Ground-based Submm/mm Follow-up Observations for WISE Selected Hyper-luminous Galaxies

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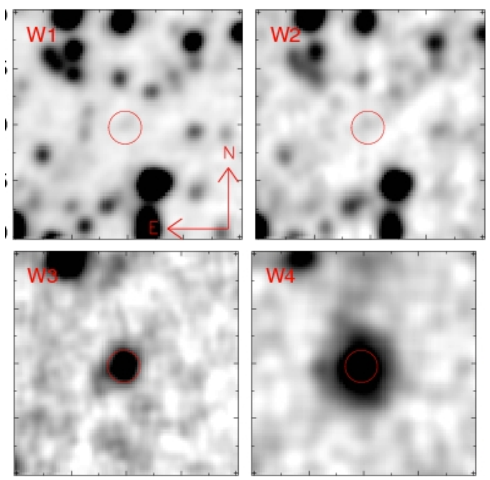
WISE exgal team

One of WISE major mission goals:

Searching for the most luminous galaxies in the universe

The most productive method so far: **W12 dropout galaxies**



(Eisenhardt et al. 2011)

W12 dropout galaxies recap:

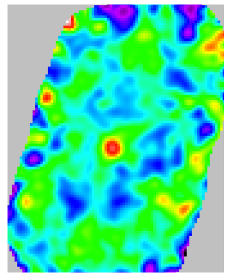
- High-z: 75% at 1.5<z <4.6, peak at z=2~3
- Mid-IR bright. W4 (22 um) > 7 mJy
  Implying very high luminosity
- Rare: ~1000 all-sky
- Many with obscured AGN spectra & Lyα emission
  1/3 with Radio NVSS 1.4GHz > 2 mJy

Overview and details of the W12 dropout sample will be in Peter Eisenhardt's talk.

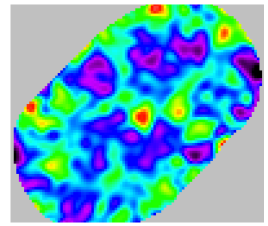
Submm/mm follow-up with Caltech Submm Observatory

Observed during several runs July 2010-Sep 2011

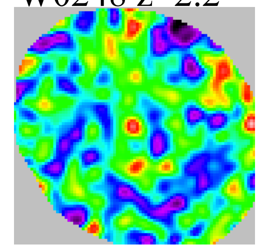
W0410 z=3.6



W0220 z=3.1



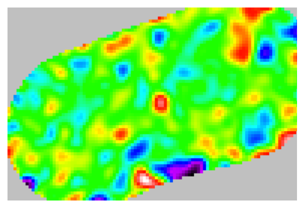
W0248 z=2.2



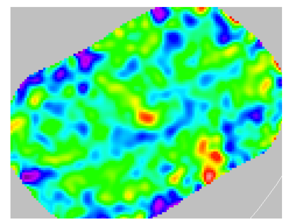
350 µm

17 observed with SHARC-II (350µm, 450µm, 850µm), 12 detections.

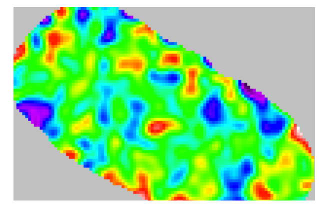
W1814 z=2.5



W2246 z=4.6



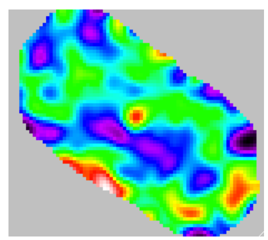
W0149 z=3.2



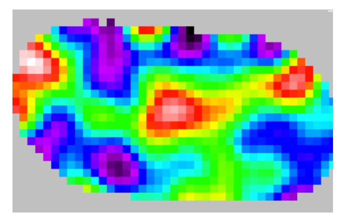
350 µm

450 µm

W0149 z=3.2



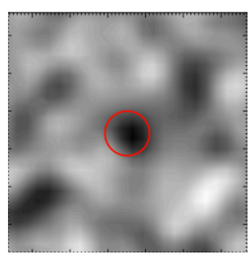
W0410 z=3.6



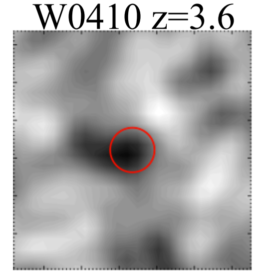
850 µm

18 observed with BOLOCAM at 1.1mm, 3 detections, 2 possible detections.

