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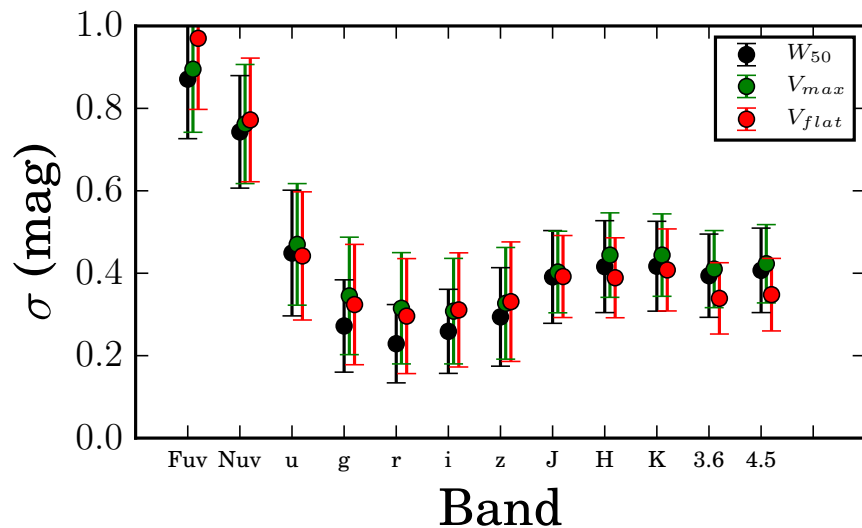
The (baryonic) Tully-Fisher relation status update ...

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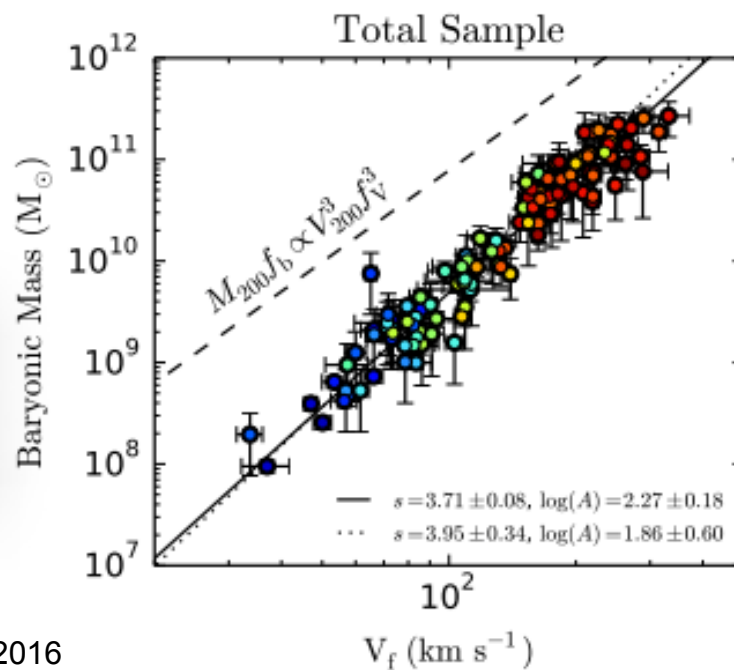
The Tully-Fisher at $z = 0$

Ponomareva+ 2017



Smallest vertical scatter
 $IR - W_{50}$
 suits for distance measurements

Extremely tight $M_{bar} - V_{flat}$ relation
 suits for cosmological models



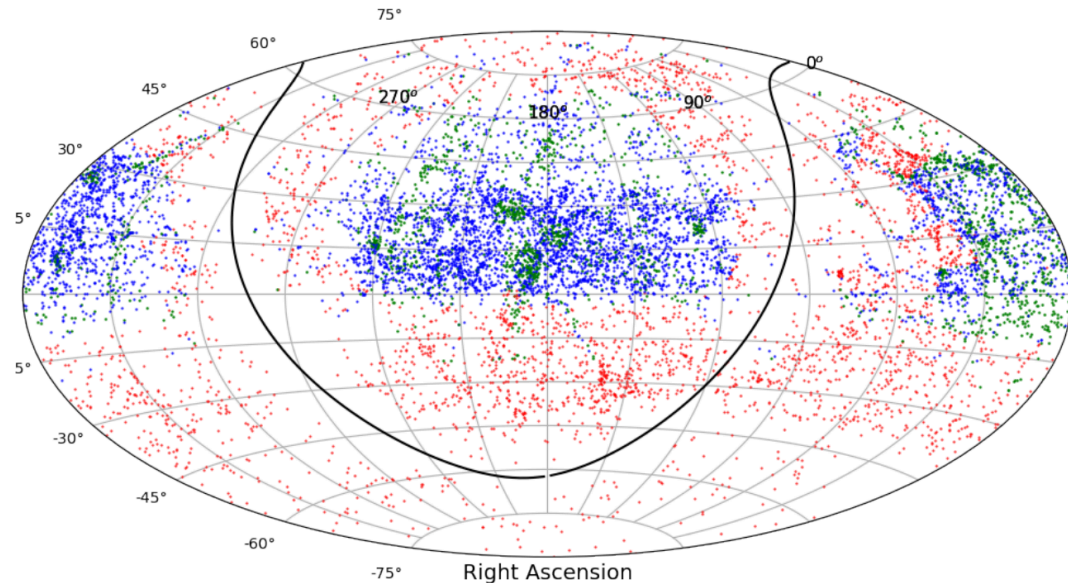
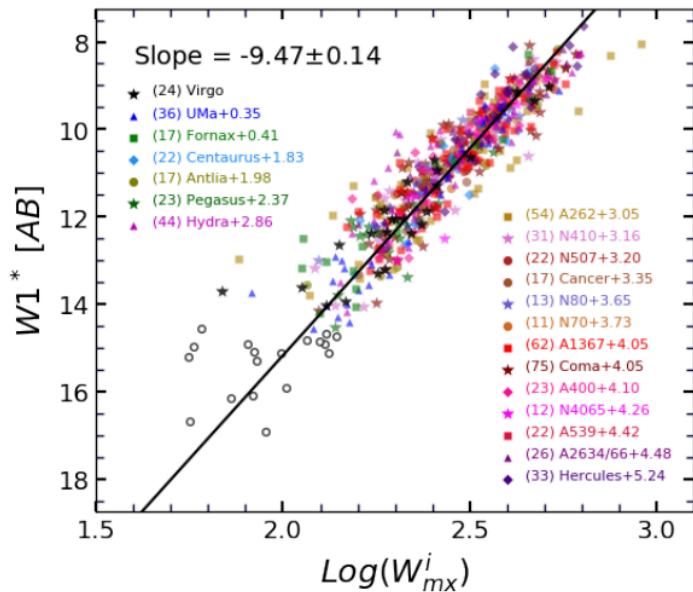
Lelli+ 2016

