COOLING-FLOW MODELS OF THE X-RAY EMISSION AND TEMPERATURE PROFILES OF ELLIPTICAL GALAXIES

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We compare the results of a spherical, steady-state cooling-flow model with gas loss with the observed X-ray emission profiles and temperatures for five bright elliptical galaxies in Virgo and Fornax. We adopt a "thermal-instability" mass-loss prescription (following Sarazin & Ashe 1989) and refer to galaxy models constrained by radially extended stellar dynamical data (Saglia et al. 1992). Our cooling-flow models are specified by three free parameters: the mass accretion rate $\dot{m}_{ext}$ and the pressure p_{ext} at some external radius r_{ext}, and a dimensionless constant q, which regulates the mass deposition rate along the flow. We find that models with confining pressures of $p_{ext} \sim 4 \div 14 \times 10^3$K cm^{-3} and significant accretion rates of external material, up to 4M$_\odot$/yr, provide emission and temperature profiles in good agreement with present-day data. The trend shown in the right frame of the lower panel in the Figure suggests a possible correlation between L_X/L_B and the iron abundance in the gas inside ellipticals. A full account of this work, together with all the relevant references, is given in Bertin & Toniazzo (1995); here below, we add a comparison of the models with some recent ASCA data (Loewenstein et al. 1994; Mushotzky et al. 1994).

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TABLE 1. Properties of the selected models

NGC	q	$\dot{m}_{ext}$ ($M_\odot$/yr)	p_{ext} (10^3 ^{0}K/cm^3)	r_{ext} (kpc)	M_{gas} ($10^{10}M_\odot$)	log(L_X) (erg/s)	$\langle kT \rangle$ (keV)	$\dot{m}_{ext}/\alpha M_\star$
1399	0.6	4.1	7.6	200	19.55	42.29	1.24	3.65
1404	0.2	0.9	13.7	50	0.88	41.50	0.78	2.13
4374	0.8	0.1	6.3	60	0.51	41.35	0.85	0.07
4472	0.8	0.6	12.6	120	4.55	42.01	1.22	0.19
4636	0.4	3.0	3.8	160	8.20	42.02	0.80	2.02

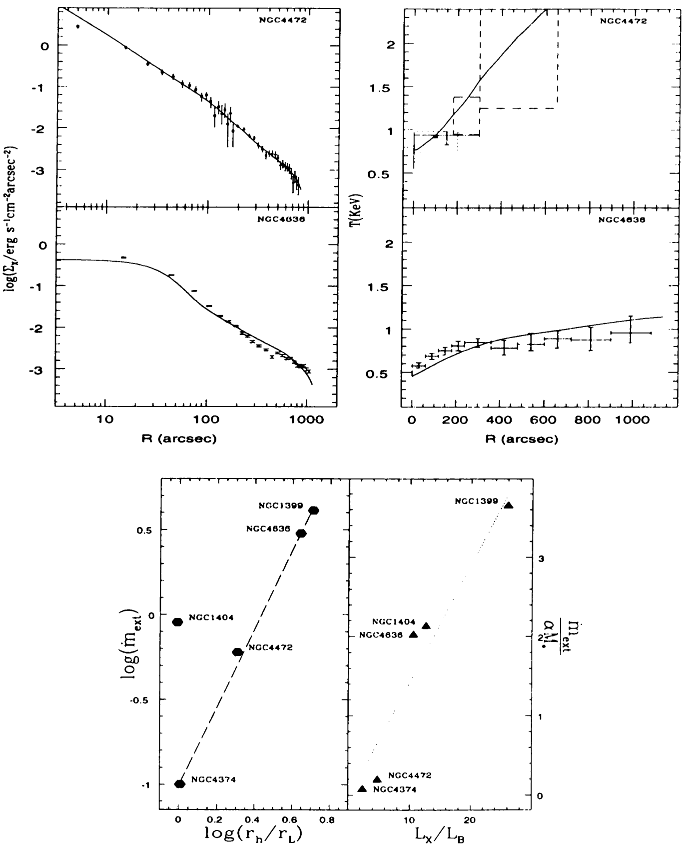

Figure 1. *Upper panels*: X-ray emission (left) and temperature (right) profiles for the selected models compared with ROSAT (for N4636, see Trinchieri et al. 1994) and Einstein+ASCA+BBXRT (for N4472) data. *Lower panel:* Left: the mass accretion rate $\dot{m}_{ext}$ is found to be larger for more diffuse halos. Here, r_h/r_L is the ratio of the half-mass radius of the *total* mass to that of the luminous mass distribution. Right: scaling of the dilution parameter $\dot{m}_{ext}/\alpha M_\star$ with the relative X-ray luminosity L_X/L_B.

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