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Emission Line Properties of Seyfert 1 Type AGN from RASS

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Abstract. We present the optical emission line properties of a sample of 155 bright X-ray selected *ROSAT* Seyfert 1 type AGN. The measured properties are gathered for correlation analysis. The strong correlations between Hβ redshift, flux ratios of Fe II to Hβ broad component and [O III] to Hβ narrow component are found.

1. Introduction

Optical spectra of Active Galactic Nuclei (AGN) exhibit an extremely wide variety of properties. Multi-wavelength observations of well-defined source samples have proved a effective means in understanding the physical processes in AGN. A large and homogeneous X-ray selected AGN sample is therefore in great importance in studying the correlations between the optical to soft X-ray continuum and optical emission line properties of AGN.

The present sample of 155 Type 1 AGN results from the the optical identification of the X-ray sources with high X-ray to optical flux ratio (f_X/f_{opt}) discovered in the RASS (Wei et al. 1999). Forty out of 155 sources are known AGN which meet our selection criteria.[1]

2. Optical Measurements

In many of the spectra there is a clear contribution from blends of Fe II line emission on both the blue and red sides of the Hβ-[O III] complex. In order to reliably measure line parameters and to determine the strength of the Fe II emission, we have carefully removed the Fe II multiplets following the method described by Boroson & Green(1992) which relies on an Fe II template.

[1]The selection criteria of the sample are: an alternative high X-ray-to-optical flux ratio criterion, i.e., $\log \mathrm{CR} \geq -0.4\,\mathrm{R} + 4.9$, where CR and R represent X-ray count rate and R magnitude respectively; declination $\delta \geq 3°$; galactic latitude $|\mathrm{b}| \geq 20°$; optical counterparts within a circle with radius $\mathrm{r} = \mathrm{r}_1 + 5''$, where r_1 is the RASS position error given by Voges et al.(1996); optical counterparts with R magnitudes between 13.5 and 16.5.

The Fe II subtracted spectra were used to measure the non-Fe II line properties. We have assumed that the emission line profiles can be represented by a single or a combination of Gaussian profiles.

The optical index α_{opt} was calculated using the continuum flux density at 4400Å and 7000Å in the rest frame. The X-ray spectral slope α_x is defined between 0.1 and 2.0 keV.

3. Correlations Analysis

we explore whether the various emission-line and continuum properties correlate with one another. For this purpose, we calculated the the Spearman rank-order correlation matrix, along with its significance matrix for measured properties. A set of 12 different properties results in 66 correlation coefficients. Among them, 31 correlations were found with two-sided probabilities Ps < 0.01.

The most striking correlations found in the present work are three correlations involving the Hβ redshift (or blueshift), flux ratios of Fe II to Hβ broad component (Fe II/Hβ_b) and [O III] to Hβ narrow component ([O III]/Hβ_n). The correlations covering [O III]/Hβ_n have never been investigated by other authors so far. There is a trend that strong Fe II/Hβ_b–weak [O III]/Hβ_n objects tend to have blueshift in Hβ while strong [O III]/Hβ_n– weak Fe II/Hβ_b tend to have redshift in Hβ. These strong correlations between Fe II/Hβ_b, Hβ redshift and [O III]/Hβ_n must reflect some physical connection between broad and narrow line emitting regions. Our results reinforce the interpretation of the "Eigenvector 1 correlations" found in Boroson & Green (1992) as driven mainly by L/L_{Edd} (Boroson 2002).

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