Distances

Cosmicflows 1,2,3,4 & to be continued...
(Tully+ 2008, 2013, 2016; Kourkchi+ 2020)

$H_0 = 75.1$

The Catalog of ~10000 Tully-Fisher Distances up to 15000 km/s



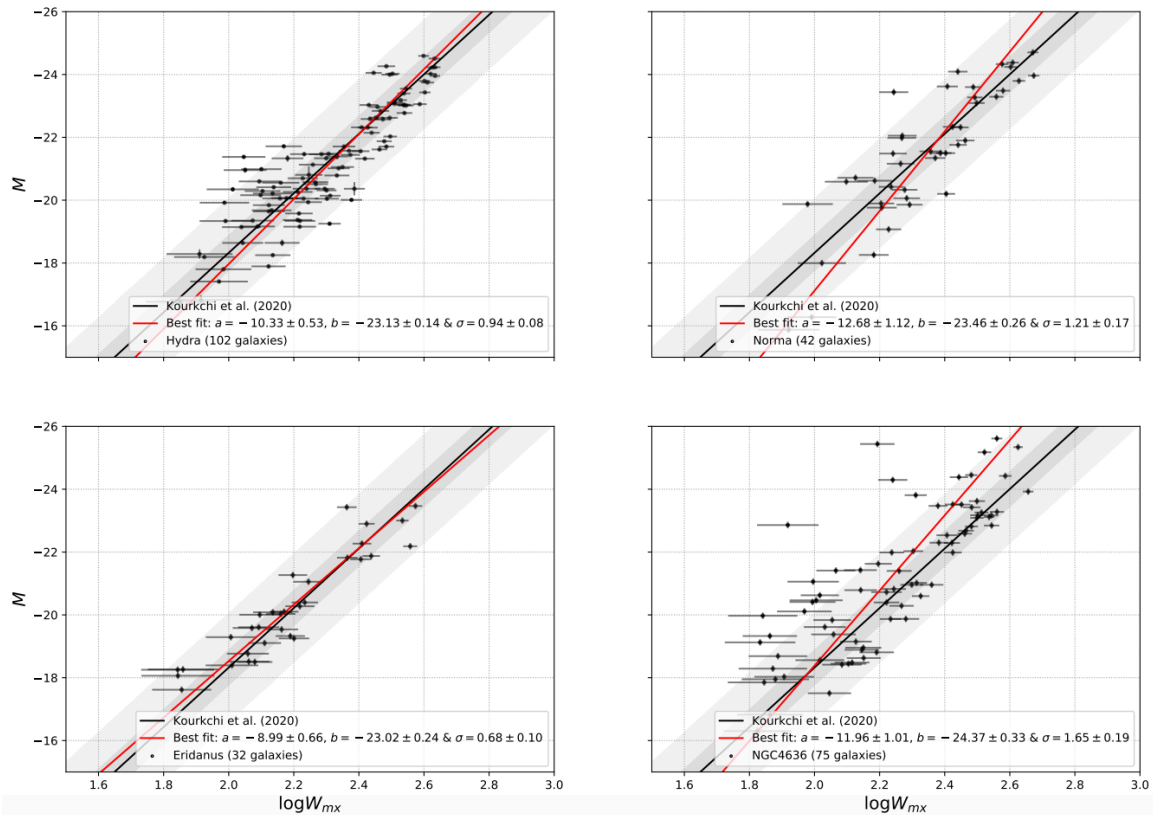
Kourkchi+ 2020b

Calibration on 14 clusters in 7 photometrical bands

Kourkchi+ 2020a

Distances ASKAP

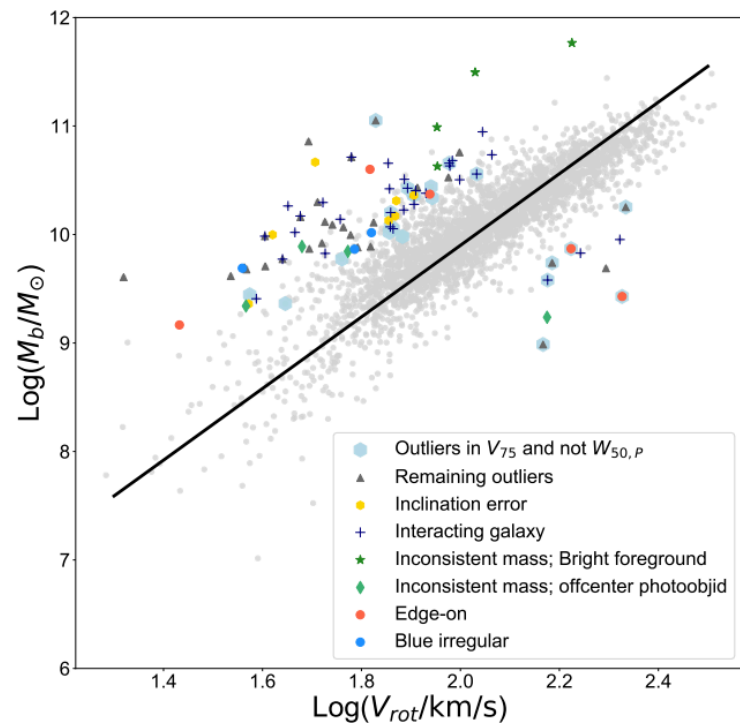
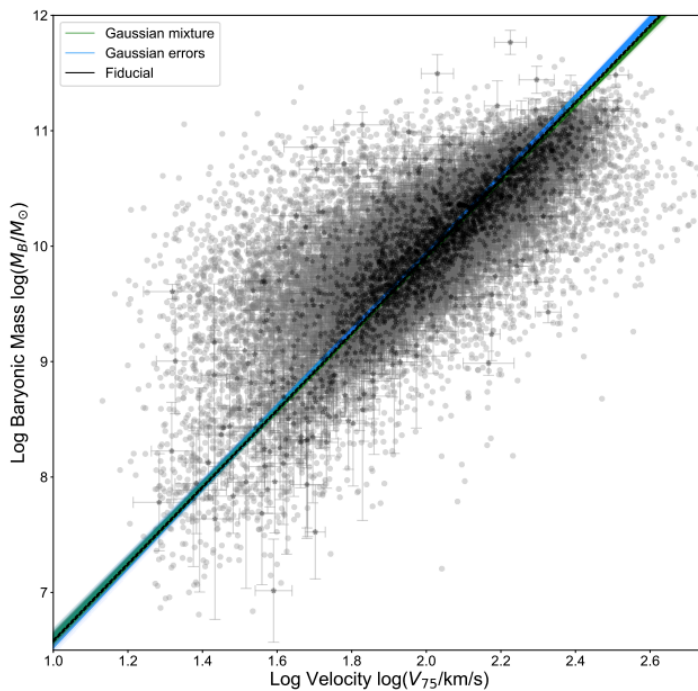
WALLABY (ASKAP): the Tully Fisher Relation in Eridanus, Hydra, Norma and NGC4636 fields



Expected: 1/2 million galaxies
 $\langle z \rangle = 0.05$ (200 Mpc)
200,000 Tully-Fisher distances