W0859 z=3.3

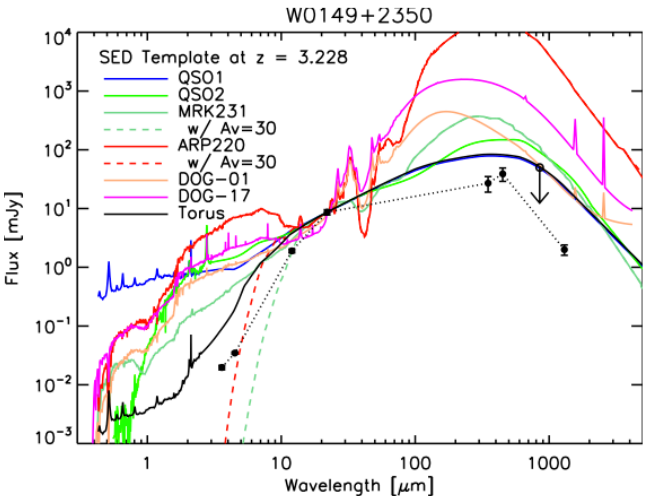


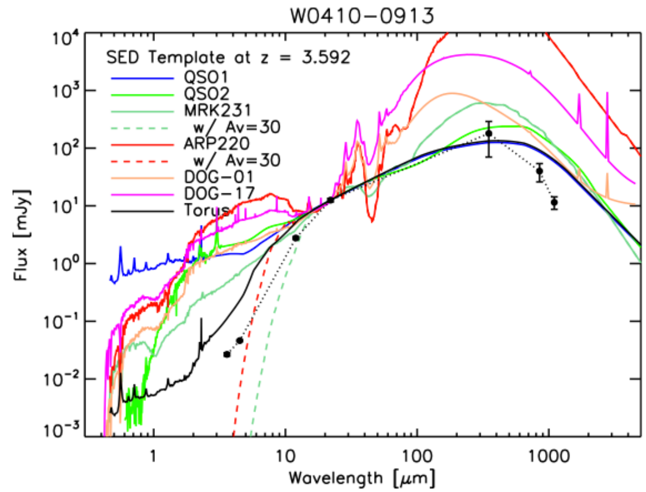
W0410 z=3.6



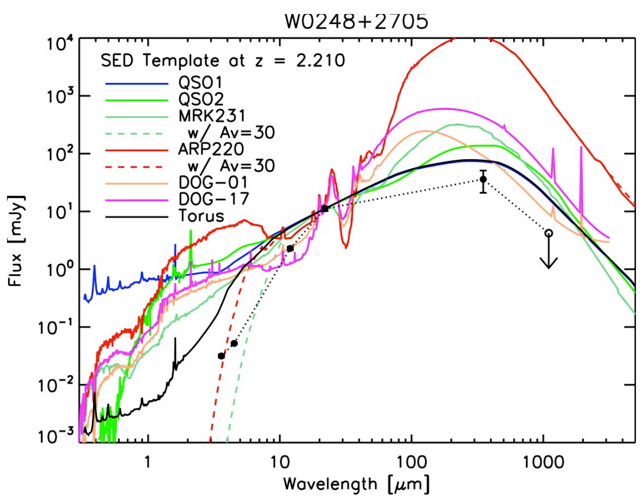
1.1 mm

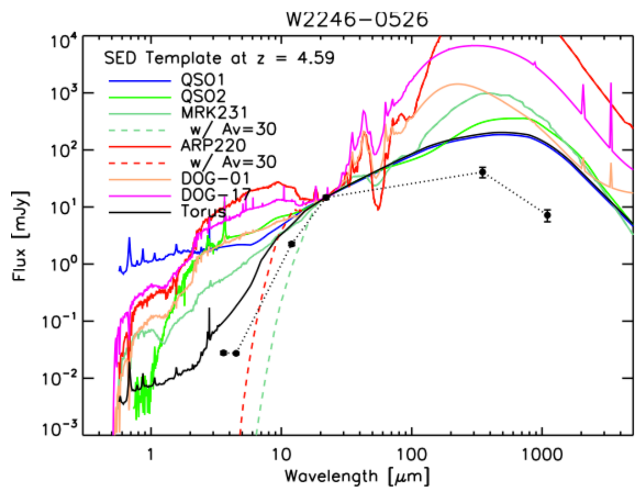
SEDs (IRAC+WISE+CSO) of W12 dropout galaxies





