not only protoclusters but also low-z (evolved) clusters of galaxies. It is the largest and most complete study of biased regions at mm wavelengths to-date.

2. OBSERVATIONS AND DATA ANALYSIS

We observed 17 fields centred on active galaxies over a redshift range of $0.5 < z < 6.3$. Sixteen of these targets are powerful radio galaxies with radio luminosities $>10^{27}$ W Hz^{-1} at a rest frequency of 500 MHz. The additional source is an optically luminous ($M_B = -27.7$) radio quiet quasar. All targets were observed during a pilot run of AzTEC on the 15 m JCMT (FWHM = 18″) in 2005, and two 6-month observing campaings in 2007 and 2008 on the 10 m ASTE(FWHM = 30″).

We reduced each 1.1 mm map in a manner similar to that described in Scott et al. (2008). This involved despiking and removing correlated sky noise from the time streams with a PCA cleaning technique. Source candidates were identified as local maxima above a signal to noise (S/N) threshold of 3 (3.5) for ASTE (JCMT) maps. Given the low S/N of the source candidates, we expected some fraction of them to be spurious. Source fluxes were corrected for flux boosting (Coppin et al. 2006), and their number density (number counts) was estimated by binning the sources in flux and correcting for incompleteness using a semi-Bayesian approach described extensively in Austermann et al. (2009). The central active galaxies that were detected at 1.1 mm were removed from the catalogues since they bias the number density results.

3. RESULTS

Figure 1 shows the cumulative number counts for the combined 17 protocluster fields and compares them to a blank field also observed with AzTEC and used as a reference (details in Zeballos et al., in preparation) Figure 1 also shows number counts determined in 2 concentric circles centred at the positions of the active galaxies and with radii of 1.5′ and 3′ respectively. A significant overdensity of ∼2 is observed in the inner area ($r < 1.5'$). Further out, the number counts decrease until they look like a blank field. The significance of this overdensity was determined using Monte Carlo simulations, where we inserted a blank field population of sources into synthetic noise maps with the same area and noise properties as the observed maps. These simulations found that the probability of detecting a number of sources in a blank field that equals or exceeds the number of sources observed in our maps inside a $r < 1.5'$ is less than 5%. This could be interpreted as a preference

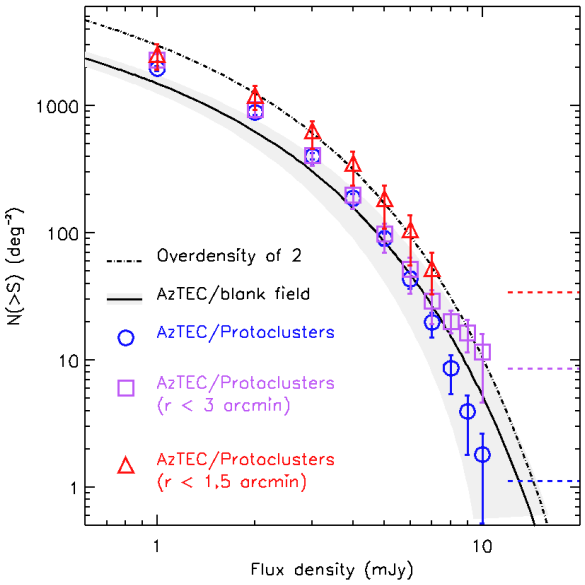

Fig. 1. Cumulative number counts for the combined protocluster sample (blue circles). The best fit to a modified Schechter function estimated from cumulative number counts of a blank field used as reference is also shown (black solid line). Red triangles (orange squares) represent the combined number counts for a 1.′5-radius (3′-radius) circular area centred on the active galaxies.

for MMGs to inhabit biased environments such as protoclusters, which supports the idea that MMGs are the progenitors of massive ellipticals since the latter are preferentially found in galaxy clusters.

We also analyzed if there was a preferred direction in which MMGs are aligned around active galaxies, and specifically if their distribution favoured the long axis of the asymetric radio emission of our radio galaxies. We rotated our 16 radio galaxy maps so that the preferred direction of their radio emission were aligned to each other. We then stacked the individual source distributions to enhance any possible alignment. The preferred direction of the MMG was calculated using the tensor of inertia of the source distribution (Zeballos et al., in prep.). We found that there is no alignment between the millimetre and radio emission.

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