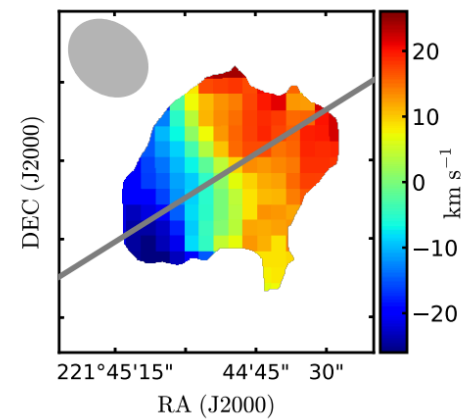
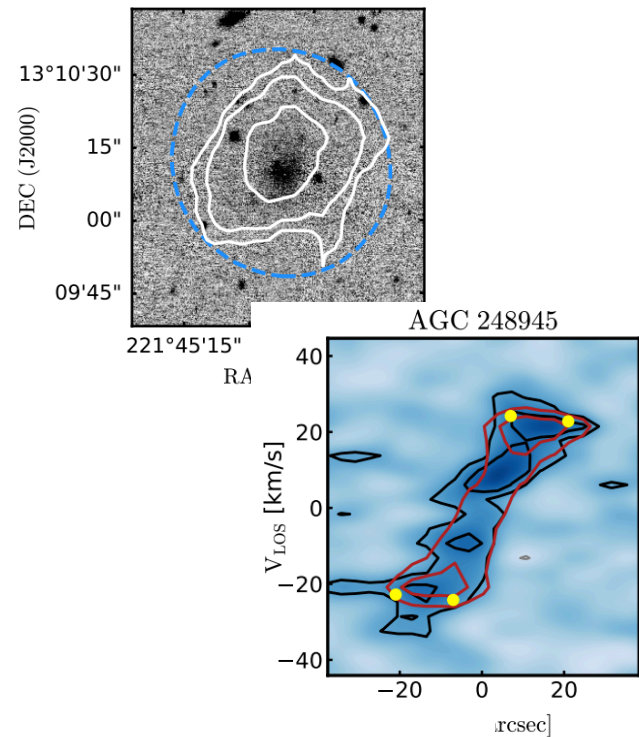
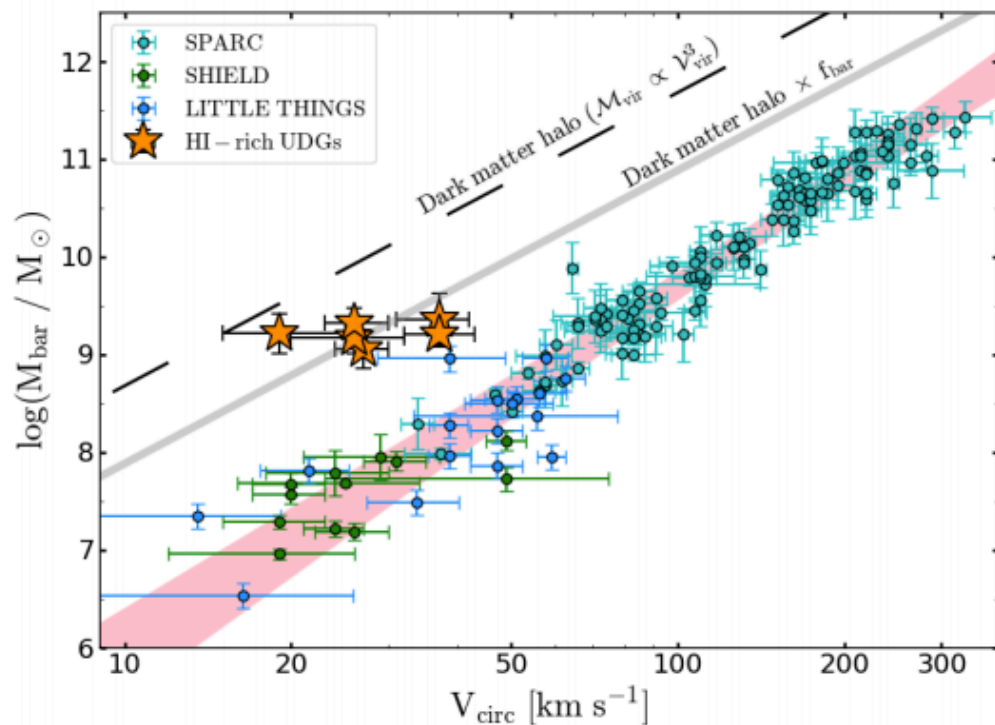
The Tully-Fisher at $z = 0$: Largest Sample