Flat 22 μm to Submm SED



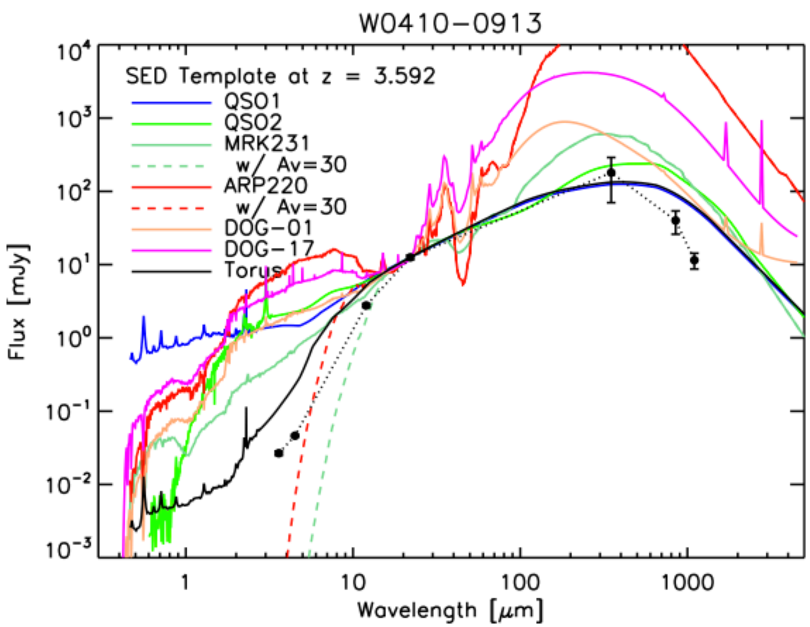


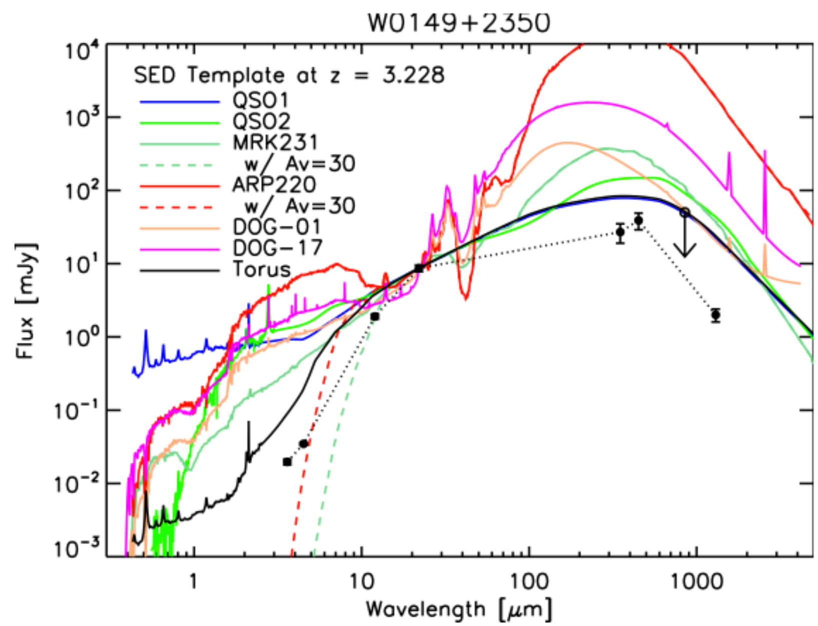
Peak at significant shorter wavelength than populations

----Hotter dust

(Wu et al. in prep)

How luminous and how hot they are:





W0410-09 at z=3.6

W0149+23 at z=3.2

A conservative method:

