

The Arecibo Pisces-Perseus Supercluster Survey: An Undergraduate ALFALFA Team (UAT) Project

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The APPS Survey

✧ The Pisces-Perseus Supercluster

- ✧ Location, Morphology, Extent

- ✧ Why is it interesting?

✧ Current Knowledge

- ✧ 21 cm Survey and ALFALFA

✧ APPSS

- ✧ What we seek to learn

- ✧ Observation strategy

- ✧ Preliminary results

Pisces-Perseus Supercluster

✦ Separate "watershed" from Laniakea

<http://www.nature.com/nature/journal/v513/n7516/full/nature13674.html>

Shapley
supercluster

Coma supercluster

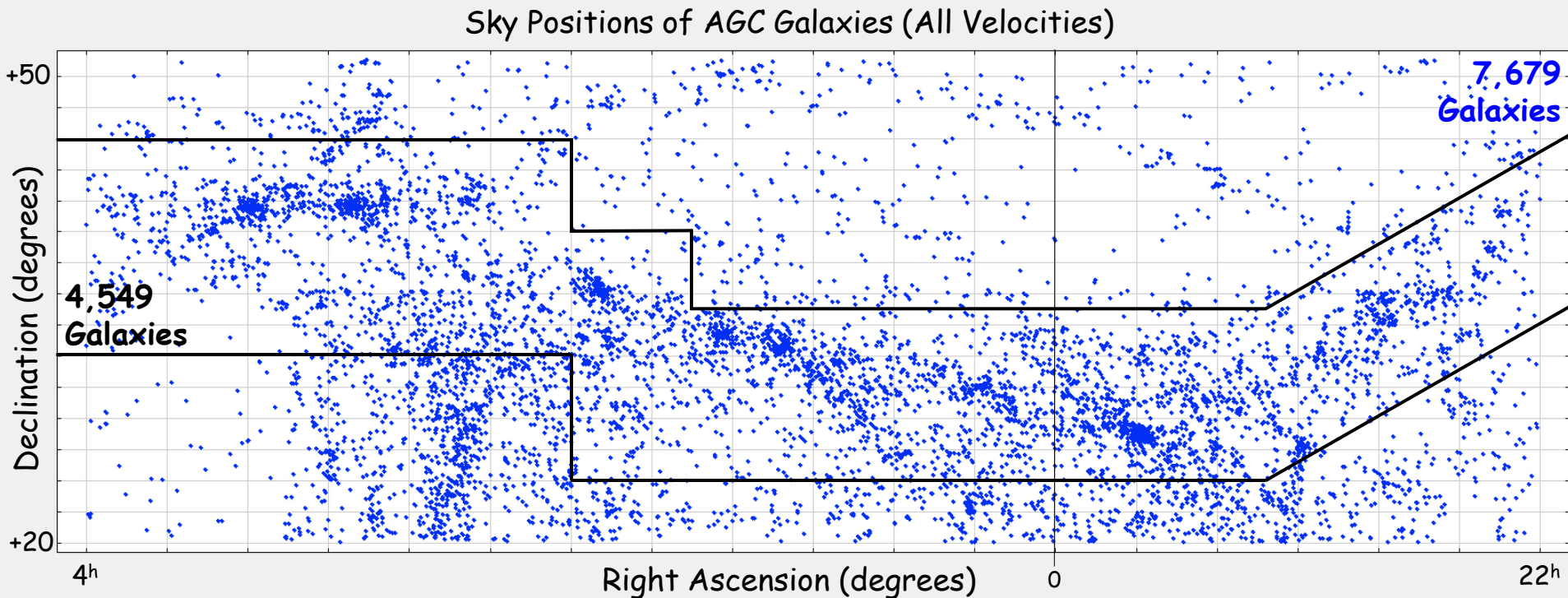
A slice of the
Laniakea
supercluster in
the supergalactic
equatorial plane.

Laniakea
supercluster

Perseus-Pisces
supercluster

Pisces-Perseus Supercluster

- ✦ Ridge: $50h^{-1}$ Mpc (Perseus to Pegasus Clusters)
- ✦ $5h^{-1} - 10h^{-1}$ Mpc deep, parallel to sky
- ✦ Voids before & behind

