TRACING HOT DUST SINCE Z=1-2 EVOLUTION OF IR LUMINOSITY FUNCTIONS AND LUMINOSITY DENSITIES



WANNA-BE-DR HUGO MESSIAS

MULTIWAVELENGTH VIEWS OF THE ISM IN HIGH-REDSHIFT GALAXIES

SANTIAGO, 30TH JUNE 2011



Monday, September 12, 2011

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Collaborators

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OUTLINE

XR

Radio

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INTRO .WHY INFRARED? .WHY DUST?

STRATEGY

.TRACING HOT DUST .SAMPLE .AGN: THE KI CRITERION

IR

UV

Optical

LUMINOSITY FUNCTIONS THE AGN BOOST

DUST .LUMINOSITY DENSITY FUNCTIONS .EVOLUTION

FUTURE

IMAGE CREDITS: CHANDRA: NASA/CXC/SAO; GALEX: NASA/JPL-CALTECH; HST: NASA/AURA/STSCI/HUBBLE HERITAGE TEAM; SPITZER: NASA/JPL-CALTECH, VLA: MPIFR BONN

HST

Spitze

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INTRO WHY INFRARED? DUST?

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XR UV handr Radio Optical Spitze HST

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...DOES IR SHOW? .COLD LONG-LIVED STARS .EVOLVED STARS .DUST

...DOES DUST HIDE? .STAR FORMATION (SF) .ACTIVE GALACTIC NUCLEI (AGN)

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FACTS

.MOSTLY EMITTING AT MIR/FIR/SUB-MM WAVELENGTHS .HIDES INTENSE SF/AGN ACTIVITY

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NARAYANAN ET AL.(2010)

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ESTIMATE LUMINOSITIES

.1.6μM - INTERPOLATION .3.3μM - OBSERVED BAND



HOT DUST CONTRIBUTION AT IR WAVELENGTHS. DASHED LINE REFERS TO ARP220, WHILE THE DOTTED LINE TO IRAS 19254-7245.

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SAMPLE SELECTION

.COSMOS (ILBERT ET AL.2009) .EARLY/LATE/STARB. - SED FITTING .AGN - K-[4.5]<0 OR KI

AGN IR SELECTION: KI

- PROS:
- .SIMPLE
- .MORE COMPLETE
- ALLOW DEEPER FLUX LEVELS
- .STATISTICALLY LARGER SAMPLES

CONS:

.RESTRICTED TO IRAC BANDS .CONTAMINATION BY SF GALAXIES .BIAS TOWARD LUMINOUS AGN .BIAS TOWARD UNOBSCURED AGN



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3 (a) (b) 2 1 0 K_s-[4.5] (AB) 3 C d 2 1 0 -1 2 2 -1 0 1 -1 0 1

[4.5]-[8.0] (AB)

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(a) (b) 0.5 0 [3.6]-[4.5] (AB) 1 °°0 0 (d) (c) 0.5 0 -0.5 2 0 0 1 2 1 [5.8]-[8.0] (AB)

STERIN ET DAS (2000 55) L'ME DERED NITHER BASHELDMBLUEHER ANGINERSO DE LIMHE TOBE OAUGINT RACIONS THE DOVILDEUR INFRAC (45) ARRELDY/LADIED (18) TOTARBEARBLS/ (G)TEHY (BR) DSTARBD R(SD)S, A (40) HYB R DOS, TEAD DO (PD) OAG NO.F THEE DORACTES PND RIC ANE OF ZIA É, TSRALCINS ON THE BASTIS (D. 2001 SIDIAR E 2002 SISE.

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IR luminosity functions

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WORTH OF NOTE

.BIMODALITY (DRORY ET AL.2009 AND REFS)

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.FAINT-END AGN AT LOW-Z

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TOT EARLY -2SB [Mpc⁻³ ΔM⁻¹ - 9-5-0.21<z<0.52 0.05<z<0.19 $log(\Phi)$ 0.52<z<0.94 0.97<z<1.86--6 -25 -20 -15 -25 -20-15M_{1.6}

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.BRIGHT-END AGN AT HIGH-Z: FLUX BOOST => BIASED MASS ESTIMATES

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TOT EARLY -2 SB [Mpc⁻³ ΔM⁻¹ 2⁻ 2⁻ 0.05<z<0.19 0.21<z<0.52 log(∲) + + 0.52<z<0.94 0.97<z<1.86--6 -25-20 -15 -25 -20-15M_{3.3}

WORTH OF NOTE .BIMODALITY (DRORY ET AL.2009 AND REFS)

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(e)15µm z=[0.6,0.8] log [\$/Mpc^3 log^1L] w/ MIPS 24µm -5 de+06 z=0.7 Xu00/Huang+07 LUF).0 10.5 log [vL^{15µm}/L₀] 9.5 10.0 11.0 11.5 (b) 8µm z=[0.6,0.8] log [\$/Mpc⁻³ log⁻¹L] -5FU ET AL.(2010) 10.0 11.0 11.5 12.0 10.5 $\log \left[\nu L_{\nu,rest}^{\theta\mu m}/L_{0}\right]$

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8/12

IR THE AGN BOOST

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THE ERG CASE EXTREMELY RED GALAXIES

COLOUR SELECTION .EROS - 1775-Ks>2.5 .IEROS - Z850-[3.6]>3.25 .DRGS - J-Ks>1.35

TWO KNOWN PROPERTIES .MASSIVE .HIGH AGN FRACTION

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DUST LUMINOSITY DENSITY FUNC.

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TOT 26 EARLY -₩ 24 LATE SB AGN 0.05<z<0.19 0.21<z<0.52 0.52<z<0.94 0.97<z<1.86 20 -25 -20 -15 -25-20-15

M_{1.6}

EARLY .CONTRIBUTE THE LEAST

LATE

.AS MUCH AS STARBURST AT THE BRIGHT-END

STARBURST

.HIGHEST CONTRIBUTOR TO THE FAINT-END

AGN

.NUMBER vs CONTRIBUTION

DUST EVOLUTION



MULTIWAVELENGTH VIEWS OF THE ISM IN HIGH-REDSHIFT GALAXIES. SANTIAGO, CHILE, 2011



TOTAL

. ...?

.DECAYS 1DEX MORE THAN SFH .FAILURE TO EXTRACT DUST EMISSION? .DUST DEPLETION? (DUNNE ET AL.2011) .DUST AT LARGER DISTANCES?

AGN vs STARBURST

3.3µм vs 6.2µм

\mathbf{Z}

Solid lines connect $3.3\mu m$ estimates probed by IRAC bands. Circles refer to local $6.2\mu m$ estimates. The shaded regions show the 3σ trend of the sfh of the universe (Hopkins&Beacom 2006, darker region refers to obscured sf, Charry&Pope 2011) scaled to the dust estimate at 0.52<z<0.94.

DUST EVOLUTION



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AGN vs STARBURST

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 \mathbf{Z}

SOLID LINES CONNECT 3.3µM ESTIMATES PROBED BY IRAC BANDS. CIRCLES REFER TO LOCAL 6.2µM ESTIMATES. THE SHADED REGIONS SHOW THE 30 TREND OF THE SFH OF THE UNIVERSE (HOPKINS&BEACOM 2006, DARKER REGION REFERS TO OBSCURED SF, CHARRY&POPE 2011) SCALED TO THE DUST ESTIMATE AT 0.52<z<0.94.