L_{IR}~2 x10^{14} L_{sun}

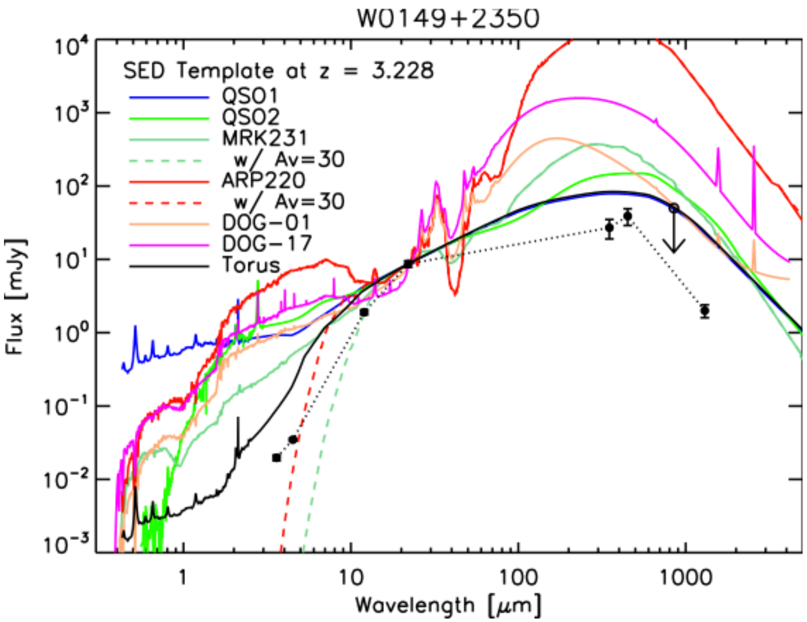
L_{IR}~6 x10^{13} L_{sun}

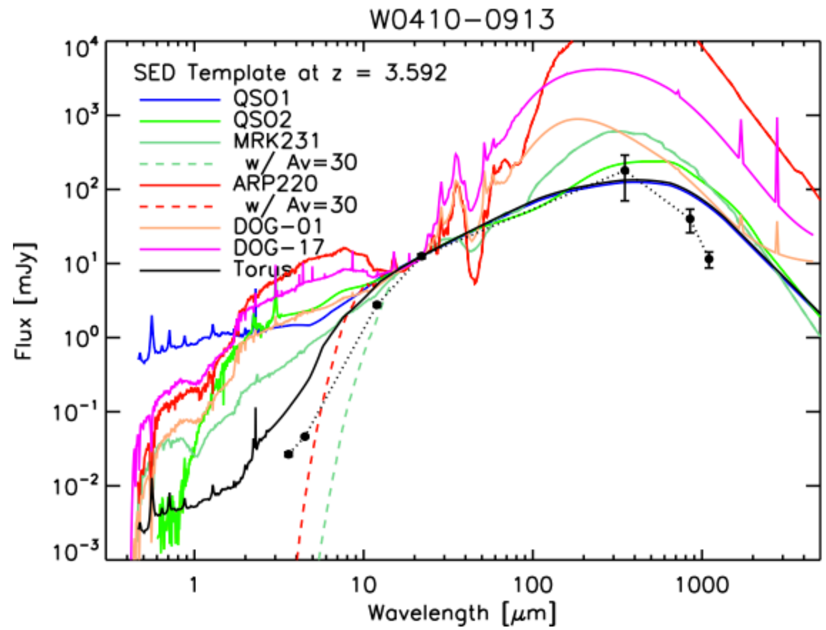
A grey body model fit:

T_{dust}=82K

T_{dust}=100K

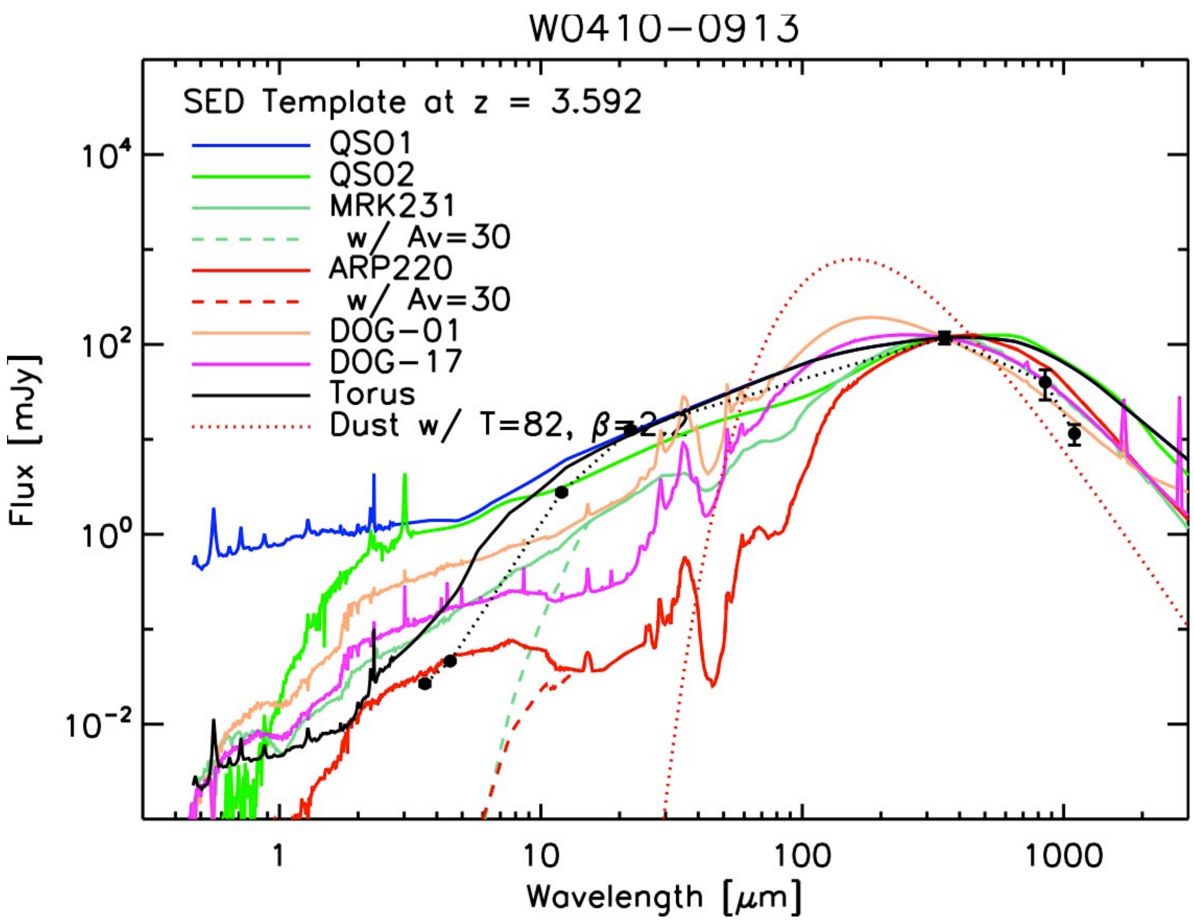
SED fit: A new population?