Automated ALFALFA Baryonic Tully-Fisher Relation

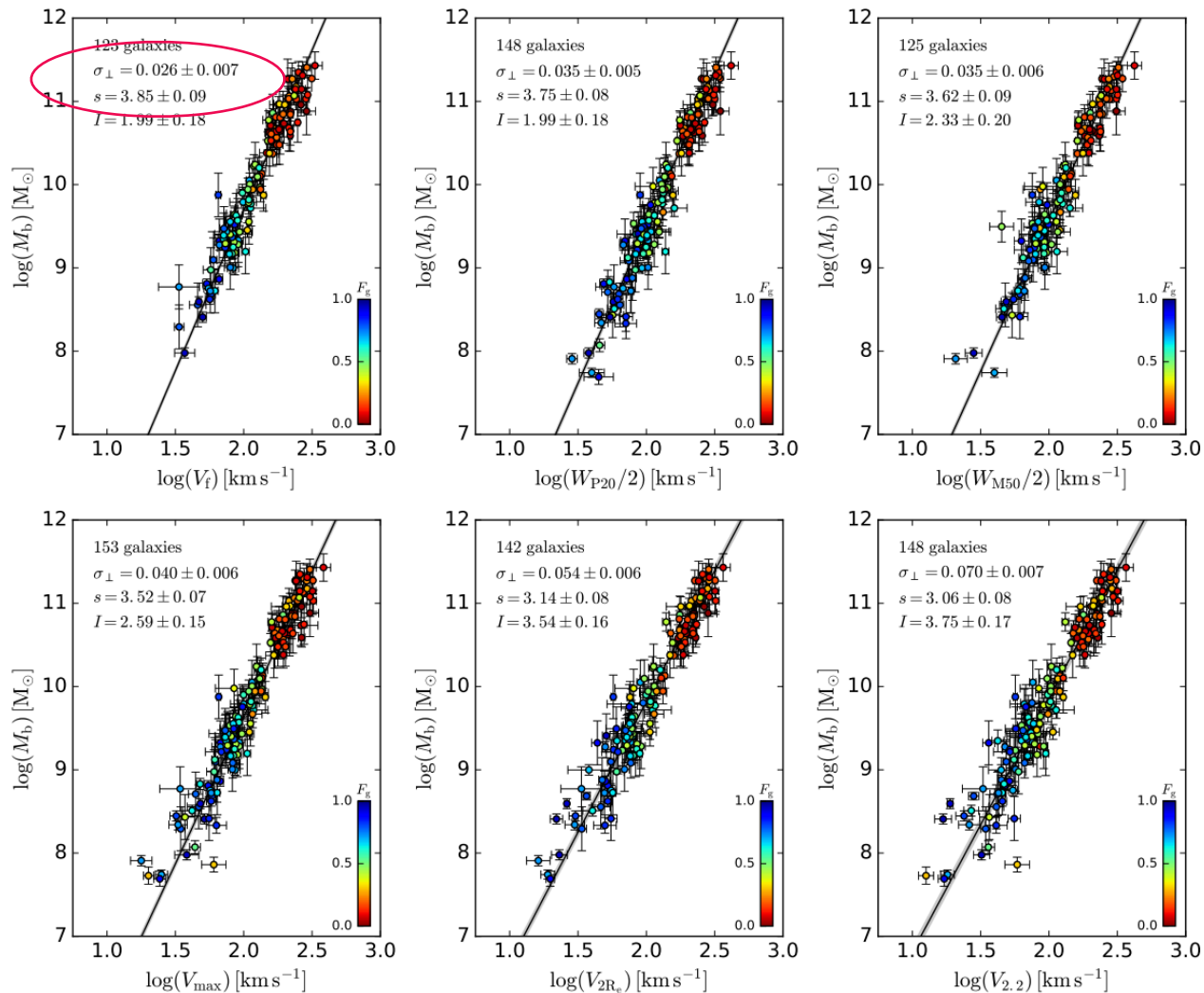


Full sample 31500+
Calibration sample 4500+

The Tully-Fisher at $z = 0$: Outliers



