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The shape of dark matter halos of galaxies derived from HI observations

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We present a study to measure the the shape of dark matter halos of gas rich galaxies that have extended HI disks. We have assumed that the halo axes ratios in the disk plane are approximately so that $q=c/a$ measures the halo prolateness or oblateness. We have applied our model to a sample of 20 nearby galaxies that are gas rich and close to face-on. We have used the stacked HI velocity dispersion and HI surface densities to derive q in the outer disk regions. We find that gas dominated galaxies (such as LSB dwarfs) that are gas dominated, have have oblate halos ($q < 0.55$), whereas stellar dominated galaxies have a range of q values from 0.2 to 1.3. We also find a significant positive correlation between q and stellar mass, which indicates that galaxies with massive stellar disks have a higher probability of having halos that are spherical or slightly prolate, whereas low mass galaxies preferably have oblate halos. We then compare our result with galaxies in cosmological simulations. We show that halo shape affects disk dynamics, and is important for estimating halo mass as well.

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