HOW UNBIASED IS A [OIII]λ5007-BRIGHT SAMPLE?

X-ray observations of Type-2 Seyfert galaxies with ASCA

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1. Introduction

We have observed a dozen bright Seyfert 2's selected by their [OIII]λ5007 emission line flux (Ueno et al 1996, Awaki et al 1996). We chose this to be a flux-limited sample free from X-ray selection effects such as intrinsic absorbing columns (N_{H}) and differences in viewing angle (Mulchaey et al 1994). Is it genuinely free from these selection effects? To investigate this, we compare the [OIII] luminosity of various Seyfert 2 galaxies. For this paper, we assume the Hubble constant to be $H_0 = 50\mathrm{km\ s^{-1}\ Mpc^{-1}}$.

2. Histogram of Absorbing Column Thickness

It is difficult to get an unbiased histogram of column density thickness, but important to the origin of the cosmic X-ray background (Awaki 1991, Comastri et al 1995), and determination of the spatial distribution of absorbing material.

We made a histogram of the absorbing column thickness of Seyfert 2's (Ueno et al 1997). One remarkable result is the concentration of the column densities between $10^{23} - 10^{24}\mathrm{cm^{-2}}$ for our [OIII]-selected sample. There are only a few objects with $N_{\mathrm{H}} > 10^{24}\mathrm{cm^{-2}}$ in our sample. However, the number of such sources could be an underestimate if extremely X-ray absorbed sources also have small [OIII] luminosities, possibly due to obscuration. Thus, we compare [OIII] luminosities in a larger Seyfert 2 sample, consisting of our [OIII]-selected sample, plus additional data to increase the number of completely X-ray absorbed sources.
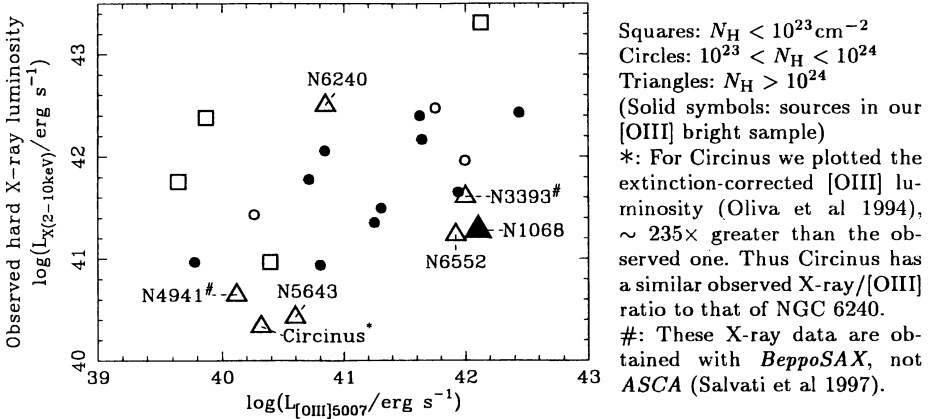
Figure 1. Plot of Hard X-ray vs. [OIII]λ5007 emission

3. Plot of Hard X-ray vs. [OIII]λ5007 emission

Figure 1 is a plot of hard X-ray vs. [OIII]λ5007 luminosity for Type-2 AGN. We distinguish between less absorbed ($N_H < 10^{23}$cm^{-2}), moderately absorbed ($10^{23} < N_H < 10^{24}$cm^{-2}) and completely blocked ($N_H > 10^{24}$cm^{-2}) AGN.

We found no significant correlation between [OIII]λ5007 luminosity and absorbing column thickness. This implies that an [OIII]λ5007 flux-limited sample should be reasonably free from X-ray selection effects such as intrinsic N_H and differences in viewing angle.

Most of the completely blocked sources have low observed hard X-ray luminosity when compared with other Seyfert 2s having the same [OIII] luminosity. This is consistent with a model in which only the scattered X-ray emission is visible. The exceptions so far are NGC 6240 and Circinus. The large X-ray/[OIII] ratios in NGC 6240 may also be due to a reduction in the observed [OIII]λ5007 line flux due to reddening, as reported in Circinus (Oliva et al 1994).

4. References

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