$\mathcal{H}_d$

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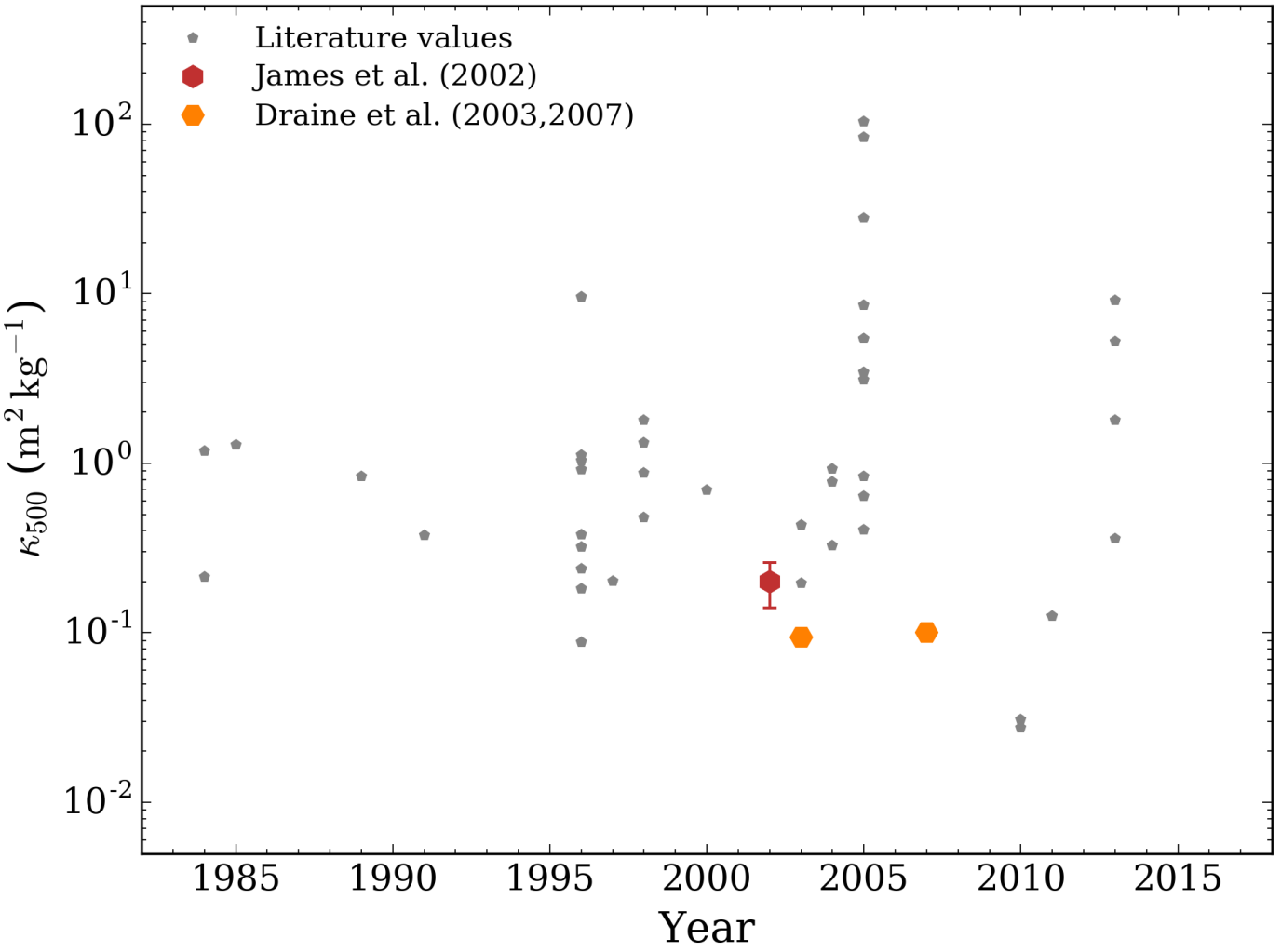
(with the *H*-ATLAS team)

The Elusive $\varkappa_{\mathrm{d}}$



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$$M_d = M_g \, \varepsilon_d \, f_Z$$

M_d = Dust mass

M_g = Gas mass

ε_d = ISM dust-to-metals ratio = 0.5 +/- 0.1

f_Z = ISM metal mass fraction (ie, ISM metallicty)

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Improvements Over James et al (2002)

Using data from the HRS

- We now have *Herschel* photometry; James et al only had IRAS & SCUBA, and so could not constrain dust temperature.
- We have integrated (and normalised) ISM metallicites from drift-scan spectroscopy
- We have integrated CO maps; they only had central pointings.
- James et al did not consider the effect of oxygen depletion on their metallicites – we do.
- James et al did not account for Helium or gas-phase metals in their ISM masses – we do.

