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Progress report

HYDROGEN BALMER EMISSION LINES AND THE COMPLEX BLR STRUCTURE

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Very close to the center of Active Galactic Nuclei (AGN), we can detect the presence of a photo-ionized plasma, that emits a spectrum of several recombination lines, whose profiles, broadened by the Doppler effect of velocity fields largely exceeding $10^3\,\mathrm{km\,s^{-1}}$, led us to introduce the name of Broad Line Region (BLR). Looking at the properties of the broad emission lines, we are now fairly aware about some of the fundamental BLR physics: we know that the plasma is charcterized by a high particle density, where the emission of lines coming from forbidden transitions is suppressed by the large rate of collisions, and that it has an optically thick component, for the ionizing radiation, which accounts for the presence of both high and low ionization stages in the gas. Since this component may only cover a small fraction of the sky, as seen by the central source, we infer that the broad line emitting plasma is arranged in a large number of small emitting clumps. At present, we know very little about the complex kinematical configurations which could support such a scenario. Since we accept that AGN are powered by matter accretion into the gravitational field of Super Massive Black Holes (SMBH), it is likely that this may occur through an accretion disk and that the BLR itself might be considerably flattened. Although there were several attempts to connect the BLR properties with models based on accretion disks, many of them have large difficulties in reproducing the observed spectra. In order to improve our understanding of the physical processes, which occur in the AGN central engines, here we describe the results that we obtained from our analysis of the broad Balmer emission line components. Adopting a technique for kinematical investigation, we show that the emission line broadening functions place some constraints, onto the BLR geometry and orientation, that are in good agreement with a two-component structural model. Therefore, we develop a modified scheme to estimate the mass and accretion rate onto the SMBH and we discuss the intriguing possibility to estimate their influence on the BLR gas thermodynamics.