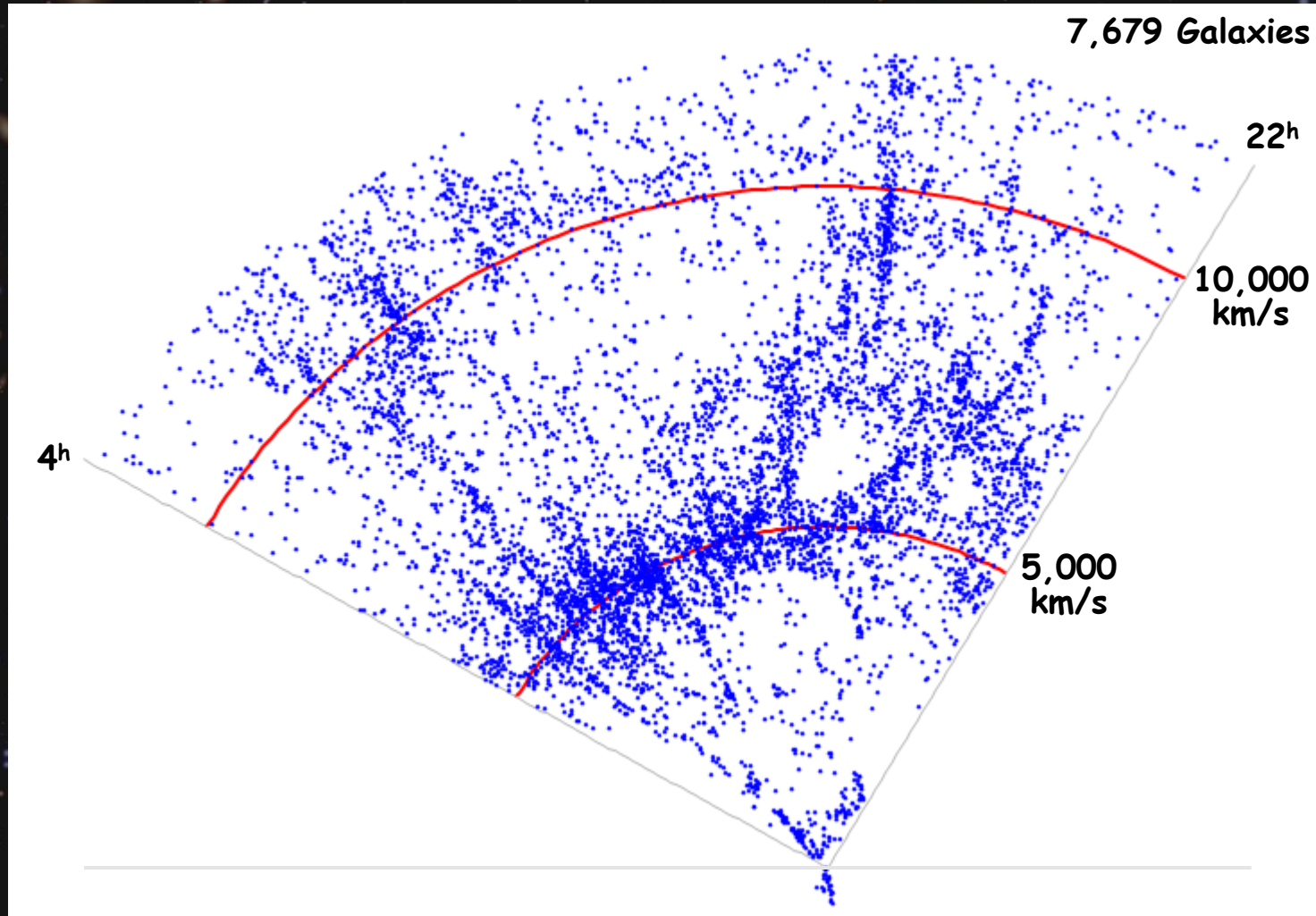


For $H_0 = 73$ km/s/Mpc, Length ≈ 37 Mpc, Depth ≈ 6 Mpc
Wegner, G., Haynes, M. P., & Giovanelli, R. 1993 *AJ* 105, 1251 (PP5)

Pisces-Perseus Supercluster

✦ The PPS Cone: $V_{\text{helio}} \sim 5,000 \text{ km/s}$

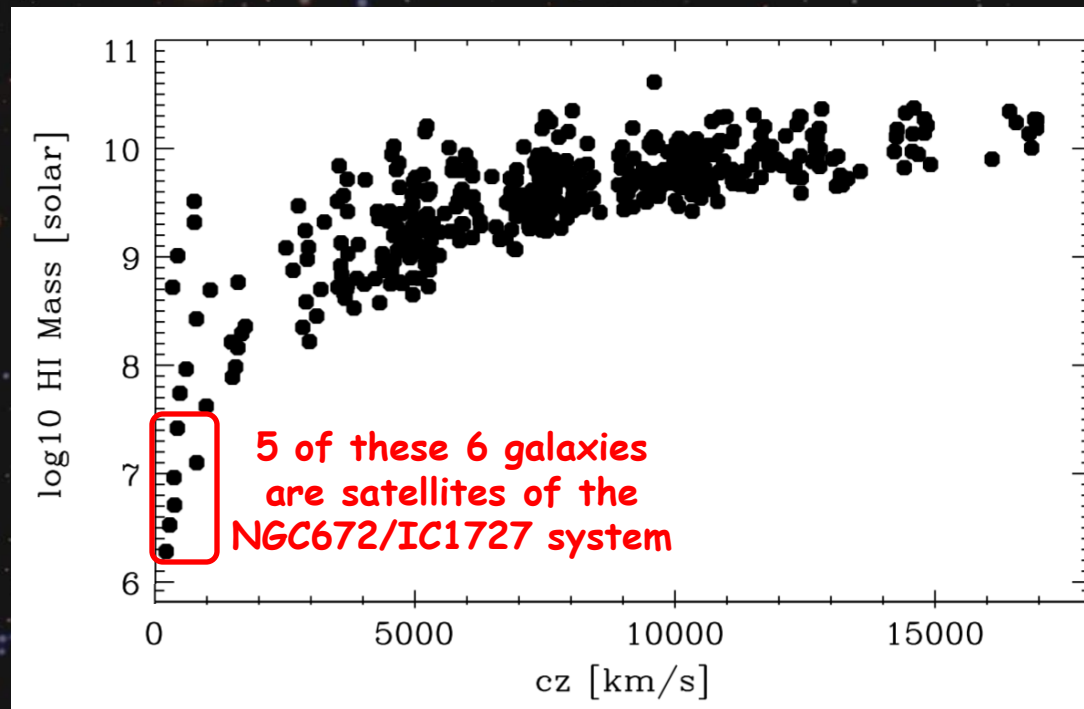
Galaxies in
variety of
local
densities at
very similar
distances.



Wegner, G., Haynes, M. P., & Giovanelli, R. 1993 *AJ* 105, 1251 (PP5)

ALFALFA PPS Results

- ✦ Saintonge et al. 2008 ($26^\circ < \delta < 28^\circ$, $22^h < \alpha < 3^h$)
- ✦ ALFALFA NOT going to fill in low end of mass function
- ✦ 80% of ($\sim 2k$) ALFALFA sources $M_{\text{HI}} > 10^9 M_\odot$



⇒ ALFALFA not going to reveal many new dwarf galaxies
Voids should contain many dwarfs!

