

Searching for Dark Galaxies: The AGES VC2 Region

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Abstract. The VC2 strip (part of the AGES blind HI survey) spans 5x1 degrees of the Virgo Cluster, from the outskirts of the cluster to its interior. The strip covers part of subcluster A while avoiding the strong continuum source M87. 40 hours of observations were taken in January-February 2007 using the ALFA instrument on the Arecibo telescope, reaching a noise level as low as 0.5 mJy. For a 200 km/s velocity width, this gives a sensitivity limit of $6 \times 10^6 M_{\text{solar}}$ at the Virgo distance (16 Mpc). Currently, 36 definite sources have been found, both by eye and with the automatic extractor Polyfind, with an additional 12 requiring follow-up observations, found only by one method.

Keywords. Dark galaxies, Virgo, high velocity clouds.

1. High Velocity Clouds

Almost all the detections have definite or candidate optical counterparts. Only 2 definite detections undoubtedly have no optical counterparts (but for other possibilities, see section 3). A moment map of these, integrated over a velocity range of 57 km/s, is shown in fig. 1. Both sources are large enough to be resolved by the Arecibo 3.5' beam. The northernmost source shows clear evidence of structure, whereas the southern source is diffuse. Owing to the relatively low velocity and large angular size, these objects are almost certainly nearby High Velocity Clouds.

2. New Virgo Detections not Listed in the VCC

The majority of galaxies detected by AGES are behind the cluster, and are not listed in the Virgo Cluster Catalogue. However these two sure detections (fig. 2) are within the Virgo velocity range, but are not listed. The first detection has a very probable dwarf irregular as an optical counterpart, almost exactly at the coordinates from the HI detection. Strictly speaking it is not a certain counterpart, since no optical redshift is available. The optical counterpart of the second detection is more ambiguous, but potential objects are visible in the SDSS image.

3. Dark Galaxy Candidates

The optical counterparts of these two detections (fig. 3) are even more ambiguous. Without optical redshifts it is impossible to determine if the supposed counterparts really correspond to the HI detections. The first detection has a potential faint galaxy very close to the coordinates from AGES, whereas the nearest candidate for the second detection is 1 arcminute away. Note that the second detection, unlike the others, is **not** a sure detection, but a peak signal to noise of over 7 makes it hard to dismiss as spurious. The sure detection has a similar signal to noise.

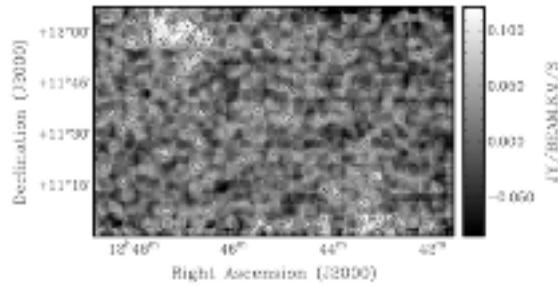


Figure 1. Integrated flux map of the H.V.C's, from 221 to 271 km/s. The lowest contour is at 55 mJy/beam.km/s, increasing in steps of 30 mJy/beam.km/s

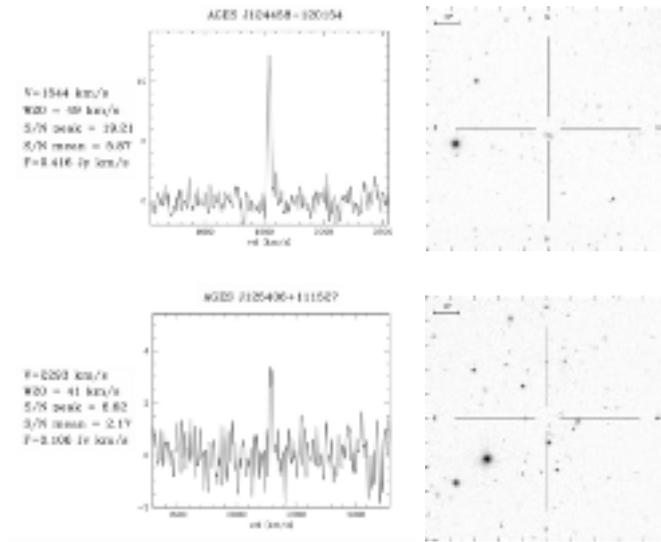


Figure 2. New Virgo objects not listed in the VCC. Left column : AGES spectrum and HI properties. Right column : corresponding SDSS image (the short line is 20”).

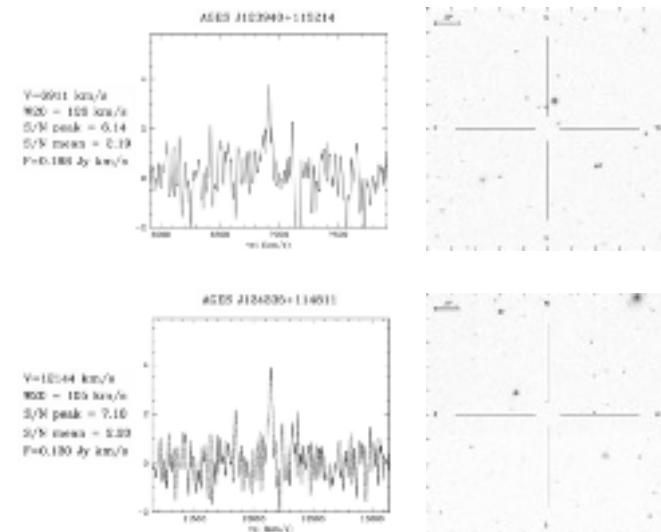


Figure 3. Dark galaxy candidates - columns as above.