

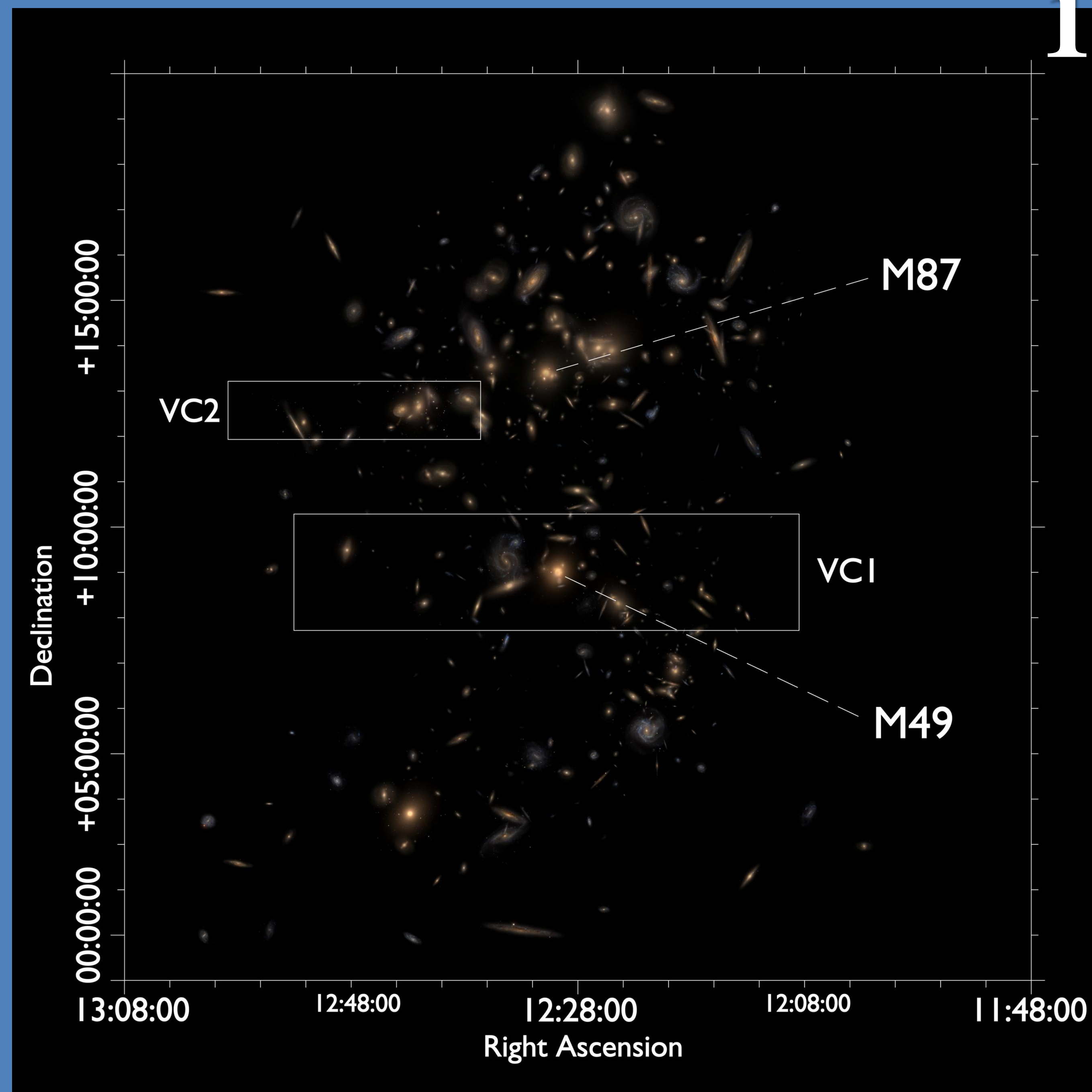


# THE VIRGO CLUSTER THROUGH THE AGES



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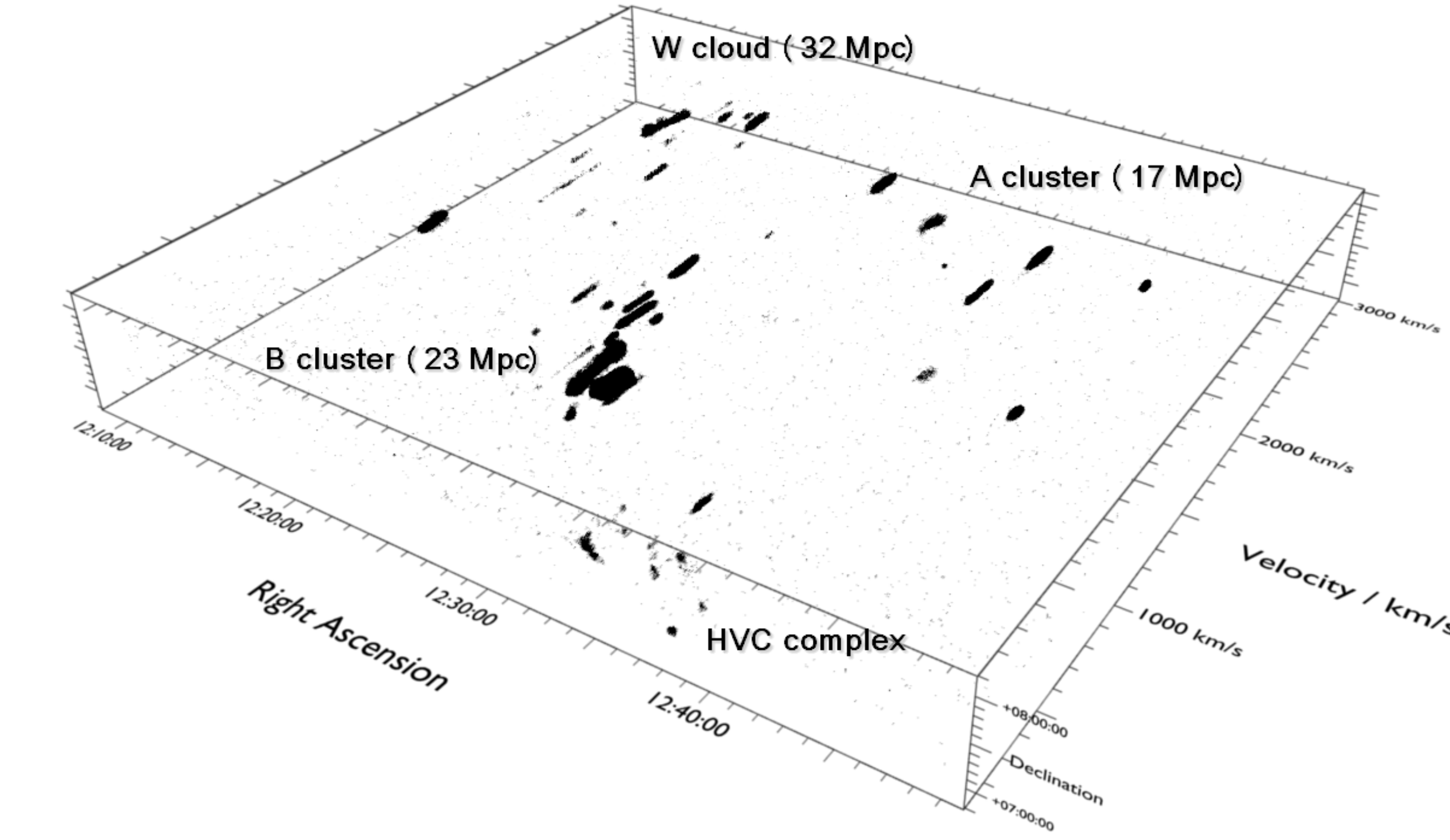
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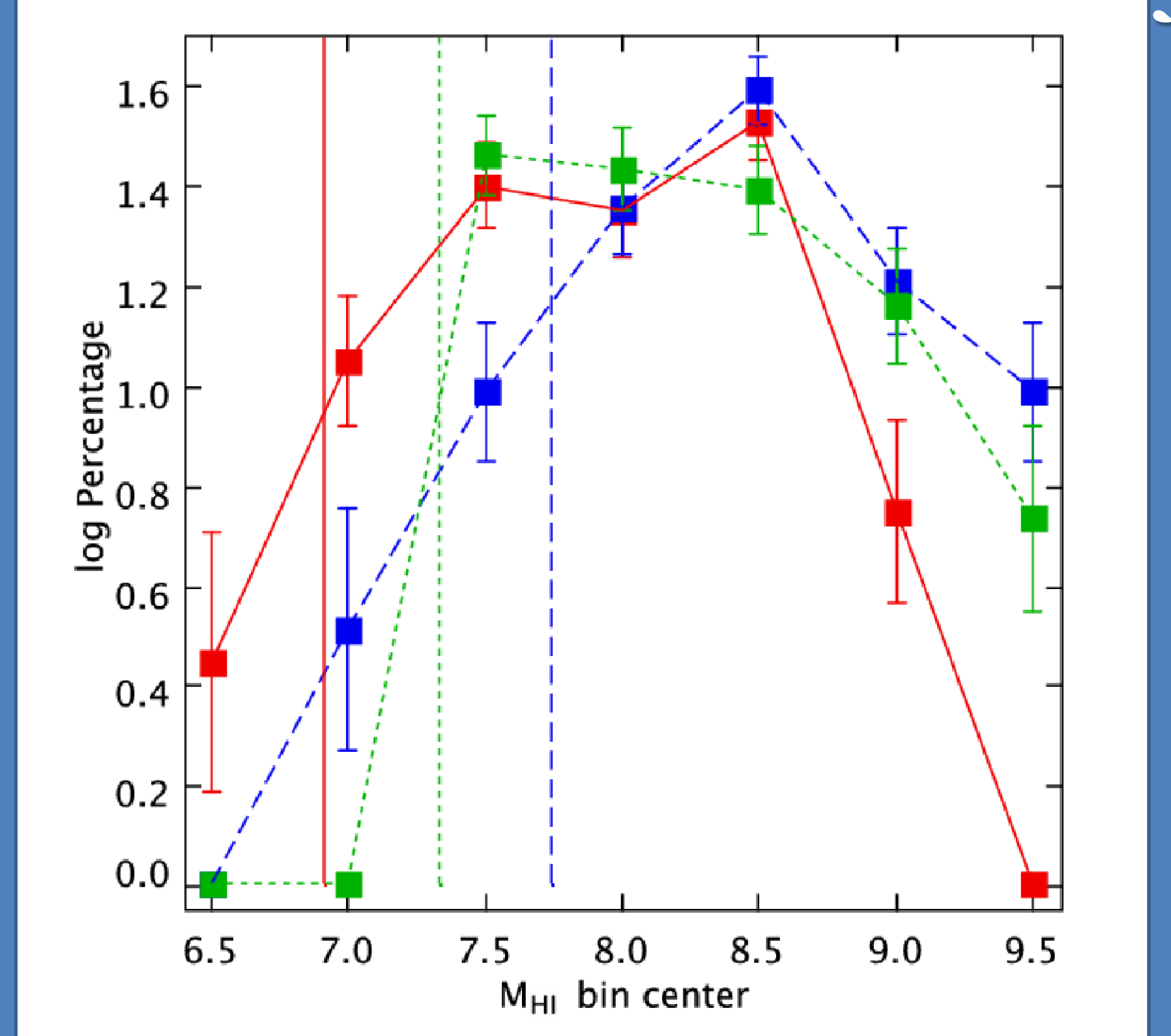
We present deep HI observations of two regions in the Virgo Cluster, obtained as part of the Arecibo Galaxy Environment Survey. Our typical rms is 0.6 mJy, equivalent to a sensitivity of  $8 \times 10^6 M_{\odot}$  at 17 Mpc distance. Thus far we have 73 cluster detections in 15 square degrees, of which 21 are not members of the Virgo Cluster Catalogue, including 3 that have no clear optical counterparts. 8 detections correspond to early-type galaxies.

