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On the origin of steep emissivity profiles in AGN accretion discs

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X-ray observations suggest high compactness of coronæ in active galactic nuclei as well as in X-ray binaries. The compactness of the source implies a strong radial dependence in the illumination of the accretion disk. This will, for any reasonable radial profile of the density, lead to a radial profile of the disk ionization. Thus, an artificial increase of the radial emissivity parameter can be seen by assuming a radially structured ionization profile of the disk. We have investigated the effect of radial ionization profiles on the observed X-ray spectra and quantified it for a wide range of parameters. In this talk, I will present the results obtained from simulations which were carried out with the current state-of-the-art models for relativistic reflection. We simulated spectra using the response files of the microcalorimeter X-IFU, which is planned to be on board of Athena. We assumed typical parameters for X-ray bright Seyfert-1 galaxies and considered two scenarios for the disk ionization: (1) a radial profile for the disk ionization and (2) a constant disk ionization. Our results suggest that steep emissivity profiles can be indeed achieved due to the radial profile of the disk ionization, which becomes more important for the cases where the corona is located at low heights above the black hole and this effect may even be more prominent than the geometrical effects. We also discuss how this might affect black hole spin measurements.

Topic

Active Galactic Nuclei: accretion physics and evolution across cosmic time

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