CLASSIFICATION SCHEMES AND PROPERTIES OF INFRARED GALAXIES

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1 OUR SAMPLE

Our sample

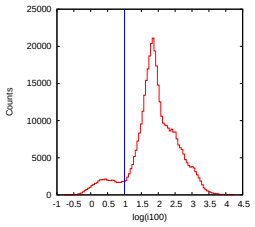

Figure: Distribution of 100 μm emission at position of each source

- in the first step, we selected source laying in regions of low Galactic emission at 100 μm ($I_{100} < 10$ MJy sr^{-1}), in order to increase the probability of finding a counterpart
- this sample of sources was identified in the NED and SIMBAD databases
- 16.4 % of sources were unidentified, 68.8 % of sources is extragalactic, about 6.6 % is Galactic, 4 % have been observed in infrared and 2.7 % in radiowavelengths

We used data from the point source catalogue called FIS which was created from observations made by AKARI satellite at four far-infrared wavebands. First we made a plot like the one to the left with distribution of 100 μm emission of dust in our Galaxy at position of each source. The high peak corresponds to sources in Galactic plane; the small one consists of sources outside it. We chose sources at areas where dust emission was lower than 10 MJy/sr. There were identified in NED and SIMBAD databases. As a result we get mainly extragalactic sources, some Galactic sources and others of unknown origin. Quite a lot haven't been identified.

2 STAR-GALAXY SEPARATION

Star-galaxy separation

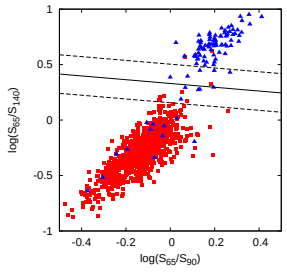

Figure: The S_{65}/S_{90}–S_{65}/S_{140}, colour-colour diagram.

- in Pollo et al. (2010) we show for AKARI/FIS BSC Version β-1 that in all the combinations of FIR colour-colour (CC) diagrams we can distinguish two separate clouds
- one of the clouds contains in all cases more than 95 % of galaxies
- the other one generally consists in more than 80 % of stars
- the figure shows scatter plot for sources with the best quality fluxes from FIS Version 1, they prove that division lines are valid

We've shown, for sources from β-1 version of FIS catalogue, that in all combinations of FIR colour-colour diagrams we can distinguish two separate clouds. We decided the division line between those clouds. And one of the clouds contains in all cases almost only galaxies, the other one generally consists in stars. The figure shows scatter plot for sources with best quality fluxes from first version of FIS catalogue. Red squares are galaxies, blue triangles are stars. The solid line is a division line and dashed lines are error lines of calculating the division. The plot proves that the separation lines are valid.

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3 GALAXY SAMPLE

Galaxy sample

- in the sample there is 27,384 galaxies; nearly 68% of galaxies have their redshift measured and practically all of them are located at low redshift below 0.1 (95th percentile is about this value)
- morphology was obtained for just over one third (34 %) of galaxies

Table: Morphological types count of 9217 galaxies

Type of galaxies	Number in IR	Percentage number in IR	in opt.
Spiral	7877	85 %	61 %
Lenticular	911	10 %	22 %
Irregular	161	2 %	4 %
Elliptical	268	3 %	13 %
All	9217	100 %	100 %

Closer look at galaxy sample reveals that they are mainly located in the local universe. And in infrared we see different morphological distribution of galaxies than in optical wavelengths. We see much more spiral galaxies, very little elliptical galaxies, comparable amount of irregular galaxies and still quite a lot of lenticular galaxies.

4 HOW FIR COLOURS VARY WITH HUBBLE SEQUENCE?

How FIR colours vary with Hubble sequence

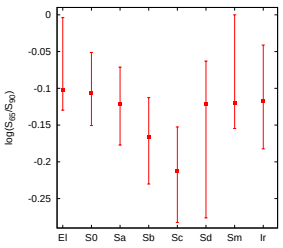

Figure: S_{65}/S_{90} vs morphological type. Filled squares are medians. The lower bar is the 25th percentile; the upper is the 75th percentile.

- medians of FIR colours change only slightly along Hubble sequence
- spiral galaxies of type Sc have smallest median for each FIR colour
- if we neglect morphological types for which there is very poor number of objects e.g. Sm then difference between highest and lowest values of median (indicated in table in red) are 0.1,0.24,0.27,0.15,0.24,0.02 and also lenticular galaxies have the highest median for almost all colours

Median of FIR colours change slightly with Hubble sequence. Sc galaxies have smallest median for each FIR colour. If we neglect morphological types for which there is very poor number of objects e.g. Sm then difference between highest and lowest values of median (indicated in table in red) are 0.1,0.24,0.27,0.15,0.24,0.02 and also lenticular galaxies have the highest median for almost all colours. Median of $log(S_{140}/S_{160})$ is almost the same for all morphological types because 140 μm and 160 μm wavebands lie very close to each other and it is very possible that both are at the Rayleigh-Jeans regime of dust emission. First rough conclusion, from all these observations, can be that lenticular galaxies contain more hot dust than Sc galaxies.