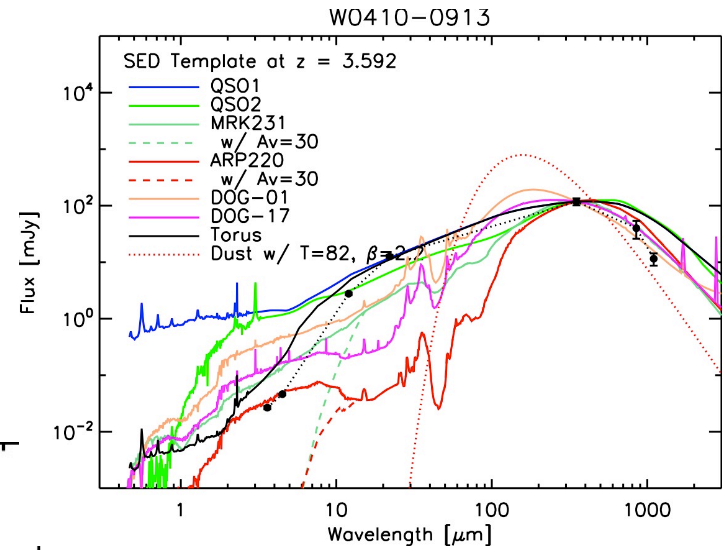
Another view

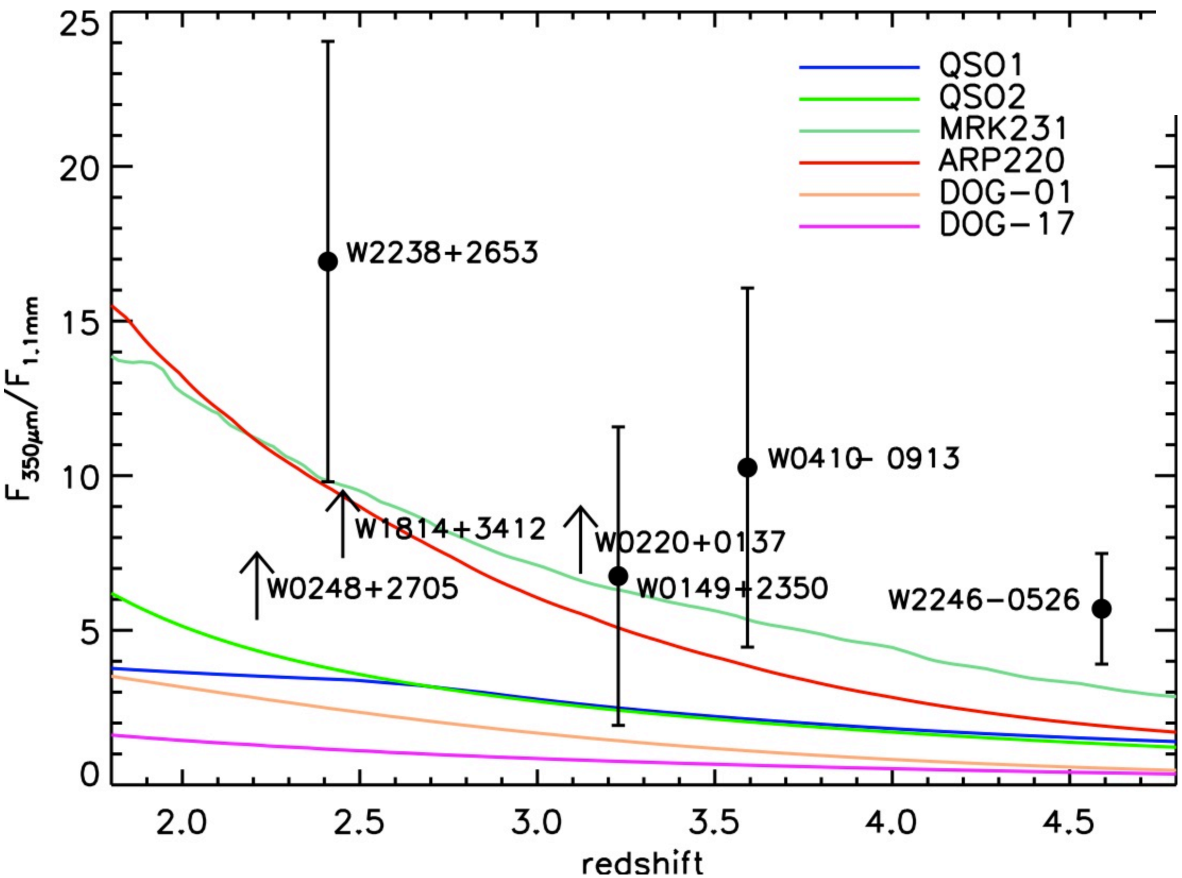
Mid-IR to submm: mid-IR excess -- Hot dust
