1 Introduction

Motive for this work:
- Most of the (sub)millimeter blank-field surveys covered only < 0.1 deg²
- The identification rate of (sub)millimeter galaxies is usually < 60%, so the samples are incomplete.

Data used:
- COSMOS, AzTEC 0.78 deg², 1.1 mm survey done to an rms of 0.9–1.7 mJy per beam (Austermann et al., 2010)
- Fields: the Lockman Hole and the Subaru/XMM-Newton Deep Field (SXD) aka Ultra Deep Field (UDF)
- Ultra-deep radio, mid-infrared, near-infrared and optical data

2 Identification of counterparts at other wavelengths

The method involves calculation of a probability $p$ that a chosen source could have been found by chance close to the AzTEC position (Dunlop et al., 1986; Dunlop et al., 1995; Chapman et al., 2007).

- We applied visual methods based on radio and 24 µm bands.
- We tested four methods of identification:
  - We selected sources bright at 8.0 m and red at $z = K$ and calculated the probability of their chance association with AzTEC sources.
  - We present the most complete sample of millimeter-selected galaxies, counterparts identified for 85% of the sample and redshifts measured for 82% of the sample (Table 1).

Table 1: Success rate of the identification process. The columns show: (1) Field name; (2) the total number of AzTEC sources; (3) the number of sources with $K$-bands at least one-pixel ($0.8$) at radio, $L_{\text{bol}}$, $K$-bands not $< 0.1$; (4) the number of sources with L([OIII] 5007 Å) < 0.1; (5) the number of sources with L([OIII] 5007 Å) < 0.1, with a redshift, and L([OIII] 5007 Å) < 0.1.

3 Redshift distribution

![Redshift distribution graph]

Figure 3: The redshift distribution of 1.1 mm-selected galaxies in the SHADES fields using optical and 1.1 mm / 24 GHz redshifts (solid black histogram) and 1.1 mm optical redshifts (grey line). Some limits to redshift estimates were included. Also shown are the redshift distributions of the 1.1 mm-selected galaxies in GOODS-N (solid red line, Chapman et al., 2009) and the 80 mm-selected galaxies in GOODS-N (dotted green line, Chapman et al., 2009). The distributions peak at $z \approx 2$ and are broad containing objects at $z \approx 0$. The difference at low redshifts between the SHADES and GOODS-N can be explained by small survey area of the latter (see Fig. 2).

4 Impact of limited area coverage on the redshift distribution

![Impact of limited area coverage graph]

Figure 4: The AzTEC 1.1 mm maps of the Lockman Hole (left $0.17$ deg as a circle) and the UDS field (right $0.60$ deg as a circle) from Austermann et al. (2000). The sources analyzed in this paper are marked and color-coded according to their redshifts. Circles correspond to optical or 24 µm redshifts, whereas squares correspond to redshifts derived from the 1.1 mm / 1.4 GHz flux ratio based on the average SED model of Smolčić (Mihalas et al., 2010). In case a multi-measurement (if method preferred is a lower limit to the redshift) each source is marked as a square. All sources divide both fields into four equal parts each with the same number of their redshift. Chapman et al. (2009) noted that < 5% of these objects do not contain any reliable redshift < 2 sources, so the fact that Chapman et al. (2009) did not show any of such objects can be explained by their small survey area.

Summary:
- We tested new methods of identification of millimeter-selected galaxies based on 8.0 µm flares and $i - K$ colors.
- We found counterparts for > 85% and measured the redshift for > 90% of the sample.
- We found a broad redshift distribution of millimeter-selected galaxies containing objects at $z < 0.4$.
- The lack of millimeter-selected galaxies at $z > 1$ in previous surveys can be explained by their low area coverage.

References

Smolčić V., et al., 2010, AJ, 140, 772

Contact

I will be happy to discuss your questions and comments during the meeting or by email huastics@ic.ac.uk