$$\kappa_\lambda = \frac{D^2}{\xi \left(M_{HI} + M_{H_2}\right) \varepsilon_d \, f_{Z_\odot} \, Z} \left(\frac{S_{\lambda_w}}{B_\lambda(T_w)} + \frac{S_{\lambda_c}}{B_\lambda(T_c)} \right)$$

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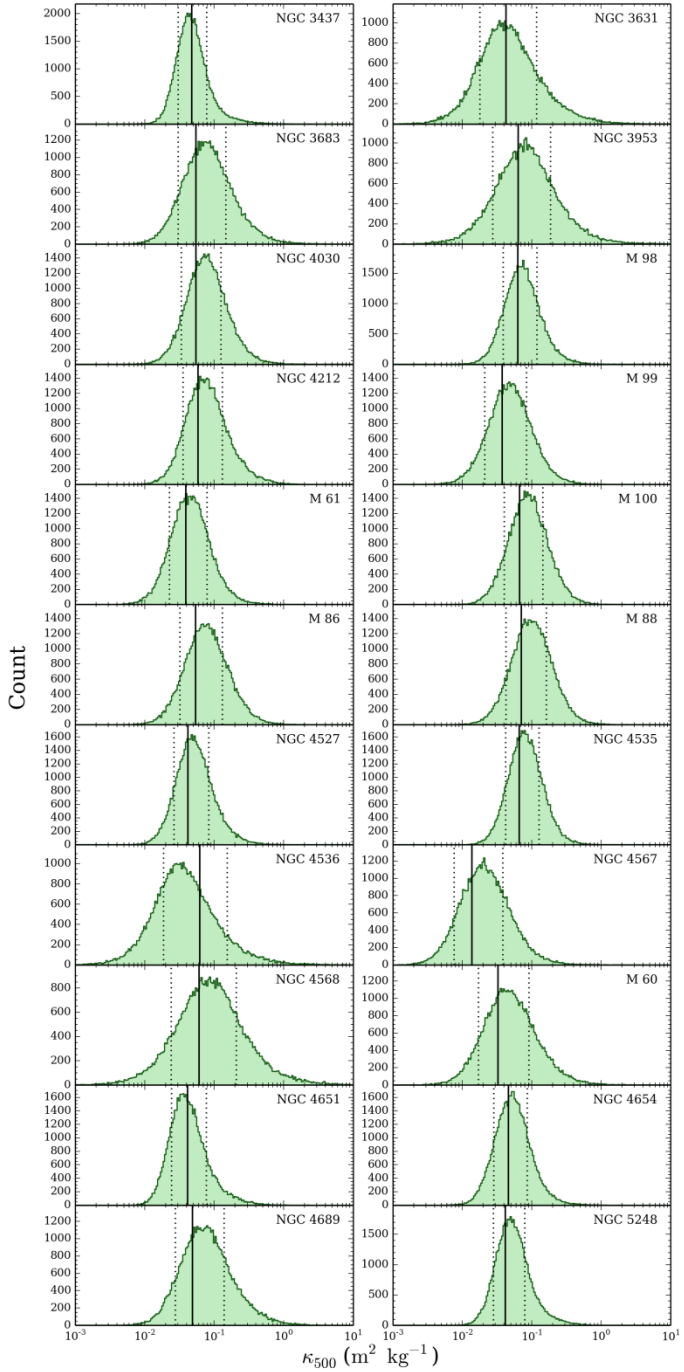
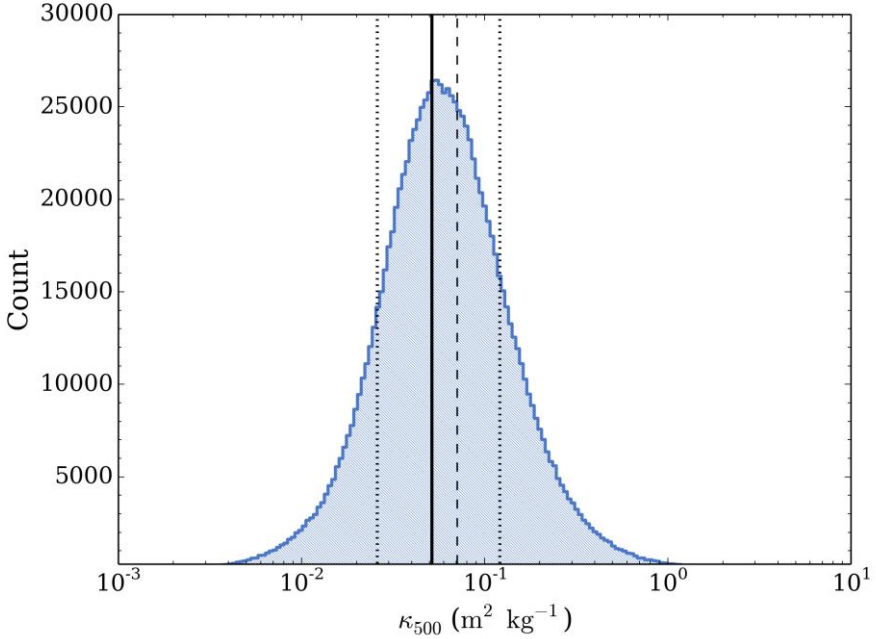