Extending ALFALFA

✦ Arecibo L-Band Wide Observations

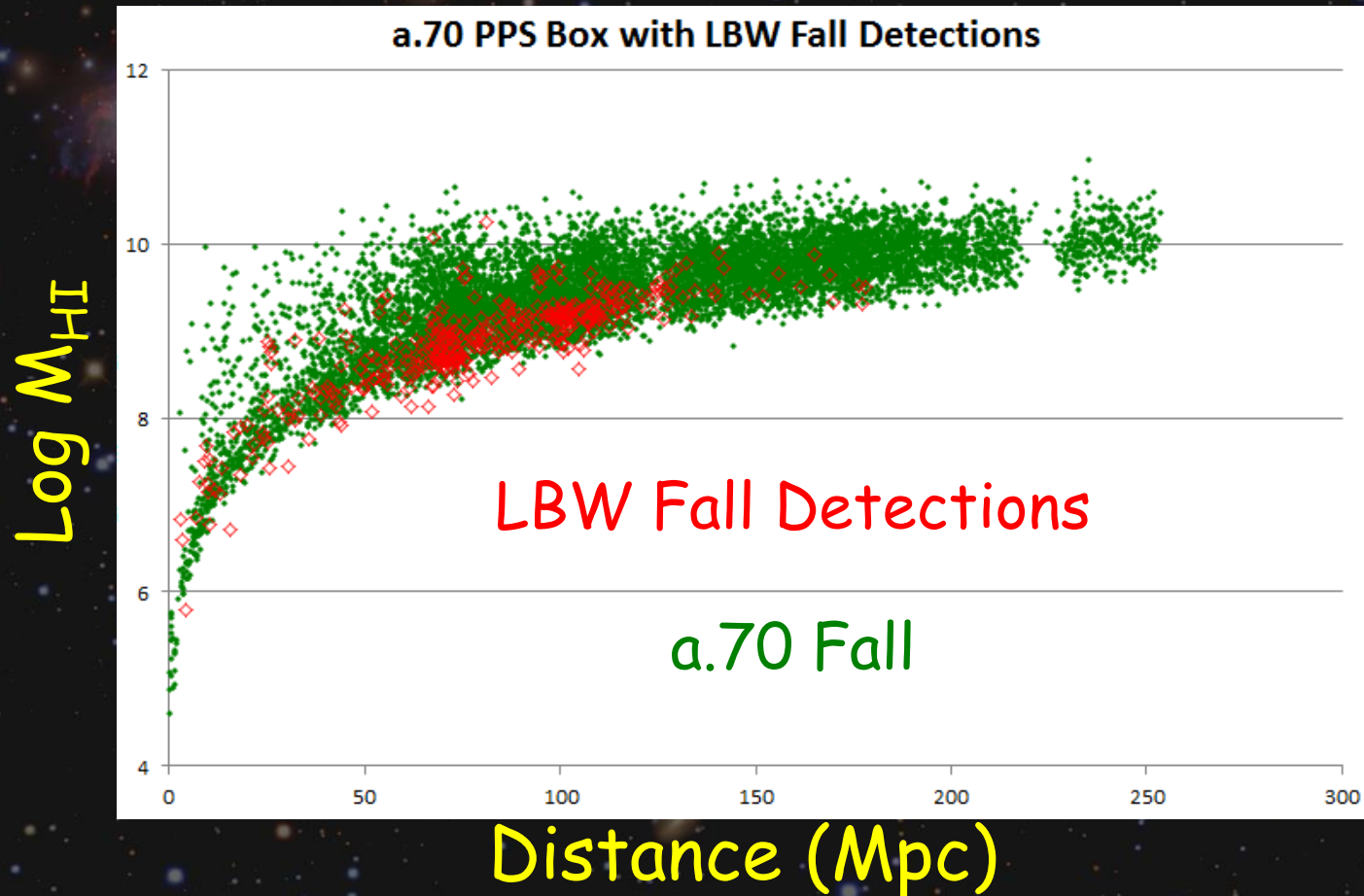
- ✦ Seek low-mass galaxies within $cz = 7,000$ km/s
 - ⇒ Extend low-mass end of mass function
 - ⇒ Increase knowledge of PPS galaxies
 - ✦ Greater sample for morphology segregation
 - ✦ Infall velocities from Baryonic TF Relation
 - ✦ Λ CDM $\Rightarrow$ Void should have more dwarfs

✦ Three Preliminary Fall Programs

- ✦ Verifying ALFALFA detections with O.C.'s
- ✦ Identify real detections without O.C.'s
- ✦ Test SDSS & GALEX photometry target selection

