Mem. S.A.It. Vol. 79, 230

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On the Iwasawa-Taniguchi effect of radio-quiet AGN

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Abstract. We present convincing evidence for an anti-correlation between the equivalent width (EW) of the neutral iron Kα line and the X-ray luminosity in the largest catalog of radio-quiet AGN observed by XMM-Newton (the 'Iwasawa-Taniguchi' or 'X-ray Baldwin' effect). If the iron line is produced in a Compton-thick material, it should be accompanied by a Compton reflection component, whose behaviour with respect to luminosity should follow that of the line. Thanks to its broad-band coverage and large collecting area, Simbol-X will allow us to perform such a measure on many sources and to verify this assumption.

Key words. Galaxies: active – Galaxies: Seyfert – quasars: general – X-rays: general

1. Introduction

The existence of an anti-correlation between the EW of the neutral narrow core of the iron Kα emission line and the 2-10 keV luminosity (the so-called 'X-ray Baldwin' or 'Iwasawa-Taniguchi' effect) has been debated in the last years. We tested this claim on the largest catalogue of radio quiet AGN high-quality X-ray spectra ever published (157 objects: see Bianchi et al., 2007, for details). Fig. 1 shows the IT effect in our data, which is highly significant (the Spearman's rank coefficient is -0.33, Null Hypothesis Probability of 4×10^{-5}).

The most likely explanation is in terms of a luminosity-dependent covering factor of the Compton-thick torus. This is in agreement with the recent discovery of a non-linear relation between thermal emission from dust and optical luminosity in AGN, which implies a decrease of the covering factor of dust with luminosity, with a slope of $\simeq -0.18$ (Maiolino et al., 2007).

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2. Simbol-X and the IT effect

If the iron line is produced in a Compton-thick material, it should be accompanied by a Compton reflection component, whose behaviour with respect to luminosity should follow that of the line. Thanks to its broad-band coverage and large collecting area, Simbol-X will allow us to verify this scenario with great precision: see Fig. 2.

References

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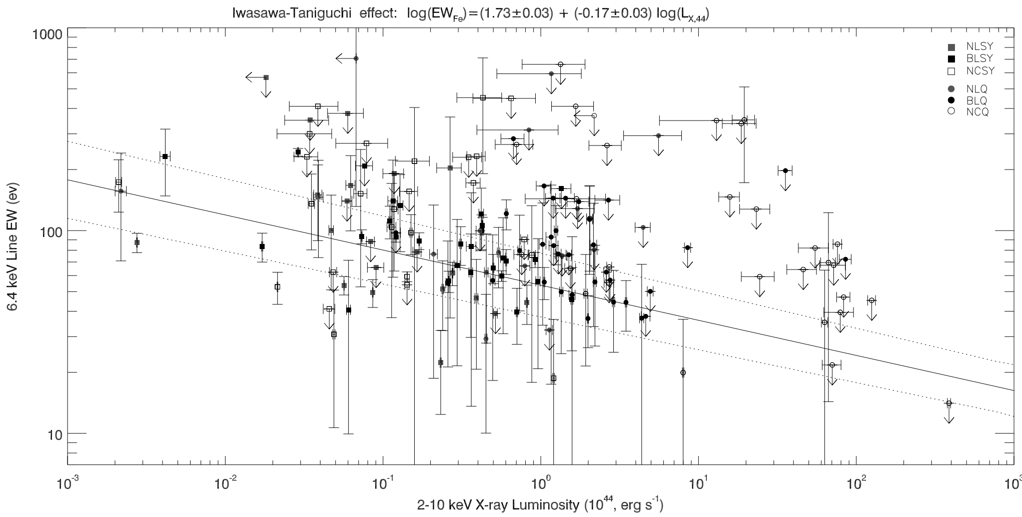

Fig. 1. The 'IT effect': neutral iron EW against 2-10 keV X-ray luminosity of radio-quiet AGN. The anti-correlation between the two parameters is shown as the best fit line, whose analytical expression is reported on the top, where EW_{Fe} is the EW of the neutral iron Kα line in eV and $L_{X,44}$ is the 2-10 keV X-ray luminosity in units of 10^{44} erg s^{-1}. The broken lines represent the combined error on the slope and normalization of the best fit. The different symbols refers to the classification of the objects, on the basis of their absolute magnitude and Hβ FWHM: *NLSY*, narrow-line Seyfert 1; *BLSY*, broad-line Seyfert 1; *NCSY*, not-classified Seyfert 1 (no Hβ FWHM measure available); *NLQ*, narrow-line quasar; *BLQ*, broad-line quasar; *NCQ*, not-classified quasar (no Hβ FWHM measure available). See Bianchi et al. (2007) for details.

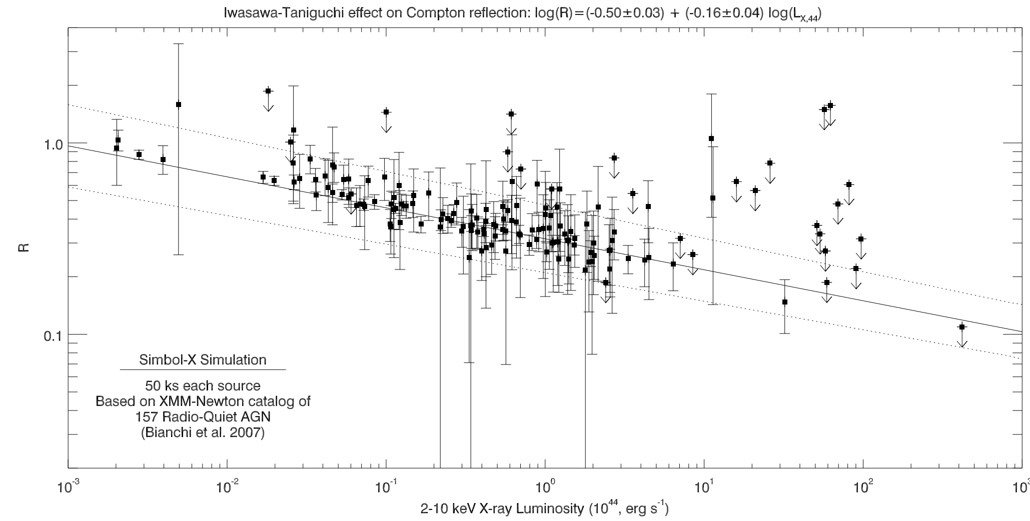

Fig. 2. The IT effect on the Compton reflection component R. The 157 data points are based on 50 ks simulated observations with Simbol-X, considering the X-ray luminosities of the objects included in the Bianchi et al. (2007) catalog and their best fit for the IT effect. The Spearman's rank coefficient for the best fit reported on the top is ρ=-0.53, for a Null Hypothesis Probability of 8×10^{-13}.