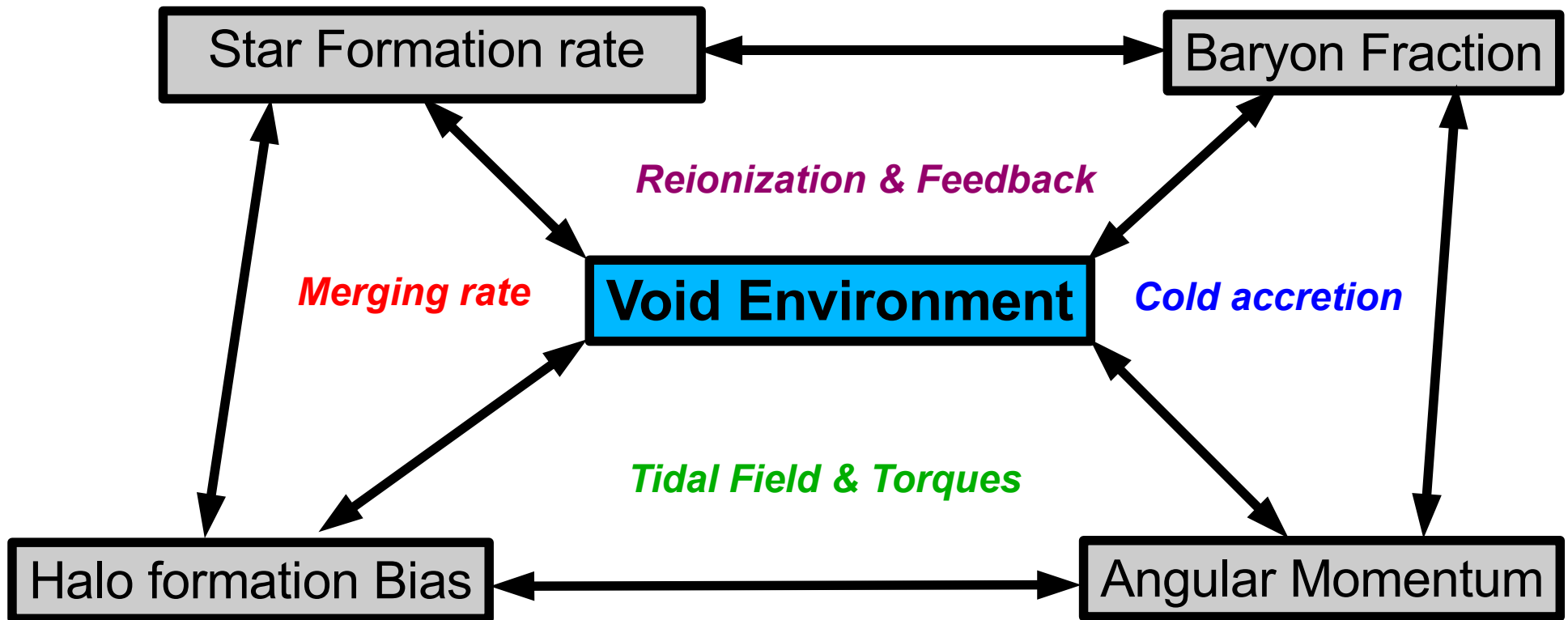
- ◆ Global properties like HI-mass content, TullyFisher, etc relations seem to be no different than the trends in denser environments
- ◆ Despite having selected the most (global) isolated galaxies, nearly half show signs of perturbed HI disks or signs of merging events. (Warp, Polar Disk, Merging)
- ◆ Five very faint nearby HI detected companion were discovered;