Submm-mm: Variation



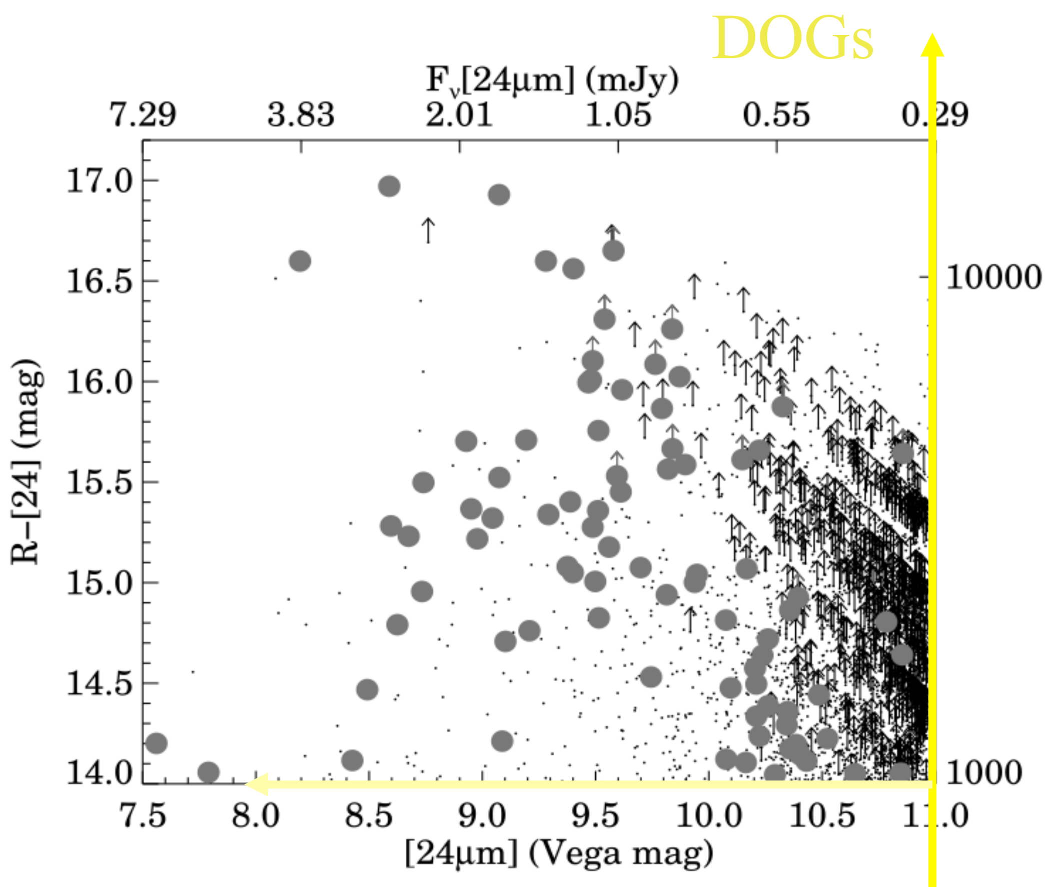
Submm-mm SED:

W12 dropouts are different from QSOs.
Indicative of starburst?





