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HI in the Virgo Cluster: Arecibo Catalogs, Statistics, and Aperture Synthesis Observations

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Abstract. The Arecibo Legacy Fast ALFA survey (Giovanelli et al. 2005) has yielded a complete HI dataset of the Virgo Cluster and its environs (Giovanelli et al. 2007; Kent et al. in preparation). ALFALFA is a more sensitive second generation blind HI survey that will cover 7000 deg^2 of high galactic latitude sky out to $cz_\odot$ ∼18,000 km/s using the seven element Arecibo L-band Feed Array. The region surveyed covers ∼ 240 deg^2 of sky from $11^h44^m <$ R.A.(J2000) $< 14^h00^m$ and $08°00' <$ Dec.(J2000) $< 16°00'$. This region has multiwavelength coverage from other surveys, including the Virgo Cluster Catalog (Binggeli, Sandage, & Tammann 1985), the Sloan Digital Sky Survey, and 2MASS. Several interesting HI candidates have been detected in the vicinity of the Virgo Cluster, all at $cz_\odot < 3000$ km s^{-1}. Assuming a distance to Virgo of 16.7 Mpc, the minimum detectable HI mass is of order 2×10^7 M$_\odot$. Some objects appear to be located near low surface brightness optical counterparts, or are the result of tidal interactions with nearby large galaxies. Such detections are clearly the result of a larger group or system. However, other isolated HI detections do not coincide with any nearby counterparts visible in optical surveys (Kent et al. 2007). The detections lie outside the influence of effects from ram-pressure stripping in the Virgo Cluster. The parameters of these detections and their follow-up observations will be described, as well as the contents of the first Virgo region catalogs released from the survey. The effects of the cluster environment on the formation and evolution of such objects will corroborated with observed properties. Followup observations with the Very Large Array have been obtained for several of the unresolved Arecibo detections. These aperture synthesis maps resolve the clouds into multiple component HI complexes. These clouds, if not gravitationally bound, would disperse within a cluster crossing time. Coupled with the fact that these clouds are not detected in large numbers, this indicates that they are likely transient phenomena. Results of this survey can be viewed at http://arecibo.tc.cornell.edu/hiarchive/alfalfa/ and through many web services that use protocols and software of the National Virtual Observatory.

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