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Kennicutt-Schmidt relation in the HI dominated regime

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Abstract. We investigate the existence of a Kennicutt-Schmidt type relation between $\Sigma_{\rm SFR}$ and $\Sigma_{\rm gas,atomic}$ in the HI dominated regions of nearby spirals and dwarf irregulars.

1. Procedure and Results

We study the Kennicuut-Schmidt relation (Kennicutt 1998) in the HI dominated interstellar medium (ISM) of nearby star-forming galaxies, the disk-averaged version of which was studied recently for dwarfs (Roychowdhury *et al.* 2014). The samples used for this work were: (i) dwarf irregular galaxies from the FIGGS survey (Begum *et al.* 2008), (ii) spiral galaxies from the THINGS survey with CO observations from the HERACLES survey from Leroy *et al.* (2013). We determine the relation between $\Sigma_{\rm gas,atomic}$ and $\Sigma_{\rm SFR}$ at the resolution of the CO maps in regions 1 kpc in size for the THINGS galaxy sample, and at 400 pc resolution in regions 400 pc in size for FIGGS and THINGS galaxies.

In the HI dominated regime the low star formation rates (SFRs) measured are affected by the stochastically sampling of the high mass end of the IMF and bursty non-continuous SF history, when SFR calibrations assume continuous star formation during the previous Myr or so. da Silva, Fumagalli & Krumholz (2014) have simulated the variation of SFR measured using different tracers with variation in the underlying true SFR and star formation history, and find that FUV is a more trustworthy tracer. We use FUV from public *GALEX* images to trace SFR, and use public *Spitzer* 24 μm fluxes to account for internal dust extinction by following the 'composite' calibration by Hao *et al.* (2011).

For THINGS galaxies we choose HI dominated region by excluding regions with detected CO emission. In order to ensure that we are sampling enough SFR to be unaffected by the uncertainties in low SFR measurements described above, we determine the average $\Sigma_{\rm SFR}$ in each $\Sigma_{\rm gas,atomic}$ bin. We find that this results in $\Sigma_{\rm SFR}$ falling off with $\Sigma_{\rm gas,atomic}$ much less steeply than what was seen by Bigiel *et al.* (2010) for the very outskirts of spirals. We find power law slopes between 1.3 and 1.6 for all samples in HI dominated ISM, but gas consumption timescales of 10 Gyrs and more.

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