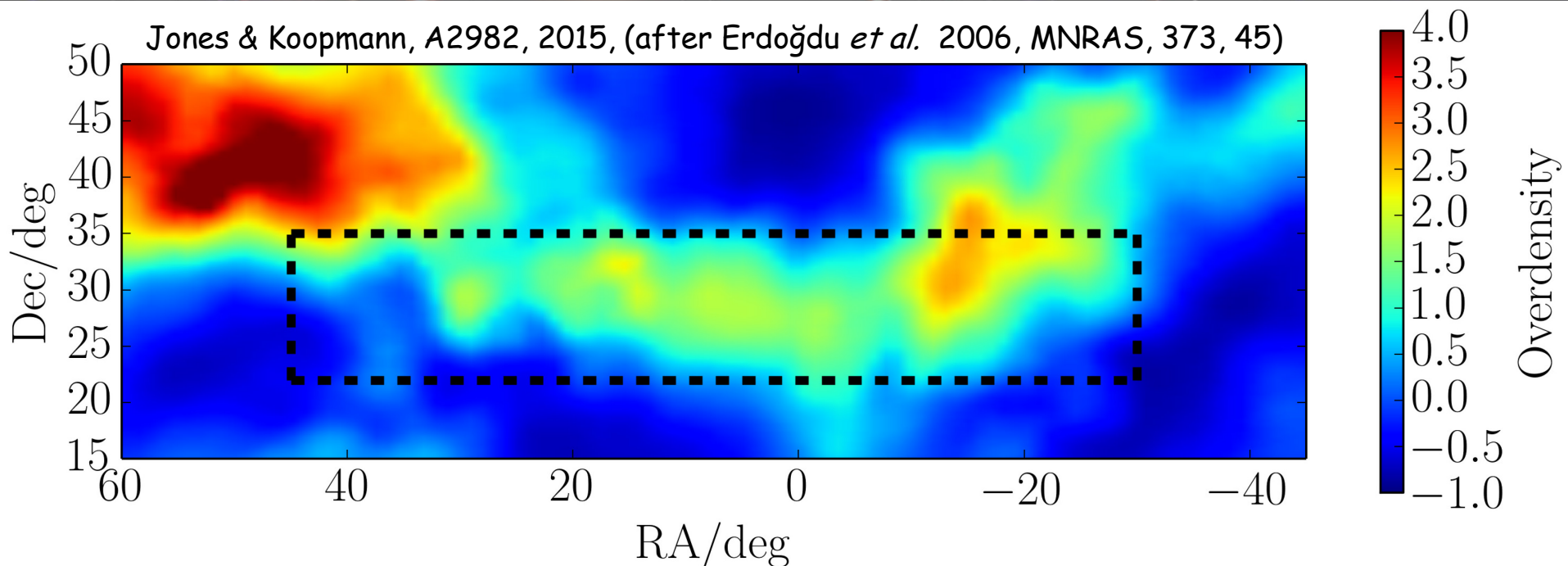
Extending ALFALFA

- ✧ Arecibo L-Band Wide Observations
 - ✧ Seek low-mass galaxies within $cz = 7,000$ km/s
 - ⇒ Extend low-mass end of mass function



APPSS

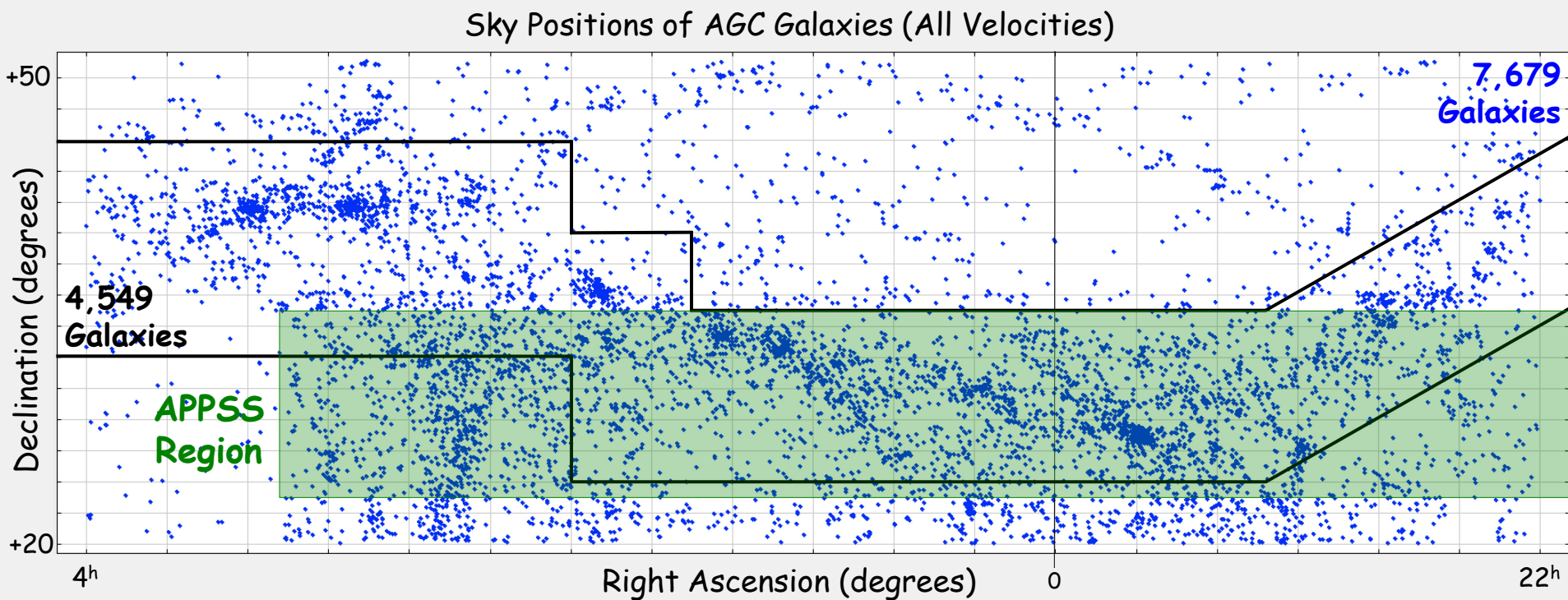
- ✴ L-Band Wide (LBW) Observations
 - ✴ 250 hours along PPS Ridge
 - ✴ 5-minute ON-OFF strategy
 - ✴ Expect to detect $M_{\text{HI}} \geq 10^8 M_{\odot}$ at dist. of PPS



Galaxy Density Distribution (2MASS Redshift Survey)