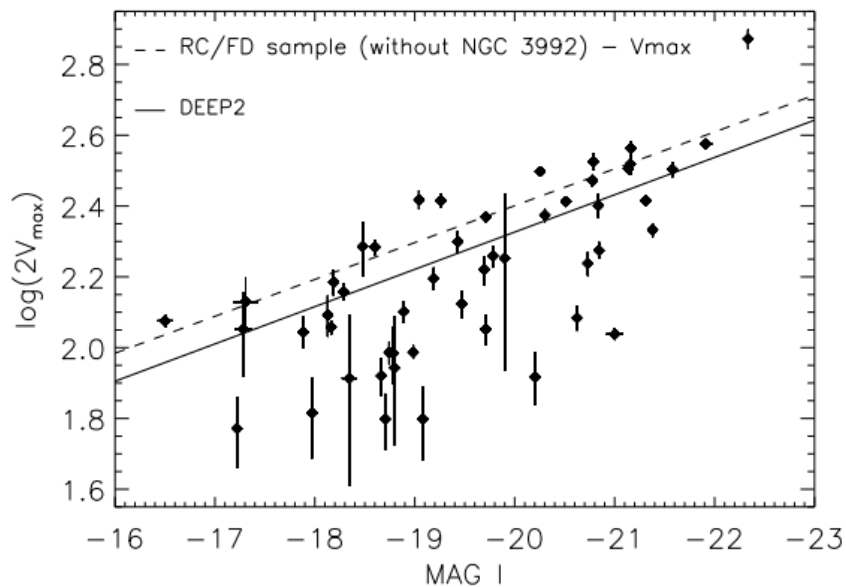
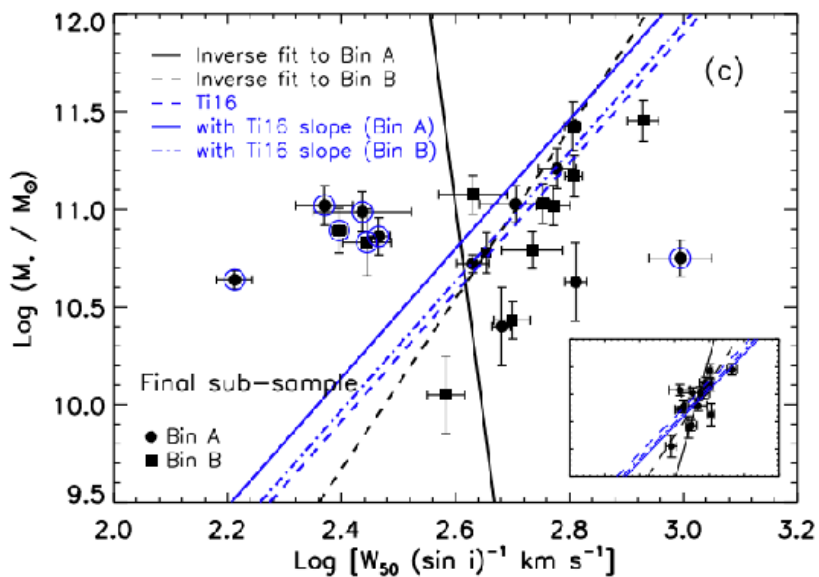
The Tully-Fisher at $z = 0$: Golden Standard



What about the TFr @ $z > 0$?

