A Blind Survey of Nearby Dusty Galaxies with Herschel-ATLAS

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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
The HAPLESS Galaxies

**Herschel-ATLAS Phase-1 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≥8) or highly flocculent

Morphologies from the EFIGI morphological catalogue (Baillard et al 2011)
Very Blue UV-NIR Colour

- GALEX Far-UV
- Optical SDSS gri
- Near-IR VIKING $K_s$
- H-ATLAS 250 µm

$FUV - K_s < 3.5$
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

**HAPLESS 7 Two Greybody**
Cold Dust Temp = 12.33 K, Mass = 7.144 $\log_{10}M_\odot$
Warm Dust Temp = 20.89 K, Mass = 6.267 $\log_{10}M_\odot$
Total Dust Mass = 7.198 $\log_{10}M_\odot$

**HAPLESS 14 Two Greybody**
Cold Dust Temp = 15.70 K, Mass = 7.396 $\log_{10}M_\odot$
Warm Dust Temp = 32.46 K, Mass = 5.663 $\log_{10}M_\odot$
Total Dust Mass = 7.404 $\log_{10}M_\odot$

**HAPLESS 20 One Greybody**
Dust Mass = 7.280 $\log_{10}M_\odot$
Temperature = 21.53 K

**HAPLESS 26 One Greybody**
Dust Mass = 7.257 $\log_{10}M_\odot$
Temperature = 13.82 K

SED-fitting routine from MWL Smith (Smith et al, 2012) $\beta=2$
Median HAPLESS dust temperature 4K lower than HRS.

Median FUV-$K_s$ colour bluer than 80% of HRS.
Median HAPLESS specific dust mass 5 times greater than HRS.
7 HAPLESS galaxies have higher $M_d/M_*$ than anything in HRS.
54% of HAPLESS galaxies have $M_{\text{HI}}/M_* > 1$, compared to 10% of HRS galaxies.
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.

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