DISCRETE SOURCE SYNTHESIS OF THE X-RAY BACKGROUND

A. Cavaliere, L. Danese, G. De Zotti
and A. Franceschini
Istituto di Astronomia - Padova

The recent deep X-ray surveys suggest that discrete sources comprise most, if not all, of the energy content of the background (cf. Giacconi, this volume). We have shown that, if sources have flat power law spectra and relatively sharp high-energy cutoffs, their combined emission can also mimic very accurately its extended (2 - 400 keV) spectral shape. A broad distribution of cutoff energies E_c is required, in this case, to model the high-energy ($E \gtrsim 20 - 40$ keV) part: a power law envelope of distribution functions of various types of sources can be envisaged; alternatively, the well-known fact that most of the 2 - 10 keV background should be produced by low flux, low E_c sources can suggest that $E_c \propto (1 + z)^{-\eta}$. The quality of the fit turns out to be not very sensitive to the amount of number/luminosity evolution assumed, though the minimum χ^2 test slightly favours strongly evolving sources. In the case of differential luminosity $\propto E^{-\gamma}$ and evolution $\propto (1 + z)^{\alpha}$ with $0 \leq \alpha \leq 6$, the best fits to pre HEAO-1 data are obtained for mean values of the spectral index $\bar{\gamma} \simeq 0.5 - 0.9$ and for dispersions $\Delta\gamma \simeq 0.5 - 0.7$. Rather wide ranges of values of $\bar{\gamma}$ and $\Delta\gamma$ are, however, still allowed; e.g., for $\alpha = 6$, the allowed intervals are $0.2 \lesssim \bar{\gamma} \lesssim 1.3$, $0 \lesssim \Delta\gamma \lesssim 0.7$.

On the other hand, we could not obtain a satisfactory fit using source spectra similar to that of the background; indeed, the smearing effect of source redshift distribution leads, at intermediate energies, to a combined spectrum smoother than observed even if extreme evolution and no dispersion of source spectral properties are assumed.

Preliminary checks indicate that the HEAO-1 data essentially confirm our conclusions: only minor changes of the best fit values of the parameters seem to be required. Of course, these much more precise measurements would strongly narrow the allowed ranges.

Complementary information is expected from deep source counts and from measurements of the energy spectrum of fluctuations at $E > 40$ keV.

G.O. Abell and P. J. E. Peebles (eds.), Objects of High Redshift, 233.