



HI Properties of Massive Galaxies from GASS + ALFALFA

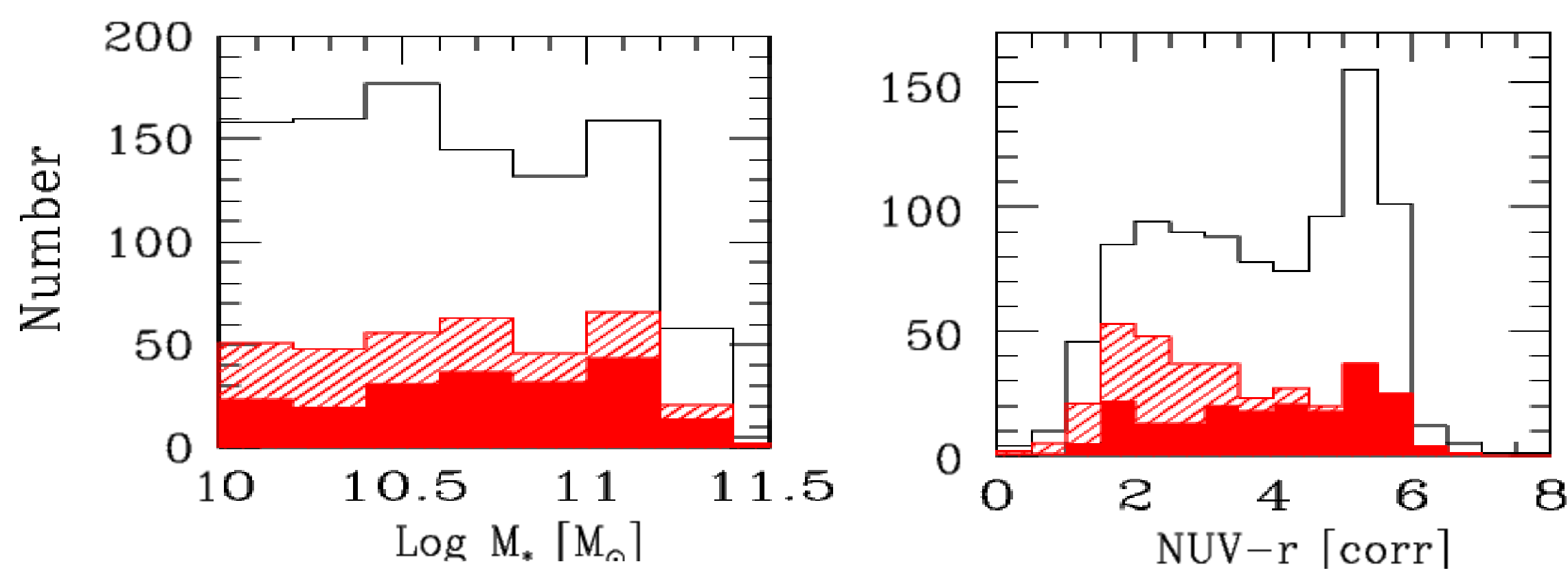
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GASS: The Galex Arecibo SDSS Survey

- *Targeted* HI survey of ~ 1000 massive galaxies designed to study galaxy transition between blue cloud and red sequence, in order to understand processes which influence gas accretion and its conversion into stars. The sample selection criteria are:
 - sky footprint: SDSS spectroscopy, GALEX Medium Imaging Survey, [ALFALFA HI survey](#);
 - $0.025 < z < 0.05$;
 - $10 < \text{Log Mstar/Msun} < 11.5$.
- First statistically significant sample of massive galaxies with homogeneously measured physical parameters (e.g., stellar mass, size, surface brightness, SFR, dust attenuation, stellar velocity dispersion, AGN properties).
- ALFALFA will provide the gas-richest objects ($\sim 20\%$ of GASS sample)