$$M_r = [-11.5, -14., -14.1, -14.9, -16.2]$$

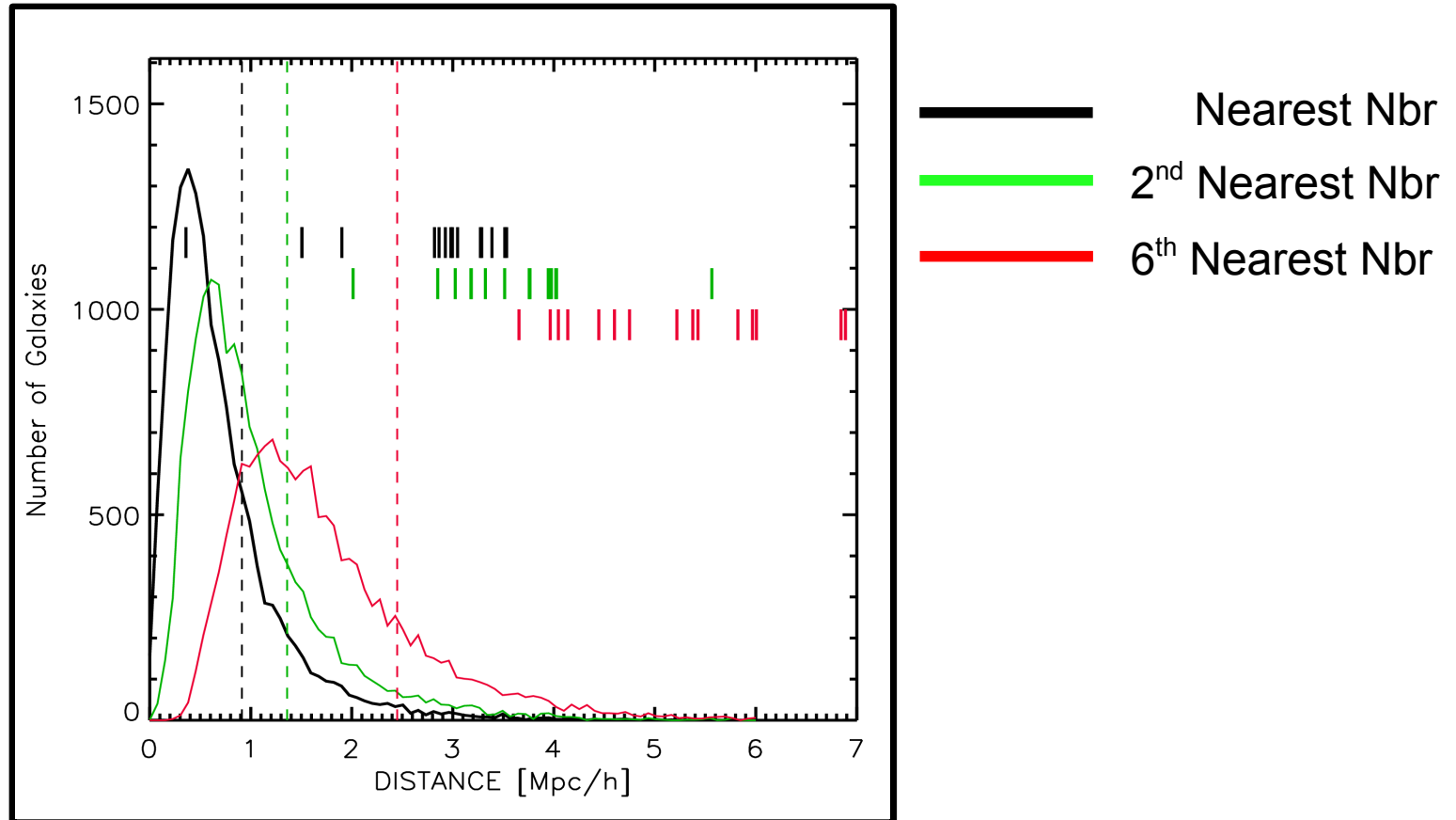
$$M_{HI} = [0.6, 0.6, 3.7, 1.4, 4.5] * 10^8$$



(How) does it fit in the LCDM galaxy formation model



Lonely, but not always isolated



Reconstruction performance