NGC 3437
NGC 3631
NGC 3683
NGC 3953
NGC 4030
M 98
NGC 4212
M 99
M 61
M 100
M 86
M 88
NGC 4527
NGC 4535
NGC 4536
NGC 4567
NGC 4568
M 60
NGC 4651
NGC 4654
NGC 4689
NGC 5248
Count
κ_{500} (m^2 kg^{-1})


Count
κ_{500} (m^2 kg^{-1})

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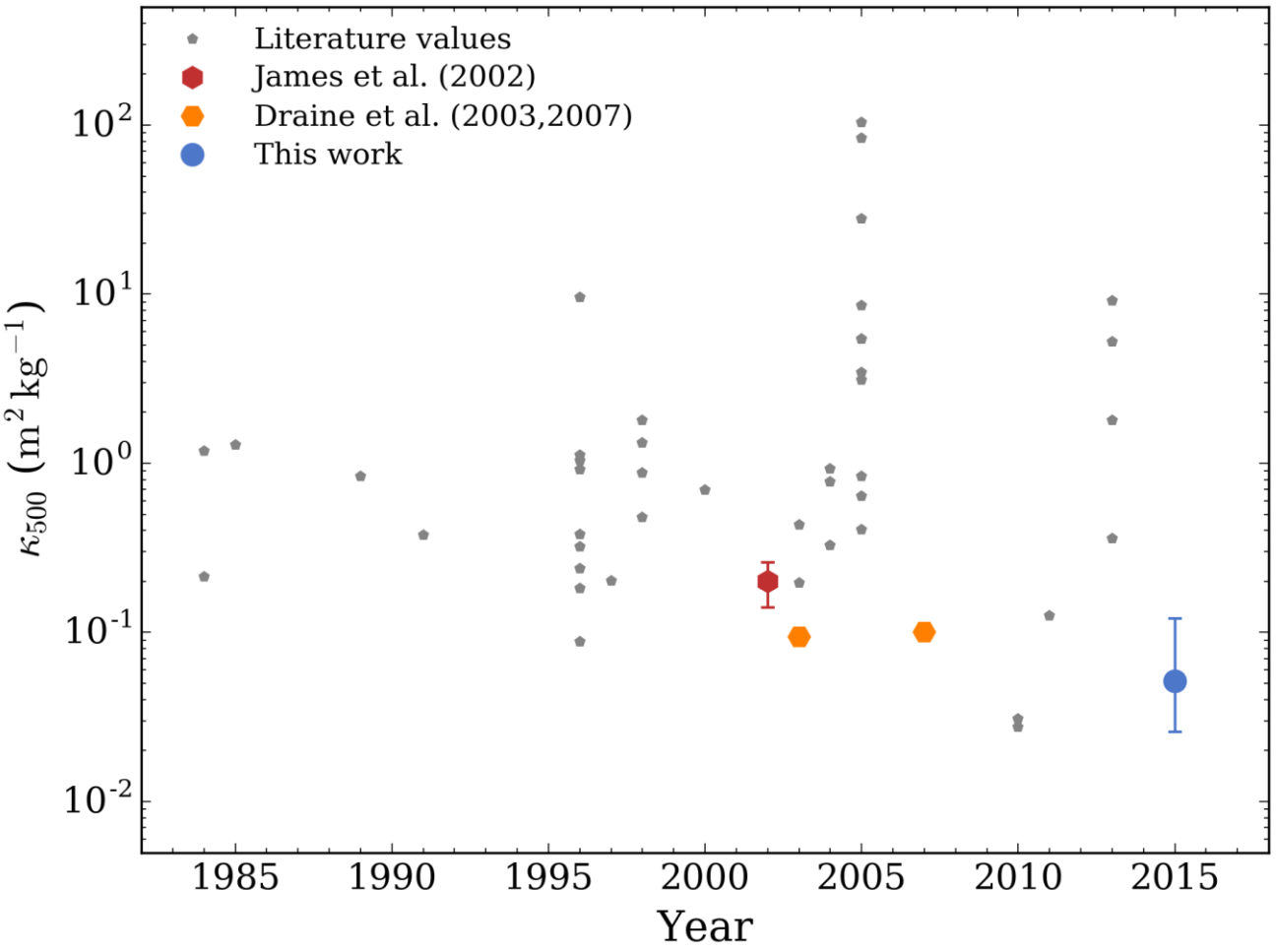
An Empirical Value For κ_d

K_{500} = 0.051 m^2 kg^{-1} (+/- ~0.24 dex)