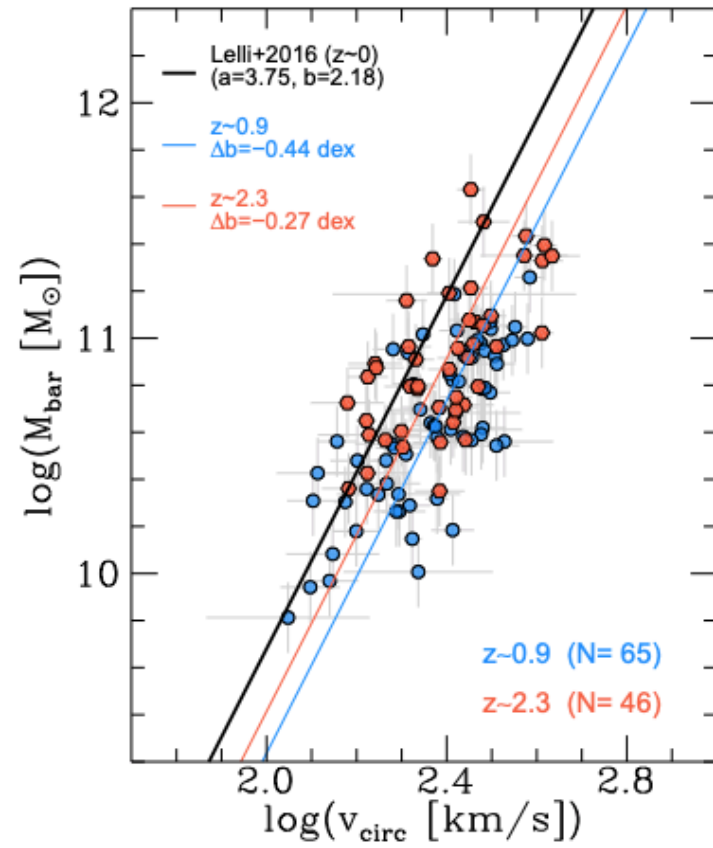
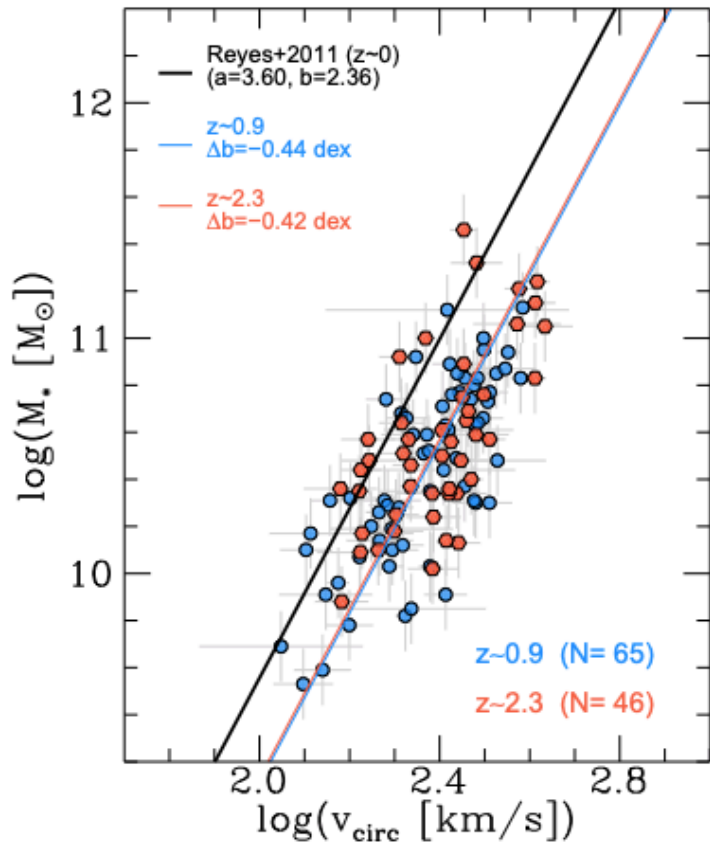
CO TFr @ $z=0.05-0.3$: No evolution

Optical TFr @ $z=1.3$: Evolution



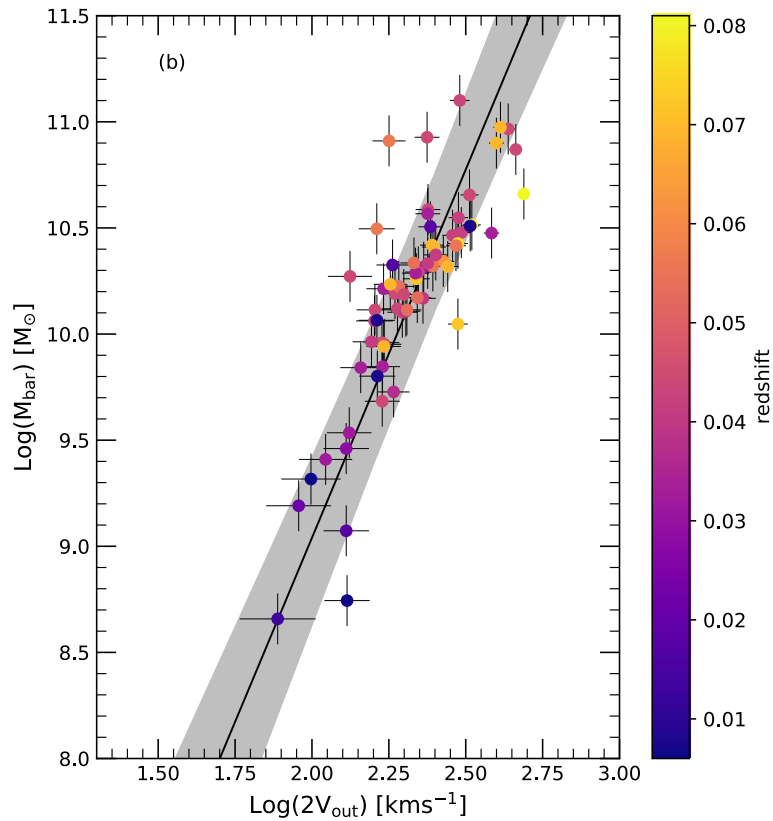
What about the TFr @ $z > 0$?

