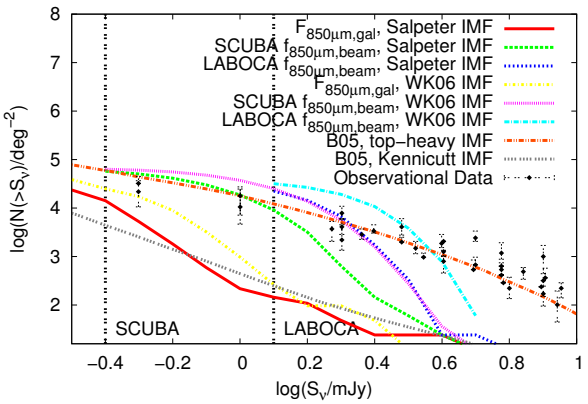

Fig. 1. Cumulative number counts deg^{-2} at 850 μm, predicted by the model simulating SCUBA and LABOCA observations, down to the respective confusion limit (indicated by dashed black vertical lines), assuming Salpeter and WK06 IMFs. For comparison, we include the counts predicted by B05 using a top-heavy IMF in bursts of star formation (orange line) and using a standard Kennicutt IMF (gray line). The symbols show a compilation of observational data obtained by different surveys using SCUBA (see B05, and references therein).

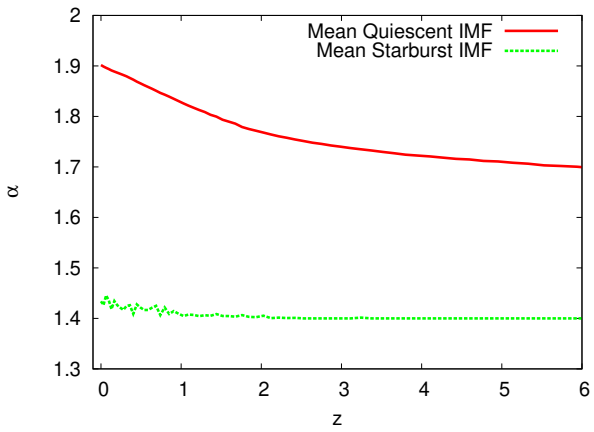

Fig. 2. Mean IMF slope for the cases of quiescent star formation and starbursts (red and green lines respectively).

in the universe. So, we build an array with simulated boxes at different consecutive redshifts, and choose a line of sight, which defines our lightcone. The final catalog spans an angular area of ∼0.083 sq deg and comprises ∼105000 model galaxies.

3. RESULTS AND DISCUSSION

We compute the cumulative number counts at 850 μm for the model galaxies, exploring two effects: (a) the beamsize of the receiver, and (b) a variable IMF slope. We simulate square beams, having 14″ and 19″ per side for SCUBA and LABOCA, respectively. Each one of the pixels receives the flux from all the galaxies that fall within it ($f_{850\mu\mathrm{m,beam}} = \sum_{\mathrm{beam}} F_{850\mu\mathrm{m,gal}}$), which is assumed as the flux belonging to one single source. Observations indicate that there is a connection between the SFR and the slope of the integrated galaxial IMF for massive stars (Weidner & Kroupa 2005); we implement the variation in the IMF slope (Weidner & Kroupa 2006, hereafter WK06) in the LCP08 model, consisting of 6 values of α in the range 1.4–2.1.

In Figure 1 we show that the counts predicted by assuming a Salpeter IMF and using the true source positions and flux densities (red solid line) are strongly underestimated when compared to the observational data, being consistent with the B05 model assuming a Kennicutt IMF. In order to investigate the effect of low resolution submm observations, we model the SCUBA (green line) and LABOCA (blue line) beams, and find that the counts are nearly consistent (at low and moderate fluxes) with the observations and the B05 top-heavy IMF model. At higher fluxes the model underestimates the counts as well. However, by assuming a WK06 IMF, the amount of galaxies with higher fluxes increases (yellow, magenta and cyan lines), finding a better agreement with B05 when considering beams.

Additionaly, when adopting a WK06 IMF we compute the mean IMF slope as a function of redshift (see Figure 2). We find that the mean IMF slope for quiescent star formation processes decreases progressively at higher z, while for starbursts it remains roughly constant. This would effectively produce a more top-heavy-like IMF at high z.

Further improvements can be introduced in the model, increasing the periodic volume in the SAG and using realistic noise maps from specific instruments. Our simulated lightcones can be designed as mock catalogs for future research with ALMA, CCAT and LSST.

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REFERENCES

Baugh, C. M., et al. 2005, MNRAS, 356, 1191 (B05)
Bruzual, G., & Charlot, S. 1993, ApJ, 405, 538
Hughes, D. H., et al. 1998, Nature, 394, 241
Lagos, C., et al. 2008, MNRAS, 388, 587 (LCP08)
Silva, L., et al. 1998, ApJ, 509, 103
Weidner, C., & Kroupa, P. 2005, ApJ, 625, 754
_____. , 2006, MNRAS, 365, 1333 (WK06)