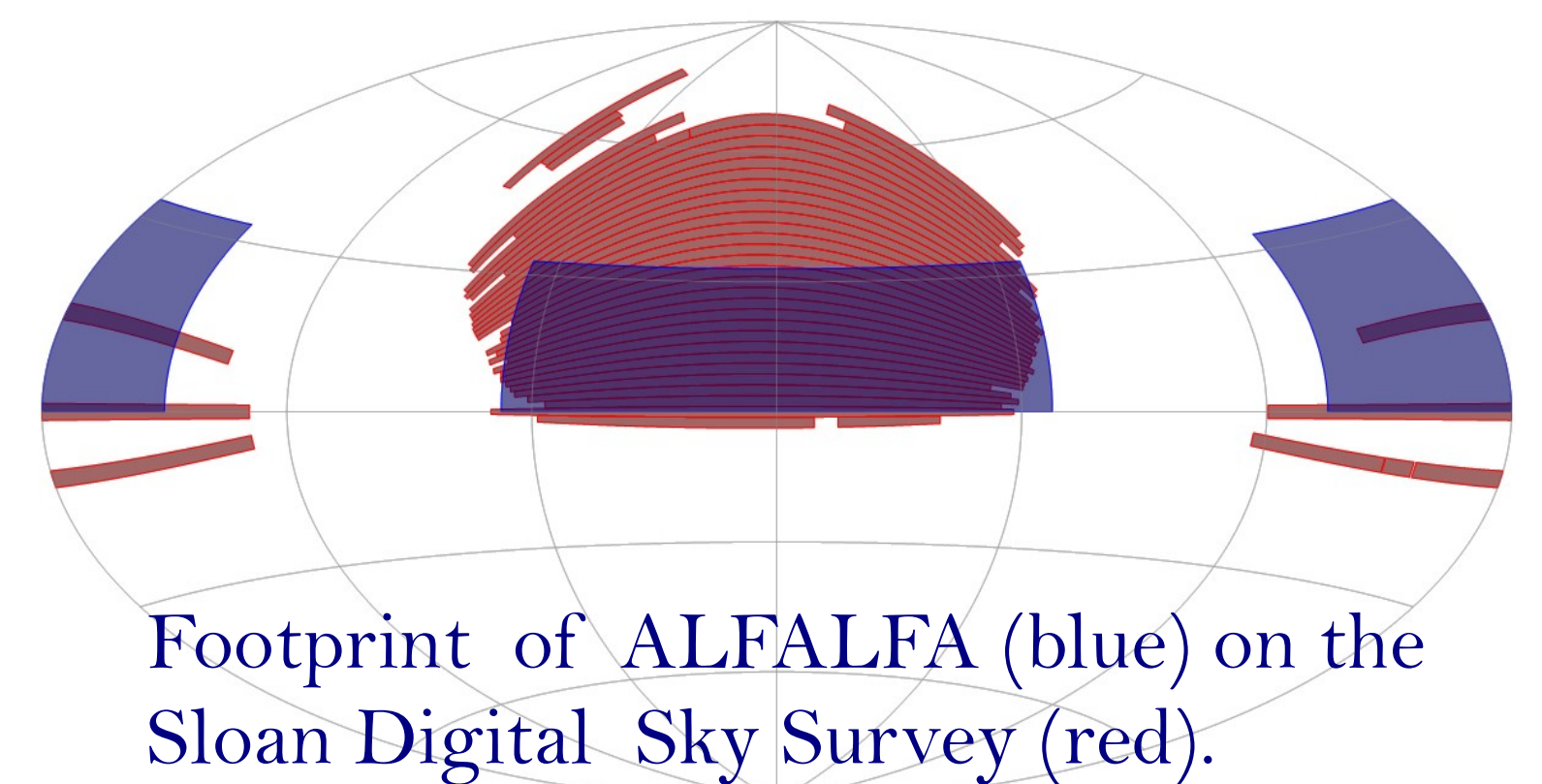
<http://www.mpa-garching.mpg.de/GASS>

Black line: GASS sample. Red: GASS targeted objects. Red hatched: targeted+ ALFALFA+HI archive (Springob et al., 2005) detections

ALFALFA: The Arecibo Fast ALFA Survey

- *Blind* HI survey of the sky designed to measure the HI in the local universe, out to $z \sim 0.06$.
- Will detect more than 25,000 extragalactic HI line sources with solar masses as low as 10^6 Msun .

