Publ. Astron. Obs. Belgrade No. 86 (2009), 407 *MSc thesis*

THE Fe II, [O III] AND C IV EMISSION REGIONS IN SPECTRA OF ACTIVE GALACTIC NUCLEI

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Abstract. We have investigated the Fe II ($\lambda\lambda$4450-5350 Å), [O III]$\lambda\lambda$4959, 5007 Å and C IV λ1549 Å emission regions of AGN by analyzing large sample of $\sim$ 130 AGN spectra. Those regions are specially interesting because there are many correlations and characteristics of Fe II, [O III] and C IV lines, which are not explained. Analysis of those correlations may help in investigation of physical and kinematical properties of those regions.

[O III] $\lambda\lambda$4959, 5007 Å lines are forbidden doublet. The flux ratio of doublet components is constant value and it does not depend on the physical properties of the emission region. We measured the value of the flux ratio using the sample of 62 AGN spectra, in order to compare our result with previous, one that were obtained from emission nebula, and with theoretical ones. We obtained the result of flux ratio: $[\mathrm{OIII}]_{5007}/[\mathrm{OIII}]_{4959}$=2.993±0.014 (Dimitrijević et al. 2007), which confirmed the theoretical calculations.

We have investigated the kinematical properties of AGNs, by analyzing the asymmetry of C IV and [O III] lines. In order to find kinematical connection between Narrow Line Region (NLR) where [O III] lines arise and Broad Line Region (BLR) where C IV lines arise, we compared their asymmetries. We found no correlation between their asymmetries, but a significant trend was observed. Also, we found kinematical connection among regions where the core of [O III] and the wings of C IV lines is formed. It is observed that kinematical properties and the degree of found correlations depend on the radio properties of AGNs.

Optical Fe II lines are analyzed in order to make the approach to many unresolved problems connected with Fe II emission (e.g. additional mechanism of excitation, geometrical place of Fe II emission region, unexplained correlations with other lines). In order to make more precise analysis, we separated those lines in three groups, according to their lower level of transition. On this way we connected the atomic Fe II properties with physical conditions in the Fe II emitting region. We compared the kinematical properties of the emission regions of Fe II and Balmer lines (Hα and Hβ), by comparing their shifts and widths. We found that the Fe II lines originate from the Intermediate Line Region, which is placed between the BLR and NLR. Correlations among the luminosities of the Fe II lines and other considered lines in spectra ([O III], [N II], Hα, Hβ) are observed. We found that the luminosity of the Fe II lines is in significant correlation with the luminosities of all considered lines, except for the [O III] lines. This exception needs further investigation in order to explaine its physical background.

References

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