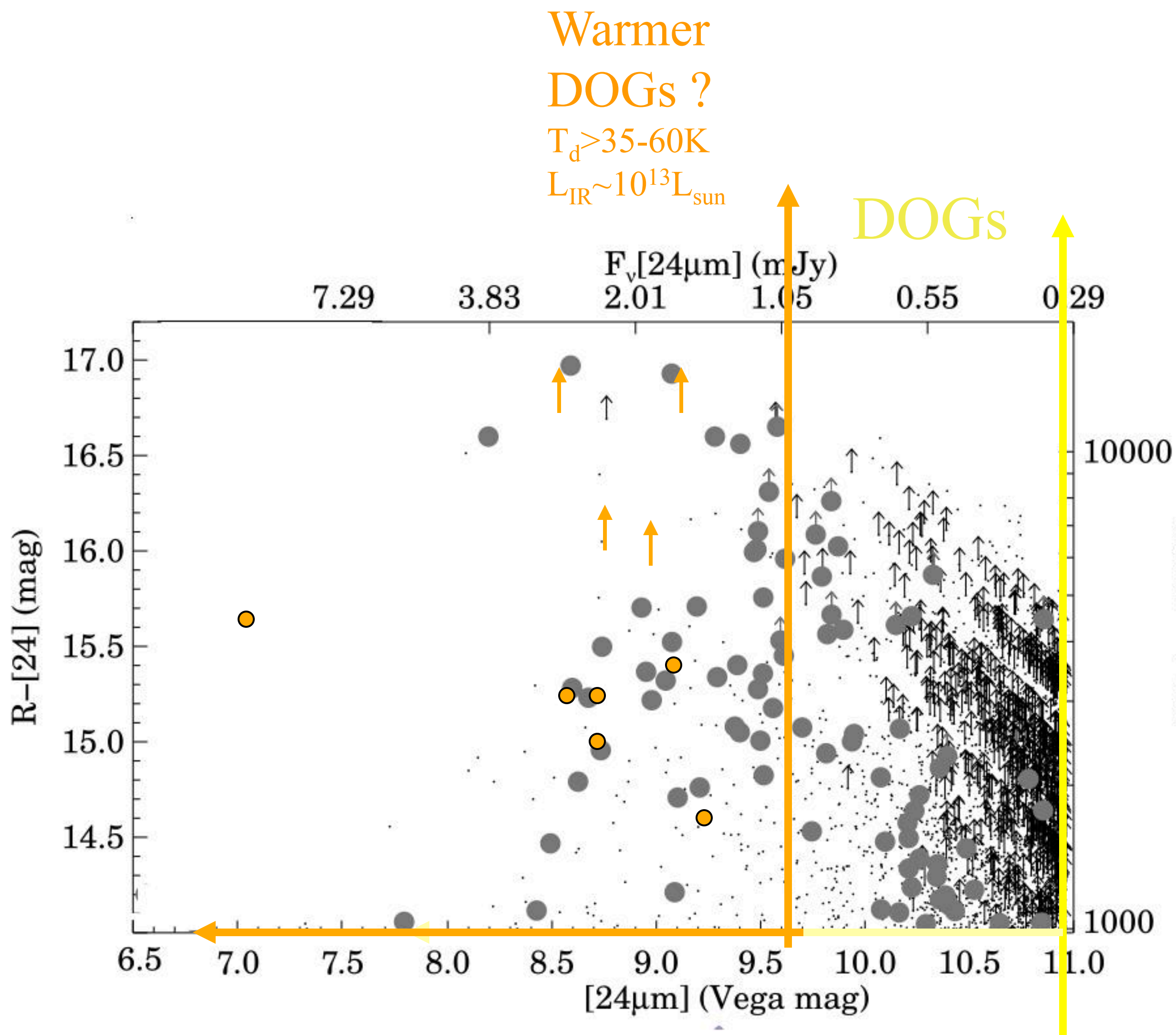
Connection to other populations



Dust-Obscured Galaxies

F_{24}> 0.3 mJy
R-[24]>14

(Dey et al. 2008)