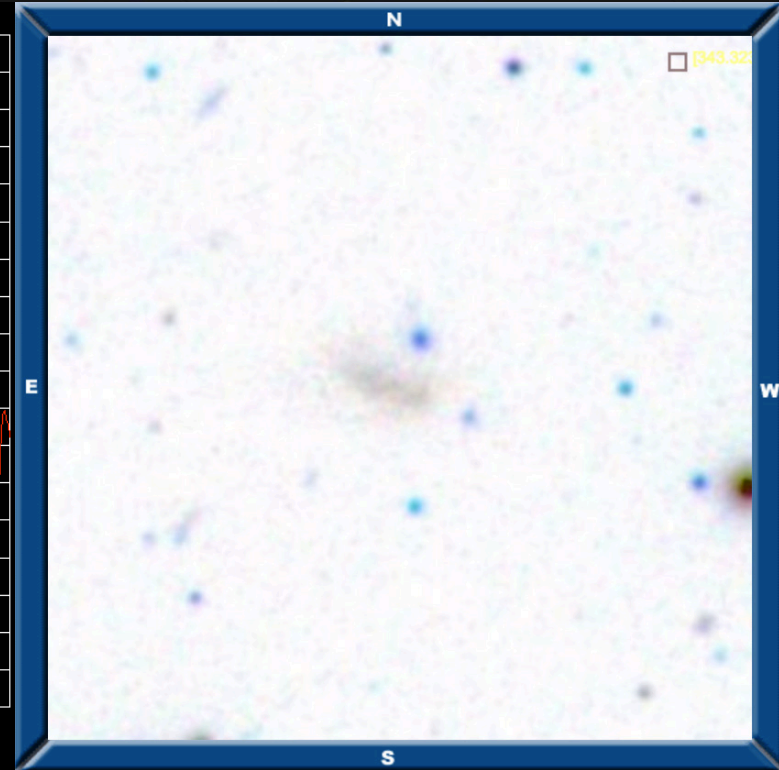
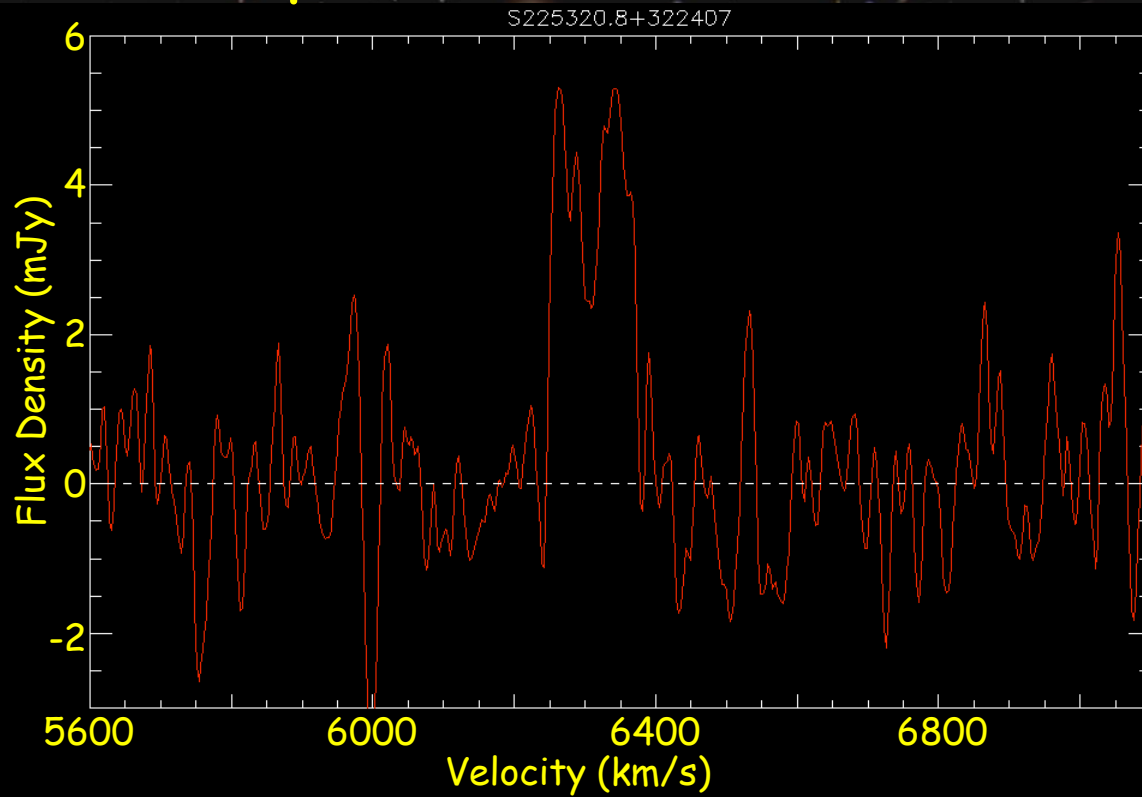
APPSS

- ✦ Infall to ridge should align with line-of-sight
- ✦ $M_{\text{HI}} < 10^9 M_{\odot} \Rightarrow$ baryonic content dominated by cool gas
- ✦ Select blue disk targets from SDSS & GALEX



APPSS Observations

📡 Sample Detection: J225320.83+322407.3



$W_{50} = 125.1 \pm 2.91 \text{ km/s}$
 $W_{20} = 128.91 \pm 2.91 \text{ km/s}$
 $v_{\text{sys}} = 6311.4 \pm 2.1 \text{ km/s}$
 $\text{flux} = 0.504 \pm 0.0474 \text{ Jy km/s}$
 $\text{S/N} = 9.30$

APPSS Preliminary Results

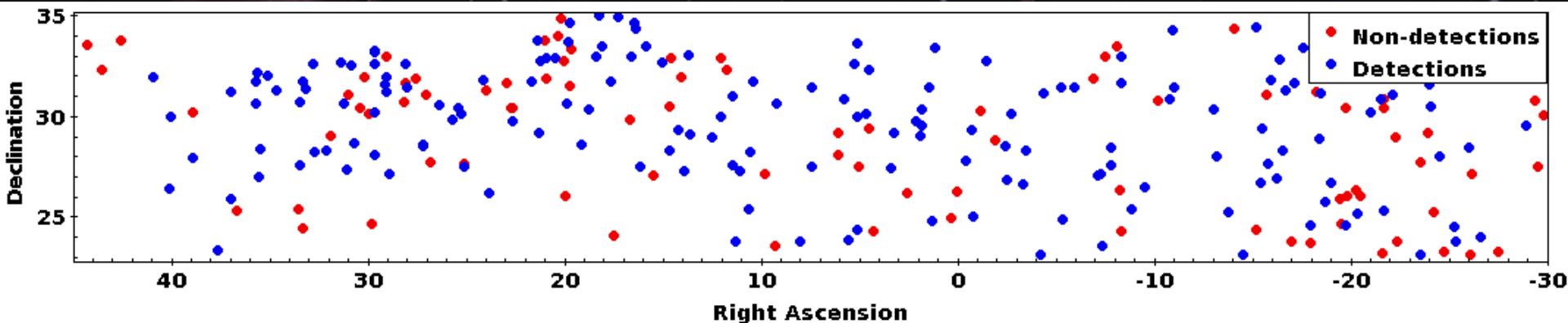
📡 319 Targets (A2982)

