PHYSICAL PROPERTIES OF THE BROAD LINE REGION IN ACTIVE GALACTIC NUCLEI

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Abstract. One of the most intriguing objects in the Universe are active galactic nuclei (AGN), being the brightest and the most distant objects. The most accepted scenario of the structure of AGN is the one in which AGN are powered by the accretion of matter from the host galaxy on to super-massive black hole. One of the ways to study the inner emitting region of an AGN, one that is closest to the black hole, is by analyzing its broad emission lines (BELs). These lines originate in the broad line region (BLR), which physics is still not fully understood. In order to probe the physical properties of the emitting plasma in the BLR we analyze the ratios of the following BELs: the hydrogen Balmer lines (Hα to Hε) and the helium lines from two subsequent ionization levels (He II λ4686 and He I λ5876). We used two samples of the BELs, one obtained from the spectral synthesis photoionization code and the other taken from the Sloan Digital Sky Survey database. We investigate the above BELs in order to find conditions in the BLR where so-called Boltzmann-plot (BP) method might be applicable. For these special cases, we found relations between the average temperature, hydrogen density and He II/He I line ratio. We estimated the physical parameters in the BLR, the average temperature and hydrogen density, to be in the range T_{av}=5700-18700 K and n_H=$10^{8.2}$-$10^{11.1}$ cm^{-3}. Moreover, we found relations between the BLR physical parameters and gas velocities, indicating that there should be some connection between the physics and kinematics in the BLR.