*All optical images shown here are RGB images from the SDSS DR7.*

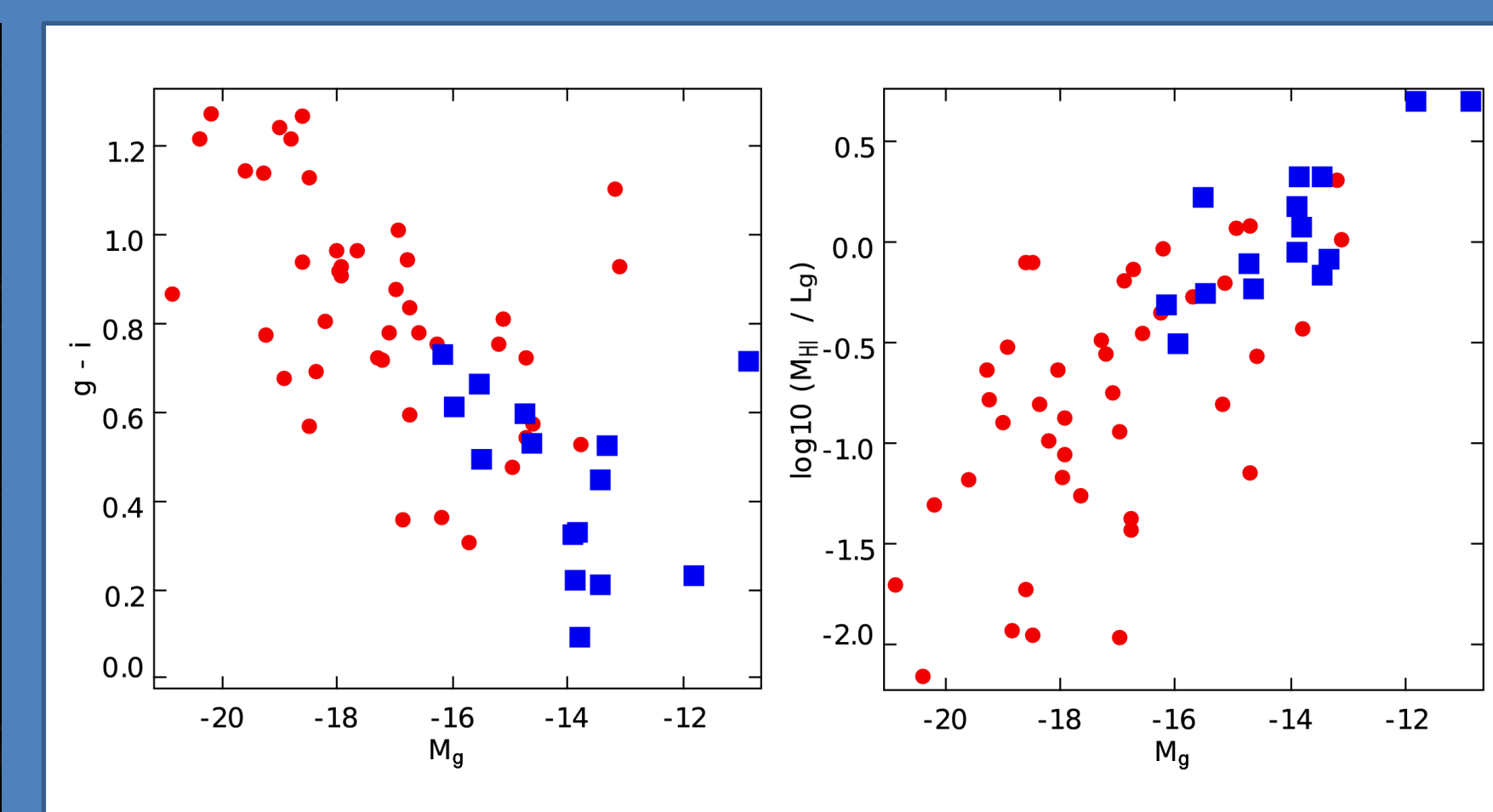
