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A Comparison with Previous Baryonic Tully- Fisher Relations

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We study how several published baryonic Tully-Fisher relations (BTFRs) fit a large sample of galaxies from the Arecibo legacy fast ALFA (ALFALFA) 21cm survey to determine which BTFR is a better template for calculating the distances and peculiar velocities of the ALFALFA galaxies. In particular, the BTFRs studied were those published by Papastergis et al. (2016) and Lelli et al. (2019). To do so, we first derived the rotational velocities and baryonic masses of a sub sample of galaxies with “good” data, which make up 68% of the ALFALFA galaxies. We then calculated the best-fit line of the sample using five different fitting methods: (1) the ordinary least squares (OLS), (2) the maximum likelihood method assuming no intrinsic scatter as defined by Papastergis et al. (2016), (3) the maximum likelihood method with intrinsic scatter along the perpendicular direction ($\sigma_{\perp, intr}$) also defined by Papastergis et al. (2016), (4) the maximum likelihood method assuming intrinsic scatter along the vertical direction (σ_y) as defined by Lelli et al. (2019), and (5) the maximum likelihood method with intrinsic scatter along the perpendicular direction (σ_{\perp}) also defined by Lelli et al. (2019). We find that fitting method (2) yields the steepest slope, 3.42, which agrees well with the values obtained in previous studies. We use this fit-line to compare with the two published BTFRs and determine that the BTFR derived by Papastergis et al. (2016) is the better template for calculating the distances and peculiar velocities of the ALFALFA catalog. This work was supported by NSF/AST-1714828 and by grants from the Brinson Foundation.