Optical TFr @ $z=0.9$ & $z=2.3$: Evolution of the ZP only

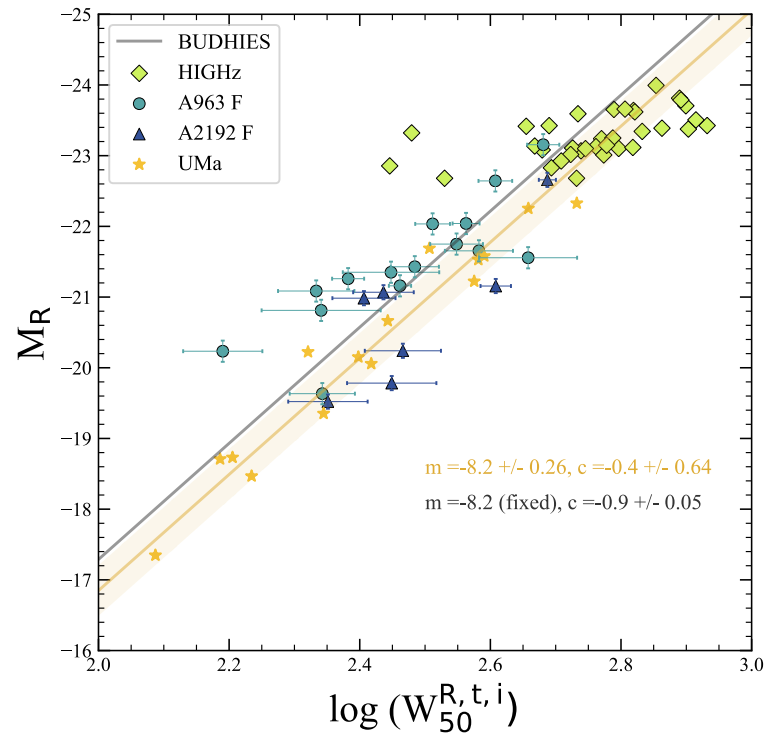


The HI TFr @ $z > 0$

MIGHTEE-HI bTFr up to $z = 0.083$

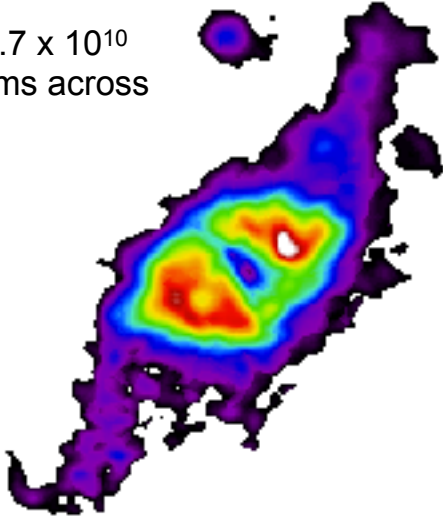


No evolution up to $z \sim 0.2$

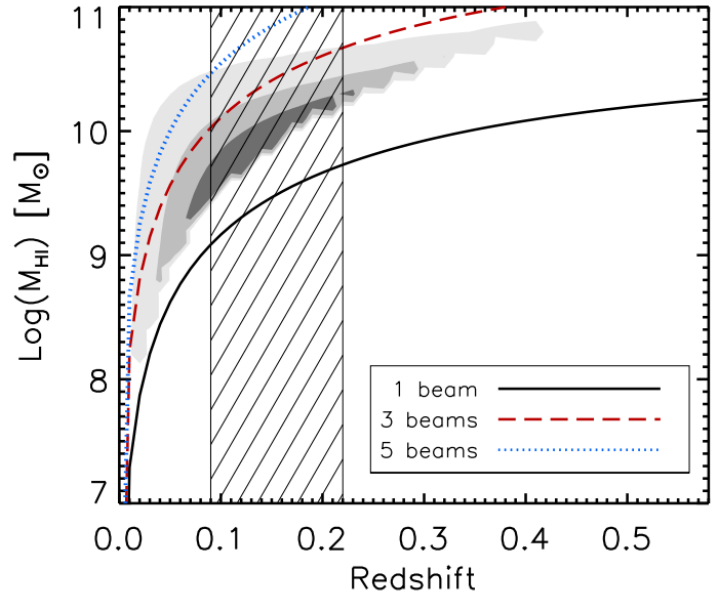


HI TFr beyond $z = 0$: Challenges

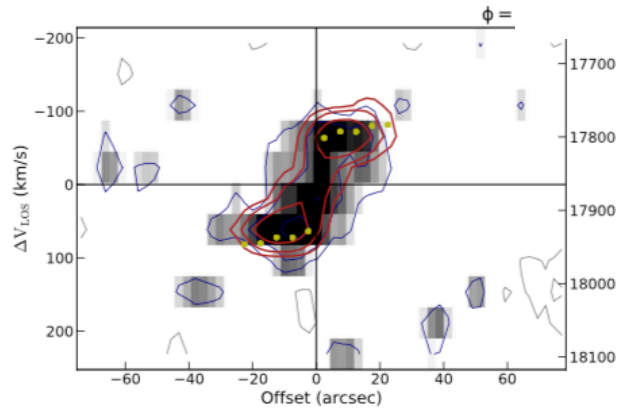
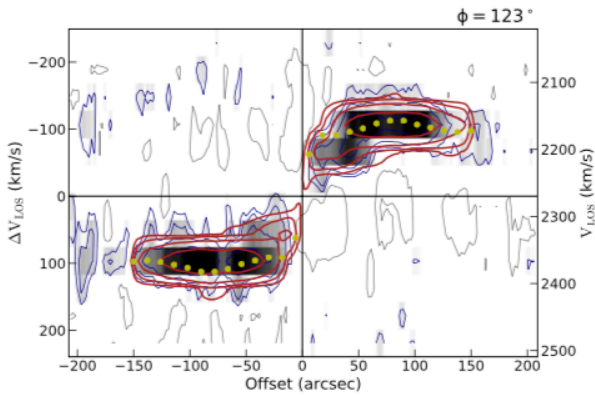
$z = 0$
 $M_{\text{HI}} = 1.7 \times 10^{10}$
