Astrophysics > Cosmology and Extragalactic Astrophysics

X-ray properties expected from AGN feedback in elliptical galaxies

S. Pellegrini (1), L. Ciotti (1), J.P. Ostriker (2,3) ((1) Department of Astronomy, Bologna University, (2) Princeton University Observatory, (3) IoA, Cambridge)

(Submitted on 19 Jul 2011)

The ISM evolution of elliptical galaxies experiencing feedback from accretion onto a central black hole was studied recently with high-resolution 1D hydrodynamical simulations including radiative heating and pressure effects, a RIAF-like radiative efficiency, mechanical input from AGN winds, and accretion-driven starbursts. Here we focus on the observational properties of the models in the X-ray band (nuclear luminosity; hot ISM luminosity and temperature; temperature and brightness profiles during quiescence and during outbursts). The nuclear bursts last for ~10^7 yr, with a duty-cycle of a few X (10^-3-10^-2); the present epoch bolometric nuclear emission is very sub-Eddington. The ISM thermal luminosity \lx oscillates in phase with the nuclear one; this helps reproduce statistically the observed large \lx variation. In quiescence the temperature profile has a negative gradient; thanks to past outbursts, the brightness profile lacks the steep shape typical of inflowing models. Outbursts produce disturbances in these profiles. Most significantly, a hot bubble from shocked hot gas is inflated at the galaxy center; the bubble would be conical in shape, and show radio emission. The ISM resumes a smooth appearance on a time-scale of ~200 Myr; the duty-cycle of perturbances in the ISM is of the order of 5-10%. From the present analysis, additional input physics is important in the ISM-black hole coevolution, to fully account for the properties of real galaxies, as a confining external medium and a jet. The jet will reduce further the mass available for accretion (and then the Eddington ratio l), and may help, together with an external pressure, to produce flat or positive temperature gradient profiles (observed in high density environments). Alternatively, l can be reduced if the switch from high to low radiative efficiency takes place at a larger l than routinely assumed.

Comments:	40 pages, submitted to ApJ
Subjects:	**Cosmology and Extragalactic Astrophysics (astro-ph.CO)**; High Energy Astrophysical Phenomena (astro-ph.HE)
Cite as:	**arXiv:1107.3675 [astro-ph.CO]**
	(or **arXiv:1107.3675v1 [astro-ph.CO]** for this version)

Submission history

From: Silvia Pellegrini dr. [view email]
[v1] Tue, 19 Jul 2011 10:33:42 GMT (174kb)

Which authors of this paper are endorsers?