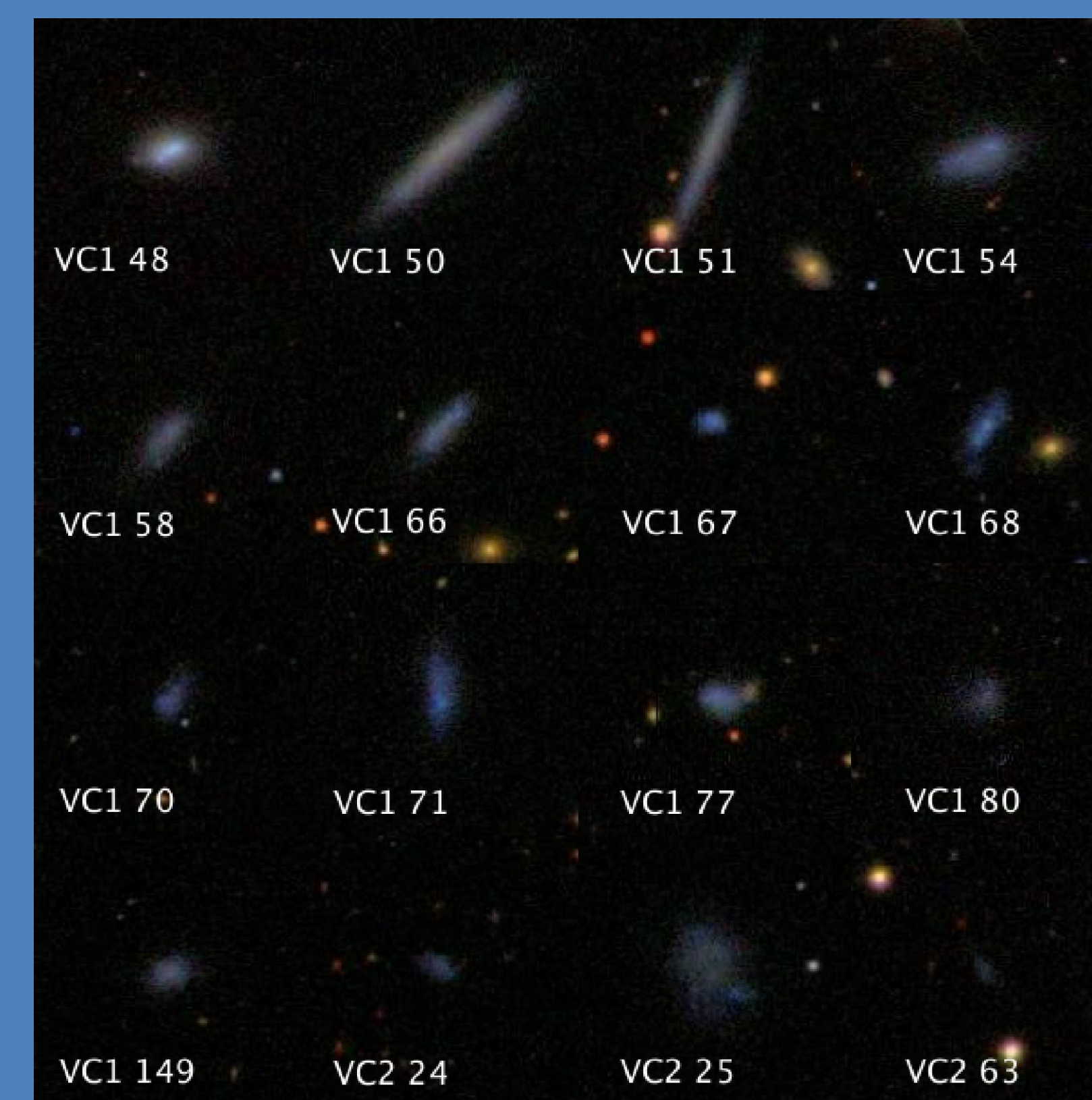
## AGES VC 1 IN POSITION-VELOCITY SPACE