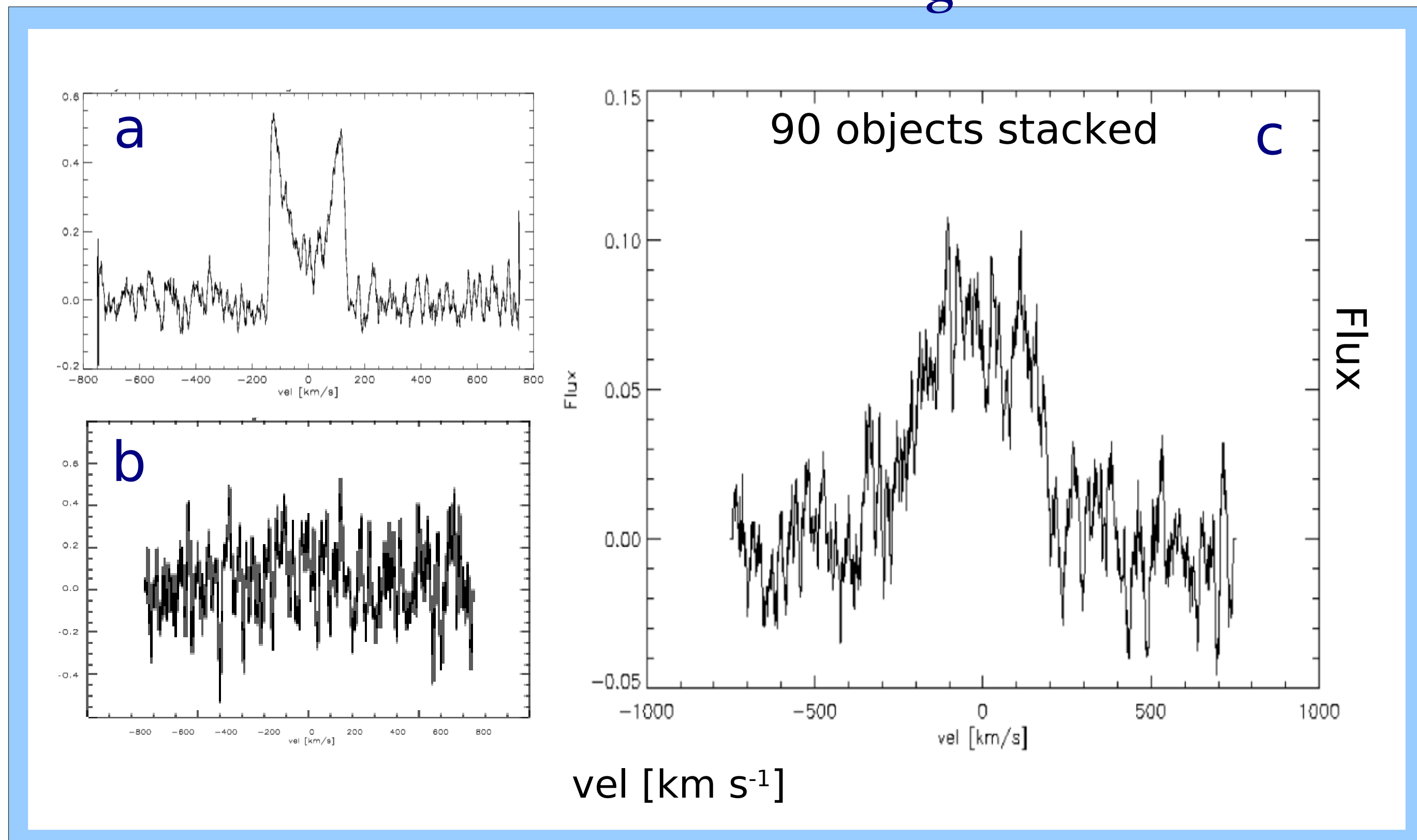
<http://egg.astro.cornell.edu/alfalfa>



ALFALFA + GASS: science from non-detections

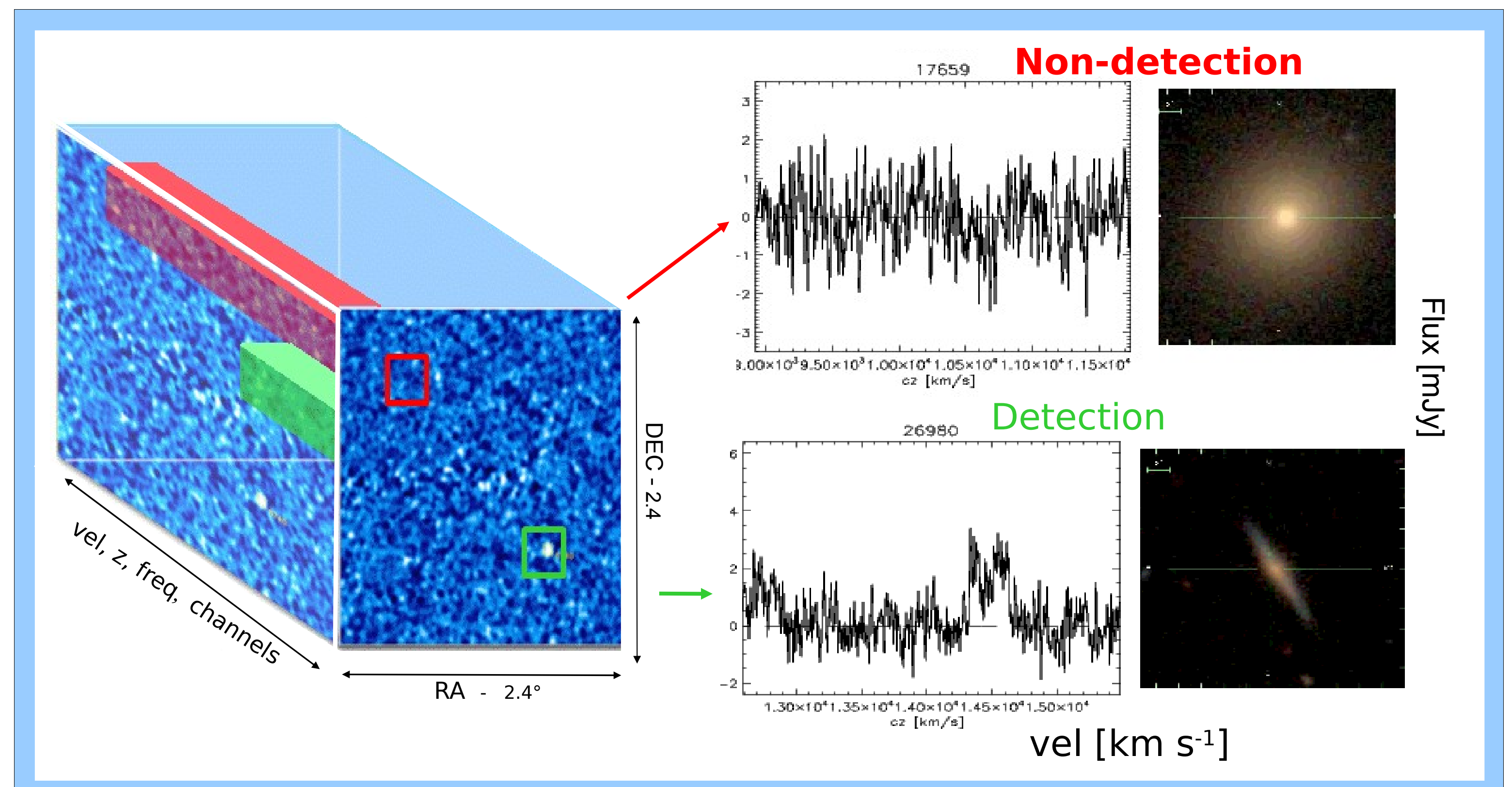
- “Parent sample” of galaxies meeting the GASS selection criteria: $\sim 10,000$. Observed by ALFALFA but (mostly) non-detected.
 - Use non-detections to recover average HI content of objects for which neutral gas information is usually missing.
- stacking (co-add) signal of non-detections in bins of similar physical properties

Simulation of stacking



Simulation of the stacking process:
sample of HI spectra (a);
selection (b) and co-adding (c) of the non-detections.