📡 173 detections

📡 92 non-detections

📡 54 uncertain (low S/N or RFI)

} From November
2016 observing
log files



Targets selected purely on the basis of
GALEX-SDSS photometry, not detected by
ALFALFA, and of unknown redshift.

APPS Preliminary Work

Posters on Thursday

✦ Testing SDSS/GALEX Target Selection:

Evan Smith et al. 342.15:

*Extending ALFALFA: Reducing LBW Observations
of Optically Selected Galaxies*

✦ APPSS SDSS/GALEX Target Selection:

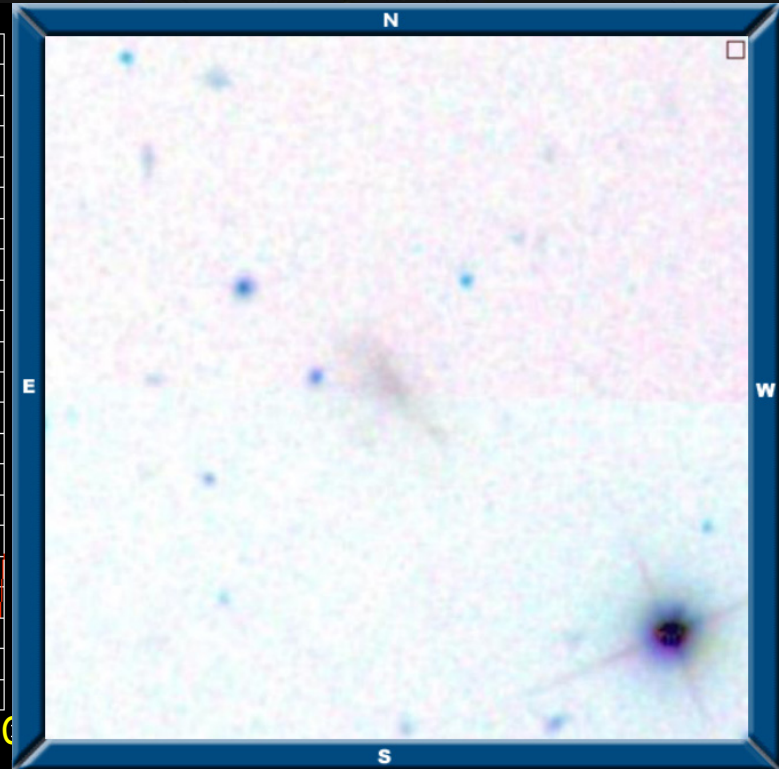
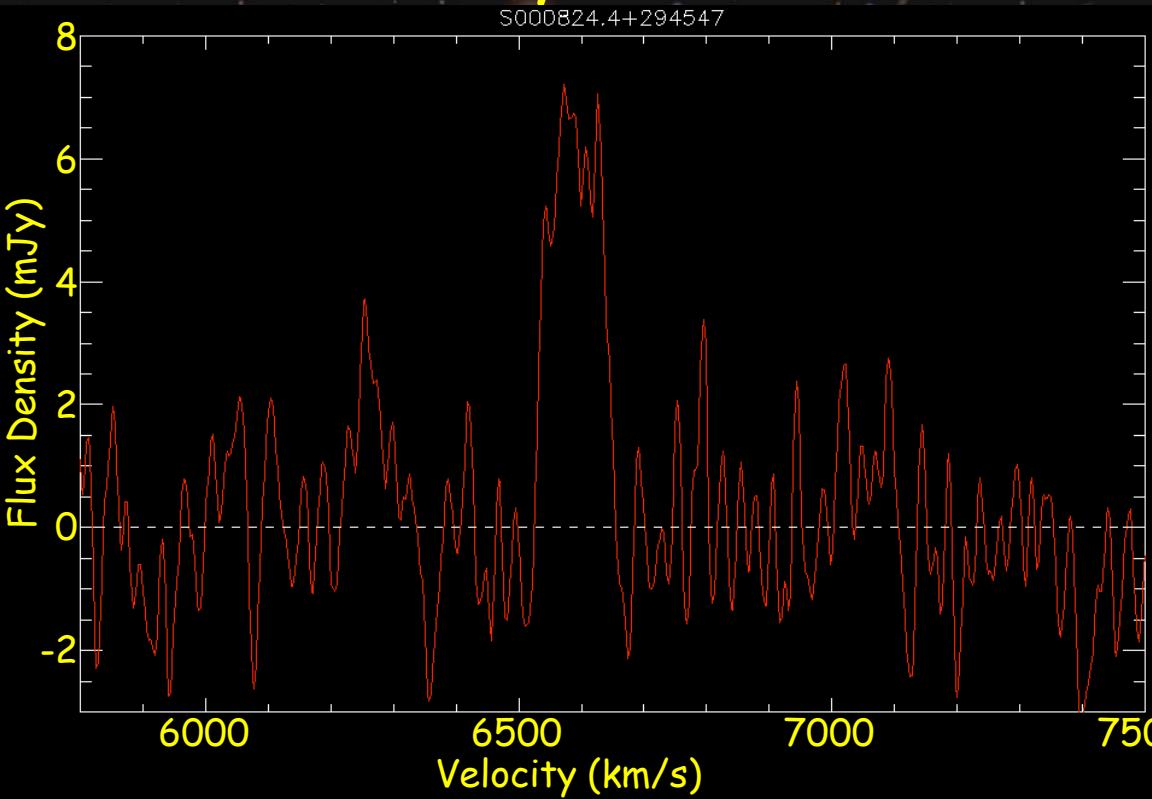
David Craig et al. 342.13:

