

Salpeter
[$\sim 100 M_{\odot}$]
0.68 to get
[emitted
integrated SFR]
0.59 to get
[emitted
current stellar Ω_*]

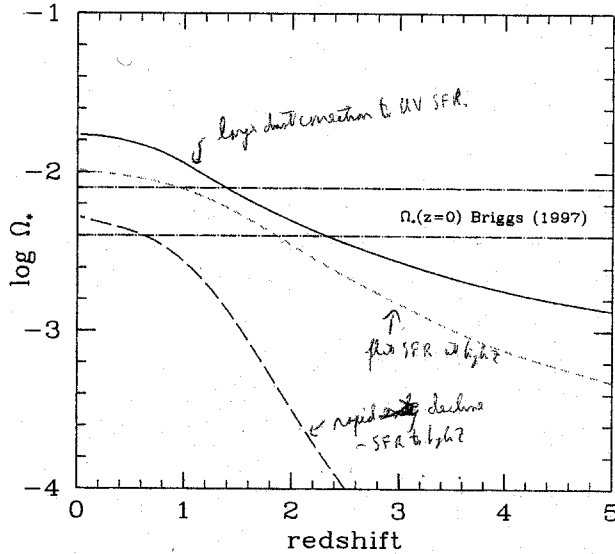


Fig. 6. Evolution as a function of redshift of the co-moving stellar mass density. Coding of the models are as in Fig. 2. The horizontal lines define the data of the total mass density of the stars at the present epoch as estimated by Briggs (1997)

and $100 \mu\text{m}$), we find good agreement with the observations independent of the chosen CSFR;

- We show that the point at $140 \mu\text{m}$ is crucial for constraining the CSFR history and seems to favour a higher comoving star formation rate at low redshifts than the UV/optically derived one; however the shape at high redshifts of the CSFR is not well constrained by the CIB measurements, contrary to previous claims;
- We suggest that the main contribution to the bulk of the CIB and more specifically to the energy at $140 \mu\text{m}$ is due to normal galaxies, lying at low and moderate redshifts, and not to distant and dusty galaxies as previously suggested;
- Concerning the history of the metal enrichment, we find that in the frame of closed-box evolution, our best-fit model to the CIB at $140 \mu\text{m}$ overpredicts the metallicity as observed in DLAs. A better agreement is obtained in the case of a model with some outflowing metal-enriched gas;
- Assuming that the ejected metal-enriched material is responsible for the IGM metallicity we derive, the IGM metal content and found it to be consistent within the error bar with the metals in the Ly α forest. However, we cannot derived conclusions regarding the IGM metal-enrichment given the large uncertainties in the data and the crudness of our metal enrichment treatment;
- Our best-fit model to the CIB at $\lambda = 140 \mu\text{m}$ overproduces the present-day stellar mass density $\Omega_*(0)$ by a factor of at least ~ 2 as compared to the current value. If the CIB at $\lambda = 140 \mu\text{m}$ is correct, then this discrepancy and the excess of light at $\lambda = 2.2 \mu\text{m}$ could be explained by our choice of Salpeter IMF. This would

then be an indication in favour of an IMF which is biased toward massive stars, opening a new debate on the universality of the initial mass function. However, one may keep in mind that our calculations have been done under the assumption that the FIR/submm background is due to a stellar component only; we neglect any contribution of AGNs in dust heating, which is probably not true.

Acknowledgements. We are very grateful to A. Blanchard for fruitful discussions. We thank the referee A. Ferrara for his useful comments which helped us to improve the content of this paper. RS acknowledges support from AAS Chretien Grant.

References

- Altieri, et al. 1999, A&A, 343, L65
 Andreani, P., & Franceschini, A. 1996, MNRAS, 283, 85
 Armand, C., Milliard, B., & Deharveng, J. M. 1994, A&A, 284, 12
 Aussel, H., Cesarsky, C. J., Elbaz, D., & Starck, J. L. 1999, A&A, 342, 313
 Barger, A. J., Cowie, L. L., Sanders, D. B., et al. 1998, Nature, 394, 248
 Barger, A. J., Cowie, L. L., Mushotzky, R. F., & Richards, A. E. [astro-ph/0007175]
 Bessell, M. S., Brett, J. M., Scholz, M., & Wood, P. R. 1989, A&AS, 77, 1
 Bessell, M. S., Brett, J. M., Scholz, M., & Wood, P. R. 1991a, A&AS, 89, 335
 Bessell, M. S., Brett, J. M., Scholz, M., & Wood, P. R. 1991b, A&A, 244, 251
 Blain, A. W., Smail, I., Ivison, R. J., & Kneib, J.-P. 1998, MNRAS, 302, 632
 Blain, A. W., Smail, I., Ivison, R. J., & Kneib, J.-P. 1999, ApJ, 512, L87
 Boissé, P., Le Brun, V., Bergeron, J., & Deharveng, J. M. 1998, A&A, 333, 841
 Brett, J. M. 1995a, A&A, 295, 736
 Brett, J. M. 1995b, A&AS, 109, 263
 Briggs, F. 1997, Publ. Astron. Soc. Australia, 14, 31
 Burles, S., & Tytler, D. 1998, ApJ, 499, 699
 Cassé, M., Olive, K. A., Vangioni-Flam, E., & Audouze, J. 1998, New Astr., 3, 259
 Chabrier, G. 1999, ApJL, 513, 103
 Charbonnel, C., Meynet, G., Maeder, A., & Schaerer, D. 1996, A&AS, 115, 339
 Connolly, A. J., Szalay, A. S., Dickinson, M. E., SubbaRao, M. U., & Brunner, R. J. 1997, ApJ, 486, L11
 Désert, F. X., Boulanger, F., & Puget, J. L. 1990, A&A, 237, 215
 Devriendt, J. E. G., Guiderdoni, B., & Sadat, R. 2000, A&A, 350, 381
 Dwek, E., Arendt, R. G., Hauser, M. G., et al. 1998, ApJ, 508, 106
 Dwek, E., & Arendt, R. G. 1998, ApJ, 508, L9
 Eales, S., Lilly, S., Gear, W., et al. 1999, ApJ, 515, 518
 Elbaz, D., et al. 1999, A&A, 351, L37
 Ellis, R. S., Colless, M., Broadhurst, T., Heyl, J., & Glazebrook, K. 1996, MNRAS, 280, 235
 Fall, S. M., Charlot, S., & Pei, Y. C. 1996, ApJ, 464, L43
 Ferrara, A., Bianchi, S., Cimatti, A., & Giovanardi, C. 1999, ApJS, 123, 437