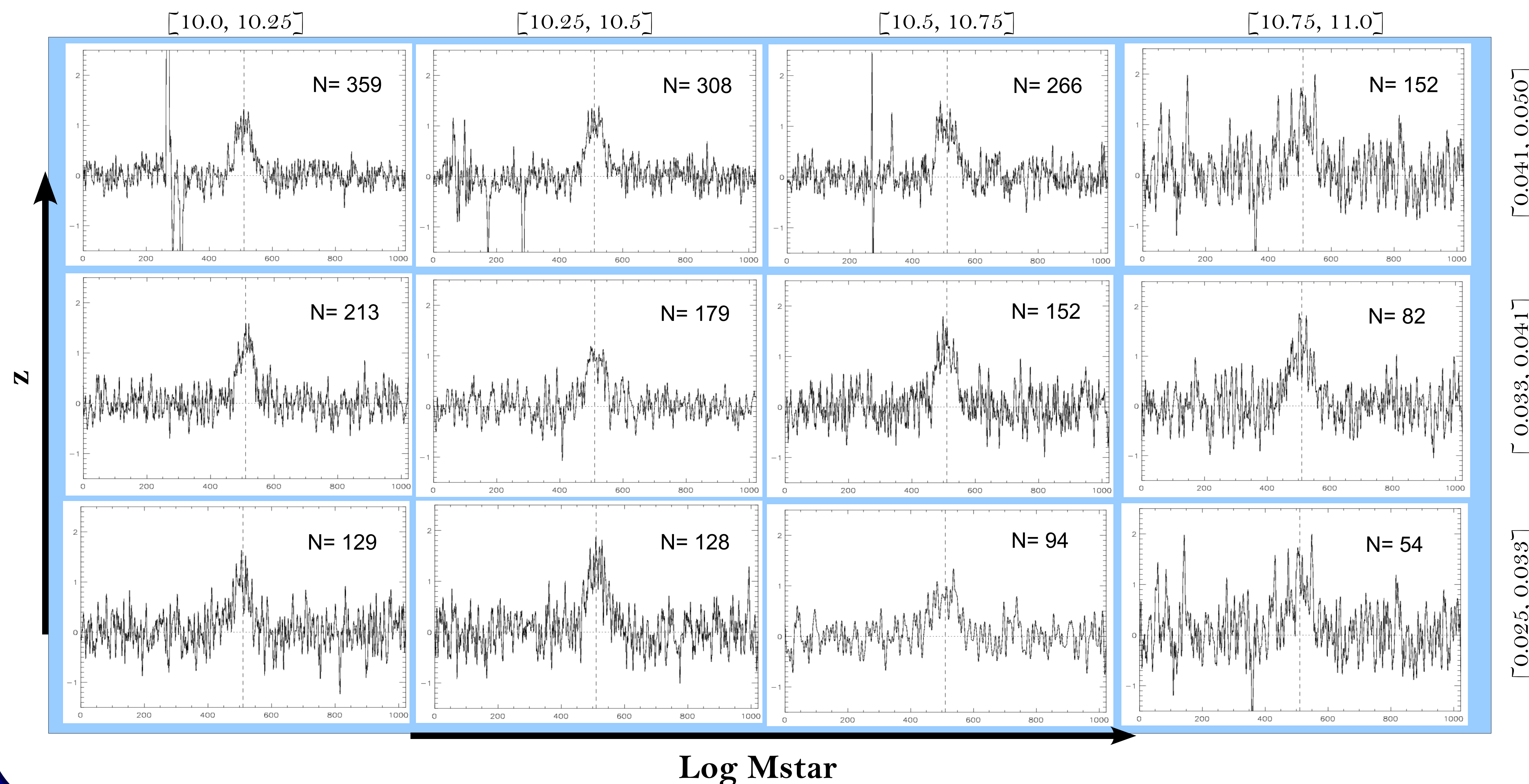
Extraction of ALFALFA data



Modified ALFALFA source-extraction tools:
given optical position and redshift, goes into the ALFALFA data-cube (on the left: ALFALFA data-cube of positions in the sky (RA,Dec) and velocities) and extract a spectrum for non-detections.
Red: no signal corresponding to input position. Green: detection

Stacking: Preliminary results

- Cross-match of “parent sample” with available ALFALFA catalogues [$7^h 30^m < \text{RA} < 16^h 30^m$, $4^\circ < \text{dec} < 16^\circ$] → 3081 objects (23% detected)
- Defined sub-samples of stellar mass and redshift (needed to evaluate HI mass) and stacked: recovered HI flux for most of them.



Stacked spectra: each single spectrum is shifted to rest-frequency and then co-added weighted by its rms.
Vertical scale: $[-1.5, 2.5]$ mJy.
The noise decreases as $\sim N^{1/2}$, as expected.
When each sub-sample is divided into bins of fixed line width (estimated from the Tully-Fisher relation), the width of the stacked spectrum is consistent with expectations.