Target Selection for the APPSS

Acknowledgments: NSF AST-1211005, AST-0724918/0902211,
AST-075267/0903394, AST-0725380, AST- 0847430, AST-1107390, NAIC

APPSS Observations

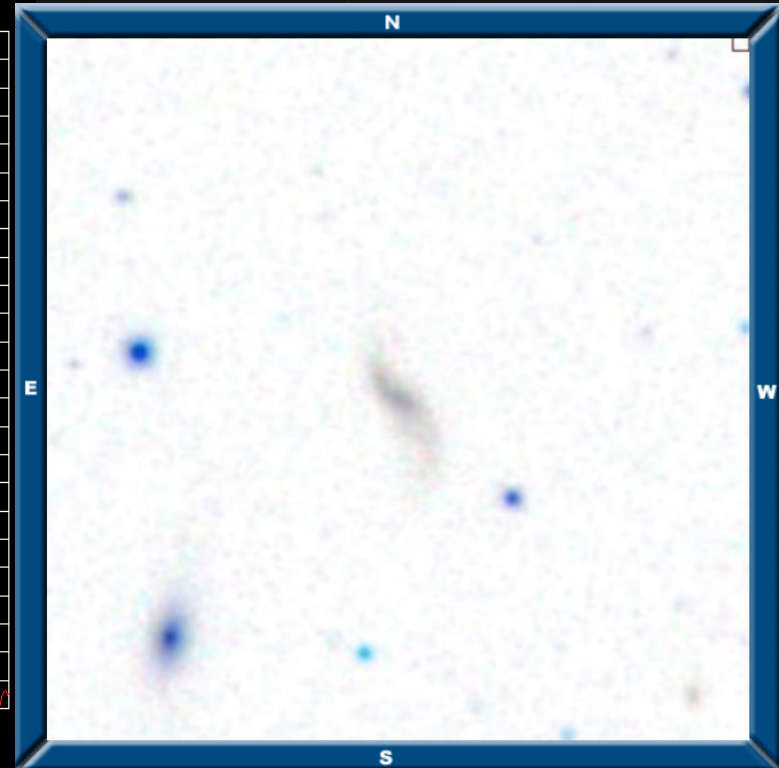
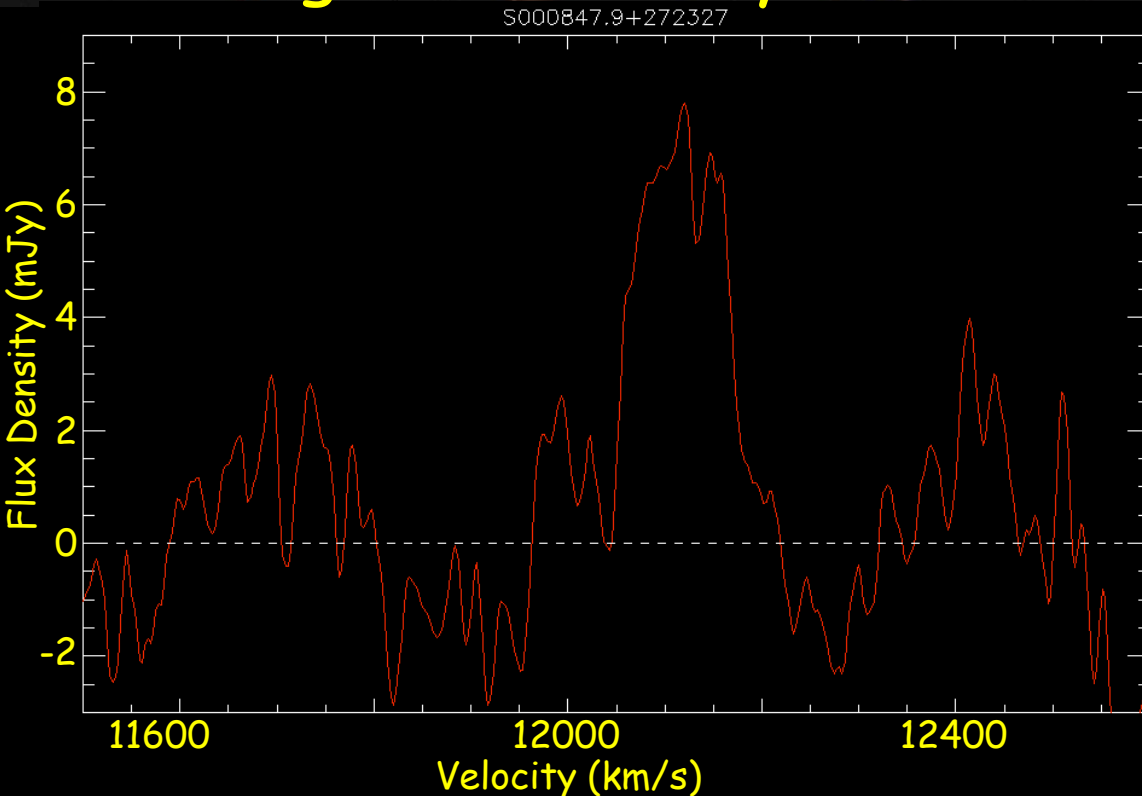
✪ Faint Galaxy: J000824.41+294547.0547