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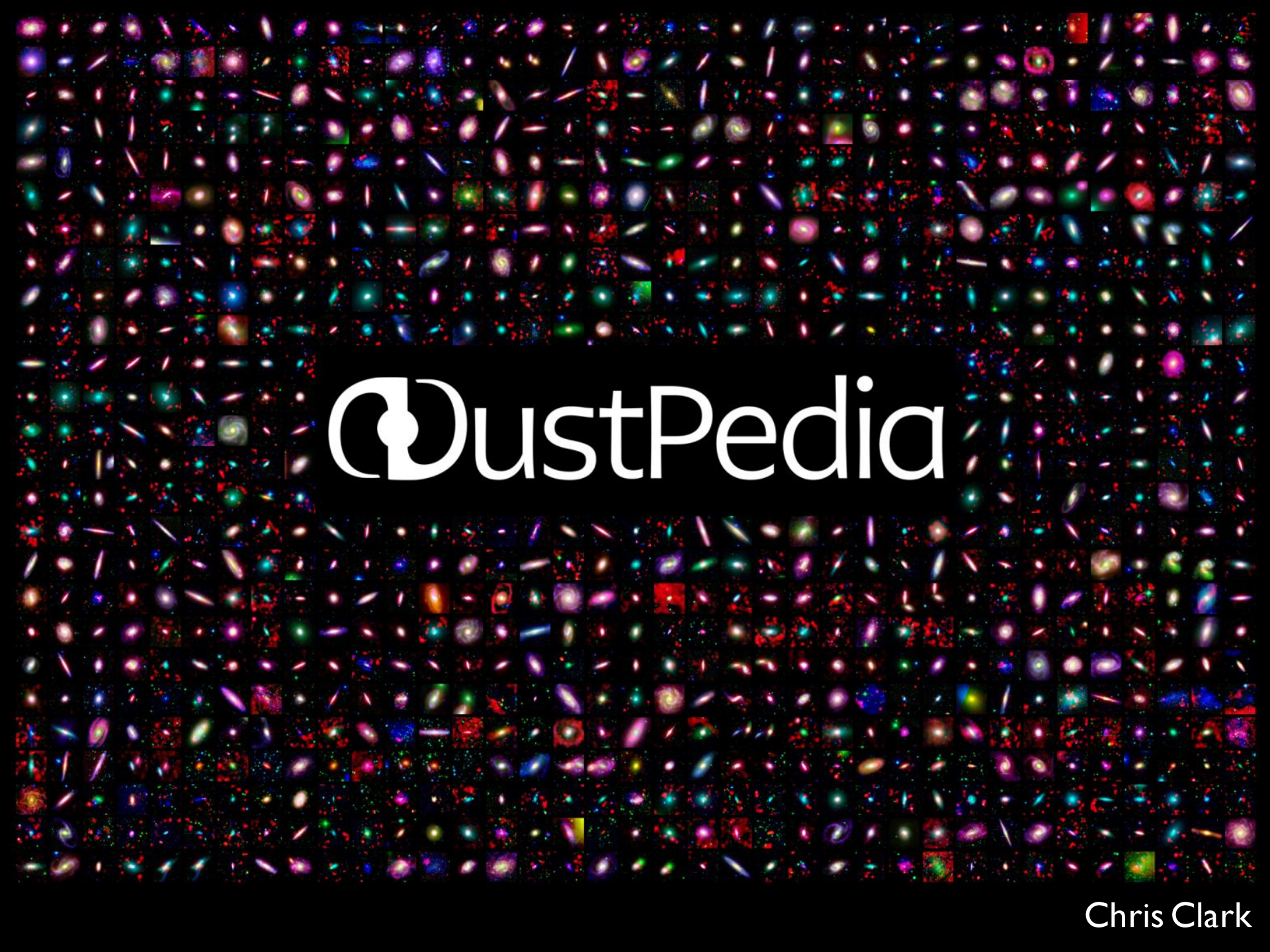

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DustPedia Overview

- THEMIS – A physically-motivated dust model based upon laboratory observations of astrophysical minerals (see papers by A Jones, N Ysard).
- SKIRT – Radiative transfer modelling suite that can fit a dust model to galaxy observations in 3D (see papers by M Baes, P De Camps, S Verstoken).
- A hierarchical Bayesian SED fitting toolkit that can be used to model both galaxies both globally and pixel-by-pixel (see papers by F Galliano).
- A database of multiwavelength imagery and photometry database for all 876 nearby galaxies observed by *Herschel* for which V<3000 km/s and D25<1' (see upcoming paper by me).