 28 beams across



$z = 0.06$
 $M_{\text{HI}} = 1.8 \times 10^9$
 3 beams across



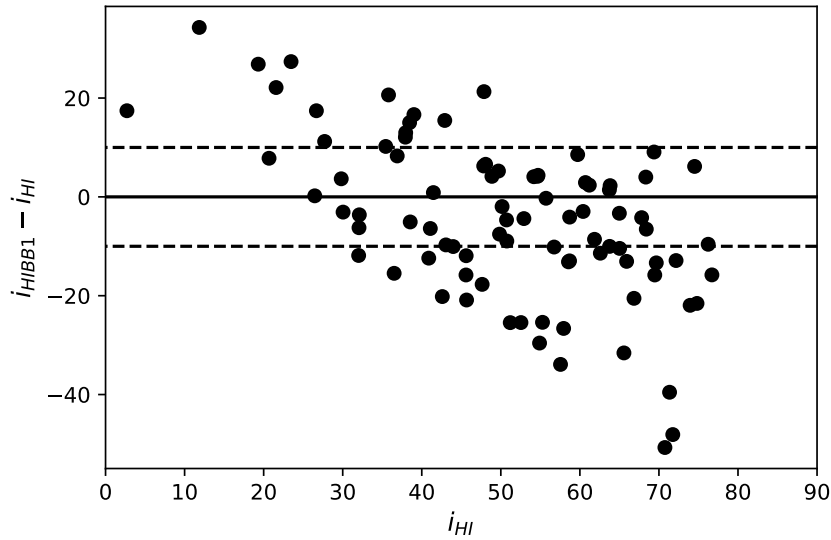
Maddox+ 2021



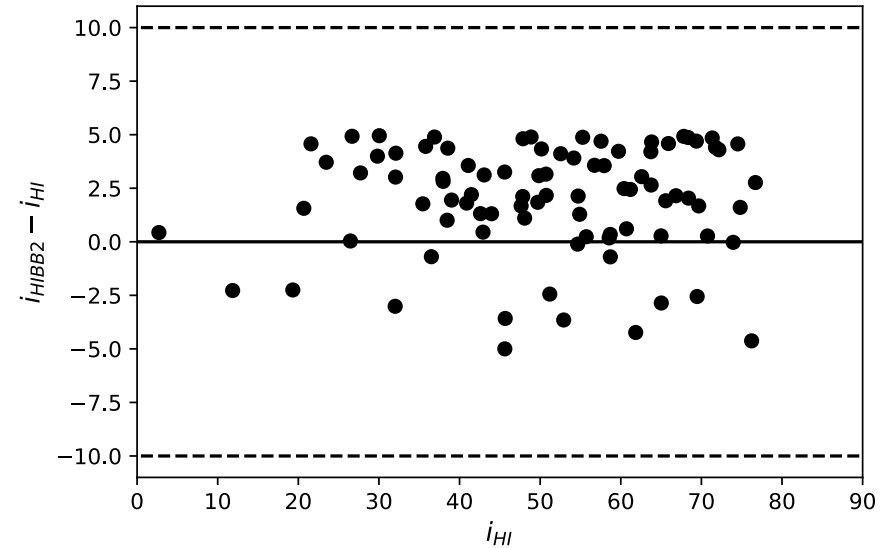
Not achievable with pathfinders

3D kinematic modelling: Inclinations

Fully automated: no initial guess for the fitting



HI inclination offered as initial guess



Need to provide initial estimate of inclination to 3DBarolo to get accurate resolved kinematics