The majority of detections from AGES in the Virgo Cluster come from the VC1 area, which is richer of the two regions in HI and optical alike. This is a very complex region, with multiple sub-clusters. We use distances given in the GOLDMine database. As well as galaxies within and behind the cluster, we have also detected a small group of High Velocity Clouds (HVCs).



The HI mass functions are shown for AGES (solid red), VIRGOHI (dashed blue) and ALFALFA (dotted green) with the approximate sensitivity limits of each survey. By virtue of its increased sensitivity, AGES detects more low-mass galaxies than either VIRGOHI21 (32 square degrees, 4 mJy) or ALFALFA (264 square degrees, 2.2 mJy) despite the smaller 15 square degree survey area of AGES.



Many of our detections are not listed in the VCC (above, blue squares) and are small, faint, blue and gas-rich in comparison to the VCC members which are detected (above, red circles). Most of these new detections are below the VCC completeness limit. In contrast to the VCC members, these new objects tend to have  $HI_{def} < 0.4$ , suggesting they have only recently entered the Virgo Cluster.

Below : optical SDSS RGB images and HI spectra from AGES of 4 of our 7 early-type galaxies detected in HI. These are all lenticulars, the remaining 3 are faint dwarf ellipticals. The lenticulars tend to be bright ( $M_g < -16.5$ ), relatively gas-poor ( $M_{HI}/L_g < 0.1$ ) objects on the transition region in the colour-magnitude diagram. Of those listed in the VCC in this region, 20% are detected in HI. They may be examples of galaxies fading from the blue to red sequence via gas loss.

In contrast, the dwarf ellipticals detected in HI are optically faint ( $M_g > -15.0$ ), relatively gas-rich ( $M_{HI}/L_g > 0.5$ ) and lie firmly on the red sequence. Only 3% of those listed in the VCC for this region are detected in HI. This suggests that the detected objects are not part of the general population and are perhaps infalling from the field.