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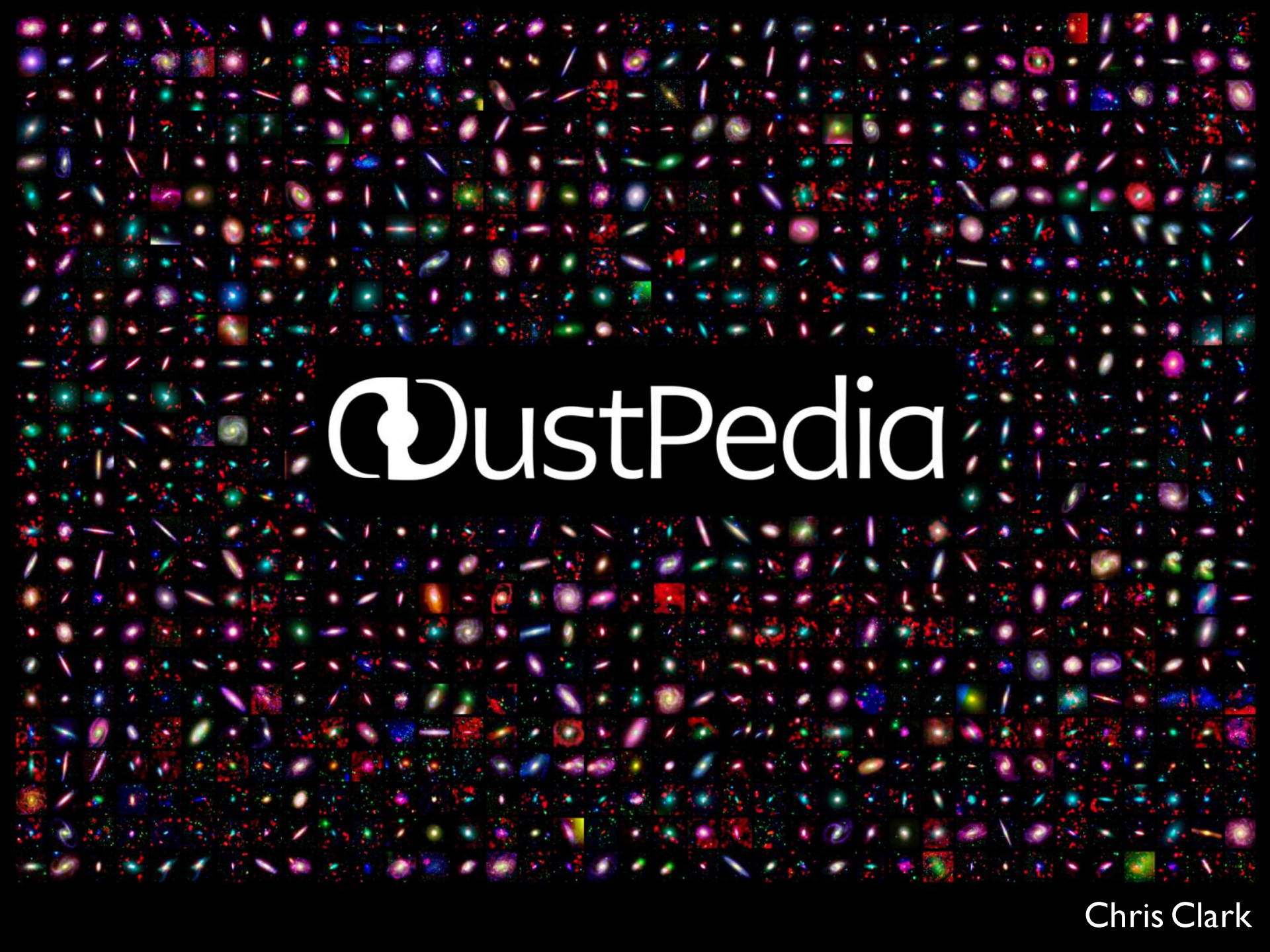