$W_{50} = 97.3 \pm 6.0 \text{ km/s}$
 $W_{20} = 148.3 \pm 9.2 \text{ km/s}$
 $v_{\text{sys}} = 6590.2 \pm 2.1 \text{ km/s}$
 $\text{flux} = 0.729 \pm 0.0358 \text{ Jy km/s}$
 $\text{S/N} = 5.78$

APPSS Observations

✦ Background Galaxy: J000847.89+272325.7

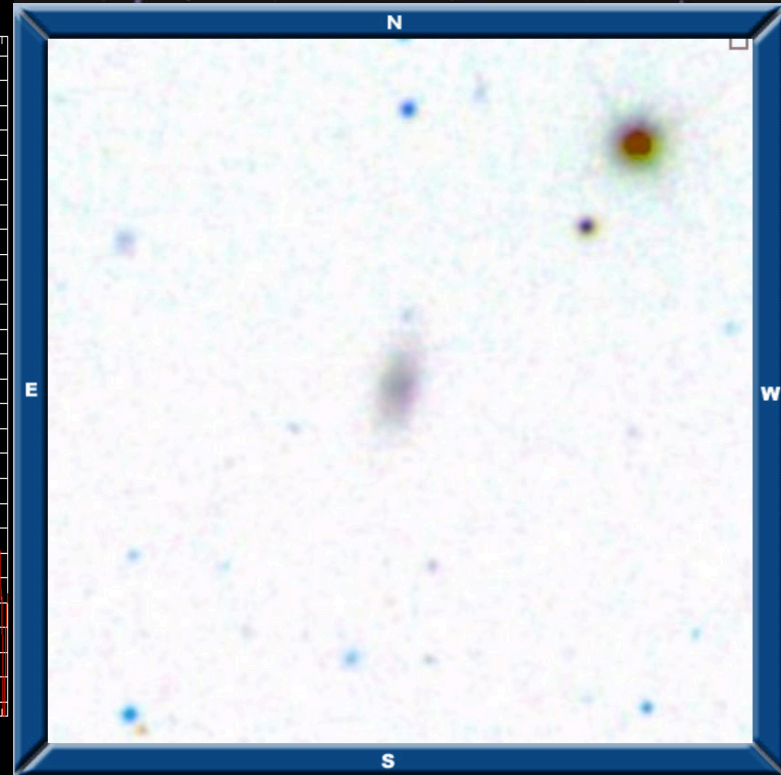
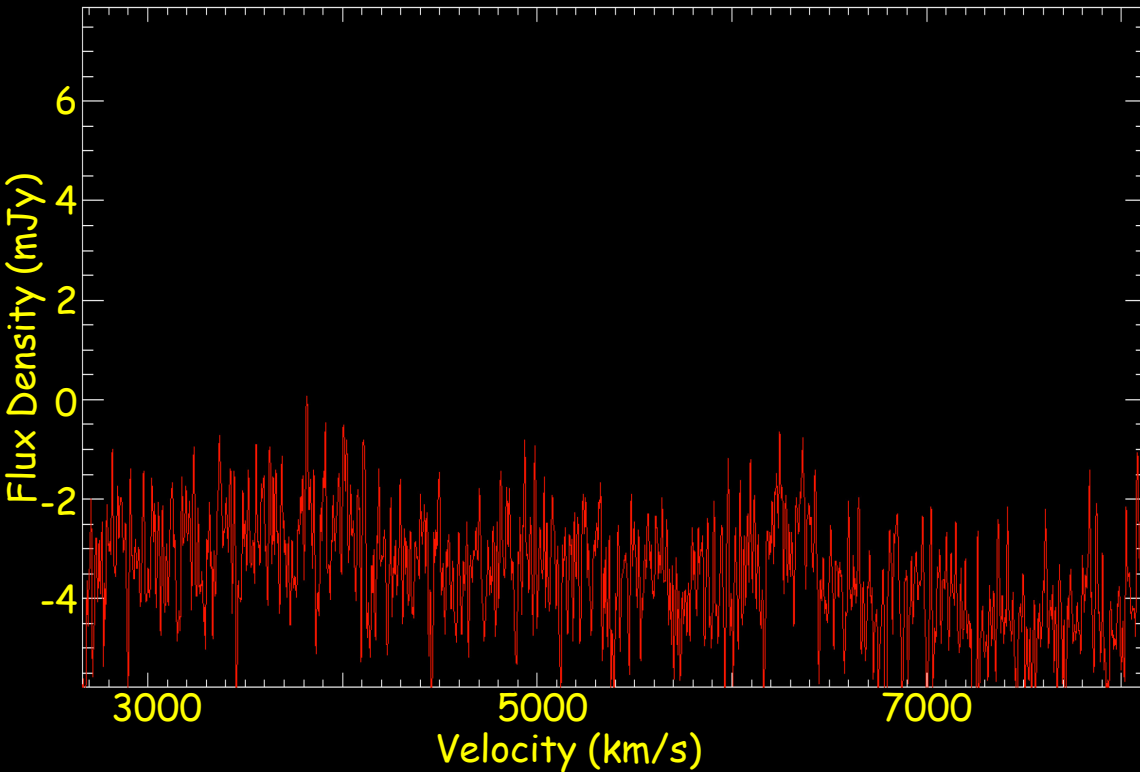


$W_{50} = 99.6 \pm 6.4 \text{ km/s}$
 $W_{20} = 151.8 \pm 9.8 \text{ km/s}$
 $v_{\text{sys}} = 12116.18 \pm 2.6 \text{ km/s}$
 $\text{flux} = 0.795 \pm 0.0434 \text{ Jy km/s}$
 $\text{S/N} = 4.497$

APPSS Observations

✶ Non-Detection: J000824.41+294547.0547

S001958.9+301246 533400053 rec: 300 tm:19:53: 1 onoff



$W_{50} = \text{___ km/s}$
 $W_{20} = \text{___ km/s}$
 $v_{\text{sys}} = \text{___ km/s}$
 $\text{flux} = \text{___ Jy km/s}$
 $S/N = \text{___}$