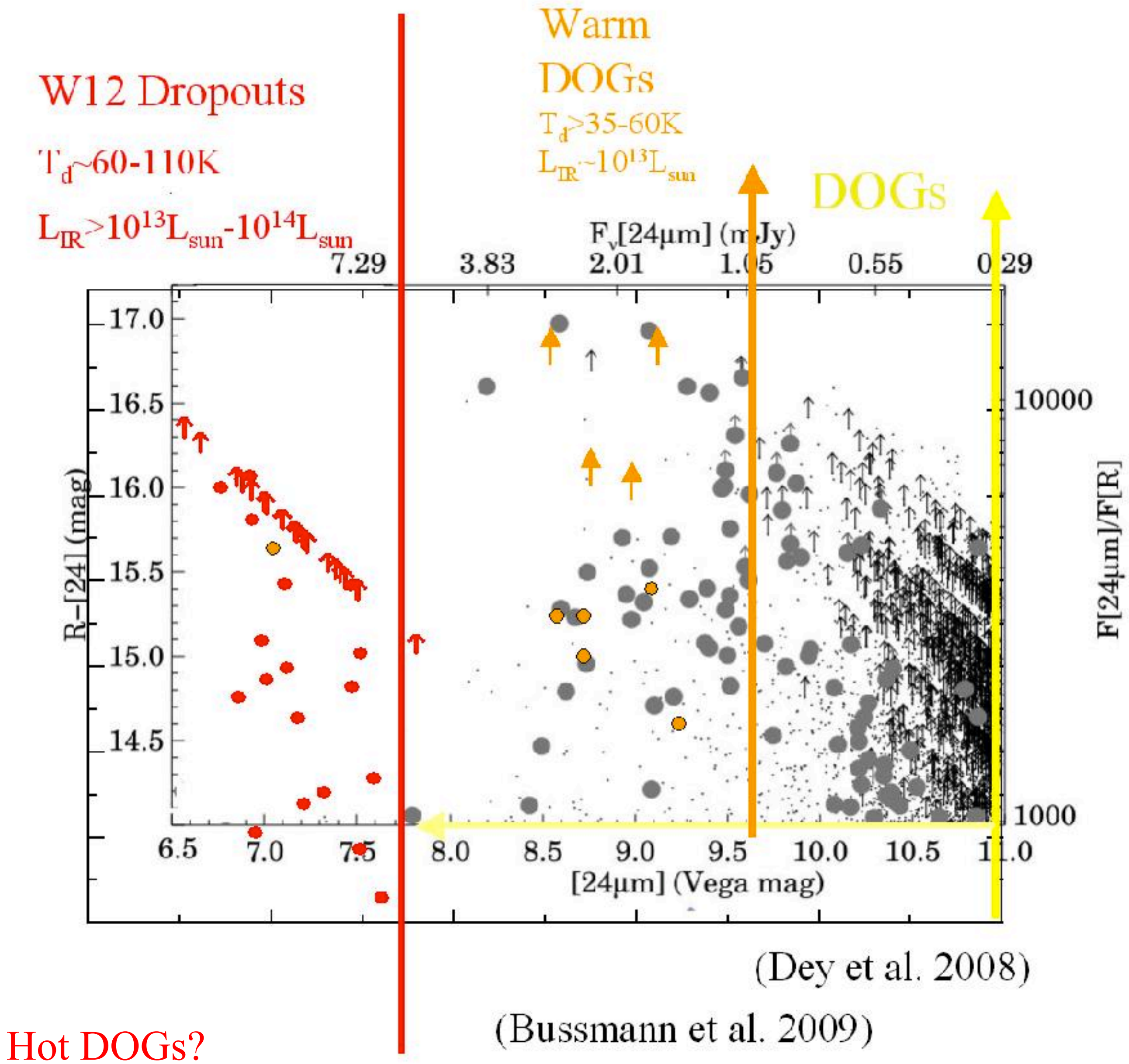
(Dey et al. 2008)

(Bussmann et al. 2009)

Dust-Obscured Galaxies

F24>0.3 mJy
R-[24]>14

(Dey et al. 2008)



W12 dropout selection is picking out the extremely luminous, hot, DOGs, from the all-sky

Summary of submm/mm follow-ups of W12 dropout galaxies

- The z~2-3 W12 dropout galaxies are hyper luminous.
  $L_{IR} \geq 10^{13}$-10^{14} L_{sun}
  => One of the most luminous population

- Hotter dust temperature than other IR luminous populations
  T~ 60-110K

- They may be extreme cases of DOGs with co-existence of powerful AGN and starburst, either tracing a short transiting phase with booming luminosity during evolution, or are a rare AGN/Starbusrt population with extreme physical conditions.