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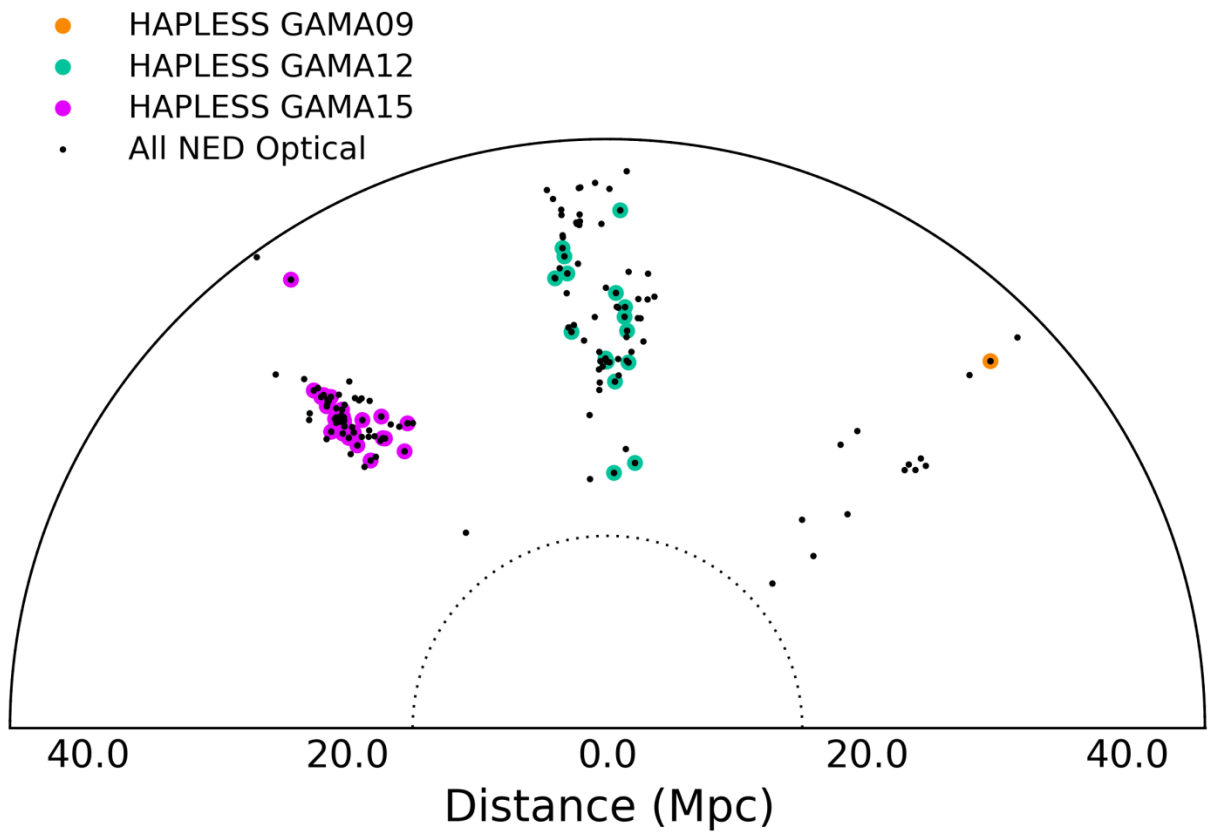
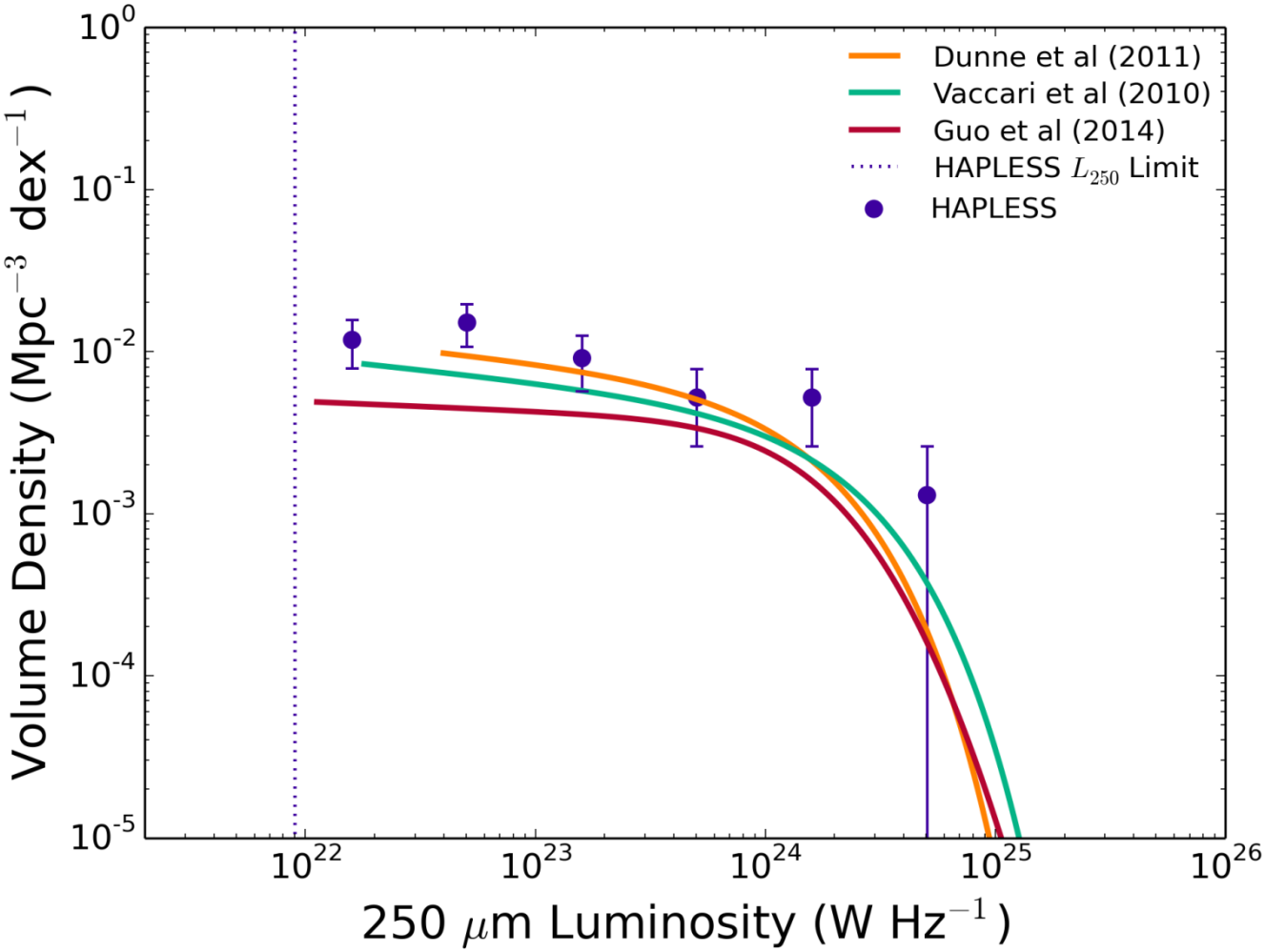
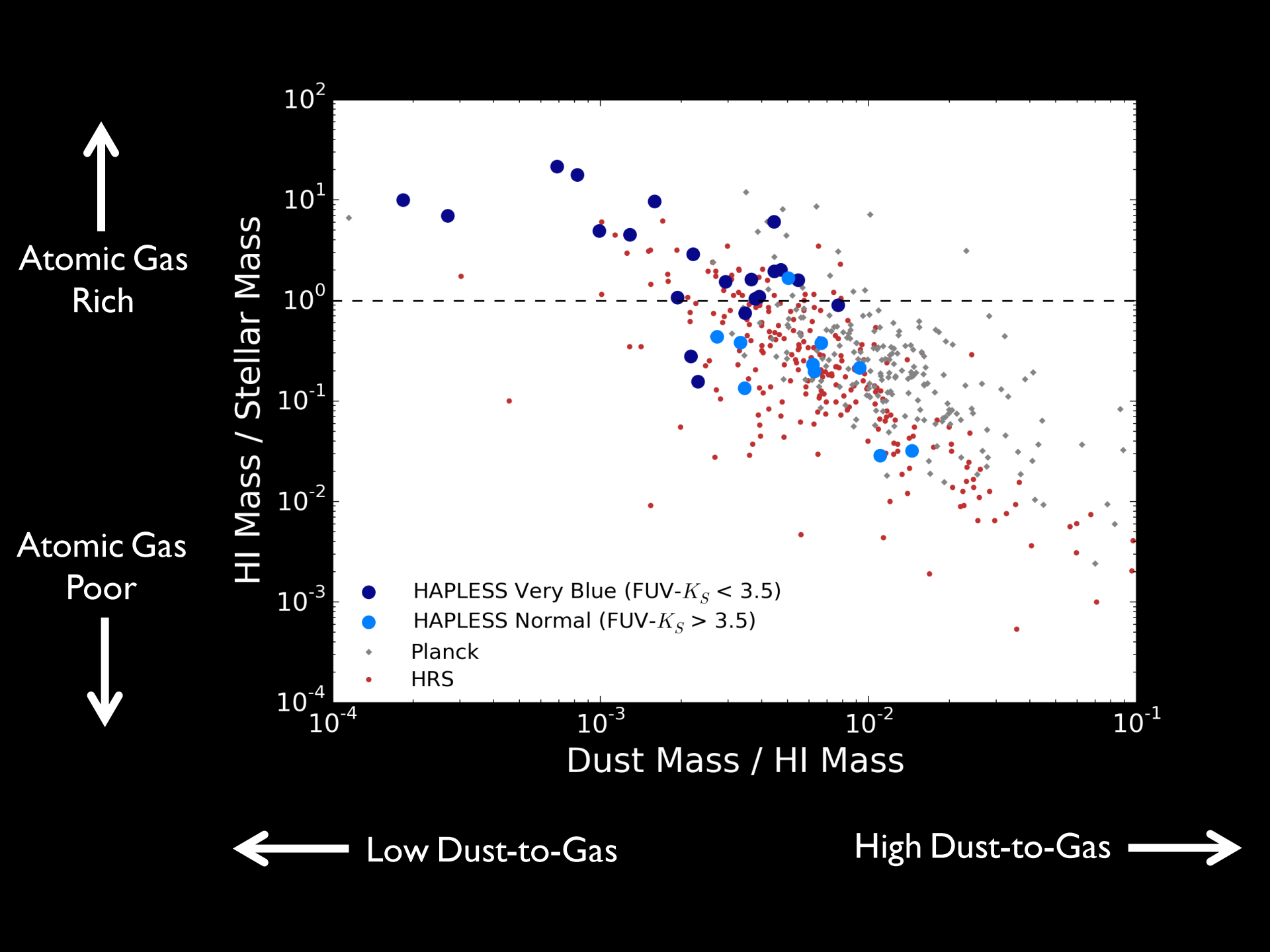
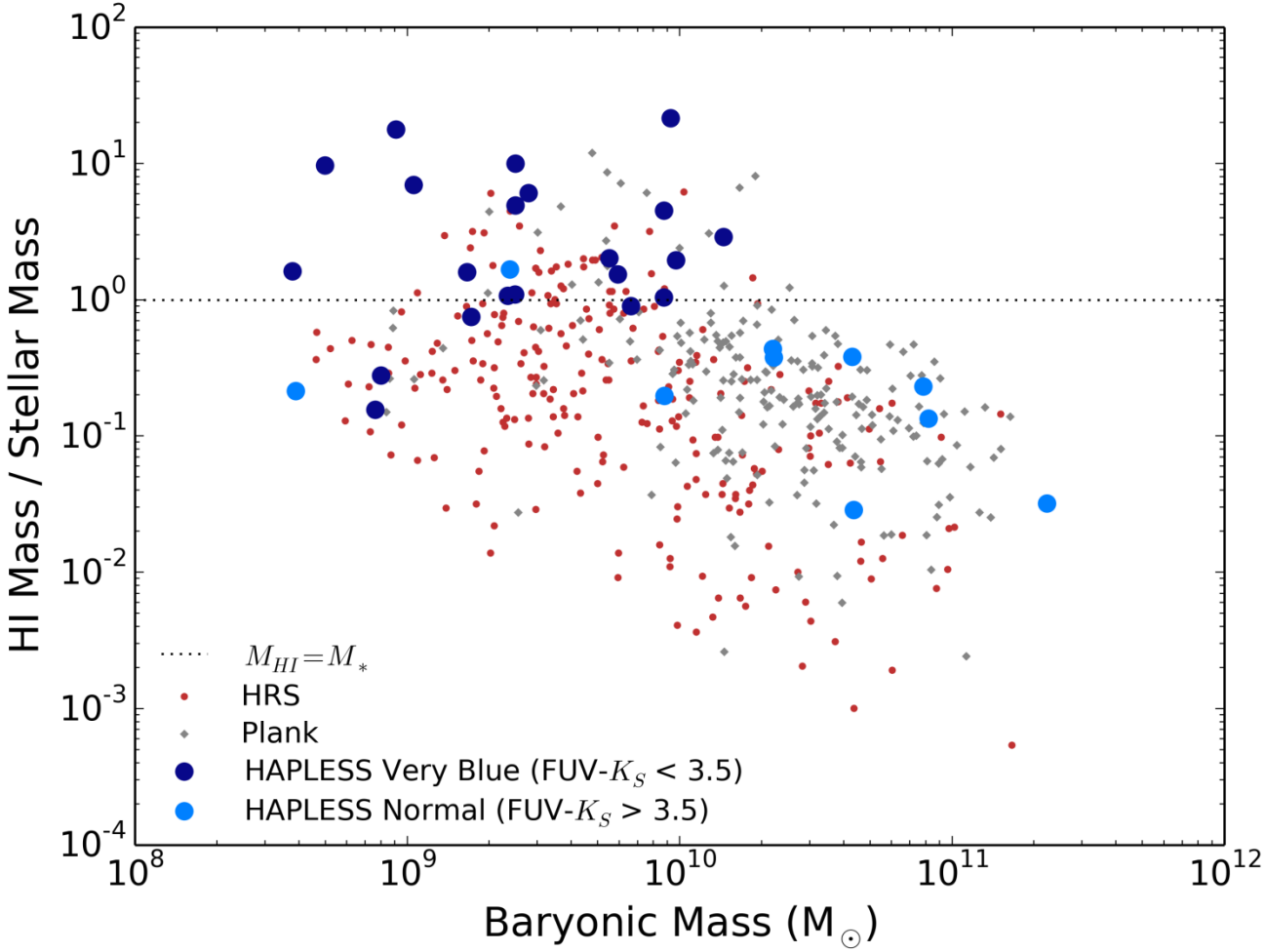

HAPLESS GAMA09
HAPLESS GAMA12
HAPLESS GAMA15
All NED Optical
40.0
20.0
0.0
20.0
40.0
Distance (Mpc)


Dunne et al (2011)
Vaccari et al (2010)
Guo et al (2014)
HAPLESS L_{250} Limit
HAPLESS
Volume Density (Mpc^{-3} dex^{-1})
250 μm Luminosity (W Hz^{-1})
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{22}
10^{23}
10^{24}
10^{25}
10^{26}


Atomic Gas Rich
Atomic Gas Poor
HI Mass / Stellar Mass
Dust Mass / HI Mass
HAPLESS Very Blue (FUV-K_S < 3.5)
HAPLESS Normal (FUV-K_S > 3.5)
Planck
HRS
Low Dust-to-Gas
High Dust-to-Gas


HI Mass / Stellar Mass
Baryonic Mass (M$_\odot$)
10^{2}
10^{1}
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{8}
10^{9}
10^{10}
10^{11}
10^{12}
$M_{HI}=M_*$
HRS
Plank
HAPLESS Very Blue (FUV-K_S < 3.5)
HAPLESS Normal (FUV-K_S > 3.5)