SPACE DISTRIBUTION OF X-RAY CLUSTERS OF GALAXIES

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The Intra-Cluster Plasma constitutes an archive of the past history of all clusters and of many groups of galaxies: statistical observations of their X-ray emission will set significant constraints on the dynamical, thermal and chemical events in these cosmic structures. Data on the local X-ray luminosity function $N(L, z \simeq 0)$ were provided by the 1st generation X-ray surveys. HEAO II provided an integral of $N(L, z)$ out to $z \simeq 0.4$, the counts from a subsample of the MSS (Gioia et al. 1984, *Ap.J.* **283**, 495): these counts result very *flat*, cf. Fig. 2.

We discuss these observations in the framework of the hierarchical clustering scenario for the dynamical structures, coupled with a two-components ICP: the average objects luminosity $L \propto M\rho T^{1/2} * [f_p + (1 - f_p)g(t)]^2$ depends also on the primordial ICP mass fraction f_p and on the accumulated fraction $g(t)$. In the extreme case $f_p \to 1$, the ICP is dominated by "primordial" gas (i.e. preceding the group era). At the other extreme $f_p \to 0$, dominant is the mass produced by stars and lost by galaxies following an initial burst of star formation, $g(t) \propto t^{\xi}$ ($\xi \lesssim 2/3$), or from a more even SFR, $g(t) \propto t$.

Figs. 1, 2 highlight some of our results, computed from $\partial N/\partial t + \partial(\dot{L}N)/\partial L = S(L, t)$; S is the t-derivative of a Press & Schechter-like multiplicity function, and $\dot{L}$ derives from L above.

These results are understood on taking over from the simple scaling laws used by White (1982, in *Morph. & Dyn. of Galaxies*) and by Kaiser (1986, *M.N.R.A.S.* **222**, 323). The l.f. scales as $N(L, z) \sim N_0[L/L_c(z)]/M_c L_c$, comprising a density evolution and a luminosity anti-evolution. The counts tend to be flattened at high fluxes by the current formation of rich clusters (cfr. Cavaliere et al. 1986, *Ap.J.* **305**, 651). At lower fluxes the d. evolution of poor clusters and groups [number $\propto 1/M_c \propto (1 + z)^{6/(n+3)}$] is balanced by the l. effect $L_c \propto (1 + z)^{(5+7n)/2(n+3)} * (1 + z)^{-3\xi}$. The counts tend to nearly Euclidean slope when $f_p \to 1$. But when $f_p \to 0$, L_c decreased sharply into the past: the lower ICP mass in older groups did offset any hierarchical trend to higher total densities. The net balance tilts toward flat counts for any $n \gtrsim -2$, if $\xi \gtrsim 1/2$.

If the counts will remain so flat with statistics increasing, their slope will require $f_p \lesssim 0.2$ (see Fig. 2); $f_p > 0.1$ is required by dissipative collapse of galaxies: the slope of the counts will constrain the efficiency of star formation (high) and the rate of galaxy evolution (continuous). Once f_p is assessed, finer information can be derived concerning not only the ICP age, but also cosmogony: e.g., flatter initial perturbation spectra and/or a larger variance in their probability distribution flatten the luminosity functions.

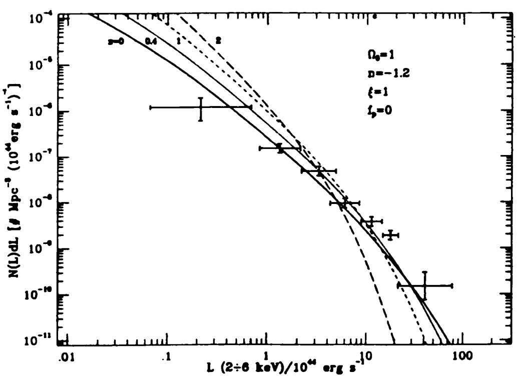

Fig.1

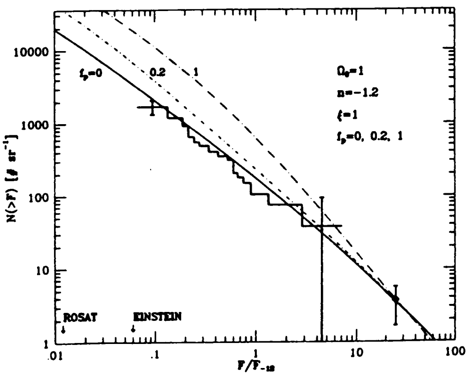

Fig.2

Fig. 1. The X-ray l.f. for $f_p = 0$, with $g(t) \propto t$ (data: Johnson et al. 1983, *Ap. J.* **266**, 425).
Fig. 2. Counts for the same model are compared with those for $f_p = 0.2$ and $f_p = 1$.

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