A Blind Survey of Nearby Dusty Galaxies with Herschel-ATLAS

Christopher Clark Haley Gomez Loretta Dunne Steve Maddox Pieter de Vis



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Targeted & Blind Surveys of Dust SINGS

Spitzer Infrared Nearby Galaxy Survey

SLUGS

SCUBA Local Universe Galaxy Survey

KINGFISH

Key Insights on Nearby Galaxies Far-Infrared Survey with Herschel

HRS

Herschel Reference Survey

IRAS

InfraRed Astronomical Satellite

Planck

Surprisingly, not an acronym

Herschel-ATLAS

Relative size of the Moon

 $(Image ~4^{\circ}x4^{\circ})$

Herschel Astrophysical Terahertz Large-Area Survey Principal Investigators Loretta Dunne & Steve Eales

The HAPLESS Galaxies



Herschel-ATLAS Phase-I Limited-Extent Spatial Survey

Upper: Optical SDSS gri

Lower: H-ATLAS 250 µm

0.0035 < z < 0.01 15 < D < 44 Mpc (Redshifts from GAMA survey, complete to r=19.8 mag)

Atypical Morphologies



75% irregular (T \geq 8) or highly flocculent

Morphologies from the EFIGI morphological catalogue (Baillard et al 2011)

Chris Clark (Cardiff) Very Blue UV-NIR Colour

GALEX Far-UV

Optical SDSS gri

Near-IR VIKING K_s

H-ATLAS 250 µm



Herschel Reference Survey (HRS)

- 323 galaxies
- Volume limited (15 < D < 25 Mpc)
- 5 Herschel wavebands (100 500 μm)
- Selected based on K-band apparent magnitude
- Sensitivity approaches confusion limit

Boselli et al (2010)

HAPLESS Spectral Energy Distributions



SED-fitting routine from MWL Smith (Smith et al, 2012)

β=2



Colour vs Dust Temperature



Median HAPLESS dust temperature 4K lower than HRS. Median FUV-K_s colour bluer than 80% of HRS.



Stellar Mass (M $_{\odot}$)

Median HAPLESS specific dust mass 5 times greater than HRS. 7 HAPLESS galaxies have higher M_d/M_* than anything in HRS.

Stellar Mass vs M_{HI}/M_{*}



54% of HAPLESS galaxies have $M_{HI}/M_* > 1$, compared to 10% of HRS galaxies.



 $FUV-K_s$ Colour (mag)

Median HAPLESS gas fraction is 0.55, three times greater than that of HRS.

Young, Dusty Galaxies?

GALEX Far-UV

Optical SDSS gri

Near-IR VIKING K_s

H-ATLAS 250 µm



Conclusion

- We used the Herschel-ATLAS survey to create HAPLESS a blind, volume-limited sample of nearby dusty galaxies.
- Most local dusty galaxies are irregular and/or highly flocculent.
- These galaxies also exhibit very blue FUV-NIR colour, and have:
 - FUV-NIR colours bluer than 80% of HRS.
 - Median dust temperature of 16 K.
 - Average M_d / M_* factor of 5 greater than HRS.
 - More HI mass than stellar mass in majority of cases.
 - Median gas fraction of 0.55.



Chris Clark Christopher.Clark@astro.cf.ac.uk

